Green for Whom? Analyzing Green Space Access and Environmental Justice Across Iowa Counties

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Abstract:

This project examines disparities in access to green spaces and environmental quality across counties in Iowa, focusing on their relationship to poverty, race, and housing burden. Using R (with tidycensus), Leaflet, and Tableau, it visualizes how environmental justice outcomes vary across the state. The resulting maps and dashboards aim to support data-informed planning that prioritizes under-resourced communities and promotes equitable access to environmental amenities.

Overview:

Environmental justice is gaining traction in urban and regional planning, especially in rural and post-agricultural states like Iowa, where communities face uneven access to green infrastructure. This project investigates how socio-demographic factors—such as poverty rates, race, and housing burden—relate to green space access and environmental quality at the **county level** across Iowa.

Using data from the American Community Survey (ACS), the project will map social vulnerability indicators across all 99 counties. These will be compared to environmental metrics like tree canopy cover, percent of county land in public parks or conservation, and land-use intensity. A composite "Green Equity Index" may be developed to identify counties most in need of green investment.

The interactive web maps (built in Leaflet) will display indicators as layers users can toggle through. Tableau dashboards will provide deeper analysis with ranking charts, scatterplots, and county comparison tools. The final result will be a digital research poster that raises awareness and supports local governments and NGOs working toward environmental equity in Iowa.

Technology:

- **RStudio** with tidycensus, sf, dplyr, leaflet, tmap
- **Leaflet.js** for web mapping
- **Tableau Public** for dashboards
- **ArcGIS Pro** (optional for land cover preprocessing and basemaps)
- **HTML/CSS** for assembling the final poster interface

Data Sources:

ACS 5-Year Estimates for Iowa Counties (via tidycensus):

- B19013_001 – Median Household Income
- B17001_002 – Persons Below Poverty
- B02001_003 – Black or African American Population
- B25003_003 – Renter-Occupied Housing Units
- B25070_007 to B25070_010 – Housing Cost Burden >30% of Income

Environmental Datasets:

- **NLCD 2019 or 2021** – Tree canopy / green land cover percentage
- **PAD-US (Protected Areas Database)** – Public park and conservation land by county
- **Iowa DNR GIS Open Data Portal** – County park lands, trails, and natural areas
- **Census TIGER/Line Shapefiles** – County boundaries

Process / Methods:

1. Use tidycensus to download and preprocess ACS data at the county level
2. Normalize and join spatial demographic data to county polygons using sf
3. Calculate percentage of green space per county from PAD-US/NLCD
4. Build a Leaflet map showing toggleable layers (income, race, green access, etc.)
5. Use Tableau to build county ranking dashboards and visual comparisons
6. Optionally use Highcharts to visualize composite "Green Equity Index"
7. Assemble results into an HTML/CSS poster site with interactive elements

Inspiration:

- Mapping Inequality (Redlining Project)
- Green Equity Mapper
- EPA EJScreen
- Iowa Environmental Council – Local policy context

Potential Challenges:

- Processing and integrating environmental land cover data (e.g., NLCD)
- Matching county boundaries across datasets with varying geometry types
- Defining a consistent and meaningful metric for “green space access”
- Balancing detail and clarity in visual design of dashboard/poster
- Managing dashboard performance with multiple indicators

Timeline for Completion:

Week 1 (Apr 6–12):

- Finalize variables and download ACS & Iowa DNR datasets
- Prepare spatial joins and calculate basic statistics in R

Week 2 (Apr 13–19):

- Build base Leaflet map and explore Tableau dashboard design
- Integrate land cover / park data by county

Week 3 (Apr 20–26):

- Finalize Leaflet web map with legend and layer controls
- Build Tableau visualizations (bar charts, scatterplots, etc.)

Week 4 (Apr 27–May 3):

- Assemble everything in HTML/CSS poster format
- Write supporting text and final descriptions

Week 5 (May 4–9):

- Polish and test interactivity
- Final revisions and submission
