Flooding & Storm Surge Suitability Analysis in Little Haiti, Miami.

Students Nina Jean-Louis, Leen Maraqa , & Aristea Tontai

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GIS Suitability Modeling Map

Abstract

Assessing and analyzing risk are key steps in the Hazard Risk Management (HRM) approach. Utilizing technology applications such as geographic information systems (GIS) mapping is one tool that can help quantify and visualize the impacts of these risks within a community. For this study, GIS was utilized to build a suitability model based upon four main risk criteria (further explained in methodology) to highlight risk for buildings and parcels in the Little Haiti community. Data was obtained through 2017 tax assessment data and NOAA weather data (see references).

Int roduction

There is a growing need for risk assessments to further inform mitigation strategies for the historic built environment, especially as it pertains to making historic communities more resilient against hazards such as flooding and coastal storm surge. A key trigger for this was the damage brought upon by Hurricane Irma in 2017. In a resiliency project led by the CLEO Institute, Association of Preservation Technology (APT), University of Miami (UM) and multiple private and municipal government stakeholders, several neighborhood surveys were completed to assess the damage impacting the historic building stock within Little Haiti. Much of the damage seen included envelope water leakage issues, roof and fenestration damage. Using coastal storm surge and digital elevation model data (DEM, for flood risk), GIS suitability mapping is applied to study which buildings are at high risk in the Little Haiti neighborhood in Miami, Florida. Additional risk factors were also included and are discussed further in the methodology.

Fig 1. Hurricane Irma storm damage in historic homes in Little Haiti. Photo obtained through APT.

GIS Mapping Materials

Fig 2. Three-Dimensional (3D) & Two-Dimensional (2D) Map of Little Haiti Suitability Model

Note. ***Red line*** *is boundary of study area.* *red structures/parcels are high risk.,* *orange structures/parcels are medium risk* *yellow structures/parcels are low risk*

Fig. 3 Three-Dimensional (3D) High Risk Area Zone 1

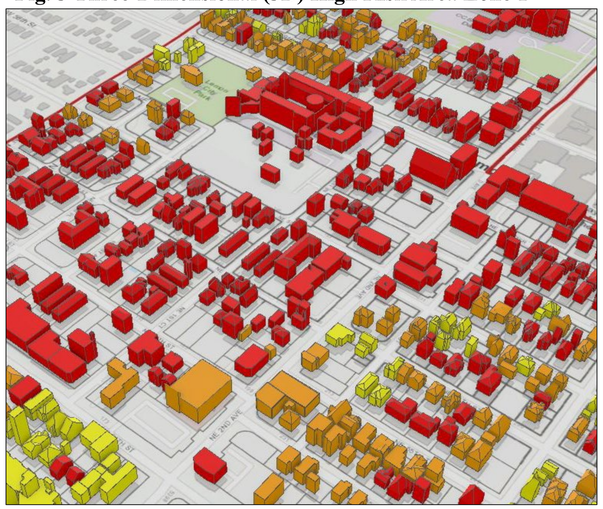

Fig 4. Three-Dimensional (3D) High Risk Area Zone 2

Note. High risk buildings were noted to be recorded in Zone 1 which is bounded by NE 59th & 54th Street in the north and south as well as N Miami Ave & NE 2nd Ave in the east and west. Zone 2 is bounded by NE 69th and 68th Street in the north and south as well as N Miami Ave & roughly NE 1st Ave.

Conclusion

The risk categories developed from the suitability model was applied to the 3D shapefiles to create colorized attributes that can highlight which specific buildings and parcels within the Little Haiti community are at high risk based on the risk parameters described in the methodology. The hope in illustrating these risks as shown will help municipal agencies (such as the Historic Preservation office) as well as non-profit organizations (such as Dade Heritage Trust) to prioritize documentation, assessment and retrofit/repair initiatives that will better inform reconnaissance surveys.

Methodology

The GIS suitability modeler is used to identify the best location to site areas of interest such as determining the where to build a housing development or determine best areas for flood control. For this study, the initial step was determining the risk criteria to be used in the modeler and transform each data set to a common suitability scale ranging from 1 to 10 where "1" is the lowest risk and "10" is the highest risk assigned. Described below are the risk criteria utilized in this study:

Building Age. Given the focus on protecting the historic built environment, we transformed building construction years from the 2019 tax assessor data to assigned risk categories of buildings ranging from 1920-1960 with buildings from 1920 being at higher risk due to age.

DEM & Flood Risk. An elevation analysis of the area was also considered to see which areas in the Little Haiti neighborhood are more prone to flooding due to lower elevation. Elevations for the neighborhood measured from 5.42-24.72 feet (which a "10" being assigned to the lower elevations).

Coastal Storm Surge. A similar approach used with the DEM & Flood Risk was utilized to assess the storm surge impact on the neighborhood.

Average Household Income. This criteria was additionally considered to also prioritize low-income areas for mitigation strategies. Household income for this area ranges from $28,867-$136,545 with a 10 assigned to the lower range of income values.

Following the determining and transforming the values from the criteria above, an equal weight was assigned relative to each criteria to develop the suitability map included herein A tertile distribution was utilized to divide the data into three parts where each risk category (low, medium, and high) contained a third of the criteria data sets.

References

(1) Association of Preservation Technology. Little Haiti Neighborhood Manual. Chicago: Association of Preservation Technology, 2020.

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