OREGON
EJ MAPPING TOOL UPDATES

July 8, 2026

EJMT NEXT STEPS

Completed Tasks

- March 2026: Narrow subdomain indicators for the Statewide Index
- April 2026: Narrow subdomain indicators for Community Designation Indexes
- May 2026: Approve indicators for the Statewide Index
- June 2026: Approve indicators for Community Designation Indexes
    - Coastal, Remote, Rural, Large City, and Small City

Round 5

(July 2026): Indicator weighting

Round 6

(August 2026): Adopt final EJMT indexes

- Setting - Community
- Pathway - Ambient Air
- Exposure – Inhalation
- Stressor – Benzene
- Exposure Time – 6 months
- Exposure Concentration – 250 ppb

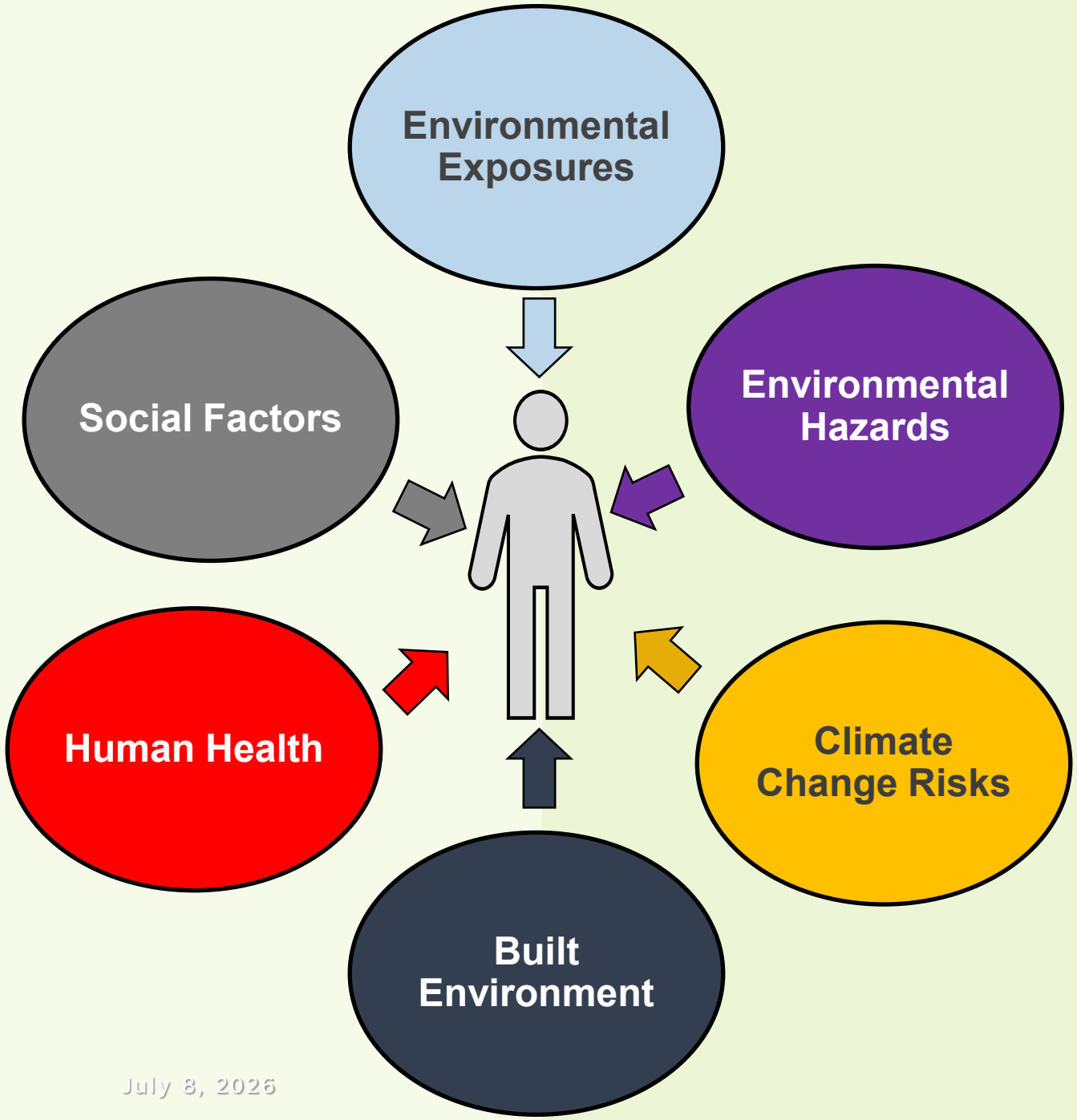
- **Short-Term Health Risks**
- Eye irritation
- Coughing
- Wheezing

- **Long-Term Health Risks**
- Reduced lung function
- Heart attack

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

CUMULATIVE RISK ASSESSMENT EXAMPLE

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



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)

INDICATOR WEIGHTING – WHAT WE KNOW

- Indicator weights represent the relative importance of each indicator as it contributes to the index.
- Indicator weighting can significantly affect a community's environmental justice index score.
- If an index does not apply any weights explicitly, the indicators will be equally weighted. However, if some indicators "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.

INDICATOR WEIGHTING OPTIONS CONSIDERED

1. No weighting
2. Prioritizing by indicator relationship with health outcomes and life expectancy at birth
3. CalEnviroScreen domain weighting:

   (Exposures * 1.5) + (Environmental Effects * 0.5)

   (Sensitive Populations * 1) + (Socioeconomic Factors * 1)
4. Conjoint analysis relying on community priorities, subject matter expert input, and scientific evidence (Recommended for future versions)
5. **Principal Components Analysis (Adopted by the EJC)**

PRINCIPAL COMPONENTS ANALYSIS: EPA DEMO

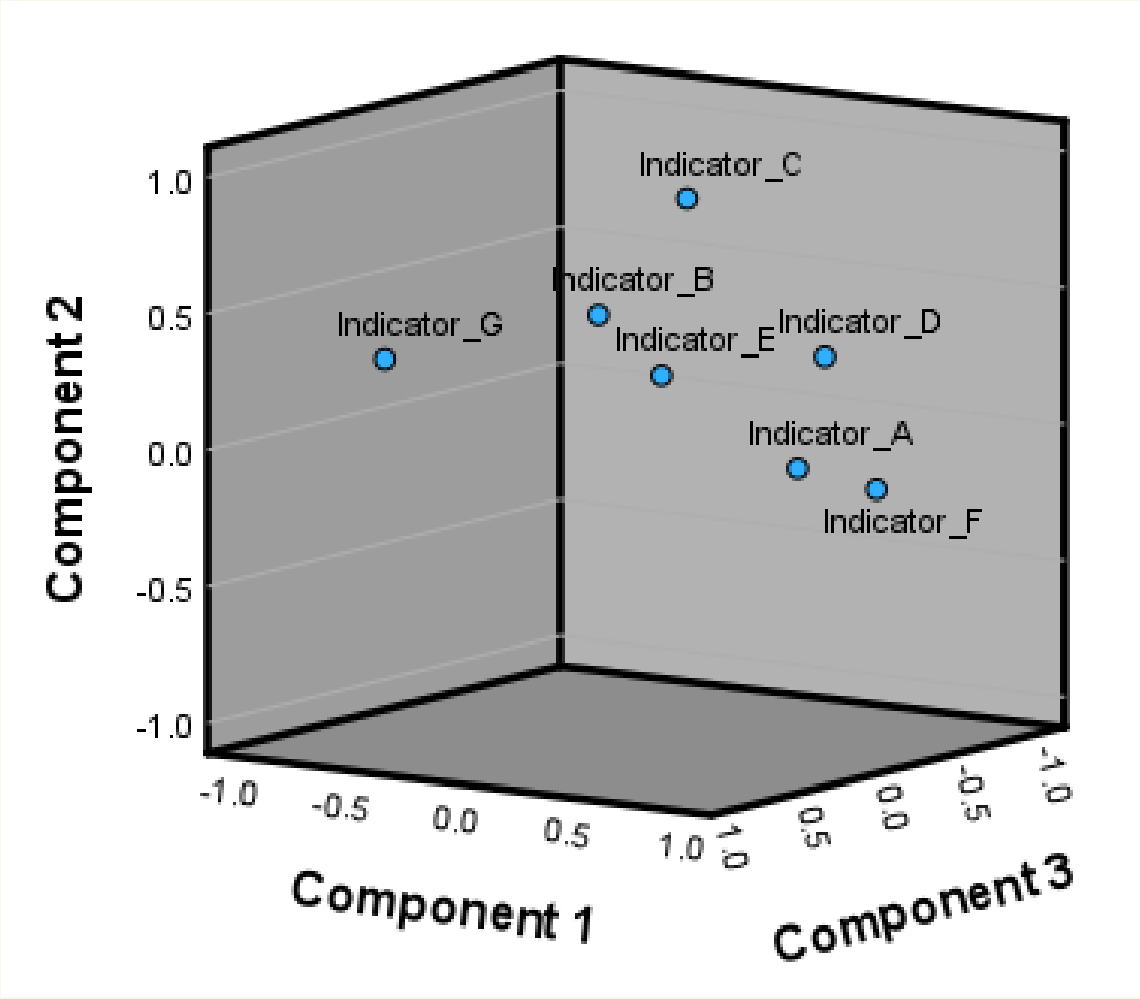
Principal Component Analysis – EPA Environmental Quality Index

Environmental Exposures x a% + **Environmental Hazards x b%** + **Climate Change Risks x c%** + **Built Environment x d%** **Human Health x e%** + **Social Factors x f%**

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

PRINCIPAL COMPONENTS ANALYSIS

- 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.



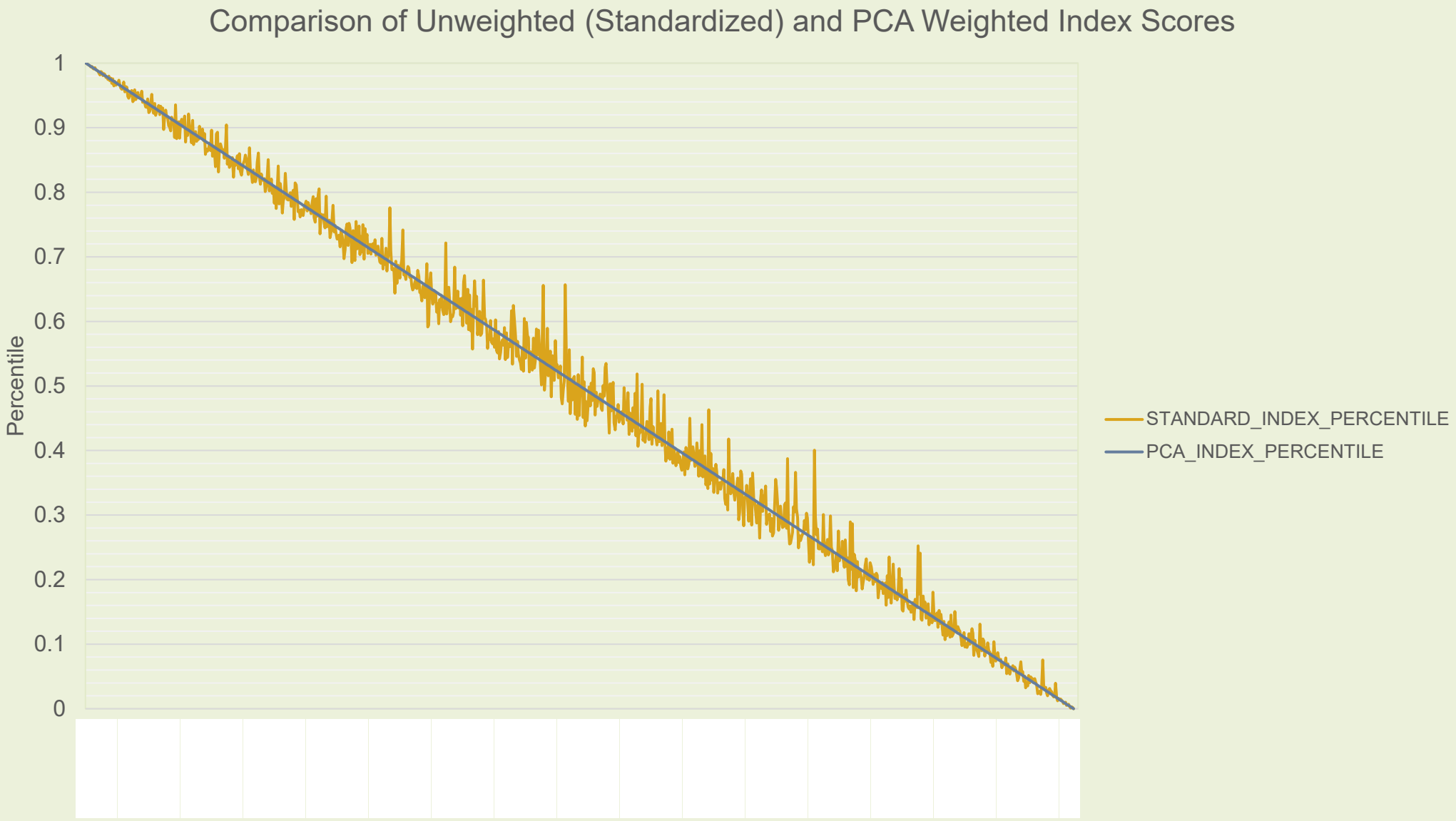
PRINCIPAL COMPONENTS ANALYSIS EXAMPLE

Indicator	Components adjusted by percent of variance							Components summed	Indicator weight
	1	2	3	4	5	6	7		
A	0.092	0.000	0.007	0.004	-0.004	0.003	0.000	0.112	**12.9%**
B	-0.070	0.017	-0.024	0.020	0.000	0.000	0.000	0.131	**15.2%**
C	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.
- Indicator covariances are weighted by the components' percent of explained variance and adjusted for correlation.
- The weighted components 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.

PRINCIPAL COMPONENTS ANALYSIS VS NO WEIGHTING



PRINCIPAL COMPONENTS ANALYSIS UNEMPLOYMENT EXAMPLE

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.

ADOPTED WEIGHTING RECOMMENDATION

- EJC Adopted Decision: Principal Components Analysis
  - Adoption Date: November 16, 2024
  - Applies to: Version 1 of the Oregon Environmental Justice Mapping Tool
  - Decision Point Reference: Decision Point 4
- Principal Components Analysis impacts to sensitivity analysis (Decision Point 8) will be reported to the EJC after indicator selection for the statewide index and community designation indexes.
- The Methodology Workgroup also recommended transitioning to participatory weighting of indicators and domains using conjoint analysis for future versions.
  - Participatory weighting should include community survey input and technical expert consultation.

CONJOINT ANALYSIS STAFF ASSESSMENT

- 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.

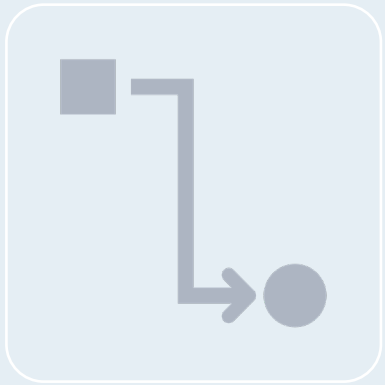
PCA WEIGHTS – PLACE DOMAIN – STATEWIDE

Environmental Exposures		Environmental Hazards		Climate Change Risks		Built Environment	
Air Quality Index Unhealthy Days	14.7%	Earthquake Risk	14.8%	Days Below 32°F	13.8%	Access to Healthcare	13.6%
Cancer Risk for Diesel Particulate Matter	14.1%	Groundwater Threats	14.6%	Days with Max Temp ≥ 90th Percentile	13.5%	Community Design Index	15.1%
Drinking Water Contaminants Index	16.2%	Hazardous Material Storage	14.0%	Drought	14.7%	Digital Equity / No Internet Access	15.2%
Transportation Noise Pollution	13.1%	Hazardous Waste Facilities	13.4%	Fire Weather Index Events	14.8%	Food Insecurity	14.0%
Lead Exposure Index	13.3%	Impaired Water Bodies	16.0%	Flood Risk	13.7%	Park Access	12.9%
Cancer Risk minus Diesel PM	14.2%	Residential Buildings in Wildfire Burn Areas	14.5%	Heat Index Days > 90°F	15.1%	Traffic Injuries & Fatalities	15.1%
Permitted Air Pollution Sites	14.4%	Wastewater Discharge	12.6%	Wildfire Risk	14.4%	Urban Tree Canopy	14.0%

PCA WEIGHTS – PEOPLE DOMAIN – STATEWIDE

Human Health		Demographic & Social Factors	
Cancer Mortality	14.9%	65+ Living Alone (Social Isolation)	13.9%
Circulatory Disease Prevalence	15.3%	Adults without a College Degree	16.4%
Diabetes Prevalence	13.8%	Below 150% of the Federal Poverty Level	14.6%
Frequent Mental Distress Prevalence	12.9%	Inheritance Proxy (Ability to Accumulate Generational Wealth)	14.6%
Population Living with a Disability	16.0%	Limited English Proficiency	13.2%
Preterm Birth Prevalence	14.5%	Population Under 5 Years Old	15.2%
Respiratory Disease Prevalence	12.7%	Uninsured Population	12.1%

ENVIRONMENTAL JUSTICE COMMUNITIES BY THE NUMBERS



The percent of Oregon communities flagged as EJ communities will coincide with percentile selected for the EJ community threshold.

Coastal and Rural communities are underrepresented on the statewide EJMT map regardless of where the EJ community threshold is reasonably set.

Remote and Small City communities are overrepresented on the statewide EJMT map.

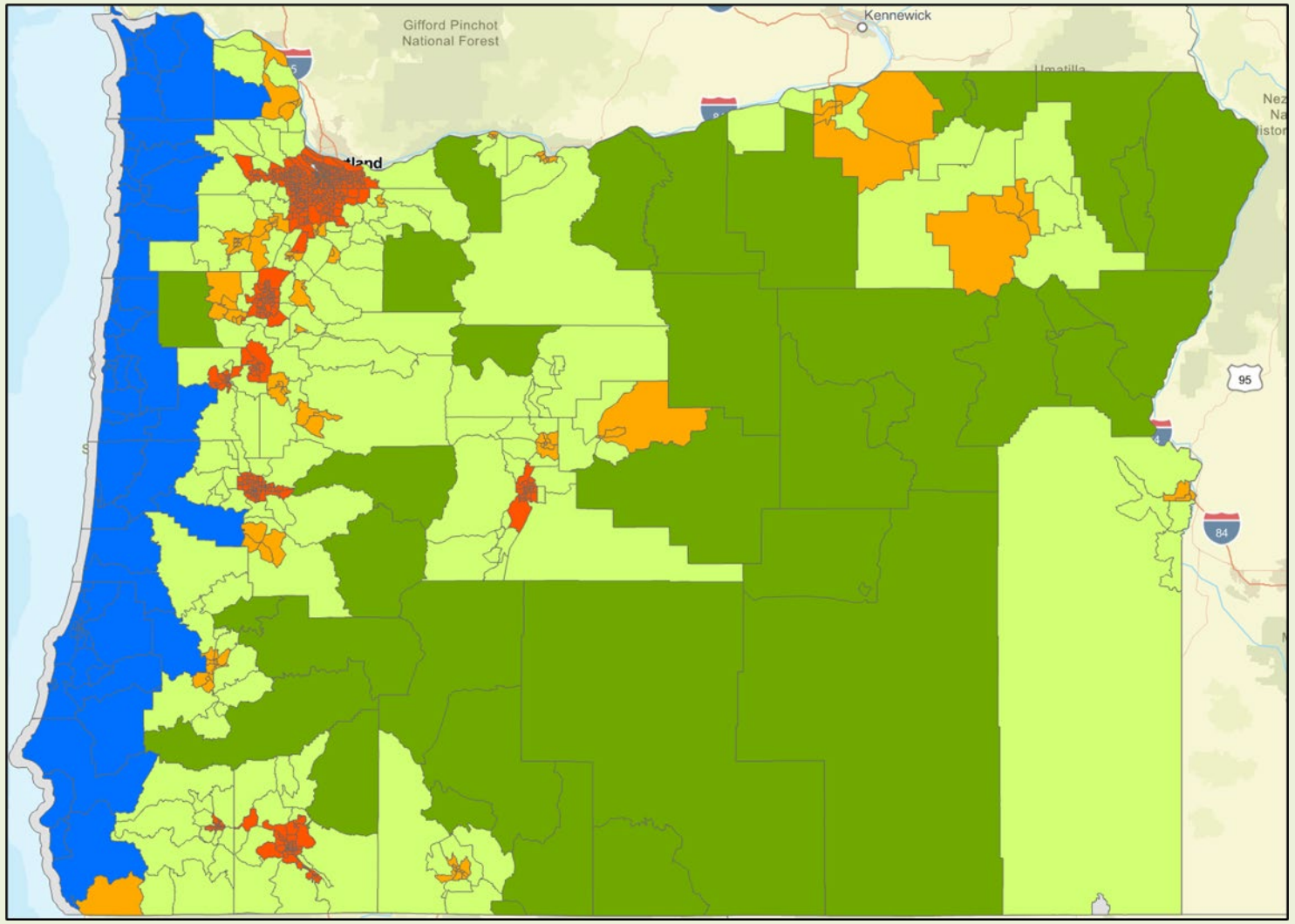
Large City communities are proportionately represented on the statewide map because ~2/3 of inhabited census tracts in Oregon are designated as Large City.

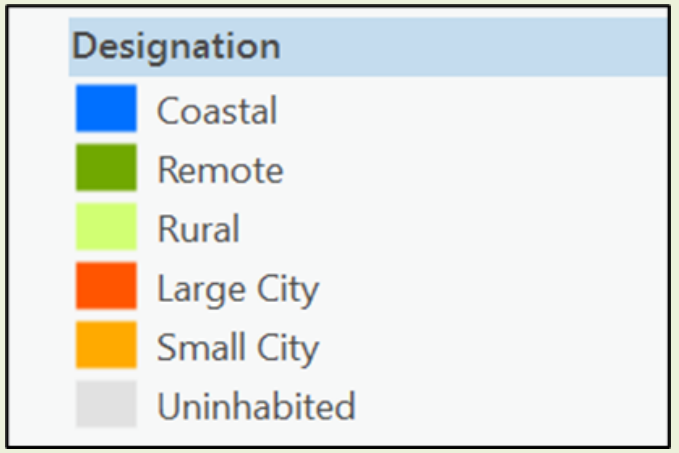
EJ MAPPING RECOMMENDATION

- The Methodology Workgroup recommends combining the flagged EJ communities from the statewide map with the flagged EJ communities from the Community Designation maps into one map.

- The Methodology Workgroup also recommends identifying whether in census tracts are flagged as an EJ community in the statewide map, a community designation map, or both in the reporting pane and mouseover dialog.

COMMUNITY DESIGNATIONS

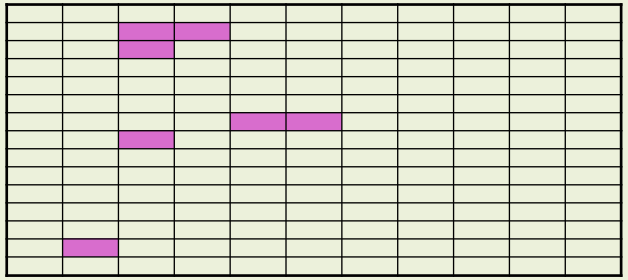




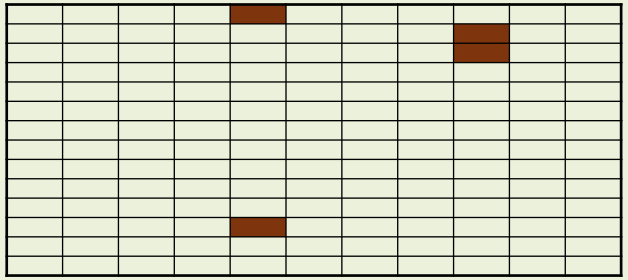
[Oregon EJ Mapping Tool Community Designations (ArcGIS Online)]

COMBINED EJ COMMUNITY MAP

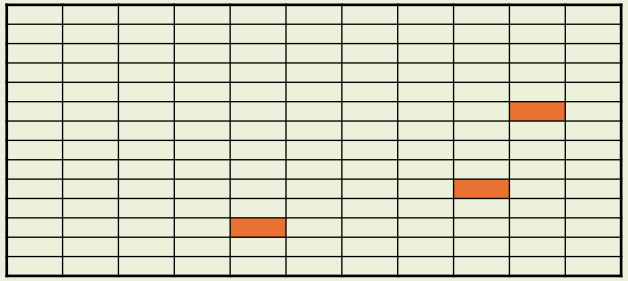
LARGE CITY INDEX



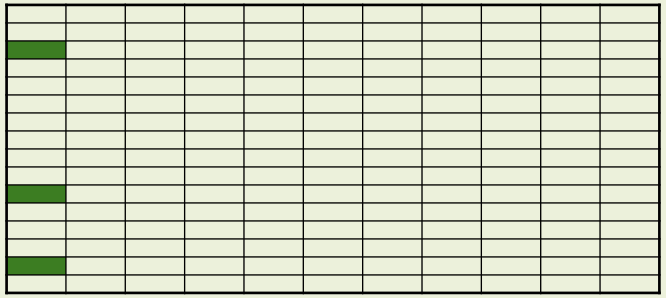
SMALL CITY INDEX



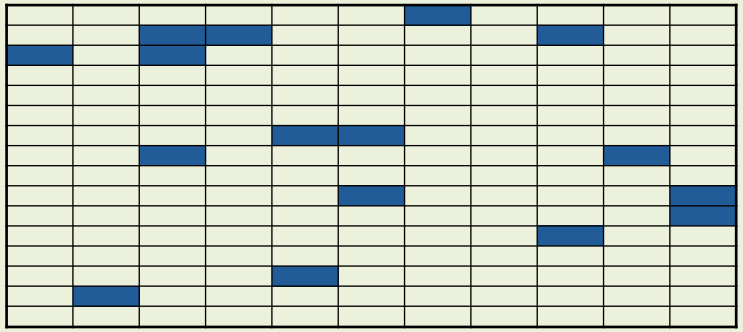
REMOTE INDEX



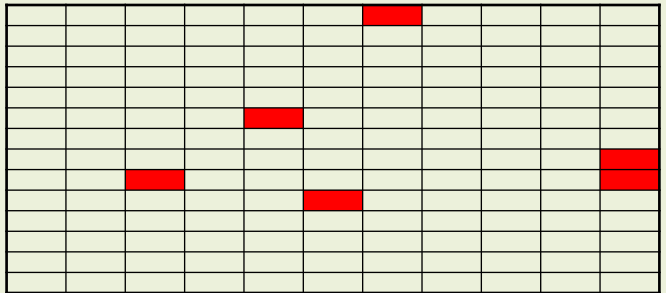
COASTAL INDEX



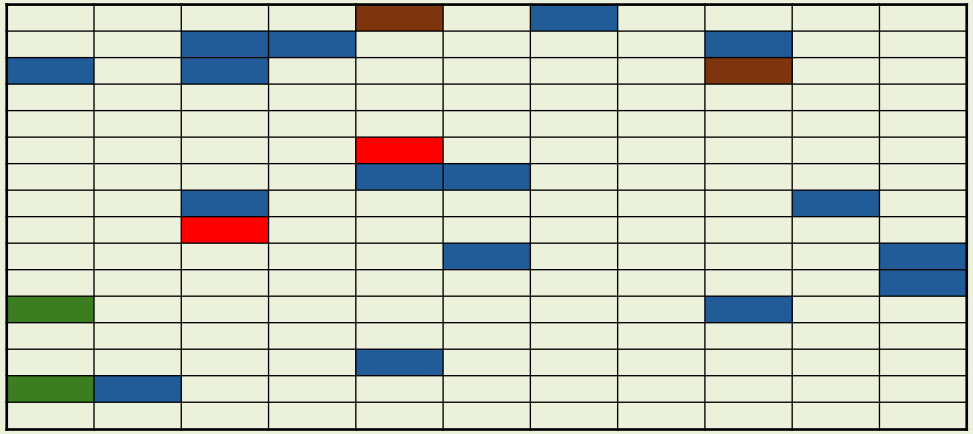
STATEWIDE INDEX



RURAL INDEX



COMBINED INDEX MAP



RATIONALE FOR COMBINING MAPS

- Combining the flagged EJ communities from the statewide map with the flagged EJ communities from the Community Designation maps into one map will require less work for users than sorting through each of the individual maps.

ADOPTION PROCESS

COMBINING EJ MAPPING LAYERS ON A SINGLE MAP

Mike Oxendine motioned to adopt combining EJ Mapping layers on a single map and develop maps for all other statewide and community designation indexes.

Lourdes Herencia seconded the motion.

Debate skipped

Amendments can be made by motion and seconding the amendment motion

Motion to Close Debate

Aye Votes: Nikita Vincent, Clara Soh, Katie Murray, Lourdes Herencia, Mike Oxendine, Jacob MacFarland, J'reyesha Brannon, and Quinn Read (Unanimous aye votes from all those present)

RESOURCES

1. EJ Mapping Tool project page
2. Adopted Decision Points
3. Indicator Selection Criteria
4. Approved EJ Mapping Tool Indicators by Subdomain
5. Approved EJ Mapping Tool Indicator Crosswalks
6. Oregon EJ Mapping Tool Community Designations (ArcGIS Online)
7. EJC Presentations - Decision Point 3a - Community Designations.pdf

THANK YOU

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