TARGET Modelling to Assess Urban Heat Amelioration Associated with Integrated Water Management (IWM) in Australian Cities

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As critical input to development of future Australian urban water policy we were engaged by the Australian Government to use TARGET (The Air temperature Response to Green infrastructure Evaluation Tool) to assess urban heat amelioration associated with various levels of IWM (amounts of water and green infrastructure in the urban fabric) for nine Australian cities for two future time frames (2030 and 2050) and for different emissions scenarios (SSP 1.2-6, 3.7-0 and 5.8-5). A unique approach was developed to morph the future climate data onto historical data (derived from the ERA5 Reanalysis product) for the 2010-2020 period. We used locally appropriate Local Climate Zones (LCZs) for Australian cities and developed scenarios for implementation of moderate and high levels of IWM across each of the LCZs consistent with published guidelines. We also developed a methodology allowing urban climate data modelled at the LCZ level to be aggregated to the statistical area (SA4) and city-wide levels.

The thermal impacts associated with the various degrees of IWM were marked and geographically differentiated, depending on the climatic characteristics of the various cities. For the current climate high IWM intervention provided reductions in annual mean daily maximum temperature ranging from -0.77 ˚C in Darwin, up to -1.86 ˚C in Perth. Generally, the drier southern cities of Sydney, Canberra, Albury, Melbourne, Adelaide, and Perth produced the greatest thermal response to implementation of IWM and the more tropical cities with higher rainfalls the least response. For some southern cities cooling was >-3.0 ˚C at the time of maximum summer temperatures. Interestingly high levels of IWM in winter produced modest warming of minimum overnight temperatures, especially for the cooler southern cities. The cooling benefits of IWM were seen across all future climate scenarios and are a real opportunity to offset projected temperature increases resulting from climate change.