# ASSESSING TEMPORAL AND SPATIAL VARIATIONS OF LAND SURFACE TEMPERATURE AND URBAN HEAT ISLAND EFFECTS IN SOUTH EAST QUEENSLAND, AUSTRALIA

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**ABSTRACT:** By 2030 nearly 60% of the world population will live in urban environments. In Australia, 89% live in urban areas, making it one of the most urbanised countries. This concentrated urban population is at increased risk to the effects of climate change and increasing urban temperatures. A fundamental challenge facing local governments in Australia and around the world is how to manage the urban energy balance to provide a comfortable, healthy and sustainable quality of life for urban populations. Relative to rural landscapes, urban land-cover increases sensible (thermal) heat emissions. Mapping urban energy exchanges and resultant temperatures is important to support effective management solutions. Remote sensing has the capacity to map and monitor urban surface temperature over different spatial and temporal scales.

The objectives of this research were: (1) to produce and assess a satellite based time-series of MODIS derived land surface temperature (LST) and urban heat island (UHI) occurrences for South East Queensland, Australia; and (2) to assess the climate and surface type features responsible for the spatial variation of LST and UHI's. South East Queensland is home to 3.2 million people with Brisbane and the Gold Coast being the major population centres.

Objective 1 focussed on a day- and night-time MODIS monthly time-series from December 2005 to February 2013. The MODIS re-projection tool was used for initial pre-processing. The UHI maps were produced based on the original processed LST images and a reference LST map. The results from this analysis showed distinct seasonal differences in LST and UHI effects, with the most significant UHI effects occurring during day-time in the summer months.

Objective 2 combined numerous data sets to support the interpretation of the LST and UHI MODIS time-series, including climate data; Google Earth; ASTER satellite thermal image data (90 m pixels); airborne thermal image data (2 m pixels); field derived air and surface temperature measurements; and land-cover maps. The results were derived using GIS analysis to overlay and compare the different data sets. The results showed that UHI effects occur at multiple spatial scales with large temperature variations between different surface types and urban structures.

These results provide important temporal and spatial information for local councils to ensure informed solutions can be developed to improve urban liveability, energy conservation and urban planning and identify urban hotspots requiring urgent management responses to reduce risk to residents and infrastructure of extreme hot days. This work also provides the foundation for future work focussing on modelling and predicting the urban energy balance from building to suburb to catchment scales.