

Building-Level Assessment of Rooftop Solar Photovoltaic Potential in Austin, Texas

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Abstract

Austin, Texas has set ambitious sustainability and climate goals, yet a comprehensive understanding of the city's rooftop photovoltaic (PV) potential remains limited. This project develops a high-resolution, building-level assessment of rooftop solar feasibility by integrating building footprints, building height data, and satellite-derived solar irradiance. Rooftop area, usable area, shading-adjusted irradiance, and annual PV energy potential were estimated for more than 350,000 buildings. Spatial analytical techniques—including multivariate clustering and Local Moran's I—were applied to reveal morphological patterns and neighborhood-scale PV opportunities. Results show strong spatial heterogeneity: large low-rise commercial roofs exhibit the highest generation potential, while downtown high-rise buildings perform poorly due to shading losses and restricted roof space. Multivariate clustering identifies five characteristic building-PV profiles, and Local Moran's I reveals meaningful hotspot, coldspot, and spatial outlier patterns. The findings highlight where Austin can most effectively expand rooftop solar capacity and inform future urban energy planning.