"A TOXIC LEGACY"
Identifying Environmental Justice Communities in Baltimore City, MD

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INTRODUCTION

Environmental Justice is centered on the idea that all people - regardless of their race, ethnicity, culture and income - are entitled to a safe and healthy environment[1]. While some argue that a safe and healthy environment is one that is free from "environmental burdens" like pollution of air, soil, and water, others expand on this definition and consider access to "environmental benefits" like greenspace or tree cover to be important indicators of a safe and healthy environment[2].

Central to this concept is the fact that across the United States, low-income communities of color are disproportionately exposed to environmental burdens while also disproportionately lacking in exposure to environmental benefits[3]. Identifying *environmental justice communities* where those factors are evident is an important step toward investing in a more equitable built and natural environment.

This project aims to identify environmental justice communities in Baltimore City by developing an Environmental Justice Vulnerability Scoring Tool that pairs demographic data for social vulnerability with indicators for environmental burdens and environmental benefits.

BALTIMORE, MD

Baltimore, the most populous city in the state of Maryland, has a legacy of discriminatory practices and disinvestment that have led to a constituency that is segregated and largely disenfranchised[4].

Recent events, like the authorization to build a trash incinerator in Southeast Baltimore, have sparked calls to action to prevent the city's most vulnerable populations from bearing the burden of environmental harm[5].

Source: Grist.org

ENVIRONMENTAL JUSTICE FACTORS

SOCIAL VULNERABILITY

Percent Minority

Relative EJ Score:
Percent Minority
0: Low relative % minority
1: High relative % minority

Low Income Households

Relative EJ Score:
Percent Low Income Households
0: Low relative % low income
1: High relative % low income

Linguistic Isolation

Relative EJ Score:
Percent Linguistically
Isolated Households
0: Low relative % households
1: High relative % households

ENVIRONMENTAL BURDENS

Proximity to Traffic

Relative EJ Score:
Traffic Proximity
0: Low relative proximity
1: High relative proximity

Vacant Parcel Density

Relative EJ Score:
Vacant Parcels per Block Group
0: Low relative parcels
1: High relative parcels

Respiratory Health Index

Relative EJ Score:
NATA Respiratory Health Index
0: Low relative index score
1: High relative index score

ENVIRONMENTAL BENEFITS

Tree Density

Relative EJ Score:
Trees per block group
0: High relative tree density
1: Low relative tree density

Park Proximity

Relative EJ Score:
Proximity to Parks
0: High relative proximity
1: Low relative proximity

DATA SOURCES

- American Community Survey, US Census Bureau (2017)
  - Minority % + Low Income %

- City of Baltimore (2019)
  - Parks + Vacant Property Data

- The Baltimore Tree Trust (2019)
  - Tree Data

- EPA EJ Screen Data (2019)
  - Linguistic Isolation Score
  - Traffic Proximity + NATA Respiratory Health Index

METHODOLOGY

Data for each Environmental Justice Factor (EJF) were compiled at the Census Block Group (CBG) level. For each EJF, every Census Block Group received a score from 0-1 based on its percentile ranking for that factor.

Each EJF required a different method for calculating the raw value depending on the type and source of data. Once this value was calculated, the process for determining each CBG's "score" for that EJF was the same. For instance, in the "Vacant Parcel Density EJF," the process was as follows:

1. Select by attribute for parcels that are vacant (using property data from the City).
2. Use a spatial join and Field Calculator to determine the Vacancy Density for each CBG.
3. Use Excel to calculate each CBG's percentile (on a 0-1 scale) for Vacant Parcel Density—its *Vacancy Score*.

Once a score was calculated for each EJF, scores were added together to determine a composite *Environmental Justice Vulnerability Score*. Each EJF score was weighted equally to determine this composite score.

Spatial Autocorrelation and Local Moran's I were used to determine clustering based on the Composite EJ Vulnerability Score.

RESULTS

Composite Score:
Environmental Justice Vulnerability
Low EJ Vulnerability
Moderate EJ Vulnerability
High EJ Vulnerability
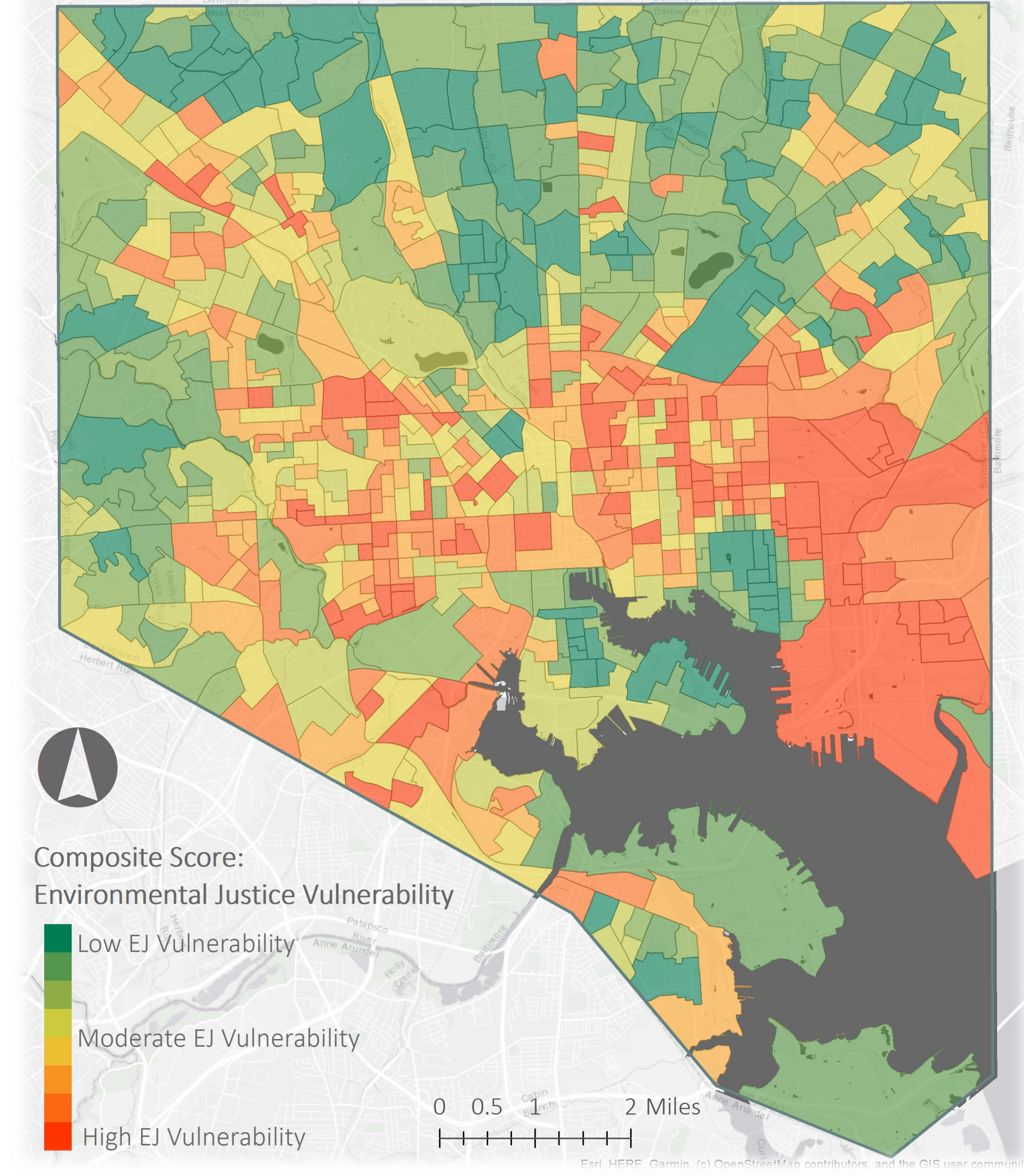
This map (top left) visualizes the composite Environmental Justice Vulnerability Score for each census block group in Baltimore. The results demonstrate that East, West, and Northwest Baltimore have the highest EJ vulnerability based on the data, compared to North and Northeast Baltimore which both have relatively low vulnerability. Waterfront neighborhoods also appear to be less vulnerable compared to their inland neighbors. Further analysis using local Moran's I and Spatial Autocorrelation confirms these findings. Clustering of EJ groups is significant at the 99% confidence level.
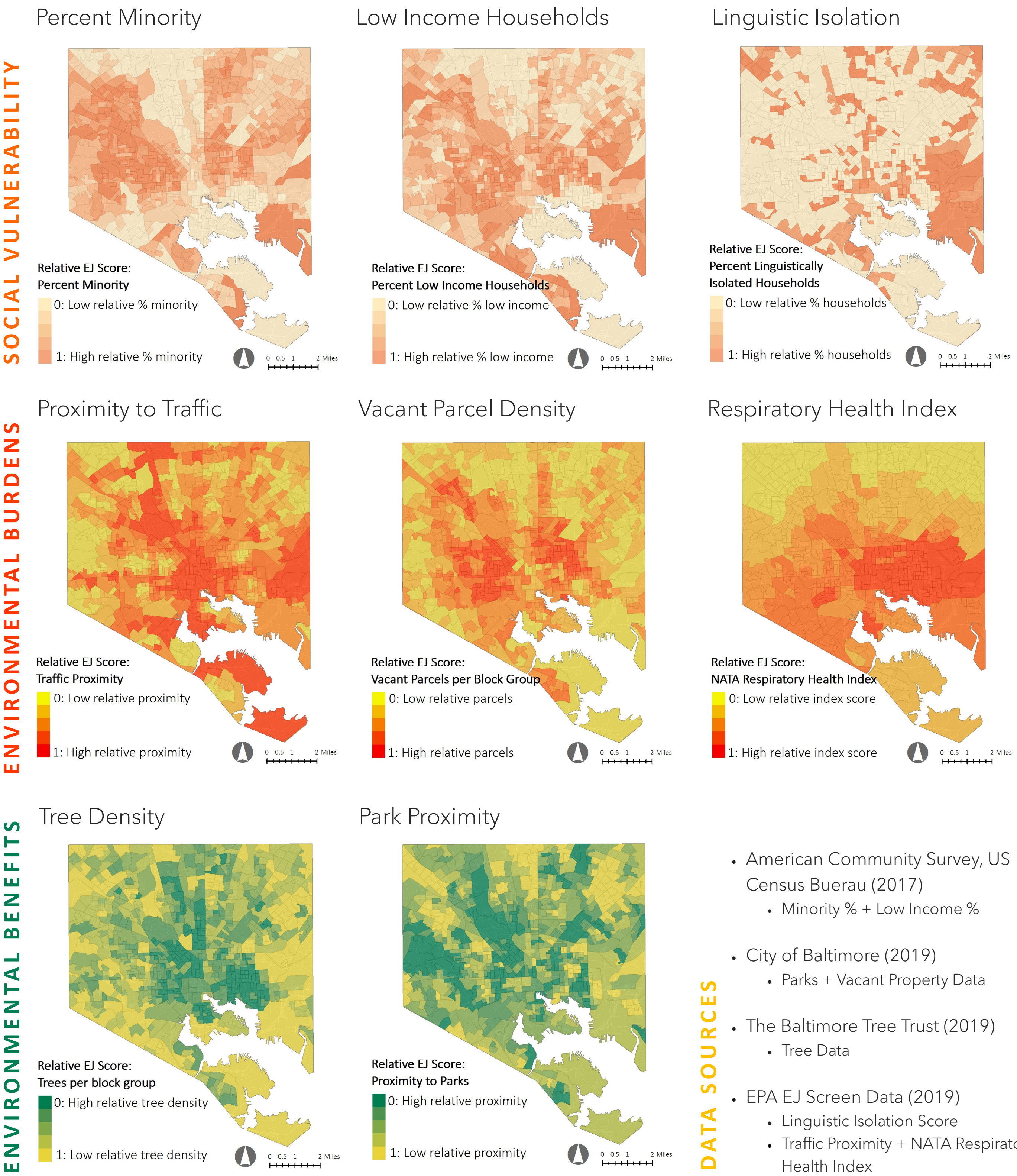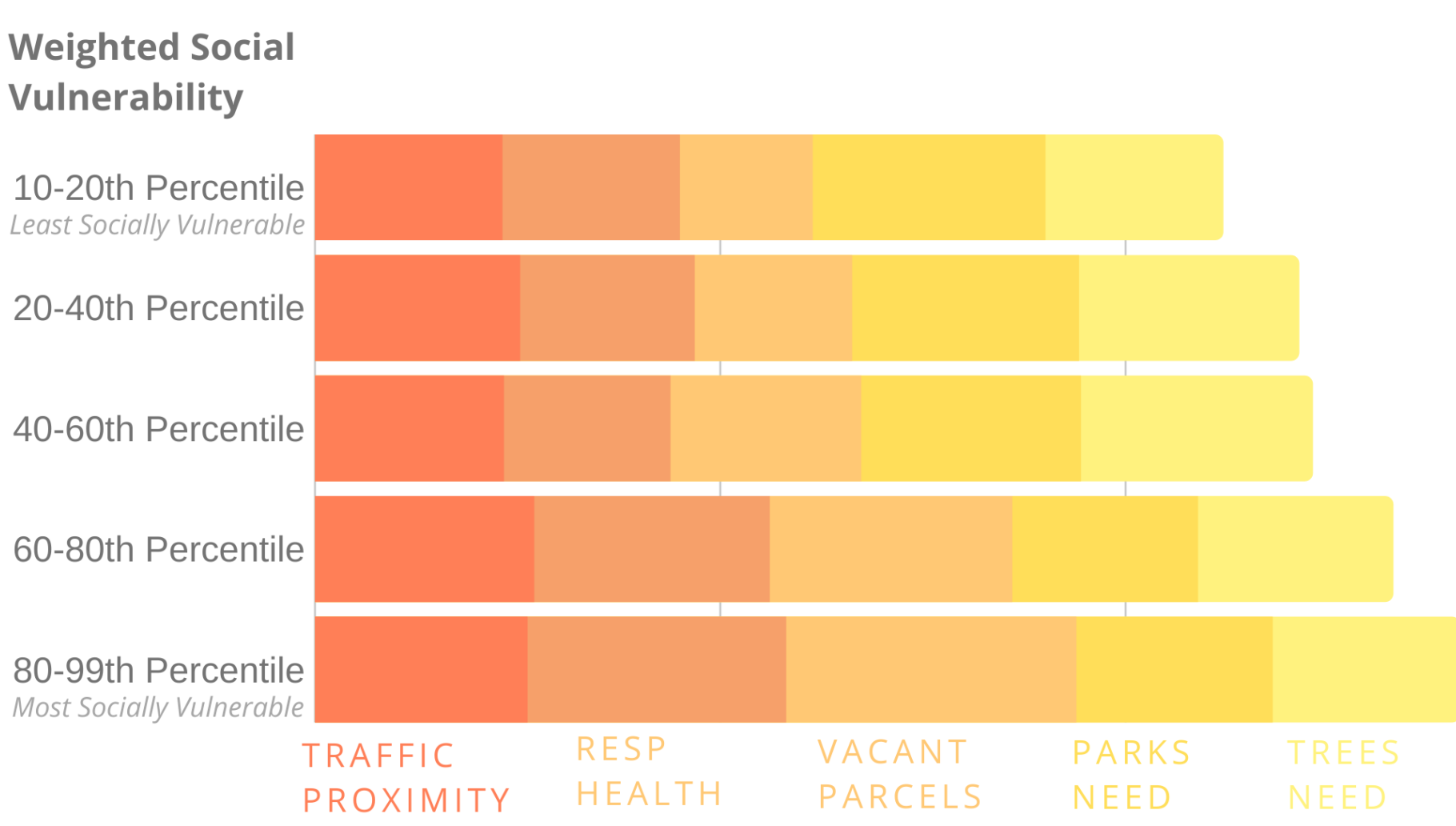
Additional analysis (bottom left) compares a weighted composite social vulnerability score with each of the benefit/burden factors. This shows that as social vulnerability increases, the total relative exposure to environmental justice concerns increases as well. This is most evident for respiratory health and density of vacant parcels.

Weighted Social Vulnerability

10-20th Percentile
Least Socially Vulnerable

20-40th Percentile

40-60th Percentile

60-80th Percentile

80-99th Percentile
Most Socially Vulnerable

TRAFFIC PROXIMITY | RESP HEALTH | VACANT PARCELS | PARKS NEED | TREES NEED

CONCLUSIONS

There is considerable value to an Environmental Justice study like this one. An analysis like this could be used by the City of Baltimore to determine where to make environmental investments or by community groups to advocate for a more just environment.

However, there are several limitations that should also be considered. Much of the data comes from the EPA's EJ screening tool. Their methodologies have not been disclosed to the public therefore can not be validated.

Further, the factors chosen to be Environmental Justice Factors were based off of academic definitions of Environmental Justice and may not be representative of the true, on-the-ground environmental needs faced by residents of Baltimore.

Understanding localized environmental threats would support a more nuanced understanding of environmental justice in Baltimore.

References:
[1] Mohai, Paul, David Pellow, and J. Timmons Roberts. 2009. "Environmental Justice." Annual Review of Environment and Resources 34 (1): 405-30.
[2] Pastor, Manuel, Madeline Wander, and Mirabai Auer. n.d. "Advancing Environmental Justice through Sustainability Planning." 30.
[3] Mendez, Michael Anthony. "Assessing Local Climate Action Plans for Public Health Co-Benefits in Environmental Justice Communities." Local Environment 20, no. 6 (June 2015).
[4] Grove, Morgan et al. "The Legacy Effect: Understanding How Segregation and Environmental Injustice Unfold over Time in Baltimore." Annals of the American Association of Geographers 108, no. 2 (2018).
[5] Grist. "Baltimore Youth Get Another Big Win in Fight against Incinerator." February 19, 2015. https://grist.org/climate-energy/baltimore-youth-get-another-big-win-in-fight-against-incinerator/.

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All maps use Lambert Comformal Conic Projection