Greening strategies for heat mitigation in a subtropical high-density city, Hong Kong

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Abstract

Hong Kong is a high-density sub-tropical city with a record of increasing trend of urban air temperature since the past few decades. Thus, high frequency and intensity of very hot days, heatwaves, urban heat island and thermal discomfort had been observed and expected to further aggravate for the rest of this century. In response, the Hong Kong's Government through the *Hong Kong 2030+* had proposed a smart, green and resilient city strategy framework for adapting and mitigating these impacts. One of the key strategic directions of this framework is "Promoting a sustainable built environment" which includes improvement of current urban greening plan and innovative blue-green infrastructure mix in urban development. In this study, we present the state-of the-art on climate change and greening strategies in Hong Kong. Furthermore, we show scientific evidence of positive impact of these strategies and optimization techniques for improved benefits. Basically, we have studied the thermal benefits of tree-planting and vertical landscape and effect of urban density on obtained thermal benefits through field measurement and numerical simulation. Results revealed that for a high-density Hong Kong, 30% tree coverage ratio is required for 1∘C and 4∘C urban temperature and Physiological Equivalent Temperature (PET) reduction. Moreover, we found that 30 - 50% of facades must be greened to potentially cause _˜1∘C reduction in both daytime and nighttime air temperature while the same could help improve daytime pedestrian thermal comfort by at least one thermal class. Lastly, practicable urban planning recommendations for development of climate-sensitive, resilient and sustainable city were presented for the attention of urban planners and landscape architects.

Keywords: Greening, thermal comfort, UHI, ENVI, met

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