Application Of Photochemical Grid Models To Identify High Priority Locations For Health-based Community Monitoring Needs

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ENVIRONMENTAL JUSTICE

Environmental Justice

Fair treatment and **meaningful involvement** of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies

Fair treatment means no group should bear a disproportionate share of the negative environmental consequences from industrial, governmental and commercial operations or policies

Meaningful involvement means:

- People have opportunity to participate in decisions that affect their environment/health

- People can influence the regulatory decisions

- Community concerns are considered in the decision-making process

- Decision makers facilitate the involvement of those potentially affected

Source: https://www.epa.gov/environmentaljustice/learn-about-environmental-justice

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AMERICAN RESCUE PLAN FUNDING

Environmental Protection Agency (EPA) announced funding for two Initiatives under the American Rescue Plan

Air Quality Monitoring Funding
$50 million USD

- Grant competition for community monitoring
- Awards to agencies for continuous monitoring
- Enhanced regional Capacity for short-term monitoring

Environmental Justice Funding
$50 million USD

- Assist under-resourced communities
- AQ monitoring plans for communities with health outcome disparities
- $720,000 to enhance development of EJSCREEN

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WHAT IS EJSCREEN?

USEPA tool: Environmental Justice Mapping and Screening Tool

- Geographic information system (GIS)

- Tool combines environmental and demographic indicators in maps and reports

Recognized Limitations:

- Pre-decisional

- It is incomplete

- It is uncertain

EJSCREEN
Environmental Justice
Mapping and Screening Tool

EJSCREEN
Technical Documentation

September 2019

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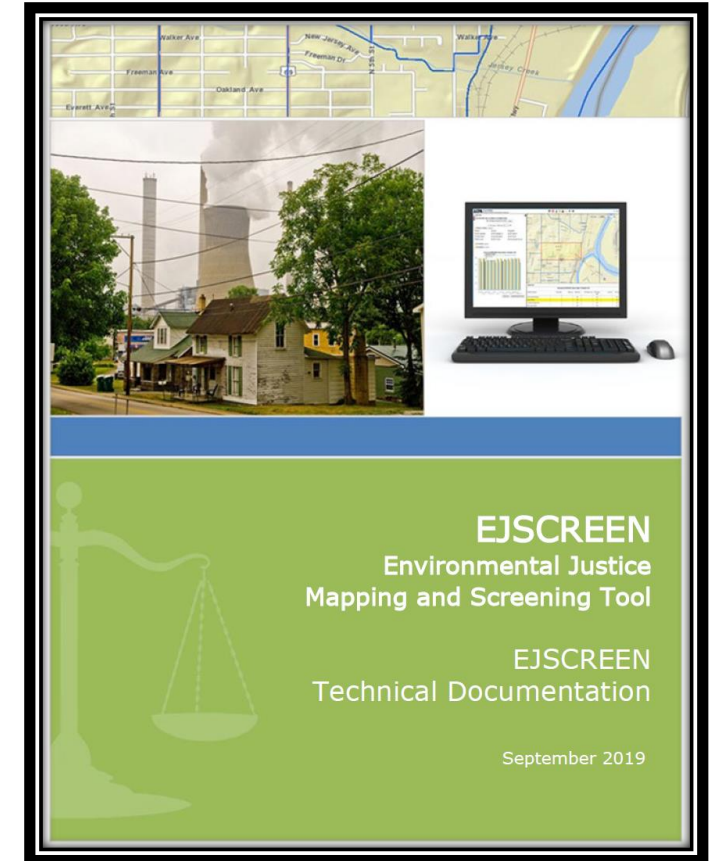
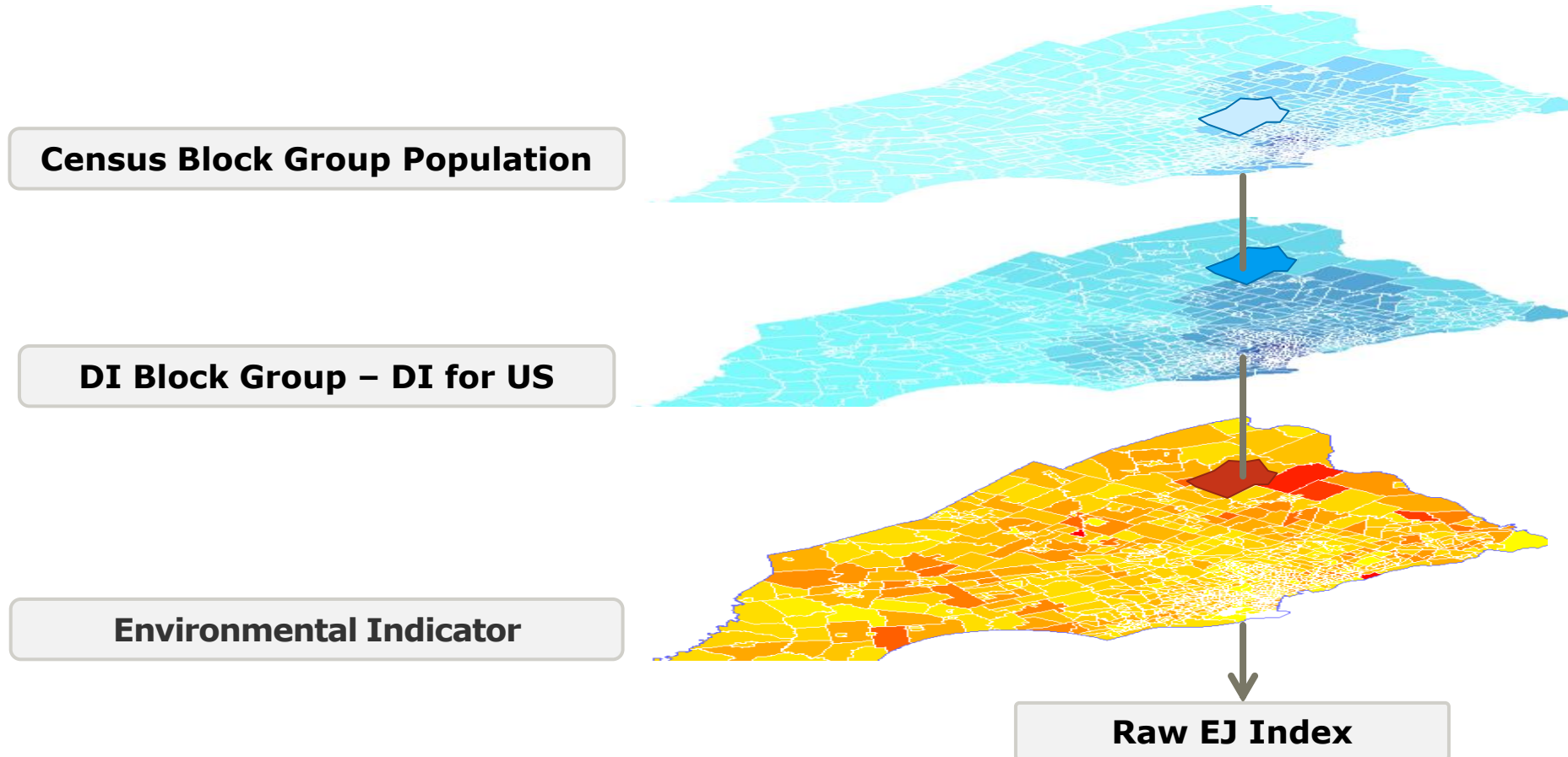# EJSCREEN ENVIRONMENTAL INDICATORS

Almost all indicators are **Air** related

Multiple opportunities for **AQ modeling:**

- Improve the spatial and temporal resolution of underlying data
- Provide insights on the main drivers for the index and indicators
- Collaboration and coordination with experts in many fields: AQ scientist, epidemiologists, regulators, etc.

Indicator	Place on Exposure–Risk Continuum	Key Medium
NATA Air Toxics Cancer Risk Lifetime inhalation cancer risk	Risk/Hazard	Air
NATA Respiratory Hazard Index Ratio of exposure concentration to RfC		
NATA Diesel PM (DPM) ($\mu g/m^3$)	Potential Exposure	
Particulate Matter (PM$_{2.5}$) Annual average ($\mu g/m^3$)		
Ozone Summer seasonal average of daily maximum 8-hour concentration in air (ppb)		
Lead Paint Percentage of housing units built before 1960		Dust/ Lead Paint
Traffic Proximity and Volume Count of vehicles (average annual daily traffic) at major roads within 500 meters (or nearest neighbor outside 500 meters), divided by distance in kilometers (km)	Proximity/ Quantity	Air/ Other
Proximity to RMP Sites Count of facilities within 5 km (or nearest neighbor outside 5 km), divided by distance		Waste/ Water/ Air
Proximity to TSDFs Count of major TSDFs within 5 km (or nearest neighbor outside 5 km), divided by distance		
Proximity to NPL Sites Count of proposed and listed NPL sites within 5 km (or nearest neighbor outside 5 km), divided by distance[6]		
Wastewater Discharge Toxicity weighted stream concentrations divided by distance in kilometers (km)		Water

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EJ INDEX CALCULATION

Census Block Group Population

DI Block Group – DI for US

Environmental Indicator

Raw EJ Index

- **DI - Demographic Index**: average of percent minority and percent low income in the block group

- Raw EJ Index values are hard to interpret

- Final EJ Index is expressed as population weighted **percentiles**. Easier to interpret

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CASE STUDY: OZONE EJ INDEX

Goal:

Replace underlying ozone data in EJSCREEN with more current and finer resolution data to understand differences relative to national screening tool

Improvements:

Data is based on State Implementation Plan modeling*

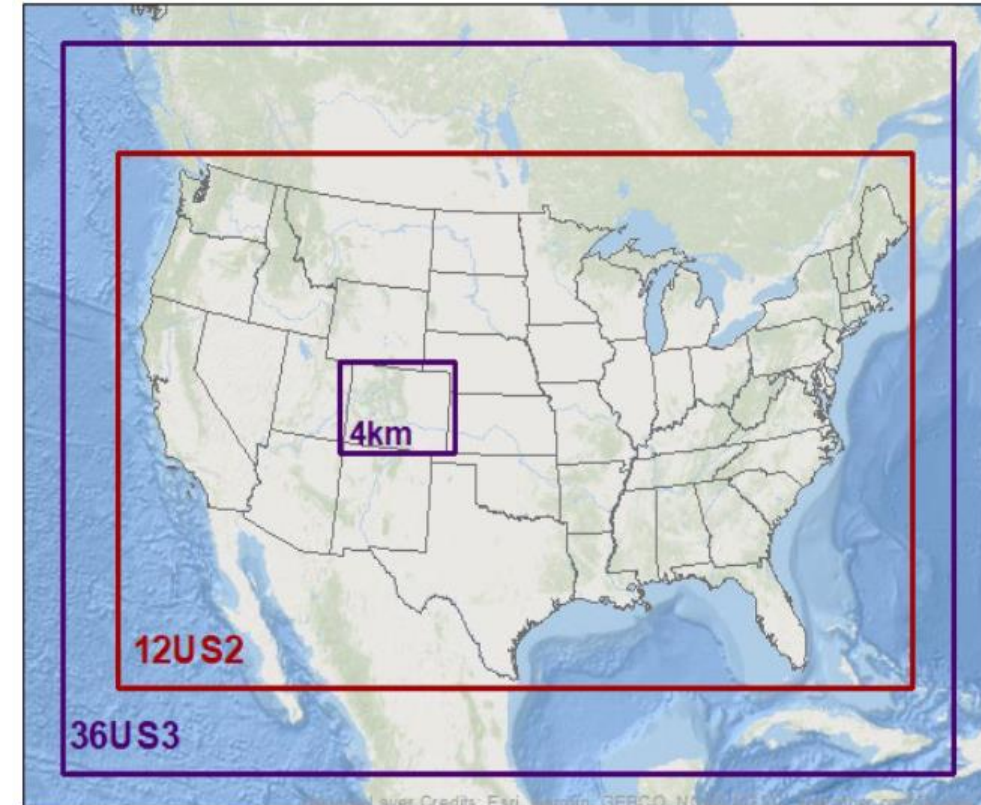Modeling is higher resolution (4 km) than EJSCREEN data (12 km)

Future modeling data implemented Source Apportionment

Proof of Concept Method:

Modeling data for 2023 (future projection)

Summer modeling data (Jun-Sep)

Data processed to obtain the highest 8-hour daily max

4km

12US2
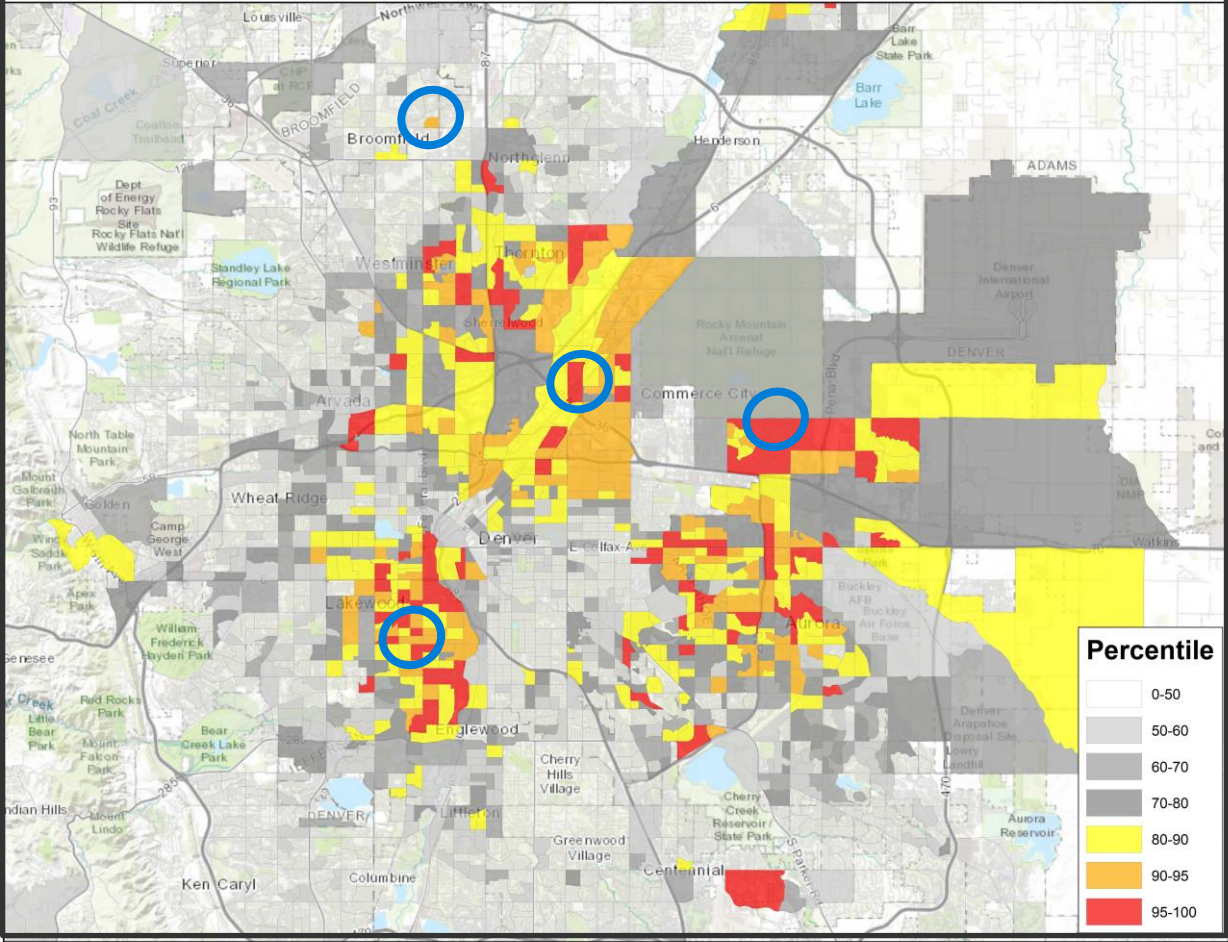
36US3

Modeling domain

*Acknowledgments:
Denver Regional Air Quality Council. https://raqc.org/sip/modeling-emissions-inventories
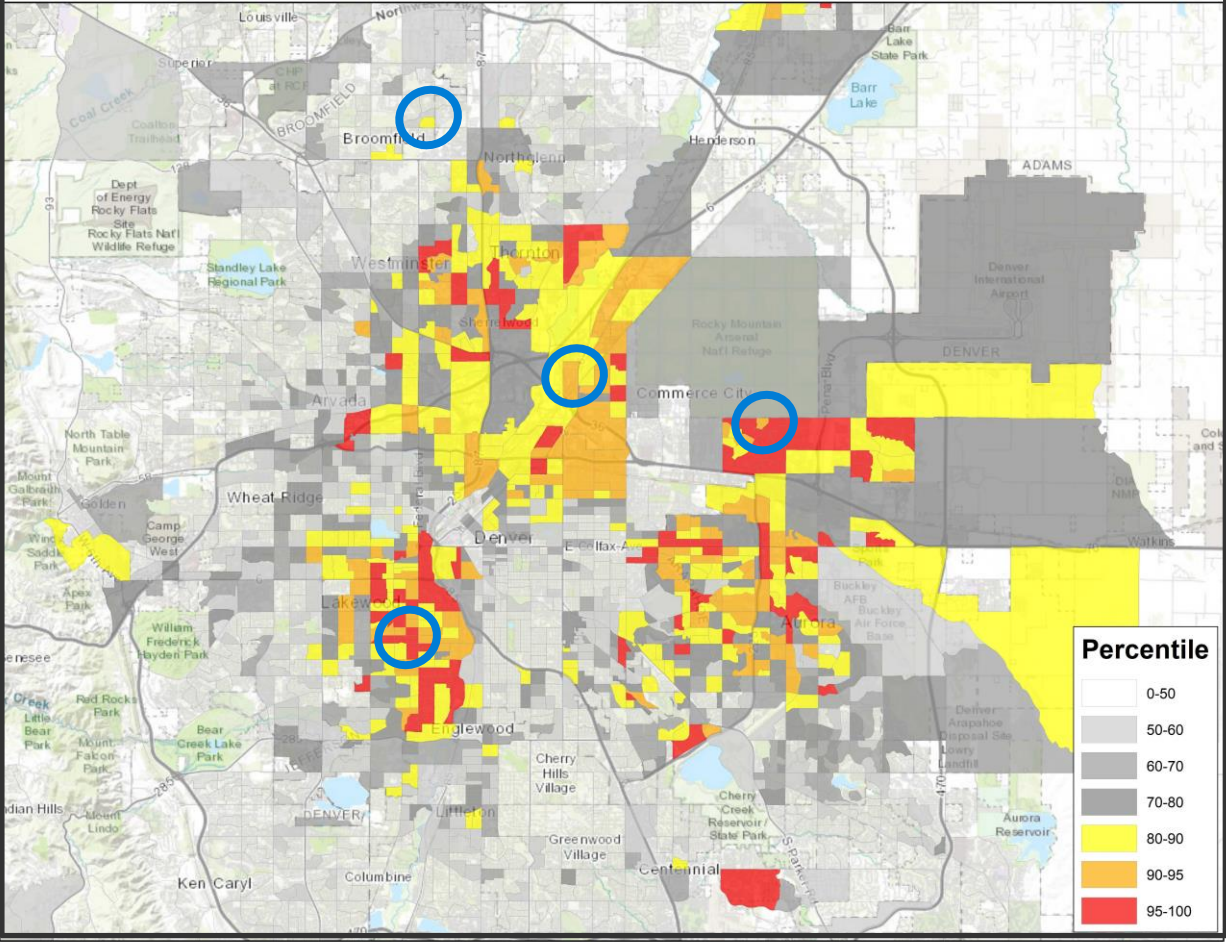Colorado Department of Public Health and Environment

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OZONE EJ INDEX RESULTS

EJ Ozone Index - EJSCREEN (Original)

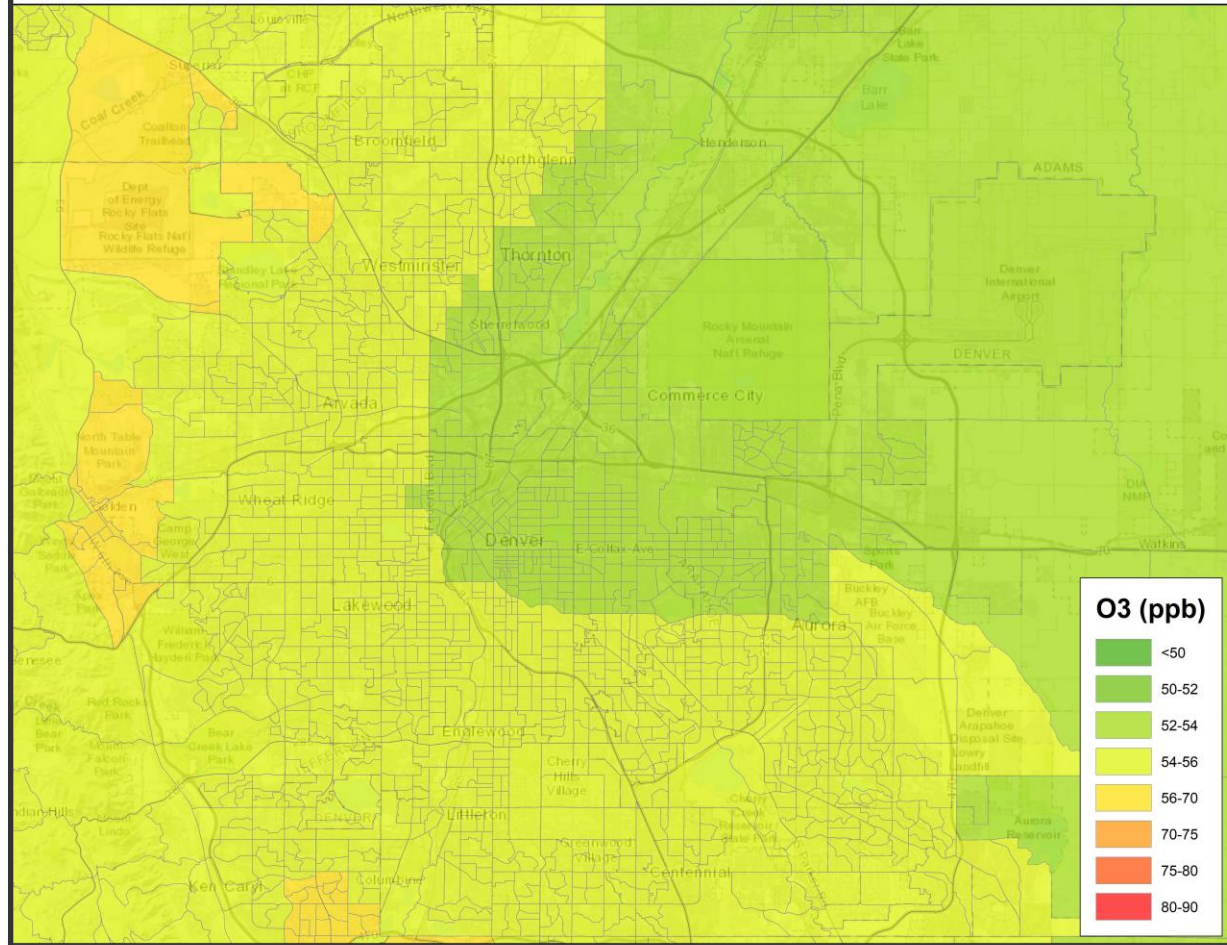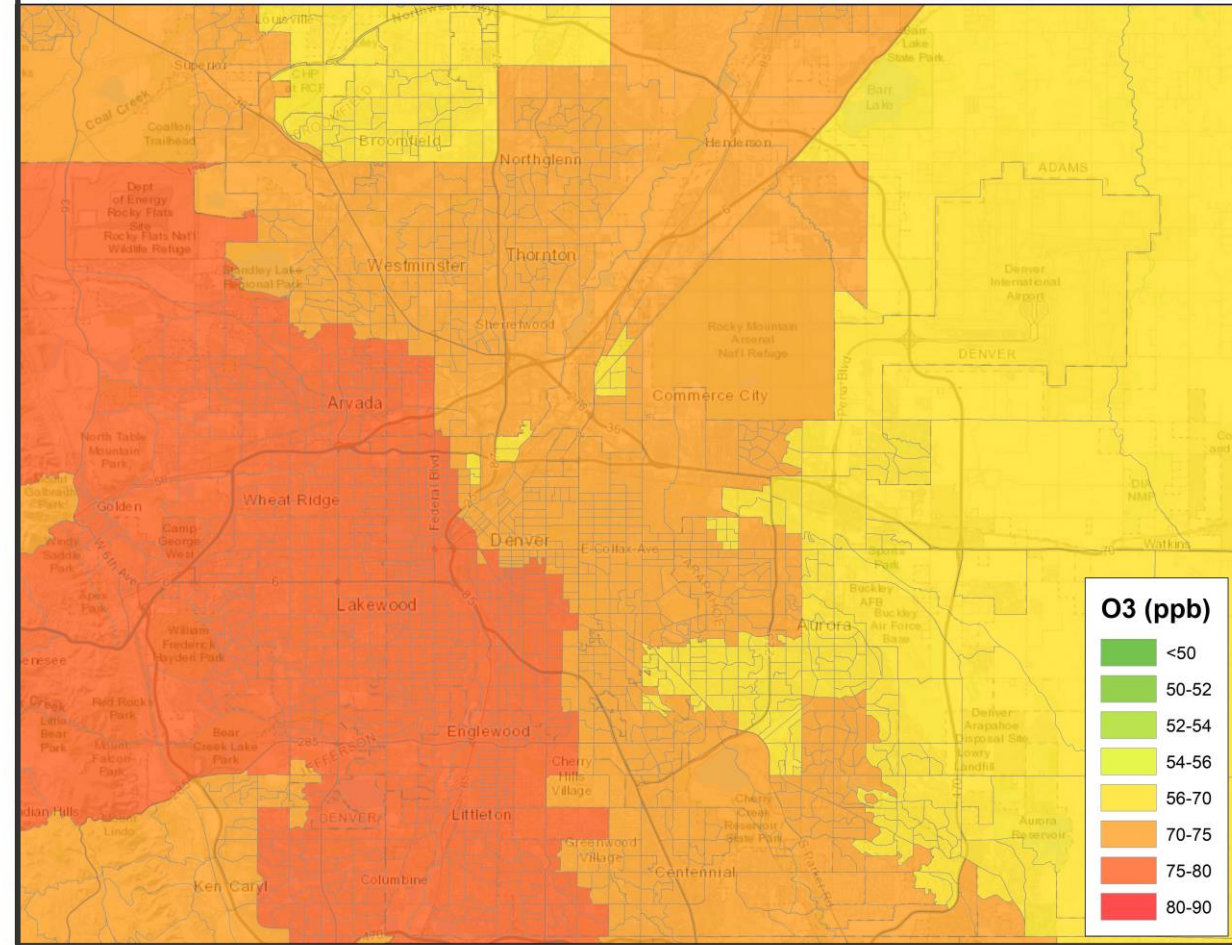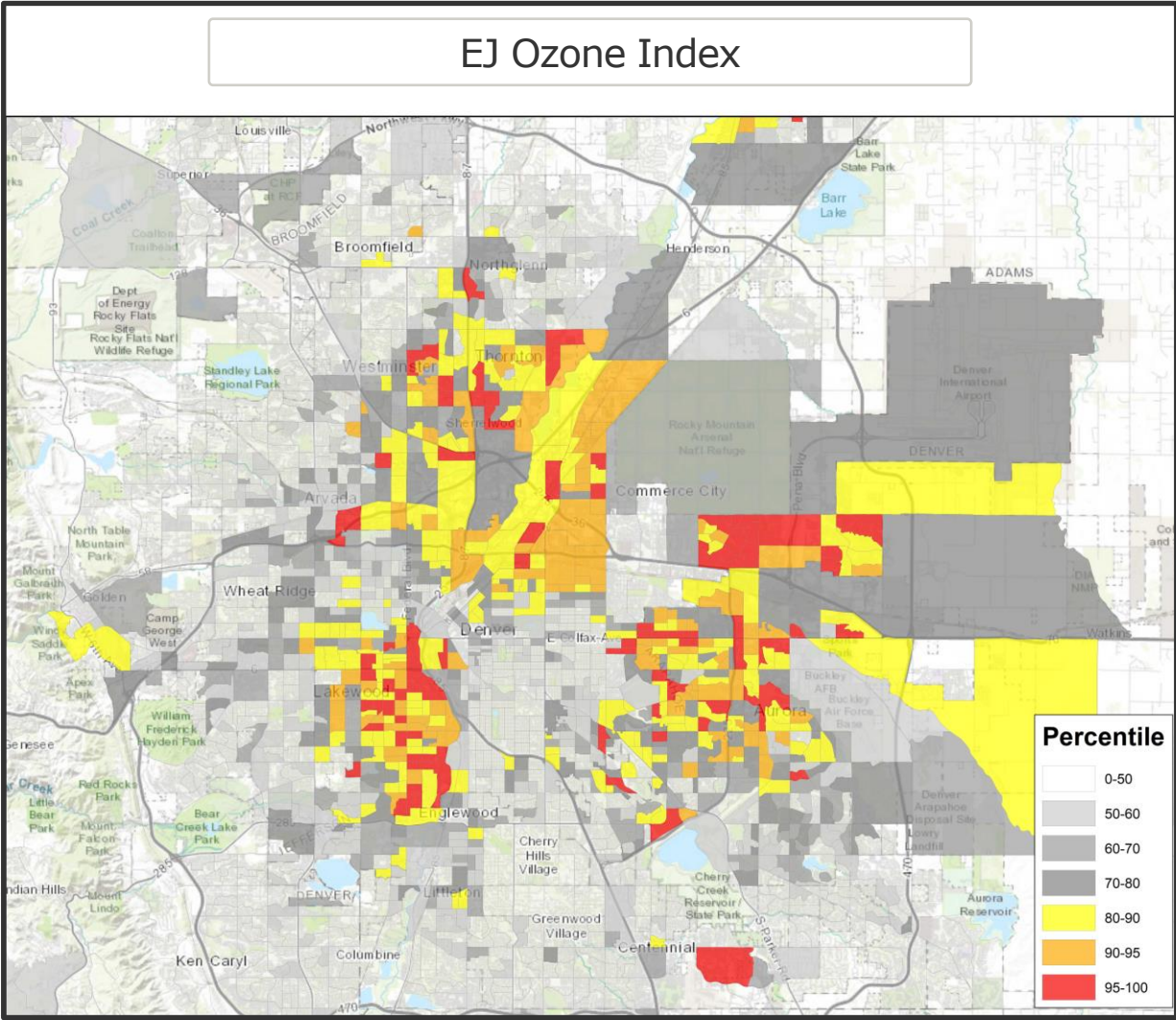EJ Ozone Index – 4km data (Update)

Percentile
- 0-50
- 50-60
- 60-70
- 70-80
- 80-90
- 90-95
- 95-100

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Differences are subtle, why?

OZONE DATA ENVIRONMENTAL INDICATOR

Ozone Concentrations - EJSCREEN (Original)

Ozone Concentrations – 4km data (Update)

O3 (ppb)
- <50
- 50-52
- 52-54
- 54-56
- 56-70
- 70-75
- 75-80
- 80-90

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Updated ozone is significantly higher and has more spatial variability than original

EJSCREEN: SENSITIVITY TO DEMOGRAPHIC INDEX

Ozone Index is highly correlated with Demographic Index
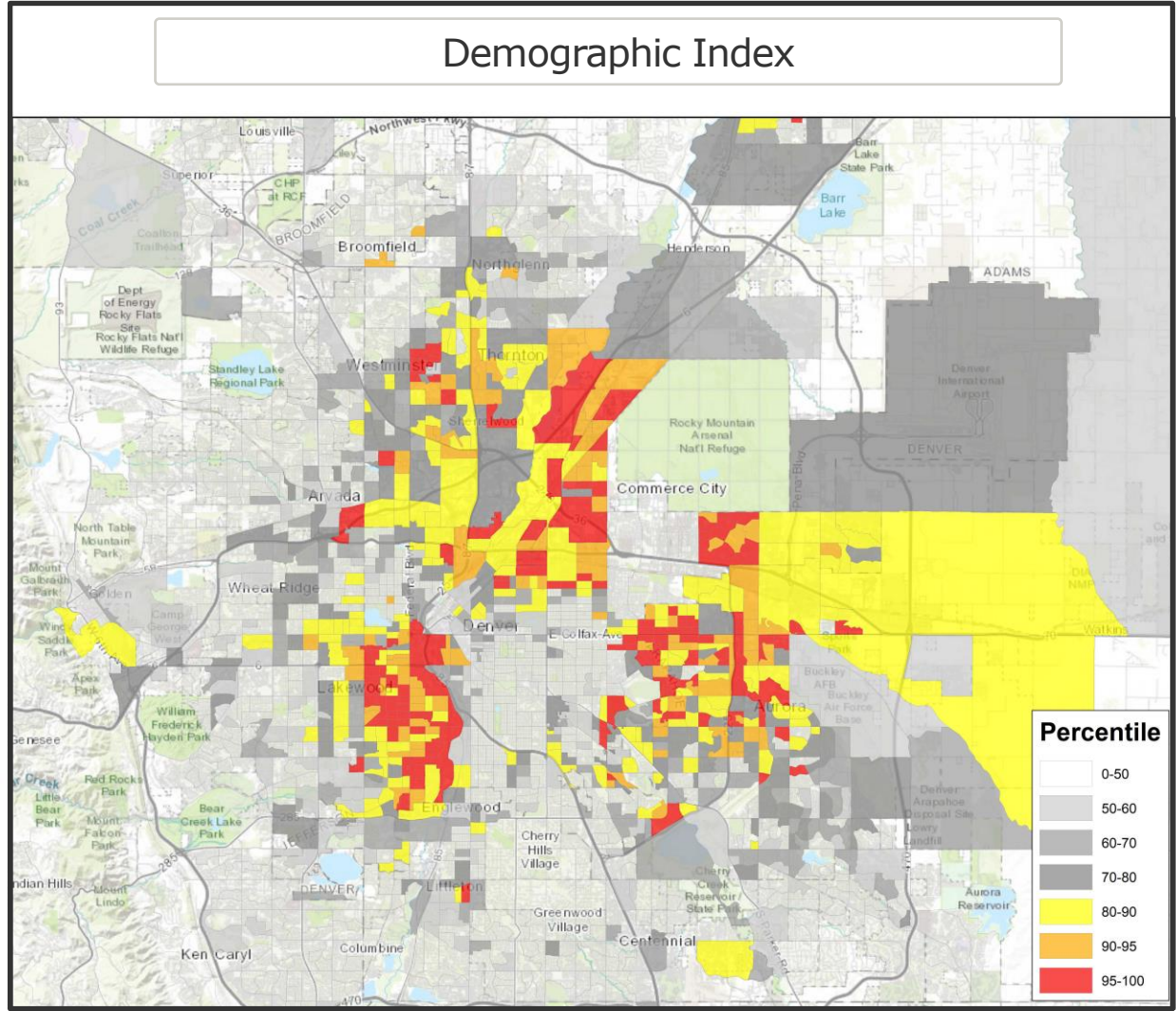
TAKE HOME MESSAGES

Updating the ozone concentrations at 4km resolution has only a slight effect on the EJ Index

The ozone EJ index is most sensitive to the Demographic Index, which is based in part on the use of a percentile-based approach to calculate the EJ indices

It is recommended that EJSCREEN's foundational methodology be re-examined in order to produce a tool that is more reflective of the minority and low-income groups pollutant burdens, even on a relative basis necessary for screening assessments.

Recommended Next Steps and Future Work:
- Conduct a thorough sensitivity analysis for all environmental indicators currently included in EJSCREEN
- Evaluate the suitability of different metrics for environmental indicators (for example 1-hour ozone maximum)
- Consider adapting EJSCREEN to enable users to select datasets to leverage full power of existing dataset such as modeling with source apportionment results

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THANK YOU

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