Cool paint experiment modifies urban microclimate

News

Cool paint coatings in cities can help pedestrians feel up to 1.5 degrees Celsius cooler, researchers at Nanyang Technological University, Singapore have found.

The road, pavement and walls of the test-site in Singapore with cool paint coatings - *NTU Singapore*

Cool paint coatings, which contain additives that reflect the sun's heat to reduce surface heat absorption and emission, are seen as one way to cool down urban areas and mitigate the Urban Heat Island (UHI) effect.

To date, most studies of cool paint coatings have been simulation-based or tested in scaled-down models.

Now, NTU researchers have conducted a first-of-its-kind real-world study in the tropics to comprehensively evaluate how well cool paint coatings reduce heat.

Lead author Dr. E V S Kiran Kumar Donthu, who completed the work as a Research Fellow at Energy Research Institute at NTU (ERIAN), said, "This is a minimally intrusive

solution for urban cooling that has an immediate effect.

“Moreover, by reducing the amount of heat absorbed in urban structures, we also reduce heat load in buildings, consequently reducing indoor air-conditioning energy consumption.”

To carry out their experiments, the NTU researchers selected four rectangular buildings that created two parallel ‘street canyons’ - narrow streets flanked by buildings – in an industrial estate west of Singapore managed by JTC Corporation.

One canyon, or ‘cool canyon’ was coated with cool paints on the roofs, walls, and road pavement, while the other canyon remained as it was as a ‘control’ for the experiment.

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Using environmental sensors, the NTU team monitored the conditions in the two canyons over two months, which included air movement, surface and air temperature, humidity, and radiation, to see how well the cool paint coatings worked in reducing city heat.

The researchers found that during a 24-hour cycle, the cool canyon saw up to a 30 per cent reduction in heat released from the built-up surfaces, resulting in the air temperature in the cool canyon being cooler than the conventional canyon by up to two degrees Celsius during the hottest time of the day, at around 4pm.

Consequently, pedestrians in the cool canyon can feel up to 1.5 degrees Celsius cooler. The NTU research team also found that air temperature in the cool canyon was lowered because less heat was absorbed by and stored in the building walls, roofs, and roads, and which would subsequently have been released to either heat up the surrounding air or the building’s interior.

Compared to conventional roofs, the roofs with the cool paint coating reflected 50 per cent more sunlight and absorbed up to 40 per cent less heat as a result, during the hottest time of a sunny day. The coated walls also prevented most of the heat from entering the industrial buildings.

Lead investigator, Associate Professor Wan Man Pun at the NTU School of Mechanical & Aerospace Engineering (MAE), said: “With global warming, people will increasingly look for ways to stay cool. Our study validates how cool paint coatings can be a strategy to reduce the urban heat island effect in future.”

The study has been published in *Sustainable Cities and Society*.