Node of Excellence in High Performance Architecture

ASSESSING THE THERMAL PERFORMANCE OF GREEN INFRASTRUCTURE ON URBAN MICROCLIMATE

Research questions

What is the thermal performance of different green infrastructure (GI) typologies?
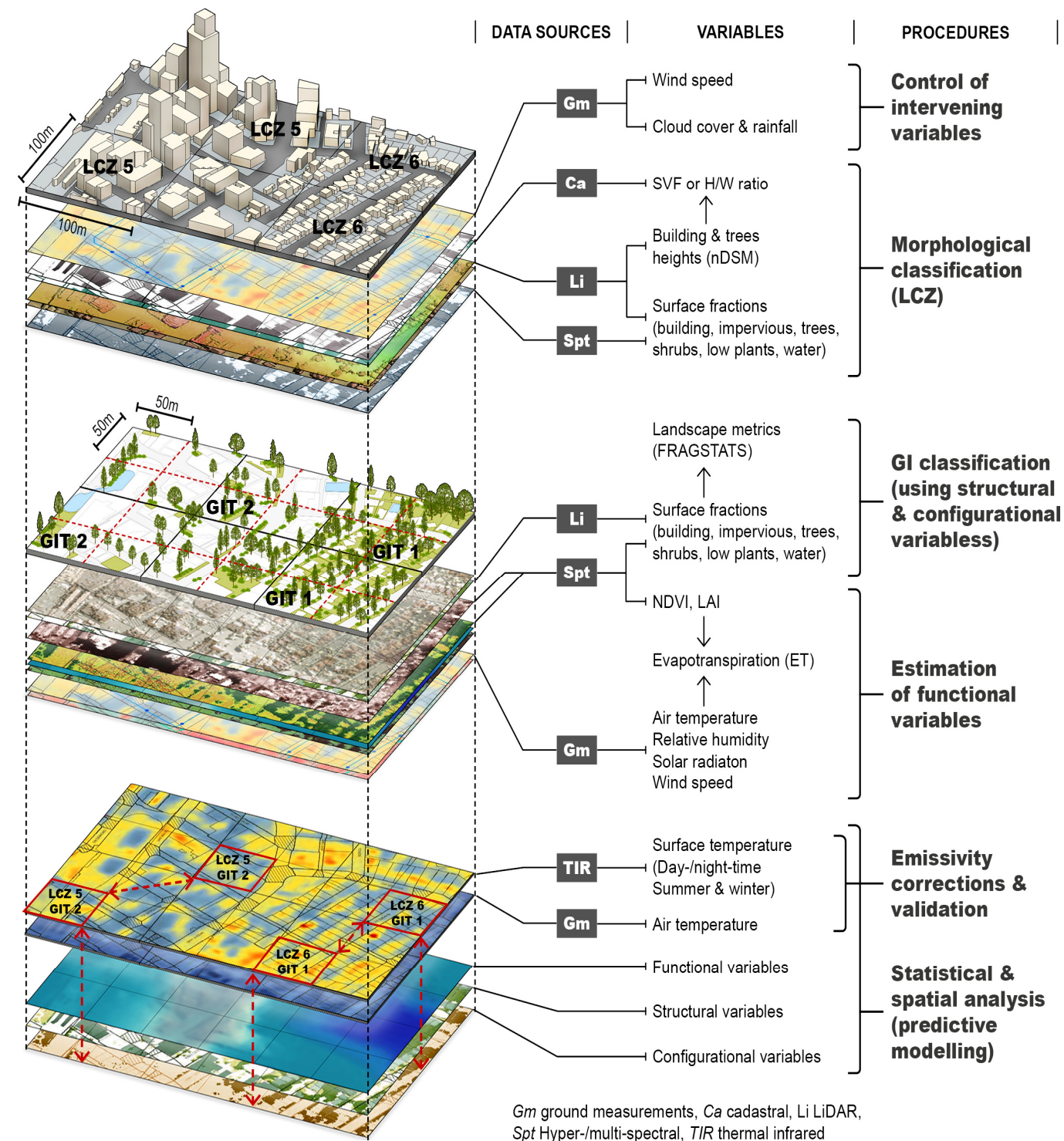
What are most effective compositions, amounts and spatial arrangements of GI required to provide an optimal thermal cooling?

Objectives

- Propose a new GI typology to support urban microclimate studies.
- Propose a methodological framework combining in-situ measurements, airborne remote sensing and predictive modelling.
- Propose a GIS-based workflow that is easily replicable by researchers and practitioners.
- Propose a list of evidence-based guidelines and recommendations for industry, local governments and urban designers.

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.

Methodology

DATA SOURCES	VARIABLES	PROCEDURES

Gm — Wind speed / Cloud cover & rainfall — **Control of intervening variables**

Ca — SVF or H/W ratio

Li — Building & trees heights (nDSM)

Spt — Surface fractions (building, impervious, trees, shrubs, low plants, water) — **Morphological classification (LCZ)**

LCZ 5, LCZ 5, LCZ 6, LCZ 6 — 100m / 100m

GIT 2, GIT 2, GIT 1, GIT 1 — 50m / 50m

Li — Landscape metrics (FRAGSTATS)

Spt — Surface fractions (building, impervious, trees, shrubs, low plants, water) — **GI classification (using structural & configurational variabless)**

NDVI, LAI → Evapotranspiration (ET)

Gm — Air temperature / Relative humidity / Solar radiaton / Wind speed — **Estimation of functional variables**

LCZ 5 GIT 2, LCZ 5 GIT 2, LCZ 6 GIT 1, LCZ 6 GIT 1

TIR — Surface temperature (Day-/night-time Summer & winter) — **Emissivity corrections & validation**

Gm — Air temperature

Functional variables / Structural variables / Configurational variables — **Statistical & spatial analysis (predictive modelling)**

Gm ground measurements, *Ca* cadastral, *Li* LiDAR, *Spt* Hyper-/multi-spectral, *TIR* thermal infrared
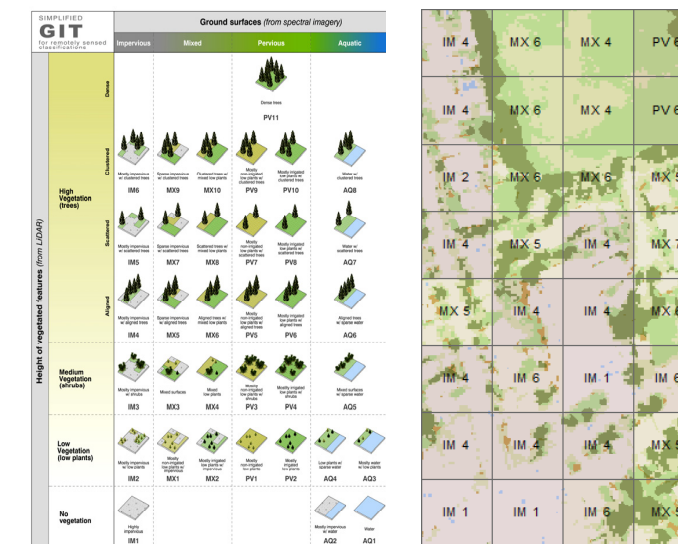
Initial results and contributions

1. An automated classification of Local Climate Zones (LCZ) based on airborne remote sensing
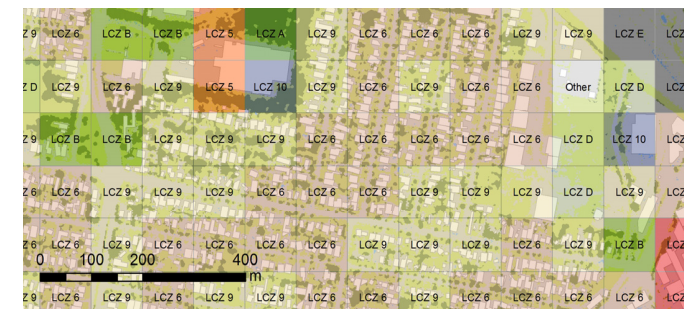
2. An automated classification system of GI typologies for microclimatic studies

3. Next stages of this research include statistical analysis and comparison of the thermal profiles of the typologies identified above in Sydney and Melbourne as case studies

Further information

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