OCTOBER 2024

# ENVIRONMENTAL JUSTICE COUNCIL MEETING

## Hosted by Oregon Environmental Justice Council

This meeting will be recorded and available on the Environmental Justice Council website: https://www.oregon.gov/gov/policies/pages/environmental-justice-council.aspx

# **Environmental Justice Council Members**

- Chair Quinn Read
- Vice Chair Valentín Sánchez
- Youth Rep Danny Cage
- OCAPIA Liaison Aparna Rajagopal-Durbin
- OCBA Liaison Ben Duncan\*
- OCHA Liaison Gustavo Morales
- LCIS Liaison Vacant

- Jim Kreider
- Tiffany Monroe
- Katie Murray
- Huy Ong
- Victoria (Vee) Paykar
- Amanda Sullivan-Astor

OCBA Liaison Duncan will be replaced by recently appointed OCBA Liaison J'Reyesha Brannon after the October 2024 EJC meeting.

# Today's Agenda

Agenda Item #2: EJC Leadership Updates
 Agenda Item #2: Dublic Commonst #4

- Agenda Item #3: Public Comment #1
- Agenda Item #4: Decision Point 4
- Agenda Item #5: Break Before Working Lunch
- Agenda Item #6: Decision Point 5
- Agenda Item #7: Decision Point 6
- Agenda Item #8: Agency Annual Reports
- Agenda Item #9: Public Comment
- Agenda Item #10: Public Comment: Council Discussion

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Agenda Item #11: Council Adjourn

October 10, 2024



# AGENDA ITEM #2

EJC Leadership Updates



# AGENDA ITEM #3

**Public Comment** 



# Leadership Updates

2025 EJC Meeting Schedule

- 2025 EJC Meetings (Hybrid)
  - February 13, 2025 (Salem)
  - April 10, 2025 (Astoria)
  - June 12, 2025 (Newberg)
  - August 14, 2025 (Tillamook)
  - October 9, 2025 (Prineville))
  - December 11, 2025 (Portland)



• Travel Updates

# Leadership Updates

Interim EJ Mapping Report

 Submitted to the Governor's Office on 9/13/2024 G-G Consultations

 In development by EJC Leadership

# Leadership Updates



- Plan for \$50,000 one-time appropriation
- Expires June 30, 2025
- EJ Mapping Tool Updates
- Elevate Shared Agency Needs

# EJC Meetings Projected Schedule (Now – 2025)

October 2024	Decision Points 4, 5, & 6
December 2024	Decision Point 7 Orientation
February 2025	Decision Point 7 Deeper Dive
April 2025	Decision Point 7 Indicator Selection Determinations
June 2025	Decision Point 8 Sensitivity Analysis Part 1 Short Session Funding Expiration
August 2025	Decision Point 8 Sensitivity Analysis Part 2
September 2025	HB4077 Statutory Deadline
October 2025	Decision Point 8 Sensitivity Analysis Part 3
December 2025	Community Listening Session Analysis

## EJC Meetings Projected Schedule (2026 – 2027)

February 2026	Local Government Feedback & Tribal Government/Community Feedback
April 2026	State Agency Focus Group Feedback
June 2026	Decision Point 9 Community Thresholds & 10 Application Design
August 2026	Decision Point 9 Community Thresholds & 10 Application Design
October 2026	Application Testing Part 1
December 2026	Application Testing Part 2
February 2027	Beta Testing & Guidance Development
April 2027	Beta Testing & Guidance Development
June 2027	Beta Testing & Guidance Development
August 2027	Draft EJ Mapping Implementation Report
October 2027	EJ Mapping Tool Rollout Communication Plan and Training Opportunities
December 2027	Finalize EJ Mapping Implementation Report

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EJ Mapping Decision Point 4



# Oregon EJ Mapping Tool Project Processes

#### Environmental Justice Mapping Decision Points

- Guide technical development
- Provide policy guidance
- Adopted by Oregon EJC

#### Implementation Guidance

- Guided by Decision Points and Listening Sessions
- Developed in collaboration with state agencies
- Adopted by Oregon EJC

#### Listening Sessions

- Inform indicator selection
- Inform policy guidance
- Participation from Oregon communities from Coastal, Rural, Remote, Large Cities, and Small Cities.
- Development guided by Oregon EJC

#### Foundational Decision Points

- Decision Point 1: Indicator Domain Selection
- Decision Point 2: Geographic Units
- Decision Point 3: Geographic Designations & Geographic Comparisons
- Decision Point 4: Weighting
- Decision Point 5: Domain Aggregation
- Decision Point 6: Data Standardization

### Community and Policy Driven Decision Points

- Decision Point 7: Indicator Selection
- Decision Point 8: Sensitivity Analysis
- Decision Point 9: Environmental Justice Community Thresholds & Flags

#### **User Interface Decision Point**

• Decision Point 10: Environmental Justice Mapping Visualizations & Reporting

# **DECISION POINTS 1-10**





# **DECISION POINT #4 – DOMAIN WEIGHTING**

### **Introduction**

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 #4 – DOMAIN WEIGHTING**



# Why is weighting so complicated?

# **DECISION POINT #4 – DETERMINANTS OF HEALTH**



Social and Environmental Determinants of Health

Image source: Whitehead, M. & Dahlgren, G. (1991). What can we do about inequalities in health? *The Lancet,* 338, 1059-1063.

# What Accounts for Differences in Health?

- Genetics (5%)
- Personal Behaviors (30%)
- Quality of Health Care (10%)
- Social and Environmental Conditions (55%)

### **DECISION POINT #4 – CUMULATIVE RISK ASSESSMENT**



Setting - Community Pathway - Ambient Air Exposure – Inhalation Stressor – Nitrogen Dioxide Exposure Time – 2 years Exposure Concentration – 250 ppb

#### **Short-Term Health Risks**

- Eye irritation
- Coughing
- Wheezing

### Long-Term Health Risks

- Reduced lung function
- Heart attack

### **Stressors**

- Age
- Sex
- Race/Ethnicity
- Economic status
- Individual behavior
- Pre-existing health conditions

Framework for Cumulative Risk Assessment. –EPA (May 2023)

## **DECISION POINT #4 – CUMULATIVE IMPACTS**

"The total harm to human health that occurs from the combination of environmental burden such as pollution and poor environmental conditions, pre-existing health conditions, and social factors such as access to quality healthcare." -HHS (2022)



## **DECISION POINT #4 – CUMULATIVE IMPACTS**



### **Community B**

**Air Pollution** 

**Poor Water Quality** 

**Extreme Heat** 

Language Barriers

Historic Racism



**Excess Heart Disease** 

## **DECISION POINT #4 – WHAT WE KNOW**

- Some of the environmental burdens listed in HB4077 affect human health and quality of life very differently. For example, environmental exposures impact communities differently than environmental hazards or climate change risks, although they can be related.
- Environmental burdens affect individual health unequally in ways that can be difficult to quantify.
- Some environmental burdens impact communities more inequitably than others.
- There are inverse relationships between some environmental burdens. For example, communities experiencing low PM2.5 concentrations can experience high ozone concentrations.

# **DECISION POINT #4 – WEIGHTING METHODS**

- No Weighting All weights and domains are weighted the same facilitating easy interpretation of the index by a range of end-users.
- <u>CalEnviroScreen</u> Weighting Environmental Hazard and Climate Vulnerability domains are weighted half as much as Environmental Exposures because the population may not be directly or regularly exposed to hazards and climate change risks. Human Health and Social Factors are weighted equally.
- Principal Component Analysis indicator weights are determined by variance in the data and influence of each indicator on the subdomain. Domains are aggregated after indicators are weighted.
- Conjoint Analysis community preference surveys + technical expert input.

### Equal Weighting Method - CDC Environmental Justice Index



- All indicators and domains are weighted equally.
- For example, if a domain has 6 indicators, each indicator will receive a weight of 16.67% (100/6).
- Domains are only weighted the same if they have an equal number of indicators.

"Due to a lack of scientific evidence supporting a specific weighting scheme, all modules are weighted equally in calculating the Overall EJI Score." ~CDC/ATSDR, 2022

Subdomain Weighting Method - Colorado EnviroScreen





### Principal Component Analysis – EPA Environmental Quality Index



- In PCA individual indicators are weighted instead of the domains. The indicator weights then influence the domain weights.
- PCA measures the covariance between indicator scores. In other words, PCA measures the magnitude of <u>inequities</u> that exist between communities for selected indicators.
- Indicators are loaded into a covariance matrix and weighted based on their variance compared to other indicators.



High positive covariance (Household income)



High negative covariance (People 65 and older)



Low negative covariance (Percent unemployed)

 Indicators with higher variation (inequities) will receive higher weights. Indicators with lower variation in their scores will receive lower weights.



### High positive covariance



Low positive covariance



### High negative covariance



#### Low negative covariance



- PCA helps to simplify data by finding new features, called principal components, that capture the most significant patterns in the data. PCA first finds the axis of greatest variation, which is the line of best fit between the data points. This line is called the first principal component. Perpendicular lines of best fit are added to the model to explain the next greatest levels of variance, which make up the subsequent components.
- These principal components are ordered by importance, with the first component explaining the most variance in the data.



x2

- The 3-dimensional graph shows what data transformed in a PCA model might look like.
- The transformed lines of best fit are called eigenvectors.
- The transformed data points are called eigenvalues.
- Eigenvectors are transformed 3-dimensionally because only 2 perpendicular lines of best fit can exist on a single plain.

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	Components adjusted by percent of variance							Components	Indicator
Indicator	1	2	3	4	5	6	7	summed	weight
Α	0.092	0.000	0.007	0.004	-0.004	0.003	0.000	0.112	12.9%
В	-0.070	0.017	-0.024	0.020	0.000	0.000	0.000	0.131	15.2%
С	0.013	0.043	-0.008	-0.012	-0.006	0.000	0.000	0.082	9.4%
D	0.090	0.017	-0.008	-0.002	0.012	0.000	0.000	0.130	15.0%
E	0.068	0.019	0.027	0.013	-0.001	-0.002	0.000	0.130	15.0%
F	0.114	-0.007	-0.011	0.005	-0.002	-0.001	0.002	0.141	16.3%
G	-0.097	0.014	0.022	0.002	0.003	0.001	0.001	0.141	16.2%
Percent of									
Variance	43.0%	17.4%	15.3%	10.9%	7.3%	3.0%	2.0%		

- The table shows an example of a component matrix used to calculate indicator weights for a subdomain.
  - The number of components are determined by the number of indicators.
  - The indicator variances are weighted by the components' percent of explained variance.
  - The weighted variances are aggregated using their sum of squares. Sum of squares are used to scale positive and negative values by their distance from the mean.
  - The subdomain weights are then calculated from their weighted relative variance.

# **DECISION POINT #4 – RECOMMENDATION**

- The Methodology Workgroup recommends using principal component analysis to weight indicators for the first version of the Oregon Environmental Justice Mapping Tool.
- The Methodology Workgroup requests flexibility to revisit the recommendation for Decision Point #4 during the sensitivity analysis (Decision Point #8) after the final set of indicators are selected.
- The Methodology Workgroup also recommends transitioning to participatory weighting of indicators and domains using conjoint analysis for future versions of the Oregon Environmental Justice Mapping Tool. Participatory weighting should include community survey input and technical expert consultation.

# **DECISION POINT #4 – PCA RATIONALE**

- Environmental conditions impact health and quality of life unequally and therefore should not be weighted equally.
- PCA is a measure of inequity that can tell us which environmental burdens and social disparities are the most inequitable in Oregon.
- PCA can also tell us which Oregon communities are experiencing the greatest inequities.
- There is an underlying assumption in using PCA for determining weights that the chosen indicators are important, comprehensive components of environmental equity.

# **DECISION POINT #4 – PCA NARRATIVE**

- Let's say unemployment is an important indicator for communities, but all communities in the state are experiencing the exact same level of unemployment. How important would that indicator be for inclusion in equity decision-making?
- Now consider two indicators are important for communities, unemployment and household income. While unemployment has no variation (Variance = 0), household income is much lower in some communities (Variance > 0). Which of these two indicators would be more relevant for equity decision-making?
- From these two premises, we can conclude that variance within an indicator is an important factor in equity decision-making.

# **DECISION POINT #4 – PCA RATIONALE**

- PCA cannot tell us whether being exposed to a particular environmental risk impacts health more than another environmental risk. For example, PCA cannot tell us whether long-term exposure to an air toxic is more harmful than exposure to a drinking water contaminant or whether living in a community with high wildfire risk is worse than living in a community with high flood risk.
- Weighting indicators by their contribution to health or quality of life would require identifying a common outcome for the subdomains and using regression to quantify the associations. We are currently unaware of an outcome that works for all the EJ Mapping Tool subdomains.

### **DECISION POINT #4 – CONJOINT ANALYSIS RATIONALE**

- 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 surveys with equitable demographic and socioeconomic representation and analyzing the data prevent us from using conjoint analysis for the first version of the Oregon Environmental Justice Mapping Tool.
- The EJ Mapping Tool Leadership Team will begin building surveys during development of the first version of the EJ Mapping Tool to collect statewide input from community members for version two of the tool.

Break before Working Lunch (return at 12:00 pm)



EJ Mapping Decision Point 5



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.

<u>Additive Effects</u> 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.

### Additive Model

**CDC Environmental Justice Index** - 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**:

- 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 × Vulnerability (Brody et al., 2012).

Additive Equation

(Environmental Exposures + Environmental Hazards + Climate Change Risks + Built Environment + Human Health + Social Factors)/6 = EJ Index Score

**Multiplicative Equation** 

(Environmental Exposures + Environmental Hazards + Climate Change Risks + Built Environment)/4 x (Human Health + Social Factors)/2 = EJ Index Score

In this hypothetical example, all subdomain scores are equal, but the combined multiplicative score is higher than the additive score.

**Additive Equation** 

(0.3 (EE) + 0.3 (EH) + 0.3 (CCR) + 0.3 (BE) + 0.3 (HH) + 0.3 (SF))/6 = (0.3)

**Multiplicative Equation** 

 $(0.3 (EE) + 0.3 (EH) + 0.3 (CCR) + 0.3 (BE))/4 \times (0.3 (HH) + 0.3 (SF))/2 = (0.7)$ 

When an environmental burden (Place) subdomain score is increased, the multiplicative index score increases more than the additive index score

**Additive Equation** 

(0.6)(EE) + 0.3 (EH) + 0.3 (CCR) + 0.3 (BE) + 0.3 (HH) + 0.3 (SF))/6 = 0.4

**Multiplicative Equation** 

 $(0.6)(EE) + 0.3 (EH) + 0.3 (CCR) + 0.3 (BE))/4 \times (0.3 (HH) + 0.3 (SF))/2 = 0.9$ 

When a disadvantaged community (People) subdomain score is increased, the increase in the multiplicative score compared to the increase in the additive score is even more pronounced because there are fewer subdomains in the People domain.

### **Additive Equation**

$$(0.3 (EE) + 0.3 (EH) + 0.3 (CCR) + 0.3 (BE) + 0.6 (HH) + 0.3 (SF))/6 = 0.4$$

**Multiplicative Equation** 

 $(0.3 (EE) + 0.3 (EH) + 0.3 (CCR) + 0.3 (BE))/4 \times (0.6 (HH) + 0.3 (SF))/2 = (1.1)$ 

# **DECISION POINT #5 – RECOMMENDATION**

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

(Environmental Exposures + Environmental Hazards + Climate Change Risks + Built Environment)/4 x (Human Health + Social Factors)/2 = EJ Index Score

## **DECISION POINT #5 – RATIONALE**

- 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 (<u>Alexeeff et al., 2012</u>).
- Priority rankings done by various emergency response organizations to score threats have used scoring systems with the formula: **Risk = Threat × Vulnerability** (Brody et al., 2012).
- Applying additive aggregation to subdomains will provide more insight into the interactions of the indicators (VanderWeele & Knol, 2014).

EJ Mapping Decision Point 6



## **DECISION POINT #6 – DATA STANDARDIZATION**

### Introduction to Data Standardization

Raw indicator data units can differ 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 the data by converting it to quantiles like percentiles or z-scores.



Mean = 0, STD = 1

# **DECISION POINT #6 – DATA STANDARDIZATION**

Key Terms:

Quantile - values that split sorted data into equal parts. Common quantiles are quartiles (four groups), deciles (ten groups), and percentiles (100 groups).

Percentile - quantiles obtained by adopting a subdivision into 100 groups. The nth 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. A high percentile means the value is relatively uncommon.

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.

# **DECISION POINT #6 – RECOMMENDATION**

The Methodology Workgroup recommends:

- Standardizing raw indicator values using z-scores.
- Reducing the effects of extreme outliers in the data.
- Using a process called "winsorization" to reduce outliers and rescale the z-scores.
- Rescaling winsorized z-scores between 1-99 percent for easier interpretation.
- 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.

## **DECISION POINT #6 – RATIONALE**

- 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. Zscores 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.

Agency Annual Reports



# Agency Annual Reports Status

<u>DEQ Reviewer</u> Vee Paykar	<u>DLCD Reviewers</u> Vee Paykar Aparna Rajagopal	<u>DOGAMI Reviewer</u> Katie Murray	<u>DSL Reviewer</u> Amanda Sullivan- Astor	<u>ODA Reviewer</u> Katie Murray
<u>ODF Reviewers</u> Amanda Sullivan- Astor Katie Murray	<u>ODFW Reviewer</u>	<u>ODOE Reviewer</u> Jim Kreider	<u>ODOT Reviewer</u> Vee Paykar	<u>OHA Reviewer</u> Jim Kreider
<u>OPRD Reviewer</u>	<u>OPUC Reviewer</u> Jim Kreider	<u>OSFM Reviewer</u> Amanda Sullivan- Astor	<u>OSMB Reviewer</u> Jim Kreider	<u>OWEB</u> Aparna Rajagopal
		<u>OWRD</u> Aparna Rajagopal		

# **Annual Report Progress**

Agencies Submitted 2023 Annual Reports to EJC

• February 2, 2024

EJC Review Due Date

• August 23, 2024

Agencies Review EJC Feedback

• July 12, 2024 - September 30, 2024

Annual Reports EJC Discussion

• October Environmental Justice Council Meeting on October 10, 2024

Agencies Prepare 2024 Annual Reports

Ongoing

2024 Agency Annual Reports Due

• January 17, 2025

# Summary of Agency Needs



# Agency Updates

# Calendar Year 2023

- Each agency will have 5 minutes to cover their presentations and address EJC member questions and comments.
- The EJC Coordinator will identify the start and end time for each presentation and call up the speakers based on the presenter list.
- Agencies may be requested to return for a future meeting at the request of EJC Leadership to address any topics of interest.
- Annual reports covering agency activities in calendar year 2024 will be submitted in January 2025.
- Agency updates covering activities in calendar year 2024 are planned for the April 2025 EJC meeting.

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# State Agency Presenters

- 1. ODA: Christina Higby
- 2. DEQ: Matthew Davis
- 3. DLCD: Sadie Carney
- 4. DOGAMI: Alex Lopez
- 5. DSL: Cait McCusker
- 6. ODF: Megan Frizzell & Danny Norlander
- 7. ODFW: Antonio (Jose) Salgado
   8. ODOE: Lauren Rosenstein

Presentations with \* have been deferred to the 12/12/2024 EJC meeting.

9. ODOT: Brenda Gessner 10.0HA: Kim Tham 11.0PRD: Katie Gauthier 12.0PUC: Michelle Scala\* 13.0SFM: Adam Meyer 14.0SMB: Tony Marin\* 15.0WEB: Alexa Schmidt\* 16.WRD: Susan Parrish & Danielle Gonzalez\*



Public Comment



**Public Comment: Council Feedback** 



Council Adjourn



# THANK YOU!

**Oregon Environmental Justice Council** 

For more information, please contact:

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