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Cool Paint Can Make Urban Areas Feel 1.5°C Cooler

Applying cool paints to roofs, walls, and roads reduces heat absorption, making the built environment more comfortable for people

https://www.asianscientist.com/2024/06/health/cool-paint-can-make-urban-areas-feel-1-5c-cooler/

AsianScientist (Jun. 12, 2024) – Scientists in Singapore have found that using cool paint coatings in cities can help pedestrians feel up to 1.5 degrees Celsius cooler, making the urban areas more conducive for work and leisure. Findings from the study conducted by researchers from Nanyang Technological University to assess the effectiveness of cool paint coatings in reducing urban heat were published in *Sustainable Cities and Society*.

Researchers have been trying to understand the impact of cool surfaces on urban comfort, especially in hot climates where cooling is needed year-round. However, studying the influence of cool surfaces on local climates has been challenging due to the complexity of measuring energy flow between buildings and their surroundings. Till now, most studies on cool paint coatings have been either simulation-based or tested in scaled-down models, limiting the understanding of their real-world application.

When construction materials absorb sunlight, they release excess heat into the city, exacerbating the urban heat island (UHI) effect. The UHI effect causes urban areas to experience warmer temperatures than their surroundings, affecting the health of urban residents and quality of their life. UHI can also make cities too hot for people, potentially causing health issues or even deaths during heat waves.

Coating surfaces like roofs, walls, and roads with cool paint, reducing heat absorption, and keeping the city cooler have been touted as solutions to mitigate the effects of UHI. Cool paint coatings are formulated with additives that reflect the sun's heat, reducing surface heat absorption and emission.

To conduct their real-scale field experiment, the researchers selected four buildings in an industrial estate west of Singapore. These buildings formed two parallel "street canyons" – narrow streets flanked by buildings. The "cool canyon" had cool paints applied to the roofs, walls, and road pavement; the other conventional canyon was used as a control for the experiment.

The scientists used environmental sensors to monitor the conditions in the two canyons over two months. They measured air movement, surface and air temperature, humidity, and radiation to assess the effectiveness of the cool paint coatings in reducing city heat.

The researchers discovered that the "cool canyon" experienced a reduction of up to 30 percent in heat released from the built-up surfaces during a 24-hour cycle. This led to the "cool canyon" experiencing air temperatures up to two degrees Celsius lower than the conventional canyon at approximately 4 p.m., the hottest time of the day.

Hence, pedestrians in the cool canyon can experience up to 1.5 degrees Celsius cooler temperatures.

The scientists also found that the lower air temperature in the cool canyon resulted from reduced heat absorption and storage by the building walls, roofs, and roads, which would have otherwise heated up the surrounding air or the building's interior.

Moreover, the team also found that compared to conventional roofs, the roofs with the cool paint coating reflected 50 percent more sunlight and absorbed up to 40 percent less heat during the peak of a sunny day. Additionally, the coated walls prevented most of the heat from entering the industrial buildings.

"Our study provides evidence that cool paint coatings reduce heat build-up and contribute to the cooling of the urban environment. This is a minimally intrusive solution for urban cooling that has an immediate effect, compared to other options that often require major urban redevelopment to deploy. 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," said Dr. E V S Kiran Kumar Donthu, lead author, who completed the work as a Research Fellow at Energy Research Institute.

Wan Man Pun, lead investigator and associate professor at the NTU School of Mechanical & Aerospace Engineering (MAE), added, "Findings from the study are not just relevant for cities in Singapore where it is hot all year round, but for other urban areas around the world too. 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."

Next, the NTU researchers plan to investigate the long-term performance of the cool paint coating at the same experiment location.

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Source: Nanyang Technological University ; Image: Shutterstock

The article can be found at: Dynamics of cool surface performance on urban microclimate: A full-scale experimental study in Singapore