

Revealing the Urban Heat Island: Investigating its Spatial and Temporal Changes and Relationship with Air Quality

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Abstract : The uncontrolled rise in population has led to unplanned, swift, and unsustainable urban expansion, causing detrimental environmental impacts on both local and global ecosystems. This research delves into a comprehensive examination of the Urban Heat Island (UHI) phenomenon in Bengaluru and Hyderabad, India. It centers on the spatial and temporal distribution of UHI and its correlation with air pollutants. Conducted across summer and winter seasons from 2001 to 2021 in Bangalore and Hyderabad, this study discovered that UHI intensity varies seasonally, peaking in summer and decreasing in winter. The annual maximum UHI intensities range between 4.65 °C to 6.69 °C in Bengaluru and 5.74 °C to 6.82 °C in Hyderabad. Bengaluru particularly experiences notable fluctuations in average UHI intensity. Introducing the Urban Thermal Field Variance Index (UTFVI), the study indicates a consistent strong UHI effect in both cities, significantly impacting living conditions. Moreover, hotspot analysis demonstrates a rising trend in UHI-affected areas over the years in Bengaluru and Hyderabad. This research underscores the connection between air pollutant concentrations and land surface temperature (LST), highlighting the necessity of comprehending UHI dynamics for urban environmental management and public health. It contributes to a deeper understanding of UHI patterns in swiftly urbanizing areas, providing insights into the intricate relationship between urbanization, climate, and air quality. These findings serve as crucial guidance for policymakers, urban planners, and researchers, facilitating the development of innovative, sustainable strategies to mitigate the adverse impacts of uncontrolled expansion while promoting the well-being of local communities and the global environment.

Keywords : urban heat island effect, land surface temperature, air pollution, urban thermal field variance index

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