NP4002

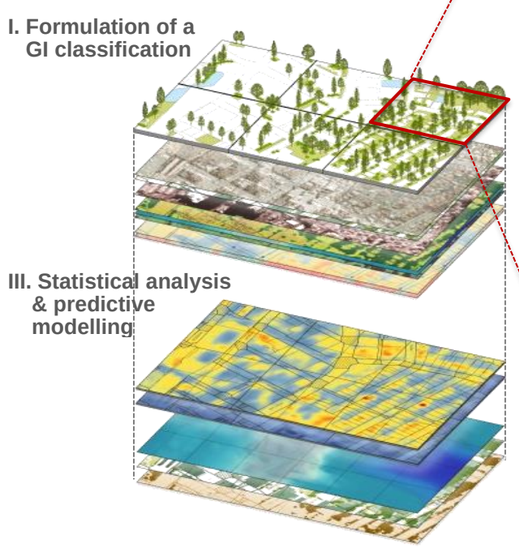
ASSESSING THE THERMAL PERFORMANCE OF GREEN INFRASTRUCTURE ON URBAN MICROCLIMATE

Research Questions

What is the thermal performance of different green infrastructure (GI) typologies on urban microclimate and which typologies and amount of greening are more effective in reducing surface temperatures at the local scale?

1.1 How can GI be classified for climatic studies?
1.2 What typologies and amount of GI are required to reduce surface temperatures more effectively?

Figure 1. Conceptual visualization of the methodological framework

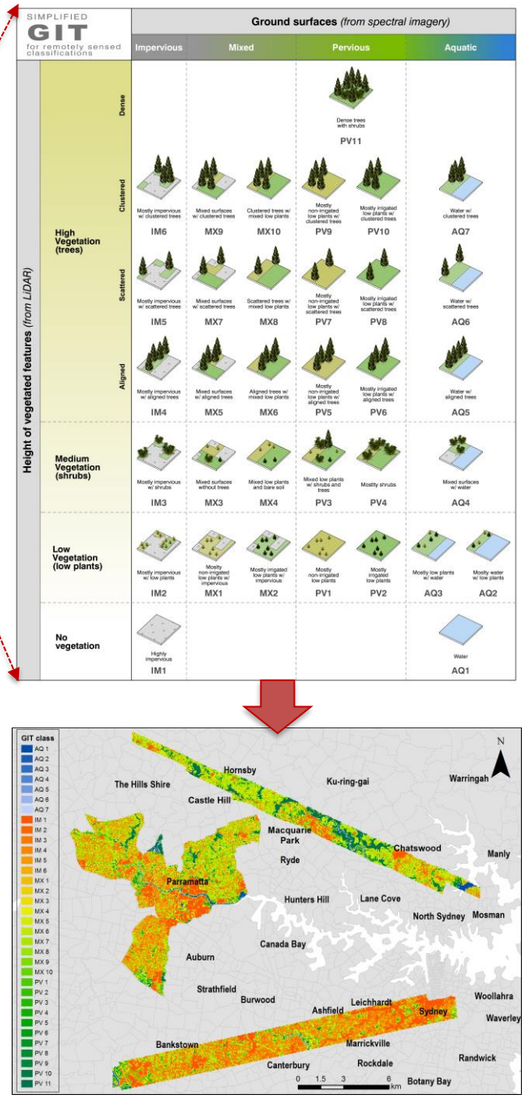


Methodology

Airborne remote sensing and spatial & numerical statistics have been chosen as methods involving the following steps:

1. Data collection using airborne remote sensing (LiDAR, thermal, multi-/hyper-spectral imagery) and mobile transects.
2. Calculation and estimation (a) *structural*, (b) *functional*, and (c) configurational indicators.
3. Spatial and statistical analysis (Model).
4. Formulation of guidelines for end-users (government and industry).

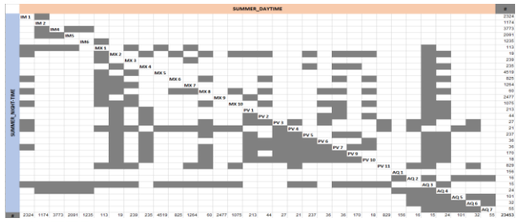
Figure 2. Proposed GI Typology based on remote sensing data (above) and results of classifications for the whole study area in Sydney (below).



Preliminary results

Figure 3. Results of pairwise comparisons of diurnal and nocturnal mean LSTs. Grey cells indicate pairs that were not significantly different (p >0.05).

SUMMER



WINTER

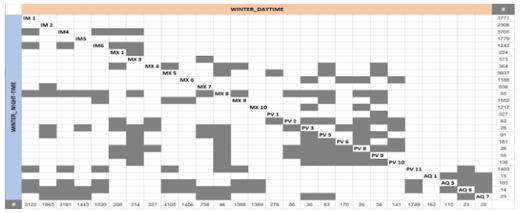
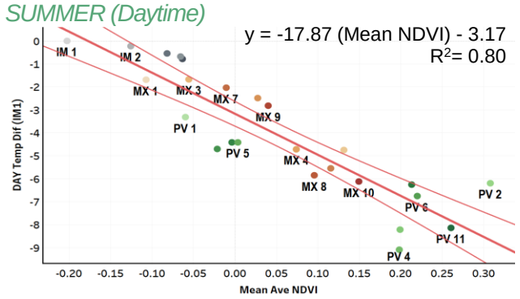
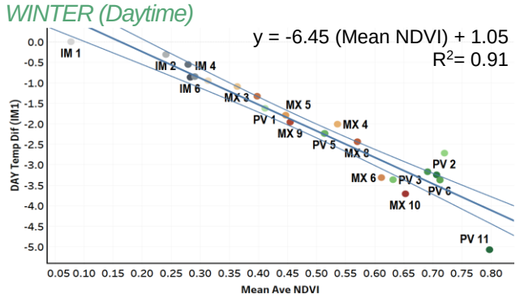


Figure 4. Correlation between NDVI and temperature lowering capacity of each typology.

SUMMER (Daytime)



WINTER (Daytime)



INITIAL EVIDENCE

- Results of ANOVA tests show significant differences on surface temperatures among typologies (81-85% for daytime and 71-74% for night time).
- At night, the positive cooling effect of vegetation is diminished by impervious surfaces.
- There are no significant surface temperature differences between scattered and aligned trees.
- Pervious and aquatic typologies, specifically water surfaces, well irrigated grasses and clustered or dense trees provided the highest temperature lowering effect at daytime.
- At night, well irrigated grasses are much cooler than forested areas while water features are the warmest.
- Lack of irrigation significantly affects temperature lowering by nearly 1.5-4.5 K.

It is crucial to determine the optimal types, amount and configuration of GI necessary to provide effective cooling benefits using data and models with higher accuracy and precision

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