

Seeking a better way to measure urban heat

SMU team studying what makes pockets of city cooler, how more of them can be created

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The weather app may say it is 32 deg C but some places in the city may feel as warm as 70 deg C, such as around urban structures, or cooler at 26 deg C, such as under the shade of a tree.

A group of Singapore Management University (SMU) researchers is on a mission to find out what makes pockets of the city cooler and more comfortable, and how more of them can be created.

The researchers are part of Cooling Singapore, a research initiative looking into how the urban heat challenge here can be addressed.

Associate Professor Winston Chow from SMU, a Cooling Singapore principal investigator, said: "We've seen how thermal comfort outdoors in Singapore can vary sharply in a matter of metres - due to changes in shade or wind speed - and we need to ascertain how well (climate) models simulate these real-life changes."

Thermal comfort refers to how warm or cool a person feels in his environment. The temperature data provided in many mobile phone weather apps usually refer to air temperature.

But this alone will not provide a true measure of the heat experienced at a particular location because surfaces and structures in the urban landscape - having been baking under the sun all day - are also sources of heat, said Dr Peter Crank, a post-doctoral research fellow at SMU who is involved in the project.

The extent to which urban structures such as roads or buildings release heat depends on factors such as their material, colour or ability to reflect heat. The presence of trees or grassy patches can also affect how people experience heat.

For example, during a walk around the SMU campus on July 1 between 4pm and 5pm, researchers found that air temperatures fluctuated between 29 deg C and 32 deg C. But the mean radiant temperature - a better measure of how humans experience heat - measured along the same route ranged from 26 deg C, in areas

shaded by trees or sheltered walkways, to 70 deg C.

Dr Crank said the higher temperatures were recorded on roads and artificial turfs - patches that look like grass but are actually plastic blades of the vegetation on rubber.

"Such data could provide city planners and urban developers with a better idea of what materials or structures to avoid using or to use less of to improve thermal comfort," he added.

Mean radiant temperature is calculated from measurements of solar radiation, or heat from the sun, and infrared heat. This type of heat is usually released by urban structures into the environment.

The researchers collect these measurements by taking Smarty - the team's nickname for their mobile biometeorological cart - on "walks" around the SMU campus. The cart is fitted with sensors that collect the data needed to calculate mean radiant temperatures.

Data collection around SMU began in March, and the researchers have plans to take Smarty for walks around Bishan-Ang Mo Kio Park by the year end.

Said Prof Chow: "The locations we selected match up well to different land covers in Singapore's urban landscape - from a mix of high-rise and low-rise buildings with street trees in the downtown core, to a large urban park space next to dense public and private residential areas at Bishan-Ang Mo Kio."

He added that there is also a mix of different shade features along the routes in each study area, from trees to covered walkways, making the routes representative of what Singaporeans usually encounter.

Climate change is causing global temperatures to rise, but Singapore has already experienced warming higher than the global average because of the urban heat island effect - a phenomenon of urban structures trapping heat.

Local temperatures are 1.8 deg C higher than they were in 1948, data from the National Environment Agency's Meteorological Service Singapore showed.

In contrast, global temperatures have warmed by about 1.1 deg C from pre-industrial times.

A spokesman for the National Re-

How hot is it really?

Air temperatures alone may not provide an accurate measure of the heat people feel as they stroll through the city. Heat-absorbing urban structures, such as roads and artificial turfs, can also be heat sources.

Now, a research team aims to develop a better understanding of how hot it really gets in Singapore, so efforts can be taken to make the city more liveable.



As part of the project, researchers from Singapore Management University (SMU) will take a mobile biometeorological cart - nicknamed Smarty - on "walks" around the SMU campus and Bishan-Ang Mo Kio Park.



The cart is fitted with sensors, such as those that can measure heat from the sun, as well as infrared heat released by surfaces.

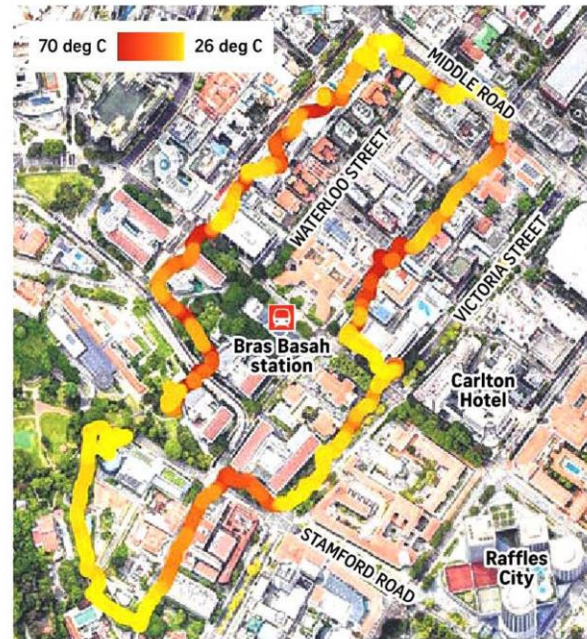


This data will help researchers calculate the mean radiant temperature, which provides a more accurate picture of how humans experience heat.

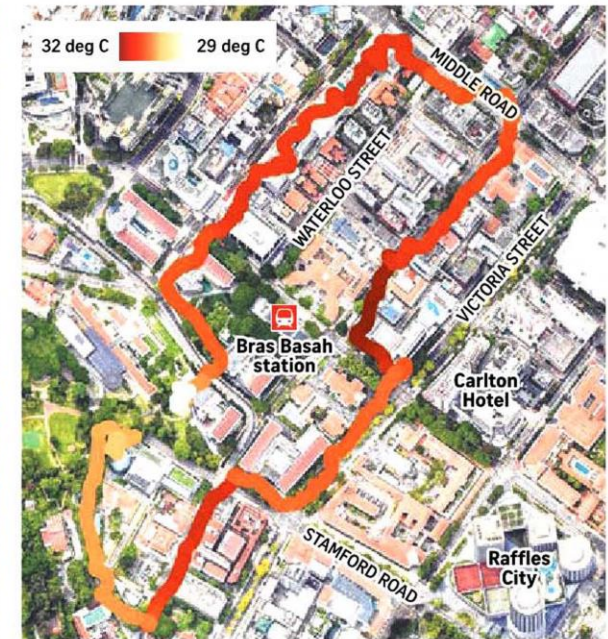


Air temperatures and mean radiant temperatures are different

Mean radiant temperatures (July 1, 4pm-5pm)



Air temperatures (July 1, 4pm-5pm)



The project will provide a more nuanced understanding of how hot it gets in the city and could inform urban planning strategies.



These strategies could include planting specific types of trees that can provide more shade, or using fewer heat-emitting structures, such as artificial turfs, in urban areas.



Depending on factors such as gender and age, people may experience heat differently. Researchers are calling for volunteers to do "heat walks" while wearing fitness trackers to develop a better understanding of this.



Those interested can sign up via this QR code

Sources: YIK SIN KANG AND PETER CRANK, COOLING SINGAPORE 2.0, SINGAPORE MANAGEMENT UNIVERSITY ST PHOTO: JASON QUAH STRAITS TIMES GRAPHICS

search Foundation, which provides funding to Cooling Singapore, said that the study of outdoor thermal comfort at the neighbourhood

scale requires data to be collected at these levels. "Measuring networks typically... do not account for smaller changes

in the microclimate or provide a representative picture of the experience of heat felt by people... The Smarty meteorological cart pro-

vides dynamic measurement of the urban environment," she added. audreyt@sph.com.sg