World Academy of Science, Engineering and Technology
International Journal of Urban and Civil Engineering
Vol:13, No:06, 2019

A Systematic Approach to Mitigate the Impact of Increased Temperature and Air Pollution in Urban Settings

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Abstract : Globally, extreme heat events have led to a surge in the number of heat-related moralities. These incidents are further exacerbated in high-density population centers due to the Urban Heat Island (UHI) effect. Varieties of anthropogenic activities such as unsupervised land surface modifications, expansion of impervious areas, and lack of use of vegetation are all contributors to an increase in the amount of heat flux trapped by an urban canopy which intensifies the UHI effect. This project aims to propose a systematic approach 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 (mean radiant temperature, Tmrt). We utilized the Rayman model (capable of calculating short and long wave radiation fluxes affecting the human body) 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. Our current results suggest a strong correlation between building height and increased surface temperature in megacities. This model will help with; 1. Quantify the impacts of the built environment and surface properties on surrounding temperature, 2. Identify priority urban neighborhoods by analyzing Tmrt and air quality data at pedestrian level, 3. Characterizing the need for urban green infrastructure or better urban planning- maximizing the cooling benefit from existing Urban Green Infrastructure (UGI), and 4. Developing a hierarchy of streets for new UGI integration and propose new UGI based on site characteristics and cooling potential.

Keywords : air quality, heat mitigation, human-biometeorological indices, increased temperature, mean radiant temperature, radiation flux, sustainable development, thermal comfort, urban canopy, urban planning
Conference Title : ICUPPW 2019 : International Conference on Urban Planning and Public Works
Conference Location : New York, United States
Conference Dates : June 04-05, 2019