



COMPARATIVE ANALYSIS OF URBAN HEAT ISLAND INTENSITY AND VEGETATION PATTERNS IN LONG BEACH AND LOS ANGELES

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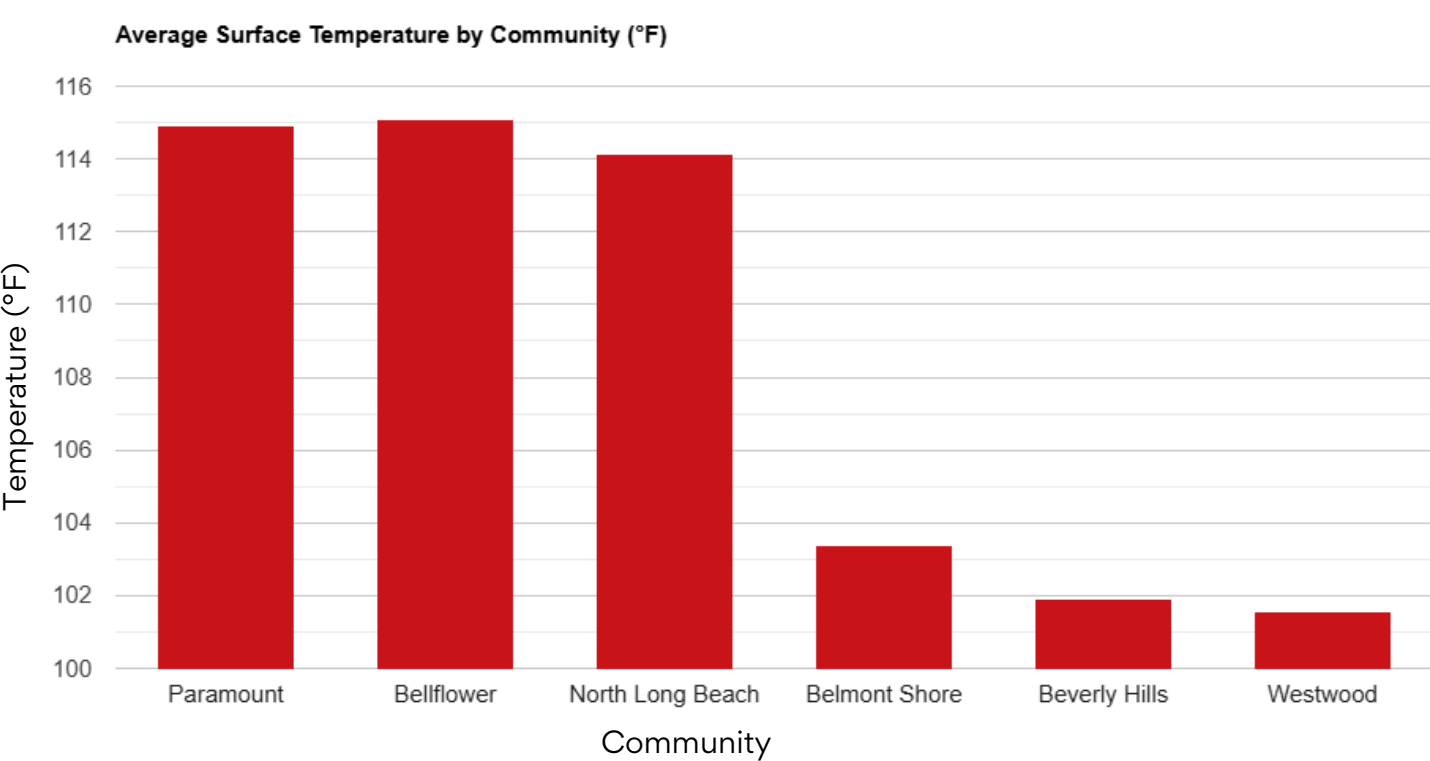
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REFERENCES

WHAT ARE URBAN HEAT ISLANDS?

Urban heat islands (UHIs) are areas within cities that experience higher temperatures than surrounding regions due to built environments such as roads, buildings, and other heat-absorbing surfaces. These materials store and release heat, causing urban areas to remain warmer, especially during the evening and night. The UHI effect is intensified in areas with limited vegetation and high concentrations of impervious surfaces (California Environmental Protection Agency).



HOW DO URBAN HEAT ISLAND (UHI) INTENSITIES AND IMPACTS VARY BETWEEN NEIGHBORHOODS?

Extreme heat is linked to increased risk of heat-related illness and respiratory conditions such as asthma. Asthma remains a significant health concern across California, particularly in urban counties (California Department of Public Health). In addition, community health data show that environmental conditions, including heat exposure and air quality, vary across neighborhoods (Los Angeles County Department of Public Health). These findings suggest that communities experiencing higher temperatures and lower vegetation may face greater health risks.

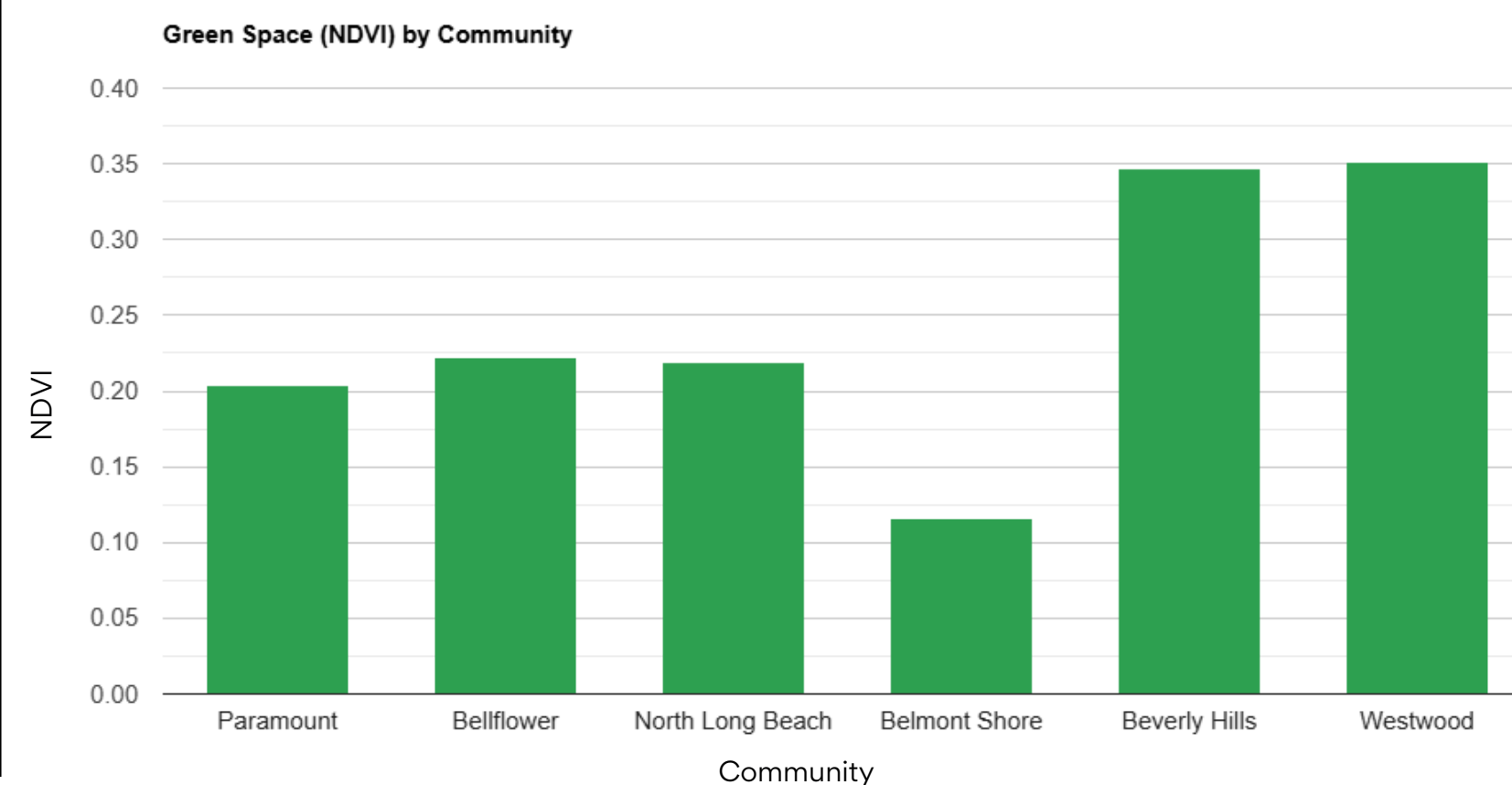
INTRODUCTION

Urban heat islands (UHIs) are a growing environmental and public health concern, particularly in densely populated areas like Long Beach and Los Angeles. As temperatures rise due to climate change, communities with limited access to green space experience higher heat exposure. These conditions can worsen air quality and contribute to heat-related health risks. However, these impacts are not evenly distributed, as lower-income and historically marginalized communities often experience higher temperatures due to differences in land use and vegetation.



METHODOLOGY

This study uses a mixed-methods approach combining remote sensing and GIS analysis. **Landsat 8 and Landsat 9 Collection 2 Level 2 imagery were used to calculate land surface temperature and generate an urban heat island (UHI) anomaly map for summer 2025 (June–September).** A land-only mask was applied to remove water influence and improve accuracy. Vegetation was analyzed using the Normalized Difference Vegetation Index (NDVI) to assess green space distribution.



RESULTS

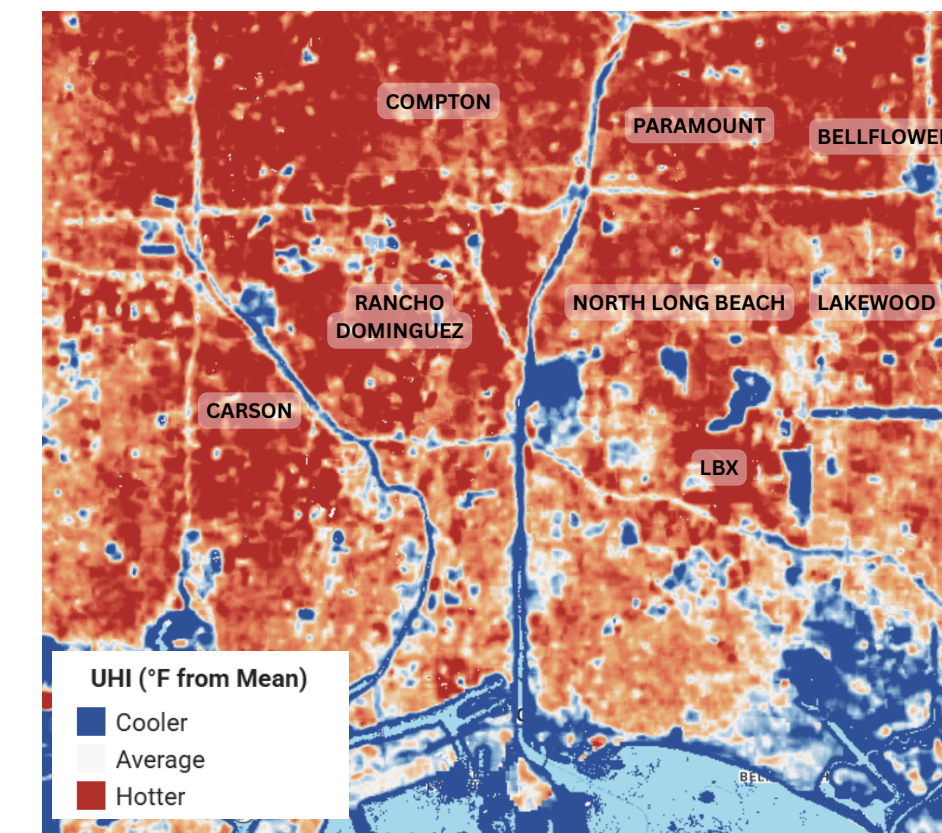


Figure 1.1 Urban Heat Island Intensity in Long Beach (Summer 2025). Land surface temperature anomalies show higher temperatures concentrated in inland and densely built areas, particularly in North Long Beach, while cooler temperatures are observed near coastal and more vegetated regions

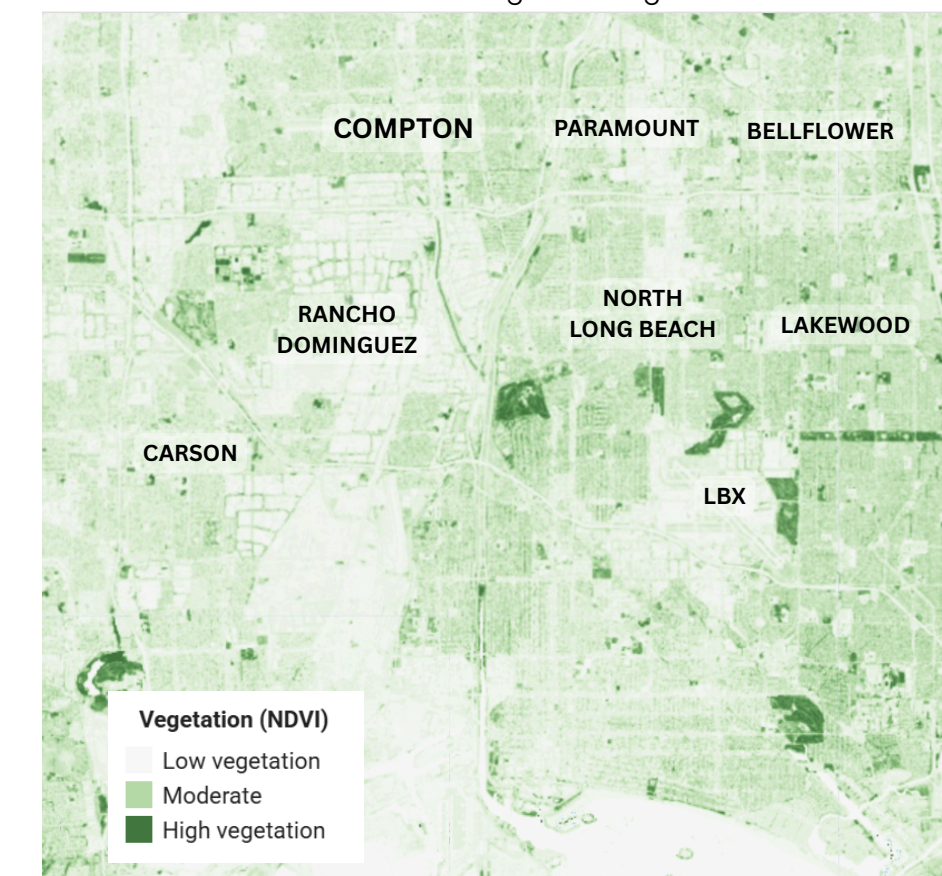


Figure 1.3 Vegetation Distribution (NDVI) in Long Beach. Normalized Difference Vegetation Index (NDVI) values indicate lower vegetation in inland areas such as Paramount and North Long Beach, while higher vegetation is observed in coastal regions. Areas with lower vegetation correspond to regions of higher heat intensity.

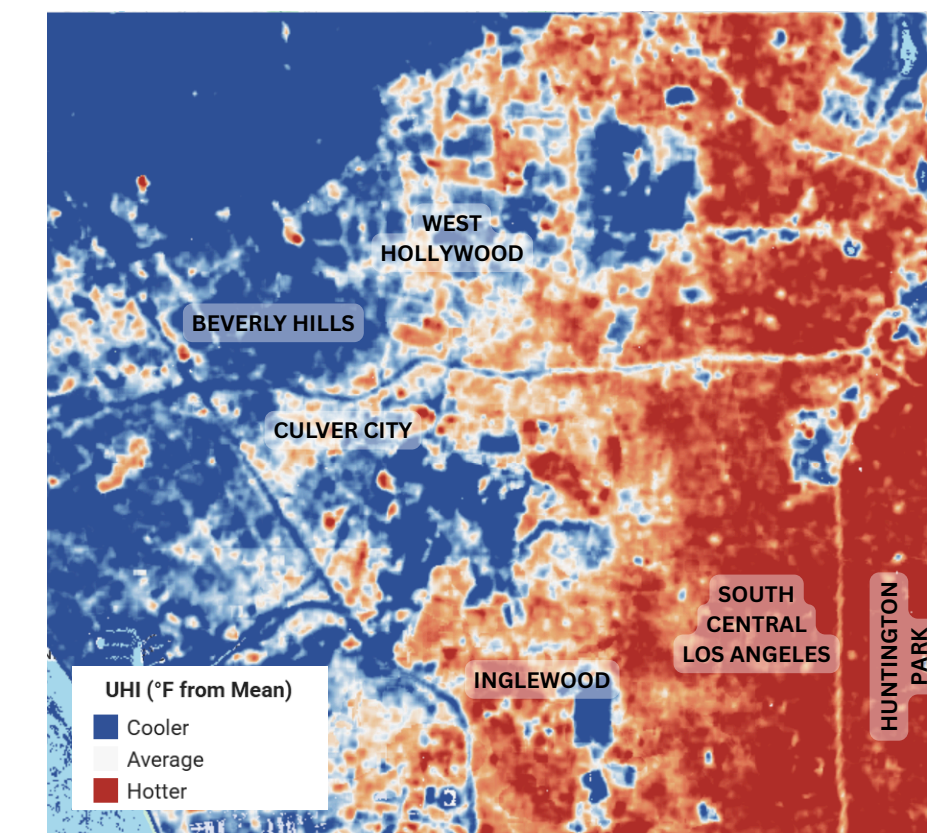


Figure 1.2 Urban Heat Island Intensity in Los Angeles (Summer 2025). Higher temperatures are observed in densely urbanized areas, while cooler conditions are associated with regions containing greater vegetation and green space, such as Beverly Hills and Westwood.

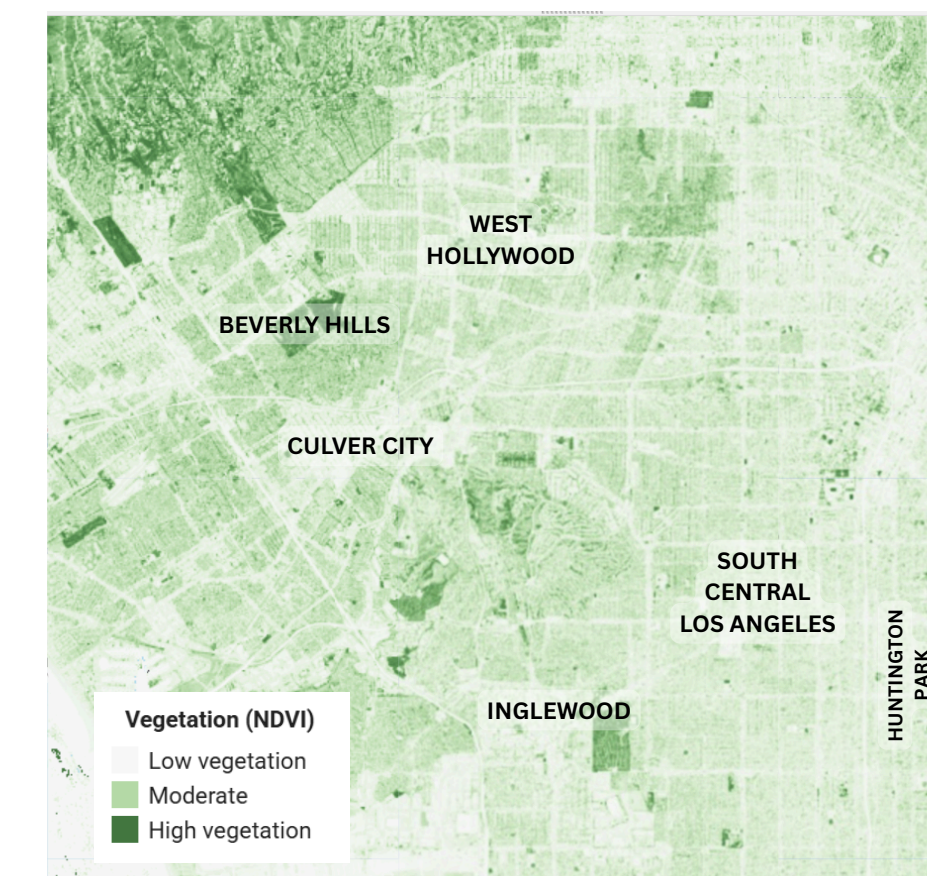


Figure 1.4 Vegetation Distribution (NDVI) in Los Angeles. Higher NDVI values indicate greater vegetation density in areas such as Beverly Hills and Westwood, while lower values are observed in more densely built environments.

RESULTS

Results show that Paramount, Bellflower, and North Long Beach experience higher surface temperatures and lower vegetation compared to wealthier areas such as Beverly Hills and Westwood. These patterns are consistent across both Long Beach and Los Angeles. Areas with reduced vegetation align with higher heat intensity, demonstrating a clear relationship between land cover and temperature. Projections indicate that extreme heat days will increase significantly over time, with Bellflower expected to experience an increase from 7 to 24 days above 91°F within the next 30 years (First Street Foundation).

ANALYSIS

The spatial patterns across both Long Beach and Los Angeles show a strong relationship between vegetation and temperature. Areas with lower NDVI values correspond to higher urban heat island intensity, while areas with greater vegetation appear cooler. Research has shown that higher temperatures are associated with increased environmental and health risks (ScienceDirect, 2023). The comparison between underserved communities and wealthier areas highlights how differences in land use and vegetation contribute to uneven heat exposure.