Climate Gentrification in Miami Neighborhoods

Visualizing historical socioeconomic vulnerabilities and ecological hazards in the context of migration and displacement

CP204c Final Project

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Projection: GCS NAD 1983

Key themes: redlining, socioeconomic status, flood risk

Introduction

Climate change causes sea levels to rise and intensifies extreme weather events—effects that are expected to worsen in years to come. Rising sealevels threaten infrastructure and coastal communities, including Miami Beach. Many of Miami's coastal communities will be flooded, causing its most sought-out properties to vanish. Inevitably, residents will relocate to new locations, regardless of who might be living there already, or those communities' underlying vulnerabilities.

Through the following analyses, we identify which communities in Miami are at the greatest risk of facing climate change gentrification. As defined by the Environmental Law Institute, the term "describes the process of wealthier, often whiter populations moving to areas less exposed to the effects of climate change that were previously occupied by lower-income residents and communities of color, thus exacerbating displacement and disparities." The communities that we identified as facing the the highest risk of climate gentrification are circled in Maps 2 and 3.

Problem Statement

As developers continue to find space for new projects in Miami, they will increasingly look for areas at higher elevations that will be readily accessible for a longer time and at lower flood risk. Historically marginalized communities did not necessarily choose to live in higher elevation areas, but their being there now puts them at risk of displacement.

Research Questions

Who needs systemic protection as flooding, sea level rise, and hurricanes push new residents into historically vulnerable areas?

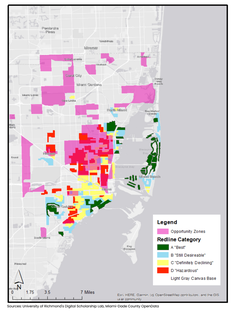
- Where are the historically redlined neighborhoods located in Miami, and are their demographics still impacted?
- Which neighborhoods are most likely to expereince environmental hazards perpetuated by climate change?
- Which neighborhoods face the risk of displacement due to climate change gentrification?

Methodology

Data Discovery	Processing	Analysis	Results
University of Richmond's Digital Scholarship Lab, Miami-Dade County OpenData	Project NAD 1983, symbology	Add transparent layer of Opportunity Zones, and change symbology of redline tracts	**Historical Vulnerability**
US Census, Miami-Dade County OpenData, MIT Living Wage, Google Maps	Data consolidation, data processing, projection (NAD 1983), vulnerability ("constraints") definition, geocoding, network building & re-projection	Suitability Analysis, Network Analysis	**Socioeconomic Vulnerability Maps**
NOAA, Miami-Dade County Open Data, FEMA, USGS	Points to polygons, projection, georectification, union DEM layers, creating new polygons, Lidar transformation, raster calculation & compilation	Lidar analysis to show elevation, Suitability analysis to show 'opportunities' for ecologically safe zones	**Ecological Hazard Maps**

Historic Redlining

Map 1: Historic Redlining and Opportunity Zones

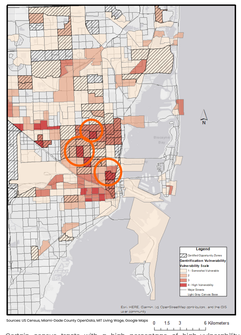


Sources: University of Richmond's Digital Scholarship Lab, Miami-Dade County OpenData

Redline zones from 1937 maps of Miami show that more desirable, whiter neighborhoods were historically concentrated along the coastline. High-minority neighborhoods, deemed hazardous are marked in red and are located further inland. 2018 Opportunity Zones are overlaid to show where current investment efforts coincide with historically marginalized neighborhoods. Many areas deemed hazardous in 1937 are now identified as opportunities for economic growth. Further, Opportunity Zones have been criticized for spurring displacement due to gentrification, which may increase climate-related gentrification risks in the highlighted neighborhoods.

Socioeconomic Vulnerability

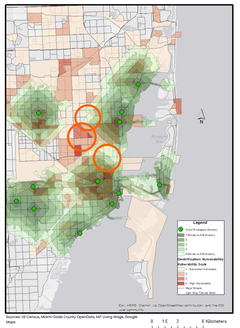
Map 2: Socio-Economic Vulnerabilty to Gentrification



Sources: US Census, Miami-Dade County OpenData, MIT Living Wage, Google Maps

Certain census tracts with a high percentage of high-vulnerability populations are at high risk for gentrification due to their socio-economic vulnerability. First we selected tracts with 75% or more rented housing units, since renters often have few property rights to stave off gentrification. We then identified tracts with a median income below the defined living wage ($33,000 according to MIT). Social vulnerability is provied by SNAP recipients and lack of internet access, showing where 50% or more units recieved SNAP benefits, and 25% or more lacked internet access. Overlaid against the Opportunity Zones and Miami newspapers noting "up and coming" neighborhoods, Little Haiti, Overtown, and Liberty City stand out as most vulnerable.

Map 3: High Risk of Early/"Easy" Gentrification

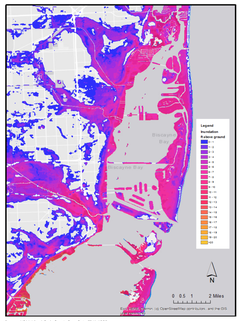


Sources: US Census, Miami-Dade County OpenData, MIT Living Wage, Google Maps

Certain census tracts will have underlying vulnerabilities to gentrification from existing amenities, like supermarkets. Prior to developers buying up land and increasing rental price markets, areas within 5 minutes of a grocery store would likely be more attractive to early-gentrifying renters. Realistic areas of interest for gentrifying populations were narrowed through network analysis to A- and B-class grocery stores, where A grocery stores were defined as Whole Foods-type grocers, B as national or regional chains, C as local chains with medium to poor reputation, and D as bodegas or those with limited produce. The Little Haiti, Liberty City, and Overtown neighborhoods, circled, are within this 5 minute network, making them further vulnerable to early gentrification.

Ecological Hazards

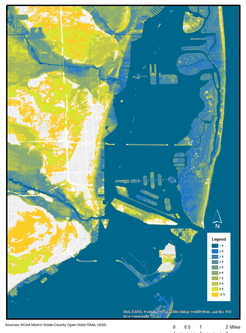
Map 4: Category 5 Hurricane Flooding (High Tide)



Sources: NOAA, Miami-Dade County Open Data, FEMA, USGS

With as low as 5 feet of hurricane flooding (5ft of "SLOSH"), all of Miami Beach is underwater, as is much of the eastern coast along Biscayne Bay, but there is a north-south strip near the coastline entirely free of flooding. That is to say, there are dry areas near the coastline that would be viable alternatives to Miami Beach. Despite the legend showing up to 20+ ft of elevation, the flood zone barely strays above 13', indicating that areas above 13 would be safe from large scale storm surge.

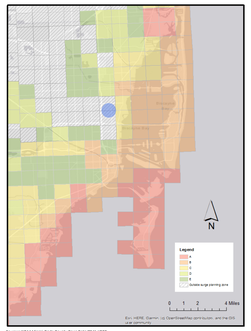
Map 5: Sea Level Rise Inundation 1-10 ft



Sources: NOAA, Miami-Dade County Open Data, FEMA, USGS

On a practical level, the map shows that at only 2-3 feet of sea level rise, the vast majority of Miami Beach and the immediate Miami coastline will be inundated, so wealthy displaced residents of the city will have to go elsewhere. The logic and appeal of higher ground's natural protection against flooding suggests that developers would likely focus on the areas of the non-flooded corridor going north-south, which includes Little Haiti almost in its entirety.

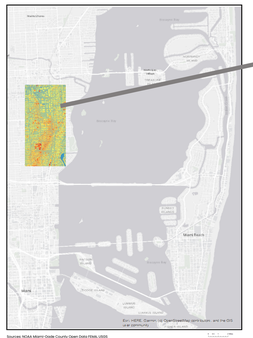
Map 6: Miami-Dade Evacuation Zones



Sources: NOAA, Miami-Dade County Open Data, FEMA, USGS

The 'dry corridor' is largely outside of the evacuation zone range entirely. The double-sided sword of these low-income areas being safe from evacuation is that wealthy residents considering leaving likely evacuation areas along the water may be looking at areas like Little Haiti, marked by the blue dot, specifically because they would not have to evacuate in the majority of hurricane situations.

Map 7: Lidar Elevation of Little Haiti Area

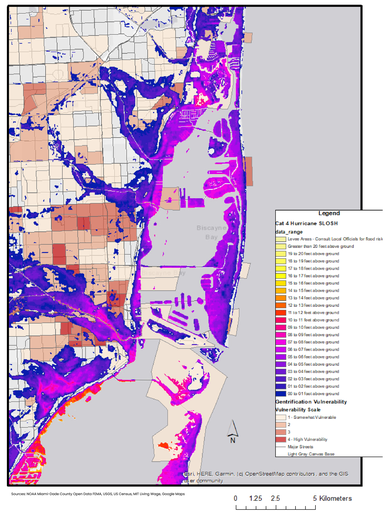


Sources: NOAA, Miami-Dade County Open Data, FEMA, USGS

Lidar data show that one of the neighborhoods identified as most vulnerable socioeconomically but largely safe from inundation is, in fact, at a visibly higher elevation. This area also coincides directly with the "Opportunity Zones" designated for development, of which the Little Haiti project is the largest nationwide. This entire corridor sits at 16-17 ft high, and given its proximity to the coastline and its relatively large spread, compared to smaller, scattered pockets, it is logical that those leaving Miami Beach or the Miami coastline might begin migrating there as the ecological hazards begin to outweigh the benefits of water features.

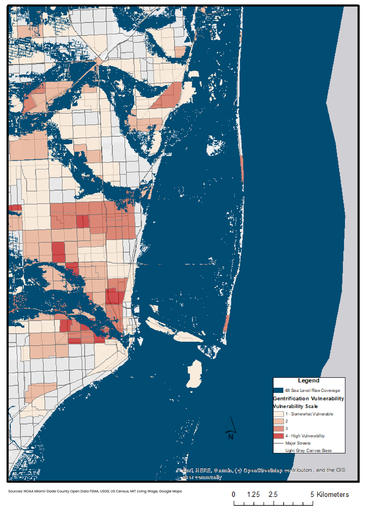
Composite Analysis Maps

Map 8: Hurricane Flooding and Social Vulnerabilities



Sources: NOAA Miami-Dade County Open Data FEMA, USGS, US Census, MIT Living Wage, Google Maps

Map 9: Sealevel Rise Inundation and Social Vulnerabilities



Sources: NOAA Miami-Dade County Open Data FEMA, USGS, US Census, MIT Living Wage, Google Maps

Our composite maps show social vulnerabiilities in context of both slow-onset and fast-onset environmental hazards: sea level rise and flooding. These two maps show more realistic scenarios than some of the extremes by presenting a category 4 storm surge and 6 feet of sea level rise. The neighborhoods previously identified as most socioeconomically vulnerable due to historic redlining, poverty, resource access, and gentrification are also visibly sheltered from these immediate hazards. This is the type of map that environmental justice advocates would use to advocate for community equity funds or housing ownership initiatives, and developers might weaponize to identify their next big paycheck. Indeed, the Magic City Innovation District, a $1 Billion dollar development project, falls into much of this area while also pushing into Little Haiti.

Challenges & Uncertainties

Our vulnerability modeling is based on our own assumptions and understandings of vulnerable neighborhoods in other cities. For example, proxy variables to measure factors like progress of gentrification or hurricane preparedness were selected based on our knowledge of vulnerability. There are qualitative pieces of information that would be beneficial in making this model more specific at a block level, including what structures have hurricane-resistant glass (and other lesser types of window protection), where FEMA or Miami-Dade County have previously denied payouts, and building-by-building construction code adherence. These would all show a direct overlap of socioeconomic vulnerability and ecological vulnerability, knowing that lower-income neighborhoods are often harder hit while also having less protection. Regarding scale limitations, it is difficult to say how much detail was lost due to our map size and therefore wouldn't have revealed certain physically vulnerable areas. Furthermore, Miami Dade County's publicly available contour map only has measurements in 5' increments, when the critical information is in literal inches of difference (and the vast majority of Miami falls into 5-10' and 10-15').

Conclusion

Climate gentrification is a long-term issue with many moving parts. It will be difficult to predict a specific timeline, but the deepening ecological hazards and socioeconomic disparities make it more important than ever to be cognizant of the most affected and least protected areas. There are already massive redevelopment projects underway in Little Haiti (including attempts to rename it "Lemon City"), which we identified as a prime at-risk location. Our research helps to identify historically marginalized neighborhoods that are most likely to experience climate gentrification and validates historical socioeconomic vulnerability markers as modern climate-side vulnerability markers, with the hope that the information here can guide policy that will provide them more protection. For example, no/low-interest loans were given to residents who were historically impacted by redlining in other cities, and similar models could be applied in the Miami neighborhoods we identified. We hope that this information validates the need for a community land trust or similar program that would work to support and strengthen long-standing Miami communities rather than displace them.