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## Assessing urban heat mitigation strategies in Singapore with a Digital Urban Climate Twin (DUCT)

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Addressing the urban heat island effect requires informed and strategic planning of measures to mitigate urban heating. This is particularly important for highly urbanized and densely populated cities in the tropics, such as Singapore, which experience high levels of thermal discomfort due to urban heat island effect, and is further intensified by global warming. To assess the impact and effectiveness of different heat mitigation measures, we utilize a Digital Urban Climate Twin (DUCT) model of Singapore. The DUCT integrates the Weather and Research Forecasting model and Building Energy Model (WRF/BEM), with an added modification to account for near-surface anthropogenic heat sources such as power plants and traffic emissions. Next to these models the DUCT also integrates various data sources such as weather conditions, landcover, buildings, traffic etc. to describe the thermal behaviour of the city.

In this study, we use the DUCT to conduct a comprehensive testing of the sensitivity of urban temperatures to various heat mitigation measures such as increasing urban greenery, changing urban morphology and improvements in building efficiencies and traffic. Preliminary results indicate that designating forest land use and incorporating green areas are the most effective in reducing local and surrounding temperatures. This is followed by increasing the urban vegetation fraction in the pre-existing urban landscape, increase in electric vehicle usage, and improvements in building energy efficiencies, which show a more limited impact on temperatures. This work aims to highlight the capabilities of the DUCT as a versatile tool for planning agencies and policy makers to test the effectiveness of various policies and guide strategic planning for the management of urban heat.