ATCS

ENGINEERING INNOVATIVE SOLUTIONS

Using GIS to Develop Innovative Solutions for Environmental Justice

Definition

What is Environmental Justice?

Environmental justice is the 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.

Two Objectives:

- The same degree of protection from environmental and health hazards
- Equal access to the decision-making process to have a healthy environment in which to live, learn, and work

NEPA and EJ

- NEPA – National Environmental Policy Act –January 1, 1970
- 1980s - The rise of EJ; 1994 Clinton established an Executive Order 12898 to address EJ in **minority and low-income populations**
- State requirements for EJ documentation are ever changing
- Justice40 – Biden Administration

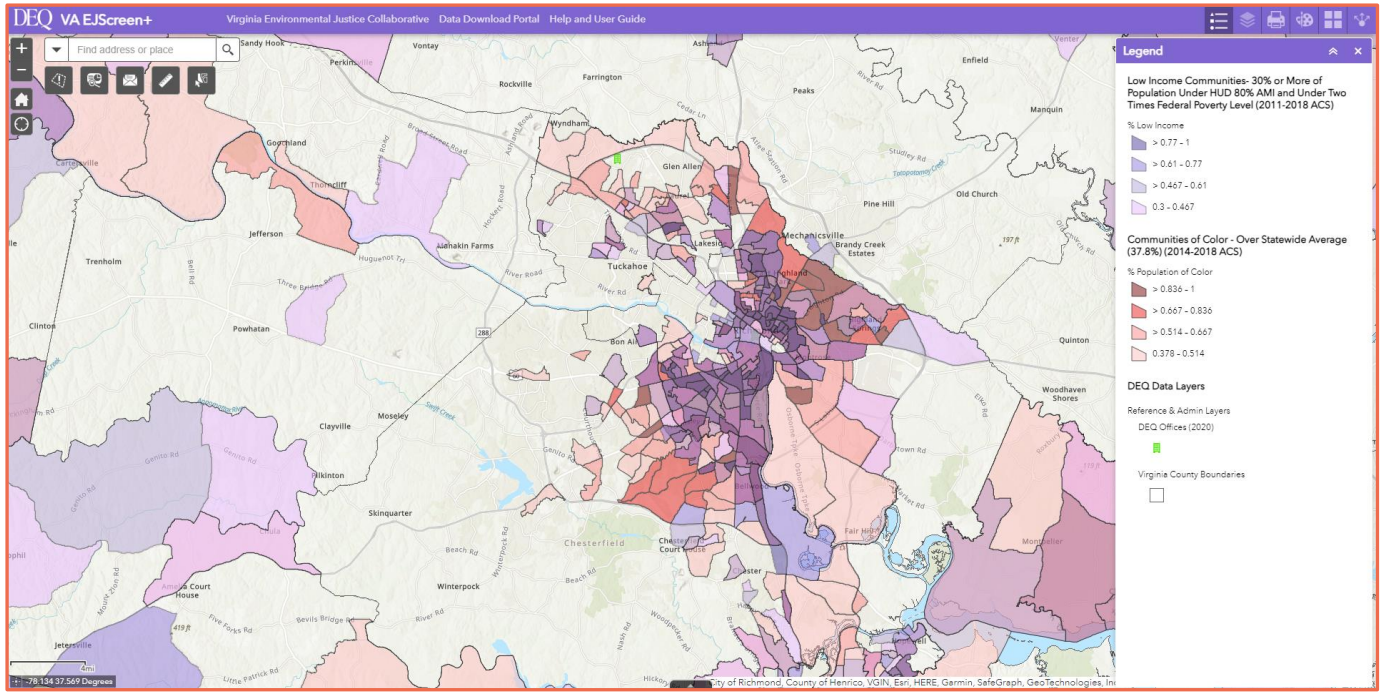
JUSTICE40

Applications

- NEPA Analysis
- Planning Studies
- Justice40 based Grant Applications
- Guided Infrastructure Investment
- Private Development
- Public Involvement
- Disaster Relief and Recovery

Evaluating Need

- Environmental justice studies typically do not exceed the Federal mandate to evaluate **minority and low-income** populations.
- These evaluations satisfy the requirements of Executive Order 12898.
- How can we paint a more detailed picture of environmental justice?

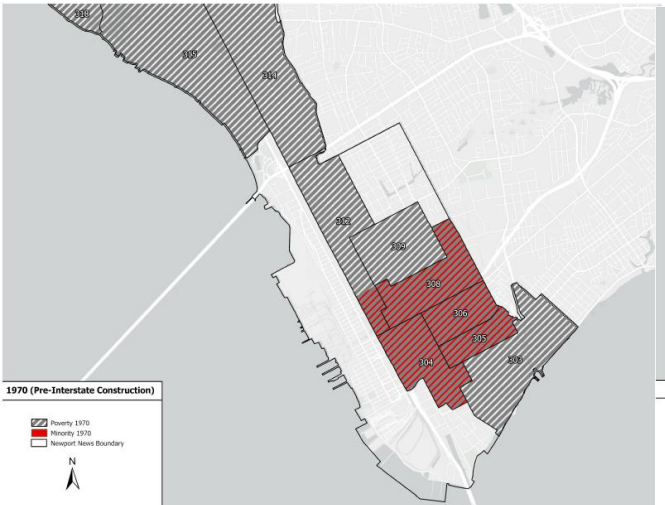


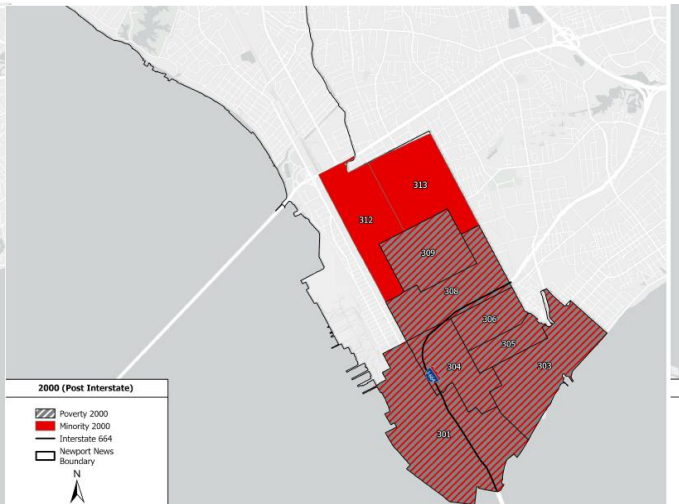
In-Depth Evaluation

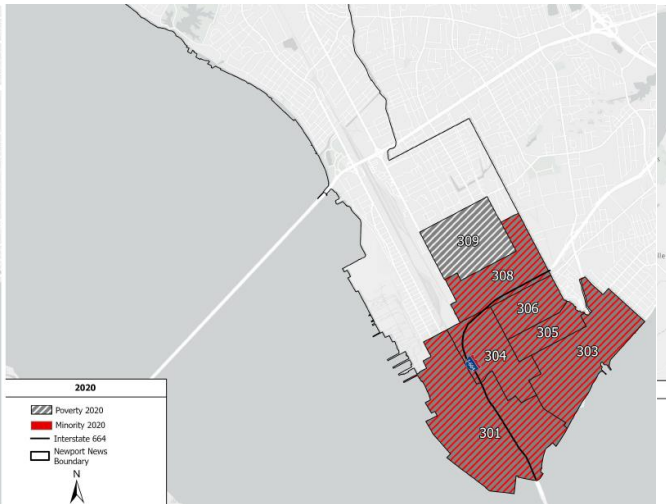
1. Census Data
   a. Race
   b. Disabilities
   c. Age
   d. Poverty/Low-Income
   e. Housing costs
   f. Commuting times
   g. Unemployment rates
   h. High school education
   i. Limited English/language other than English spoken at home
   j. Persons per household
   k. Computer/Internet usage
   l. Population per square mile
   m. 0 and 1 vehicle household
   n. Education level
   o. Age of housing
2. Tribal lands
3. School lunch programs
4. Low-income housing
5. Air quality/Ozone
   a. Asthma
   b. Other diseases
6. Sickness clusters
   a. Low Birth Weight
   b. Cancer Clusters
7. Noise
   a. Trains
   b. Airport
   c. Highways
   d. Event centers
   e. Industrial centers
8. Noise wall locations
9. Public transportation availability
10. Walkability
11. Green space
12. Nutrition/smoking/genetic factors
13. Health care availability
14. School availability/school conditions
15. Community facilities
16. Flight paths
17. Cumulative impacts
18. Civic engagement
19. Waste dumps
20. Hazardous waste sites/cleanup site
21. Drinking water status/groundwater threats/impaired water
22. Property values
23. Foreclosure rates
24. Accessibility to voting
25. Areas prone to natural disaster
26. Pesticide Use
27. Children's Lead Risk from Housing
28. Diesel Particular Matter
29. Linguistic Isolation
30. Proximity risk (industrial sites, freight corridors, dams, etc.)

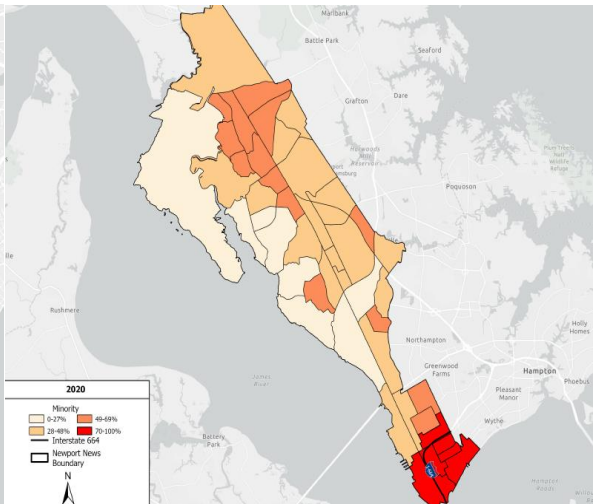
Use Case

- Newport News
  - USDOT Reconnecting Communities Grant Award
  - Southeast Area Community has been greatly affected by poor decision making in the past and has a history of being historically underinvested
  - Utilized GIS to identify the Southeast Area Community and map how the interstate historically changed the demographics of the community
- Catalyst for creating our own GIS based EJ tool









Methods

- Research Existing Tool
  - CalEnviroScreen
  - PennEnviroScreen
- Data collection
  - Collected data for 32 indicators
    - EPA
    - Census Bureau
    - Virginia Department of Health
    - VDOT
- Divided indicators into four subtypes
  - Exposure Indicators
    - Example: PM 2.5, Pesticide Use, Traffic Impacts
  - Environmental Effects
    - Example: Superfund Sites, Impaired Water Bodies, Cleanup Sites
  - Sensitive Populations
    - Example: Low Birth Weights, No Health Insurance, Cancer, Disabilities
  - Socioeconomic Populations
    - Example: Educational Attainment, Age, Linguistic Isolation, Poverty

pennsylvania DEPARTMENT OF ENVIRONMENTAL PROTECTION | PennEnviroScreen DEP

CalEnviroScreen 4.0

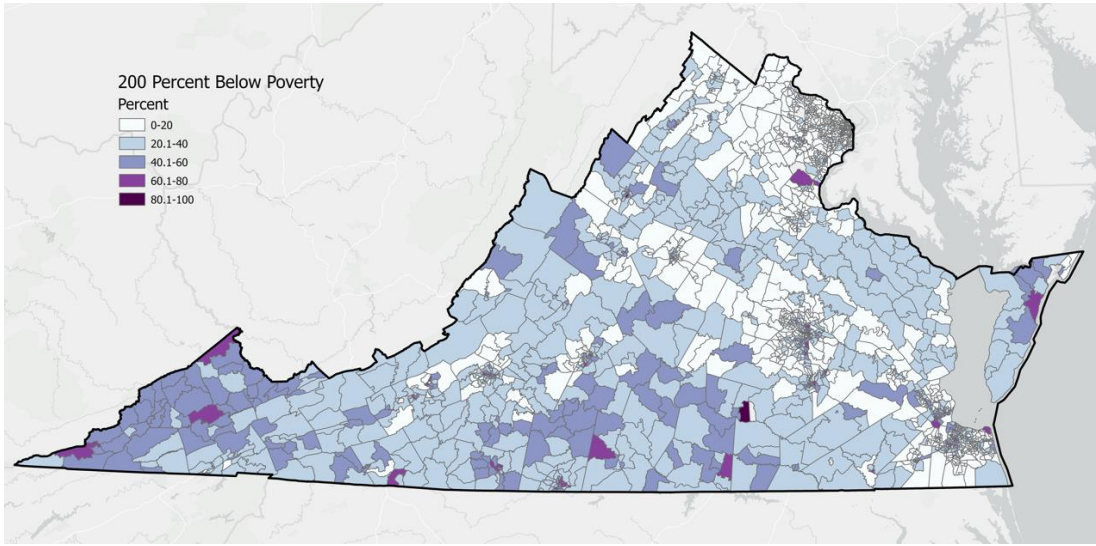
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

VDOT Virginia Department of Transportation

United States® Census 2020

Methods

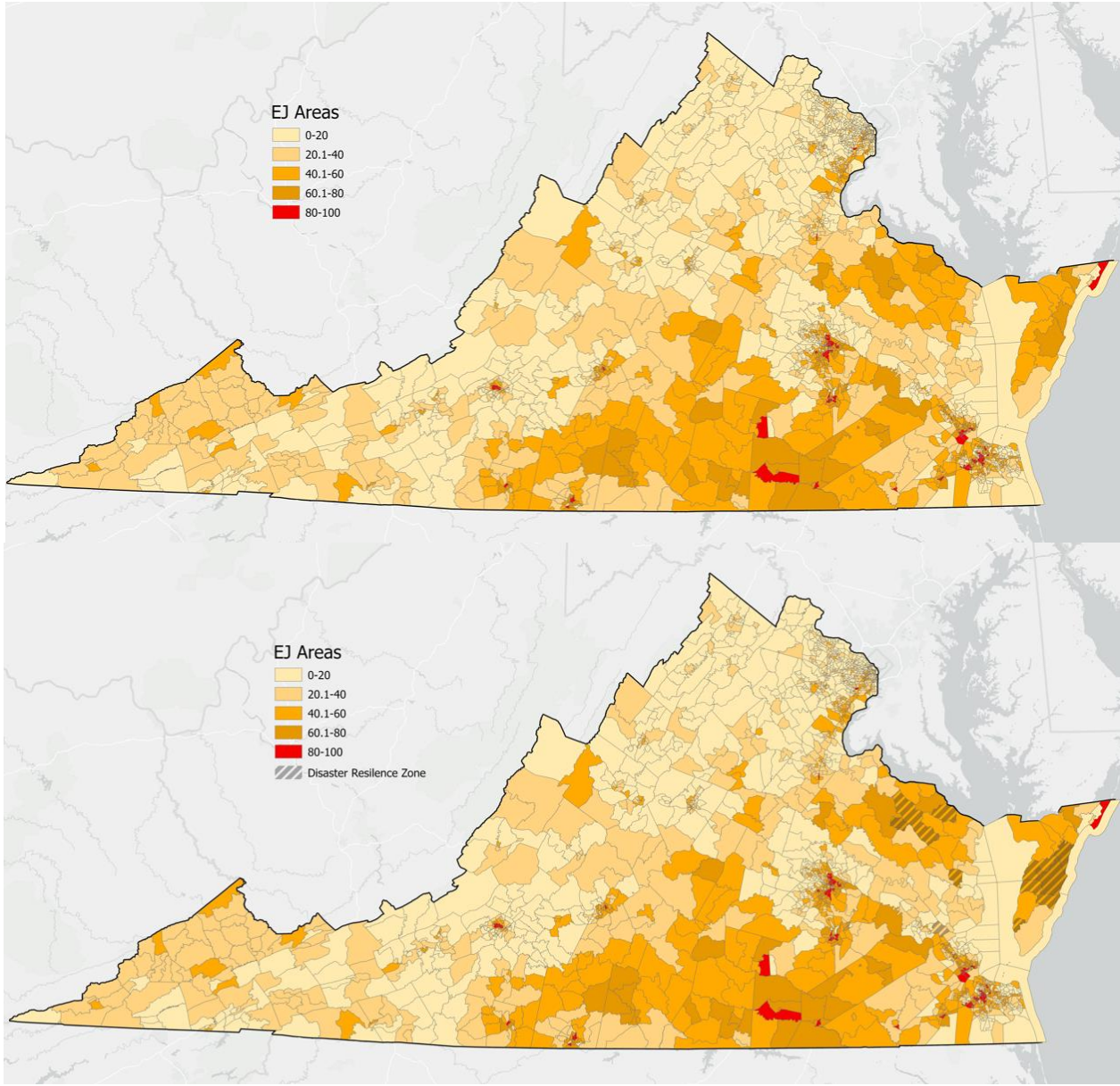
- Each Indicator within each census track is given a percentile score
- A Component Score was given to each census tract
- Scored were then given to the Population Characteristics and Pollution Burden to calculate the Final Score
- A percentile is then developed for the Final Score to Determine the EJ areas
- Census tracts at or above the 80th percentile are determined to be EJ areas



$$\text{Final Score} = \frac{\text{Pollution Burden}}{\text{Max Pollution Burden Score}} \times 10 \times \frac{\text{Population Characteristics}}{\text{Max Population Characteristics}} \times 10$$

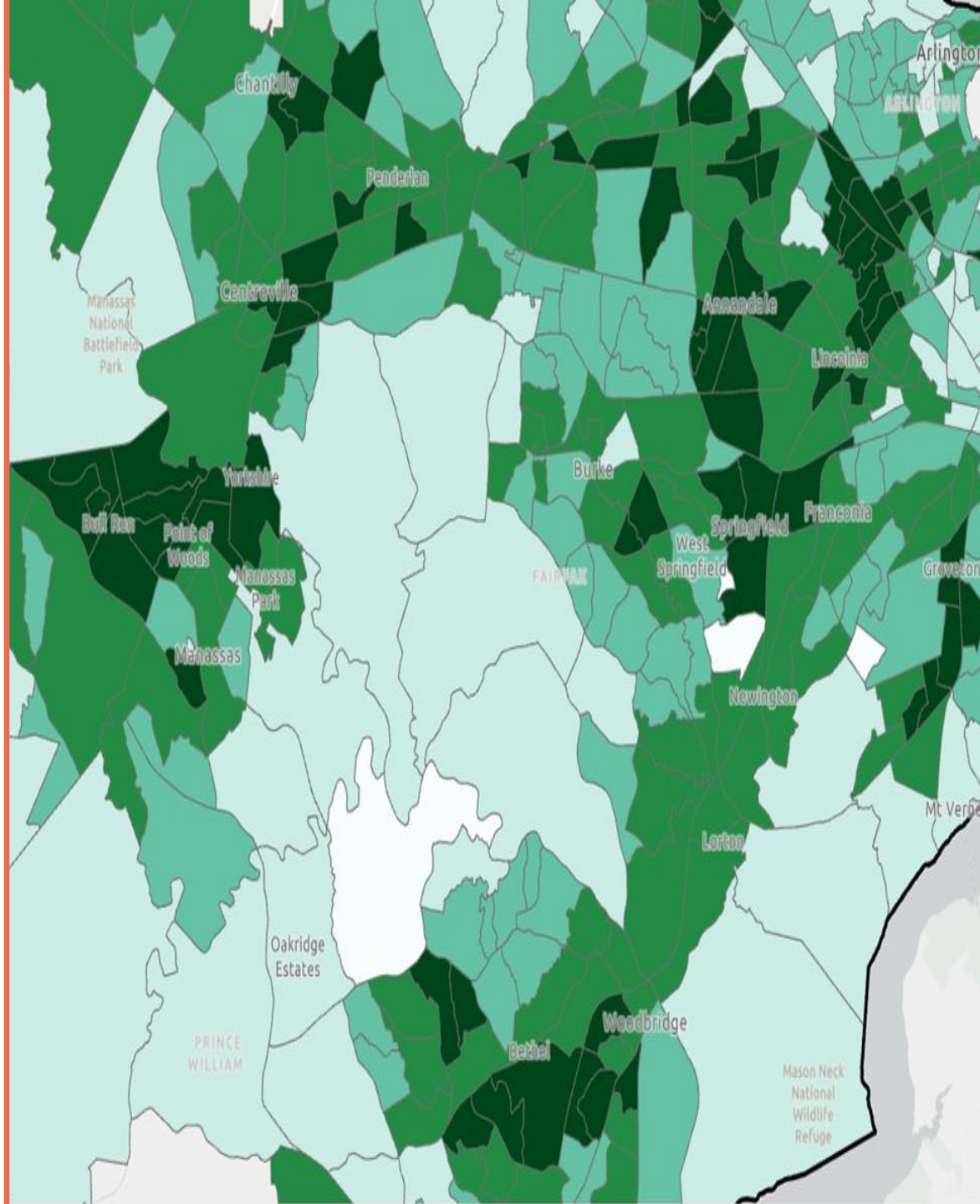
Final Results

- Final results will be symbolized using graduated colors based on the percentile ranking to display a thematic map of EJ defined areas
- Apply study areas and proposed projects to the map for an analysis on impacted EJ areas
  - Provide results on a granular level
  - Determine impact on a slide scale
- Overlay additional data
  - FEMA Disaster Resilience Zones



Future Outlook

- Final Product 2024
- Public Involvement
- Updating Data Using Block Groups
- Expand Our Analysis to Other Regions
- Best Management Practices
    - Updating the data



Thank you

QUESTIONS?