

Application of RayMan Model in Quantifying the Impacts of the Built Environment and Surface Properties on Surrounding Temperature

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Abstract : Introduction: Understanding thermal distribution in the micro-urban climate has now been necessary for urban planners or designers due to the impact of complex micro-scale features of Urban Heat Island (UHI) on the built environment and public health. Hence, understanding the interrelation between urban components and thermal pattern can assist planners in the proper addition of vegetation to build-environment, which can minimize the UHI impact. To characterize the need for urban green infrastructure (UGI) through better urban planning, this study proposes the use of RayMan model to measure the impact of air quality and increased temperature based on urban morphology in the selected metropolitan cities. This project will measure the impact of build environment for urban and regional planning using human biometeorological evaluations (Tmrt). Methods: We utilized the RayMan model to estimate the Tmrt in an urban environment incorporating location and height of buildings and trees as a supplemental tool in urban planning and street design. The estimated Tmrt value will be compared with existing surface and air temperature data to find the actual temperature felt by pedestrians. Results: Our current results suggest a strong relationship between sky-view factor (SVF) and increased surface temperature in megacities based on current urban morphology. Conclusion: This study will help with Quantifying the impacts of the built environment and surface properties on surrounding temperature, identifying priority urban neighborhoods by analyzing Tmrt and air quality data at the pedestrian level, and characterizing the need for urban green infrastructure cooling potential.

Keywords : built environment, urban planning, urban cooling, extreme heat

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