Feasibility Analysis on Mitigative Measures in Combating SURFACE Urban Heat Islands for Urban Districts of Bangalore

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ABSTRACT

As an inadvertent result of urbanisation, cities often experience a distinguished climate when compared to their surrounding rural areas. Termed as the 'Urban Climate', it depicts elevated near-surfaces air temperatures due to a variety of causes. Notably one among the causes is the steady replacement of natural surfaces by built surfaces along vertical and horizontal axis in the form of buildings and pavements respectively, constructed from materials with high thermal inertia and low albedo. The urban surface hence tend to absorb a significant proportion of the incident radiation during daytime thereby sufficiently warming-up, and subsequently enhancing its release as heat during nighttime. This results in the formation of the diurnal-nocturnal phenomenon 'Surface Urban Heat Islands' which enhances intensity of 'Atmospheric Urban Heat Islands' (Urban Warming) and aggravates impacts of 'Global Warming', therewith registering inevitable stress on ecosystems, thermal power plants, cooling demands, thermal comforts etc. Though several researches have highlighted the qualitative features for detection of 'Surface Urban Heat Islands' via thermal imageries and 'heat-balance' modeling, none have sufficiently carried out on-ground viability analysis for their control. This paper hence quantitatively addresses the effectiveness of usually cited mitigation measures such as cool roofs, green roofs and cool pavements. The study apart from analyzing a lab scale model, also envisages real-time measurement on existing environs depicting the aforementioned mitigation measures. The study area for present research involves observatories across both Bangalore Urban-Rural, and encompasses monitoring of ambient air temperature, near-surface air temperature, surface temperature and relative humidity; for existing and author defined controlled conditions. The climatic conditions are verified employing the use of identical-calibrated multiple handheld Thermo-hygrometers with a surface probe. The study eventually postulates the guidelines for combating urban warming from a micro-scale point of view by considering a single dwelling and its immediate surrounding pavement as a single unit.

Keywords: surface, air, temperature, pavement, albedo, thermal.