

Oregon EJ Mapping Decision Points 4-6

Welcome Package



Welcome!

By Environmental Justice Mapping Leadership Team:

Hoang-Van Nguyen & Eric Main

Welcome Environmental Justice Council to your Decision Points 4-6 information session with the Environmental Justice Mapping Tool Leadership Team!

We look forward to orienting you with the considerations influencing staff's recommendations for Decision Point 3a.

Let's learn together!

INSIDE

OBJECTIVES & OUTCOMES

How will this help with future EJC decisions?

BACKGROUND INFO

DECISION POINTS #4, #5, & #6

Briefing and considerations.

Objectives & Outcomes

We organized these information sessions with the following objectives and outcomes in mind.

Objectives:

1. Brief Oregon Environmental Justice Council members on upcoming mapping Decision Points #4, #5, & #6.
2. Address questions regarding recommendations for Decision Points #4, #5, & #6.
3. Provide context about how Decision Points #4, #5, & #6 contribute to development of the Oregon Environmental Justice Mapping Tool.

Outcomes:

1. Empower EJC members to meaningfully discuss and deliberate on Decision Point #4, #5, & #6.
2. Prepare the Council adopt recommendations on Decision #4, #5, & #6.

Methodology Workgroup Membership

By Eric Main

The following agencies from State and Local government and academic institutions are participants in the Methodology Working Group

State:

Oregon Health Authority, Department of Environmental Quality, Department of Administrative Services, Department of Transportation, Department of Land Conservation and Development, Department of Forestry, Department of Agriculture, Department of Energy, Department of Human Services, Public Utilities Commission

Local:

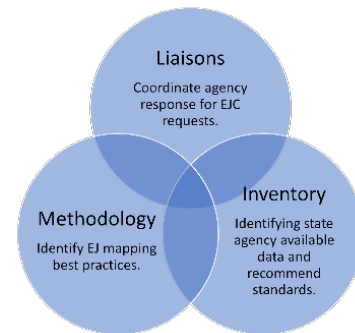
Portland Metro, Multnomah County Public Health

Academic:

Portland State University - Population Research Center and Oregon State University - Institute for Natural Resources

Working Group Roles

By Hoang-Van Nguyen, Eric Main, & Melissa Foltz



DEQ, OHA, DAS, OSU Institute for Natural Resources, and PSU Population Research Center form the Environmental Justice Mapping Tool Leadership team.

Liaison Team: These are liaisons to the EJC with representatives from 16 state agencies. They are led by Environmental Justice Council & Policy Coordinator, Hoang-Van Nguyen.

Methodology Team: This is a workgroup of technical experts from state and local agencies and academic partners led by OHA, Eric Main providing support regarding decision points.

Inventory Team: This is a workgroup of data experts from state agencies who will collect and analyze state agency data led by DAS, Melissa Foltz.

Adopted Decisions

By Hoang-Van Nguyen

Decision Point #1 Indicator Domains: Place and People

Decision Point #2 Geographic Units: Census Tracts

Decision Point #3: Compare Communities by Designation and Statewide and use Small and Large City Designations for Micropolitan and Urban

EJ Mapping Decision Points Summary



By Eric Main

The 10 decision points for the Environmental Justice Council are based on best practices for building composite indices used to identify communities experiencing disproportionate environmental burdens, health and social disparities, and community benefits and opportunities.

The decision points include:

1. Domain selection: April 2024
2. Geographic units: April 2024
3. Geographic comparisons and community designations: June 2024
4. Domain/indicator weighting: October 2024
5. Domain aggregation: October 2024
6. Data standardization: October 2024
7. Indicator selection: Planned April 2025
8. Sensitivity analysis
9. EJ community threshold
10. Visualizations

Listening Sessions

By Hoang-Van Nguyen & Eric Main

First listening Session: To be determined

Listening sessions will be with hosted in Oregon communities and tribal communities to collect information about their lived experiences within their environment. The goal is to understand environmental burdens and benefits and their influences on human health and quality of life.

This information is essential to the Environmental Justice Mapping Tool project since it will guide how we identify environmental justice communities, so they have better opportunity to receive governmental funding to improve their lives.

Leadership Team Membership

By Hoang-Van Nguyen

The EJC is the sponsor and decision maker for the Oregon Environmental Justice Mapping tool.

The following state agencies and academic partners make up the Oregon Environmental Justice Mapping Tool the Leadership Team:

State Agencies:

Department of Environmental Quality, Oregon Health Authority, and Department of Administrative Services.

Academic Partners:

Oregon State University, Institute for Natural Resources and Portland State University, Population Research Center.

Decision Point #4

Introduction

By Eric Main

The Methodology Workgroup evaluated 5 weighting methods using indicators from the U.S. Climate Vulnerability Index to populate Oregon EJ Mapping Tool domains:

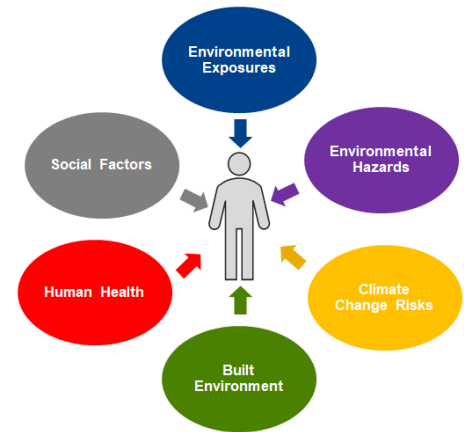
- No Weighting - All weights and domains are weighted the same facilitating easy interpretation of the index by a range of end-users.
- Colorado EnviroScreen Weighting - Environmental Hazard and Climate Vulnerability domains are weighted half as much as Environmental Exposures because the population may not be directly exposed to hazards and climate change risks. Human Health and Social Factors are weighted equally.
- Regression Weighting - indicator domains are weighted by the strength of their relationship with life expectancy at birth.
- Principal Component Analysis - indicator weights are determined by variance in the data and relative importance of the indicators within the domains. Domains are aggregated after indicators are weighted.
- Conjoint Analysis - community preference surveys + technical expert input.

The steps taken to setup the EJ index models for the evaluation include:

- Select Indicators from the U.S. Climate Vulnerability Index.
- Categorize indicators by subdomain - environmental exposures, environmental hazards, climate change risks, built environment, human health, social factors.
- Standardize raw indicator values as percentiles.
- Analyze weighting methods.
- Compare results - tracts in the 80th percentile by community designation.

EJC October 2024 Decision Point #4

By Eric Main



The Environmental Justice Mapping Tool Leadership Team will request the Environmental Justice Council to decide on the fourth decision point during their October 10, 2024 meeting.

Decision point #4: Weighting

Why is weighting important?

- Indicator weights represent the relative importance of each indicator as it contributes to the index.
- If an index does not apply any weights explicitly, the indicators will be equally weighted. However, if some indicators or domains “matter” more than others, different weighting should be applied.
- Whether choosing to keep equal weights or alter weights to favor indicators, the choice of weights is subjective and should be backed by a strong rationale.

Decision Point #5

Introduction

By Eric Main

The Methodology Workgroup evaluated two indicator and domain aggregation methods commonly used in composite indices: additive and multiplicative.

Additive Model

CDC Environmental Justice Index Rationale:

Additive models allow for a greater influence of individual modules on the overall model. In the case of the EJI, this means that a community that experiences high levels of social vulnerability and environmental burden could receive a high overall EJI score, even if it does not score high for health vulnerability. This feature may be seen as a strength or a weakness of the model, something which has been a topic of debate in states which have implemented a multiplicative model.

Multiplicative Model

CalEnviroScreen Rationale:

- Existing research on environmental pollutants and health risk has consistently identified socioeconomic and sensitivity factors as “effect modifiers” that multiply the risks posed by the pollutants.
- Some people (such as children) may be 10 times more sensitive to some chemical exposures than others. Risk assessments apply numerical factors or multipliers to account for potential human sensitivity in deriving acceptable exposure levels (US EPA, 2012).
- Priority rankings done by various emergency response organizations to score threats have used scoring systems with the formula: **Risk = Threat x Vulnerability** (Brody et al., 2012).

EJC October 2024 Decision Point #5

By Eric Main

The Environmental Justice Mapping Tool Leadership Team will request the Environmental Justice Council to decide on the fifth decision point during their October 10, 2024 meeting.

Decision point #5: Data Aggregation

Why is data aggregation important?

Data aggregation is the function of combining multiple indicators into one value. Indicator and domain aggregation reflects our understanding of how health effects from environmental burdens are intensified by pre-existing health conditions and social factors.

Key terms:

Cumulative Impacts - when multiple sources of pollution and other environmental stressors combine over time to cause adverse effects to human health and wellbeing.

Additive Effects - when the effects of one exposure are independent of other exposures.

Multiplicative Effects - when the effects of one exposure are associated with other exposures.

Synergistic Effects - when combined impacts are greater than the sum of individual impacts.

Decision Point #6

Introduction

By Eric Main

The Methodology Workgroup evaluated two indicator standardization methods commonly used in composite indices: percentiles and z-scores.

Percentiles - quantiles obtained by adopting a subdivision into 100 groups. The n th percentile of a set of data is the value at which n percent of the data is below it. For example, a percentile score of 25 means that 25% of the other scores are lower.

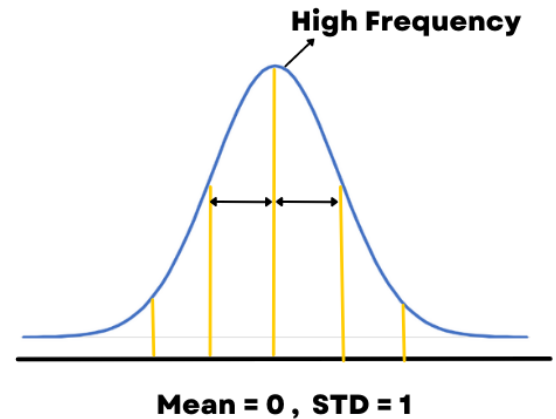
Rationale for Percentiles: indicators used in environmental justice analyses have varying underlying distributions. Percentile rank calculations provide a useful way to describe data without making any potentially unwarranted assumptions about those distributions. A community's percentile for a given indicator simply tells the percentage of communities with lower values of that indicator.

Z-score - the distance and direction of an observation away from the population mean. If a z-score is equal to 0, it is on the mean. A positive z-score indicates the raw score is higher than the mean average. For example, if a z-score is equal to +1, it is 1 standard deviation above the mean.

Rationale for Z-Scores: z-scores are used to identify outliers and similarities between populations. Indicators with extreme values thus have a greater effect on the composite index. This might be desirable if the intention is to reward exceptional behavior. Caution should be taken when using z-scores when extreme result in wide ranges. It may be necessary to cap high and low z-scores, exclude the best and worst sub-indicator scores from inclusion in the index or assign differential weights based on the "desirability" of the sub-indicator scores.

EJC October 2024 Decision Point #6

By Eric Main



The Environmental Justice Mapping Tool Leadership Team will request the Environmental Justice Council to decide on the sixth decision point during their October 10, 2024 meeting.

Decision point #6: Data Standardization

Why is data standardization important?

Raw indicator data units can differ by a lot and are often incompatible for aggregation inside a composite index. For example, it would not make sense to combine median income in census tracts with percent of population living with a disability because one value is monetary and the other is a percentage. Therefore, it is necessary to normalize or standardized the data by converting it to quantiles like percentiles or z-scores.

REFERENCE

Decision Point #4 Recommendation

EJ Council decisions needed for Decision Point 4:

Selection of a preferred indicator and domain weighting method for the Oregon Environmental Justice Mapping Tool version 1.0 and selection of a preferred indicator and domain weighting method for future versions of the tool.

1. The Methodology Workgroup recommends using principal component analysis to weight indicators within domains for the Oregon Environmental Justice Index Tool. There is currently no recommendation for weighting domains separately. Domain weighting should be re-evaluated during the sensitivity analysis to determine whether adjustments are appropriate.
2. The Methodology Workgroup also recommends transitioning to participatory weighting of indicators and domains using conjoint analysis for future versions of the Oregon Environmental Justice Index Tool. Participatory weighting should include community survey input and technical expert consultation.

Rationale for Principal Component Analysis:

- We know that environmental factors impact human health and quality of life, and the effects are not equal.
- Applying toxicology methods like relative risk assessment is not an appropriate approach to indicator weighting because there are too many individual factors that influence human health and quality of life.
- Principal component analysis does not quantify environmental health risks; however, it allows us to weight indicators by the level of variability in the data and thus, their influence on the domains.
- Evaluating the relationships between environmental indicators, social factors, and human health using PCA will allow for adjustments to indicator weights if necessary.
- Statistical weighting methods have some disadvantages, but it is a better starting point than equal or semi-equal weighting.

Rationale for Conjoint Analysis:

- HB4077 requires Oregon community participation in the development of the Environmental Justice Mapping Tool.
- Conjoint analysis will give us greater opportunities to incorporate community concerns into indicator weighting.
- Unfortunately, the time and resources required for setting up community online surveys and analyzing the data prevent us from using conjoint analysis for the first version of the Oregon Environmental Justice Mapping Tool.

Decision Point #5 Recommendation

EJ Council decisions needed for Decision Point 5:

Selection of a preferred indicator and domain aggregation method for the Oregon Environmental Justice Mapping Tool.

The Methodology Workgroup recommends using CalEnviroScreen's multiplicative approach to domain aggregation where the subdomains are summed, but the primary domains (Place & People) are multiplied.

$$(\text{Environmental Exposures} + \text{Environmental Hazards} + \text{Climate Change Risks} + \text{Built Environment})/4 \times (\text{Human Health} + \text{Social Factors})/2 = \text{EJ Index Score}$$

Rationale for using multiplicative domain aggregation:

- Cumulative impacts are not independent. Health effects caused by environmental exposures are multiplicative in vulnerable populations (McHale et al., 2017).
- Evidence from human studies have shown that population characteristics can modify the response to pollution burden multiplicatively, providing scientific support for the use of a multiplier (Alexeeff et al., 2012).
- Priority rankings done by various emergency response organizations to score threats have used scoring systems with the formula: **Risk = Threat x Vulnerability** (Brody et al., 2012).
- Applying additive aggregation to subdomains will provide more insight into the interactions of the indicators (VanderWeele & Knol, 2014).

Decision Point #6 Recommendation

EJ Council decisions needed for Decision Point 6:

Selection of a preferred data aggregation method for the Oregon Environmental Justice Mapping Tool.

The Methodology Workgroup recommends:

- Standardizing raw indicator values using z-scores.
- Reducing the effects of extreme outliers in the data.
- Rescaling z-scores between 1-99 percent for easier interpretation.
- Using a process called "winsorization" to reduce outliers and rescale the z-scores.
- For future versions of the Oregon EJ Mapping Tool, explore the feasibility of identifying optimal indicator scores and scale the data by distance from the optimal score or reference point.
- A percentile does not describe the magnitude of the difference between two or more communities. For example, a community ranked in the 30th percentile is not necessarily three times more impacted than a community ranked in the 10th percentile.
- Investments in communities should be made where risks are the worst. Z-scores are more accurate than percentiles at identifying outliers and similarities between communities. Indicators with extreme values thus have a greater effect on the composite index.
- It may be necessary to cap high and low z-scores to avoid skewing the mean indicator scores.
- The Methodology Workgroup endorses further exploration of setting reference points for indicators because it can show whether a goal is achieved for a community or how far it is away from reaching a goal.