

Repeating History: How do Discriminatory Housing Policies impact Climate Change Vulnerability

Introduction

This analysis serves as a holistic risk assessment Boston's climate change vulnerability. It takes into account not simply geographical elevation, but also "social vulnerability", defined by Climate Ready Boston (CRB) as "the disproportionate susceptibility of some social groups to the impacts of hazards, including death, injury, loss, or disruption of livelihood." CRB identifies some potentially vulnerable groups as older adults, children, people of color, people with limited English proficiency, people with low or no incomes, people with disabilities, and people with medical illnesses.

The map in figure 1 uses data from the National Oceanic and Atmospheric Association (NOAA) to visualize coastal flooding or sea level rise (up to 10 feet above average high tides) using elevation data. Based on Boston's history of racial discrimination with redlining, school segregation, bussing, etc (which still greatly impact the social inequities in the city today), it is vital to take into account policy and social vulnerability when planning for climate change, not just geography. This analysis reveals meaningful parallels between climate vulnerability and historic policies which still segregate the city today.



Figure 1: coastal flooding or sea level rise 10 feet above average high tides from NOAA Data

Methods:

1. Datasets gathered:
 - HOLC redlined maps of Boston
 - projected flood levels
 - Current Boston Demographics: Race, Low to no income, Limited English Proficiency
2. Using ArcGIS pro, the projected flooding shapefiles from the NOAA dataset were added to a base map of Boston
3. Datasets were merged to create a map which combined HOLC grade (A-D) with the demographics of Race, Low to no income and Limited English Proficiency. These demographics were originally used in the 1930's to determine HOLC grade.
4. Symbology was edited to show graduated colors with color schemes from light to darker values.
5. A regression model was created in Arc GIS Pro to explore the relationship between redlined areas

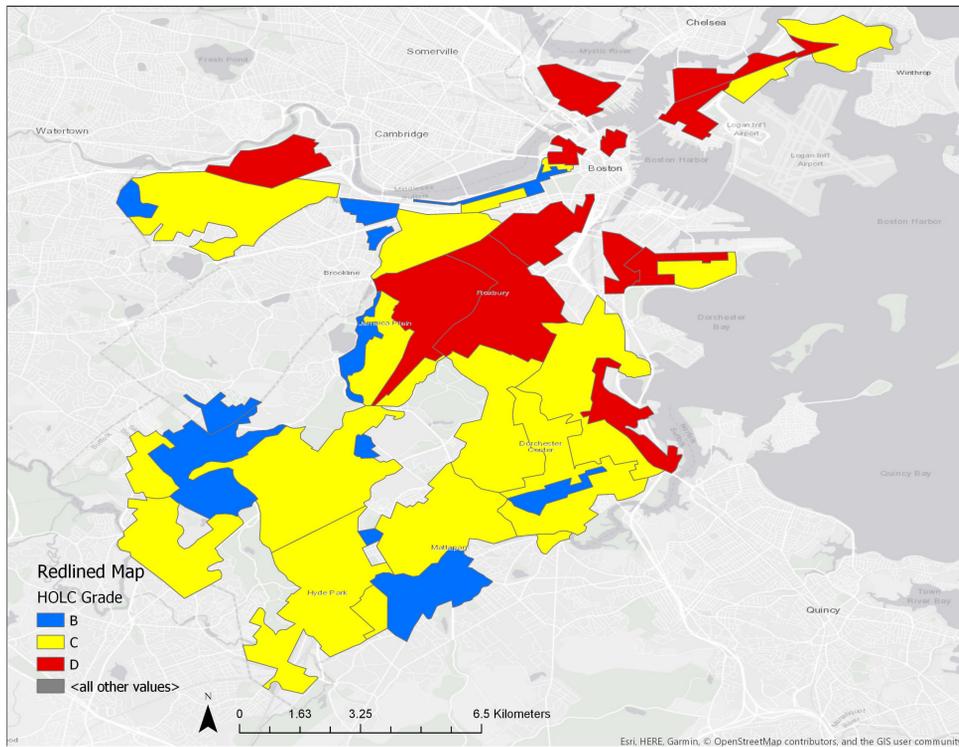


Figure 2: Original Map showing Boston Redlining from policy map

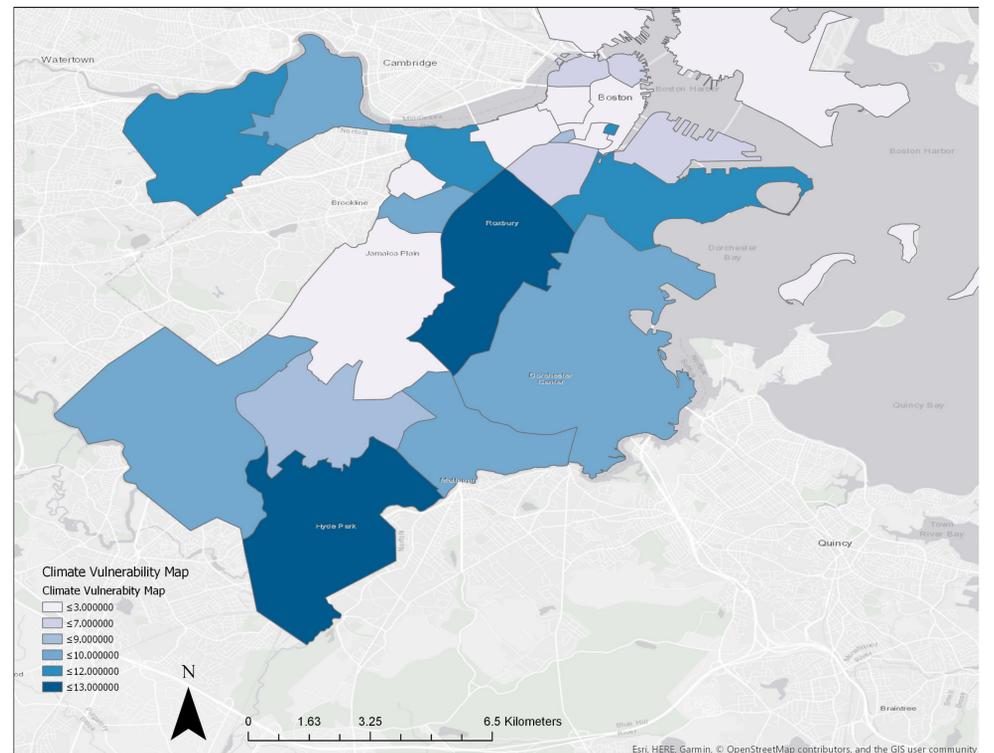


Figure 3: Merging Climate Vulnerability Characteristics and HOLC Grade

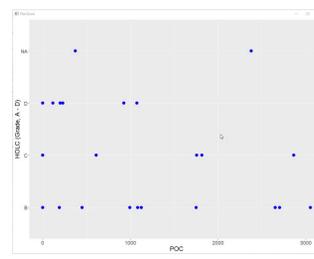
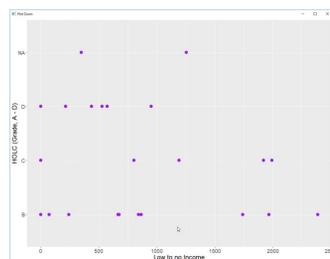
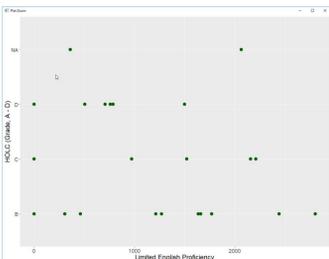
Redlining:

This policy, practiced in 239 cities throughout the United States, occurred when the Federal Housing Authority refused mortgage insurance in communities of color, labeling them as "blighted". Government surveyors color-coded neighborhoods green for "best," blue for "still desirable," yellow for "definitely declining" and red for "hazardous." The "redlined" areas were the ones local lenders discounted as credit risks, in large part because of the residents' racial and ethnic demographics. They also took into account local amenities and home prices. neighborhoods with a surplus of quote on quote "undesirables" were marked as bad investments for financial institutions- as such loans in these neighborhoods were unavailable or very expensive, and investment in the neighborhoods virtually ceased leading to decay and abandonment . Figure two shows an original Home Owners' Loan Corporation redlined map of Boston.

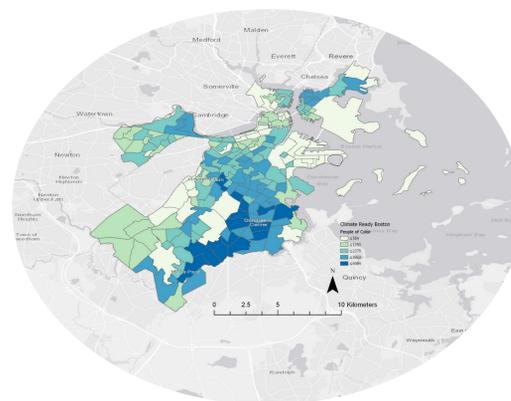
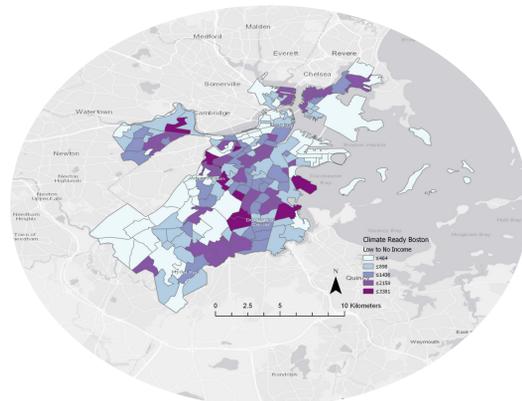
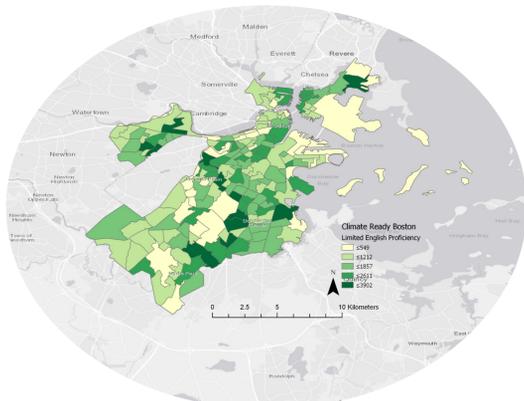
Conclusions

The policy of redlining serves as a predictor for three characteristics which increase climate vulnerability: population of people of color, population of people with limited English proficiency, and population of people with low to no income. These characteristics were also used to determine mortgage lending by the FHA in the 1930's. According to my regression analysis, the climate vulnerability characteristics of people of color (POC), limited English proficiency (LEP), low to no income have R squared values of 0.75, 0.94, and 0.89 respectively, meaning that the model explains 75%, 94%, and 89% of the variability in HOLC grade for the respective categories.

Based on these findings, it is clear that it is necessary to consider data beyond geographical data when creating policies to strengthen Boston's resilience to climate change. It is imperative to collect more data on Climate Vulnerability Going Forward



| Outcome | Model | Adjusted R2 | AICc |
|------------|-----------------------------|-------------|--------|
| Final Rank | Limited English Proficiency | 0.94 | 77.15 |
| Final Rank | Low to no Income | 0.89 | 91.8 |
| Final Rank | People of Color | 0.75 | 112.91 |



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Data Sources:

1. "Climate Ready Boston Social Vulnerability." Arcgis.com, Climate Ready Boston,
2. "DigitalCoast." Sea Level Rise Viewer.
3. Lab, Digital Scholarship. "Mapping Inequality." Visualizing Emancipation.

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