



Factsheet on Singapore's Efforts to Mitigate the Urban Heat Island Effect

Background

1. The Centre for Climate Research Singapore (CCRS) has projected that Singapore's maximum daily temperature could reach 35 to 37 degrees Celsius by year 2100, if carbon emissions continue to rise at the same rate. This is compounded by the Urban Heat Island (UHI) effect, a phenomenon where urban areas, which are more built-up and densely populated, are warmer than rural areas. This happens due to the emitting of waste heat from sources such as cars and factories. Buildings also trap considerable heat during the day which then dissipates at night.

2. Since 2019, an inter-agency working group led by the Ministry of Sustainability and the Environment (MSE) and the Urban Redevelopment Authority (URA) has been working to implement initiatives to mitigate the UHI effect in Singapore.

UHI Mitigation Roadmap – Three Key Strategies

3. Three key strategies have been identified to achieve this:

Understanding UHI effects

4. To understand UHI effects better, the Government will deploy an island-wide network of climate sensors to collect data on ambient temperature, relative humidity and wind speeds. For instance, NParks will be deploying a network of 40 environmental sensors in western Singapore.

5. The data collected will validate two computational models simulating Singapore's climate:

- a. the Singapore Variable Resolution (SINGV) model, developed by CCRS, to accurately model future climatic scenarios at island-wide resolutions;
- b. the Integrated Environmental Modeller (IEM), developed by the Housing Development Board (HDB) to simulate wind flow through a specific planning area, and identify where solar heat is more likely to build up. This helps planners design open spaces and optimise building layouts and orientation to promote natural ventilation.

Simulating the effectiveness of UHI mitigation strategies

6. These climate models, along with other models simulating variables such as energy consumption and transport use, will be integrated into a digital twin of Singapore as part of the 'Cooling Singapore 2.0' research project, co-led by Principal Investigators from the Singapore-ETH Centre and Singapore Management University. The digital twin will holistically simulate Singapore's urban climate, and will allow policymakers to assess the effectiveness of various mitigation strategies.

Interim UHI mitigation measures

7. The findings and insights from the research will inform our UHI mitigation action plan and enhance the scope of UHI mitigation measures. Measures that are being implemented include increasing greenery provision in existing built-up areas, planning layouts of new buildings to maximise shade and wind flow and electrifying our vehicle fleet. Local research has found that electrifying our vehicle fleet could mitigate up to 85% of heat emissions, and help to reduce morning air temperatures by more than 0.2 degrees Celsius in a quarter of Singapore's roads, up to a maximum of 0.9 degrees Celsius¹.

8. Another key measure is the use of 'cool materials' on buildings. Studies have shown that cool materials absorb less heat, resulting in temperature decreases of up to 1.6 degrees Celsius for surrounding air temperature, and 5.6 degrees Celsius for wall surface temperatures. To date, JTC Corporation and the Building and Construction Authority (BCA) have piloted the use of cool materials in industrial buildings and educational institutions.

9. Moving forward, the Government is looking to partner interested building owners and cool materials suppliers to conduct pilots in other building and infrastructural archetypes, including transport infrastructure, residential districts, and commercial buildings. For example, as part of its Green Towns programme, HDB will be working with town councils to conduct a large-scale pilot on the application of cool materials on building facades and driveways. If effective, the application of cool coatings may be extended island-wide.

Collective efforts to "Keep Singapore Cool"

10. Beyond these efforts, individuals can also play a part to help keep Singapore cool. For example, by increasing the temperature settings on our air-conditioners in our rooms, we can reduce the amount of heat our air-conditioners release to the ambient surroundings, apart from reducing carbon emissions. We can also use our air-conditioners less often or switch to public transport options to reduce UHI effects in our local surroundings. With the collective effort from the Government, academia, private sector, and individuals, we can "Keep Singapore Cool" and improve the level of thermal comfort for our community.

**Ministry of Sustainability and the Environment
Urban Redevelopment Authority**

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¹ Singh, Vivek Kumar; Acero, Juan A.; Martilli, Alberto (2020) Evaluation of the impact of anthropogenic heat emissions generated from road transportation and power plants on the UHI intensity of Singapore. Cooling Singapore 1.5, ETH Zurich Research Collection.