

“Evaluating the Impact of Urban Green Spaces on Urban Heat Island Effect in Quezon City Using Multiple Datasets”

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ABSTRACT

Developing countries such as the Philippines are experiencing rapid urban expansion, where economic and demographic shifts generate both opportunities and environmental challenges. In the Philippine context, the ecological state of its cities reflects the impact of rapid population growth on environmental degradation. According to Global Forest Watch, Metro Manila lost approximately 94 hectares of tree cover between 2001 and 2024, with the greatest losses occurring in Taguig, Caloocan, Quezon City, Las Piñas, and Valenzuela. Quezon City, the largest in Metro Manila in terms of land area and population density, lost about 12 hectares of tree cover during this period. It also hosts the region’s largest remaining urban forest, the La Mesa Watershed, along with several other key green areas that are now at risk of further reduction due to ongoing urban expansion. Along with the reduction in urban green spaces (UGS) is a noticeable increase in land surface temperature (LST) in cities over the past years, intensifying the Urban Heat Island (UHI) effect — a phenomenon in which the expansion of built environments traps heat, causing higher temperatures compared to surrounding rural areas. As a result, this pattern poses significant repercussions to the environment and human health, including higher ambient temperatures, increased energy demand, and greater risks of heat-related stress. However, previous studies have often examined UGS and LST separately, emphasizing a gap in the direct quantification of the relationship between UGS loss and UHI intensity in the Philippines. Other studies have also broadly defined green spaces and relied solely on remotely sensed data, using shorter timeframes for trend comparison, which limits the accuracy of the analysis. In this study, the direct implications of UGS decline on LST trends in Quezon City from 1980 to 2024 using multiple datasets will be investigated. The research will be conducted in three methodological phases. First, UGS change analysis will employ a more specific classification and change detection approach, integrating both remotely sensed and ground-truth data. Second, a spatiotemporal analysis of LST will utilize remotely sensed and in situ meteorological data. Third, an overlay analysis of validated UGS and UHI, aimed at producing hotspot maps that identify areas requiring immediate action for UGS preservation, monitoring, and intervention. The findings of this study will provide empirical evidence of the direct link between UGS decline and UHI intensity, underscoring the need for strengthened UGS conservation and expansion efforts in dense urban areas.

Keywords: Tree cover loss, Urban Green Spaces (UGS), Urban Heat Island (UHI), Land Surface Temperature (LST), Remote-sensed data, Ground truth data, and In-situ data