NP4002 UNSW Node of Excellence in High Performance Architecture

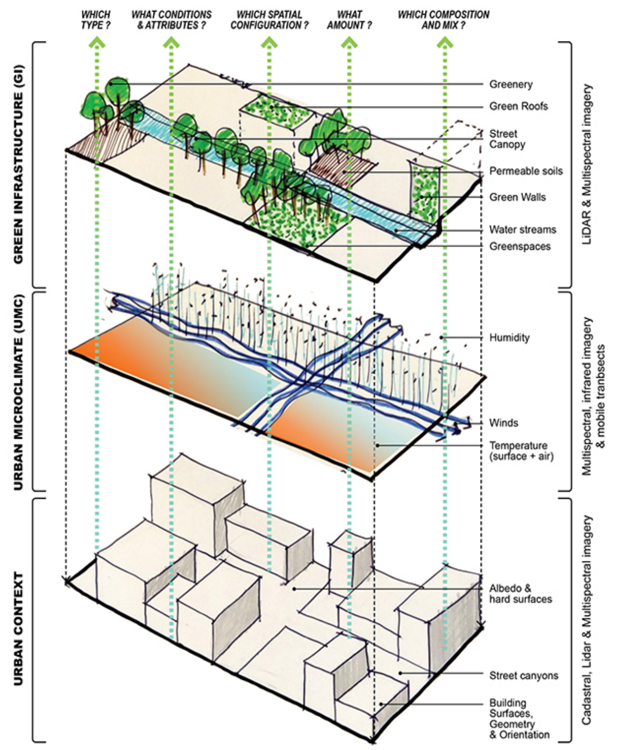
ASSESSING THE THERMAL PERFORMANCE OF GREEN INFRASTRUCTURE ON URBAN MICROCLIMATE

Research Question

What types, extension, mix and spatial distribution of Green Infrastructure (GI) are more effective in providing cooling benefits on Urban Microclimates (UMC)?

Which methods and parameters are more appropriate to assess the thermal performance of GI at local/precinct scale?

Figure 1. Conceptual visualization for the thermal assessment of Green Infrastructure



Methodology

Considering that this is an ongoing project, **airborne remote sensing and spatial & numerical statistics** have been chosen as preliminary methods involving the following steps:

1. Formulation of an urban green infrastructure typology (UGIT).
2. Selection and classification of site samples using local climate zones (LCZ).
3. Data collection using airborne remote sensing (LiDAR and multispectral imagery) and mobile transects.
4. Calculation and estimation of indicators based on the (a) *structural* (size, height, perviousness); (b) *functional* (LAI, evapo-transpiration) and (c) *contextual* (location, spatial distribution) attributes of GI.
5. Spatial and statistical analysis.
6. Model formulation and simulation of future scenarios and guidelines.

Preliminary Results

The preliminary results confirm that GI types can be grouped into four high level categories: (1) tree canopy; (2) green open spaces or surface covers; (3) green roofs; and (4) vertical greenery systems (Figure 2).

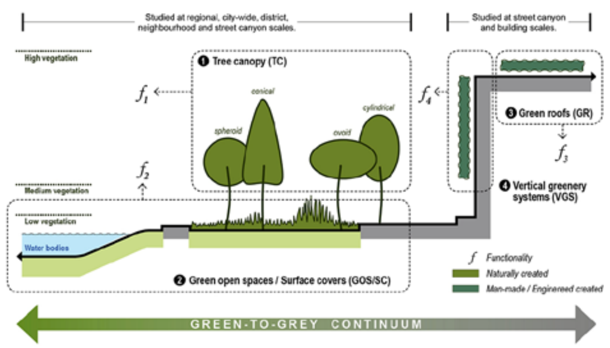


Figure 2: High level GI Categories.

These high level categories have been disaggregated in a variety of subclasses. The resulting sub-categories will enable the spatial analysis of thermal indicators at local scale (Figure 3). Researchers working on urban microclimate and UHI, will be able to use this matrix for analysing, comparing and reporting their results.

Figure 3: Urban green infrastructure typology (UGIT) matrix to support microclimate studies.

Subsequent stages will be focused on mapping and allocating a series of thermal indicators to particular GI sub-classes.

Conclusions

Initial findings demonstrate that it is needed a thermal evaluation of GI at a local scale (precinct). For this analysis, it is crucial to use an urban green infrastructure typology (UGIT) to evaluate how the *structural*, *functional* and *contextual* attributes of GI influence on UMC. The best method detected so far is the use of airborne remote sensing combined with mobile transects. This combination will signify a great advance to provide higher accuracy and precision

Anticipated impacts

This research proposes an evaluation framework to identify critical urban areas where thermal benefits of GI have to be enhanced. Resulting guidelines are envisaged as a communication and visualisation tool to inform practitioners and governments on most effective strategies and policies necessary to design and deliver cooler precincts. It is expected future changes in policy and design principles to improve human health & wellbeing, and to reduce carbon emissions & energy consumption.

It is crucial to determine the optimal types, amount, composition and configuration of GI necessary to provide effective cooling benefits. A proper spatial scale and resolution is required for a more precise and accurate analysis of the impacts of GI on UMC.

Further information & Contact

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