

INTENSITY AND SPACIAL INFLUENCE OF URBAN PARKS: A CASE STUDY IN SÃO PAULO, BRAZIL

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MAIN CONTEXT

- Benefits of vegetation
- Objectives
- Methodology
- Leaf density measurements
- ENVI-met model with vegetation
- Analysis of Results
- Final Considerations

BENEFITS OF VEGETATION

1. Social and psychological functions.
2. Climatic functions
3. General ecological functions.
4. Urban development functions

OBJECTIVES OF THE RESEARCH

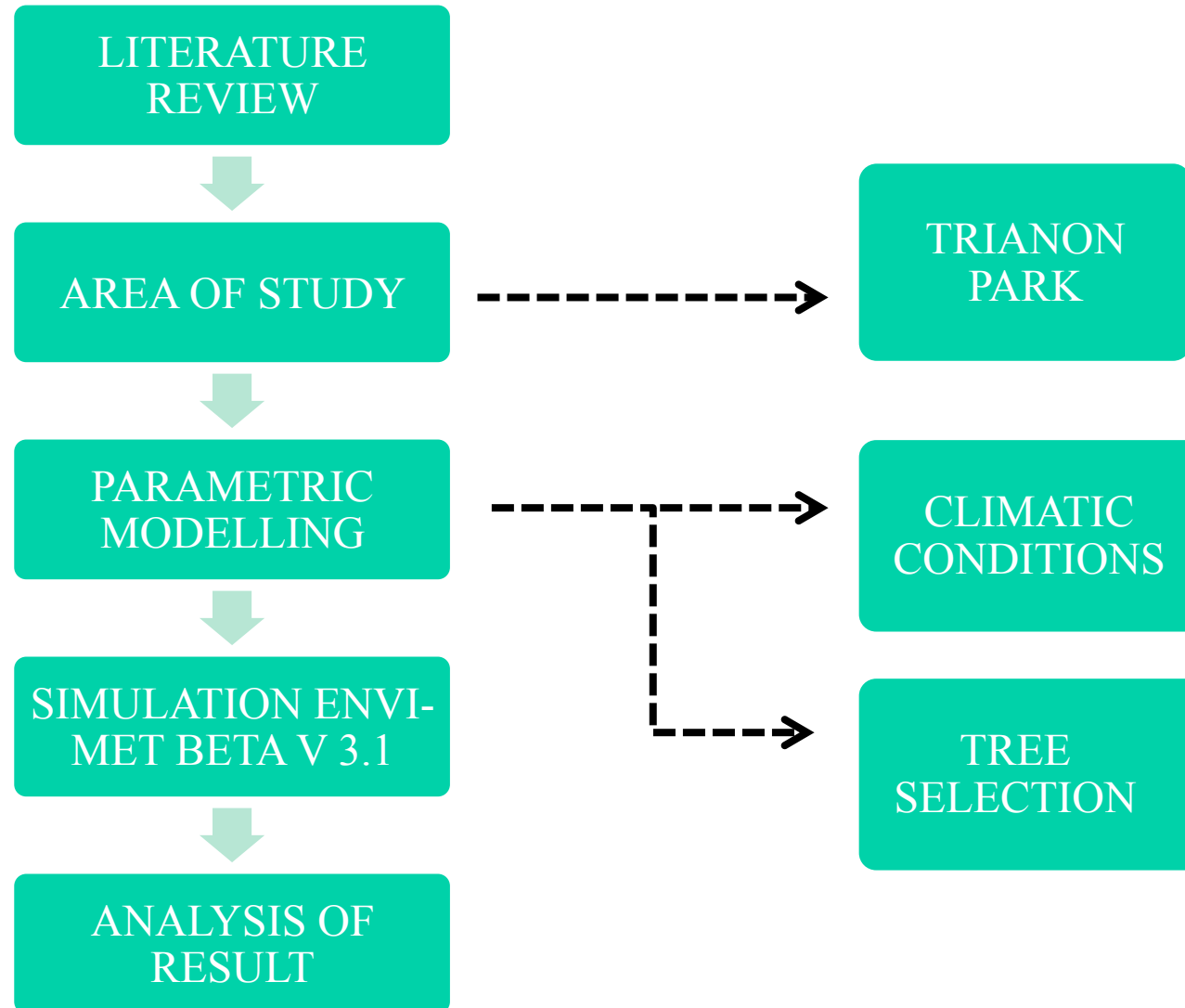
Quantify:

- INTENSITY
- SPATIAL DISTRIBUTION

for the microclimate effects by a vegetated area.

Based on variables: air temperature, humidity and the surface temperature at the level of the pedestrians.

METHODOLOGY – AREA OF STUDY



AREA OF STUDY

SP METROPOLITAN CITY

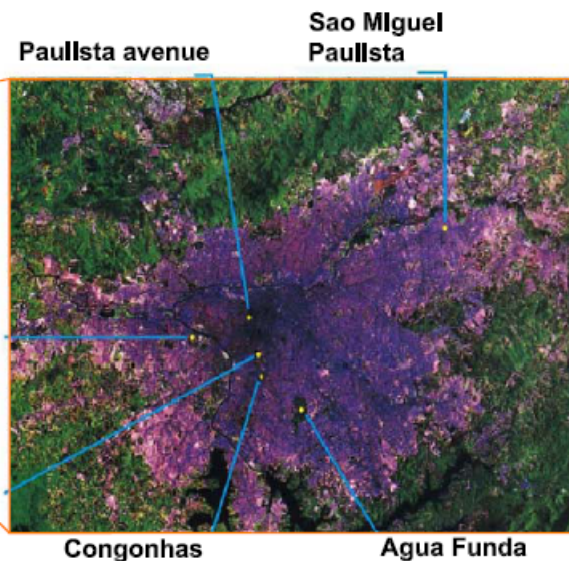
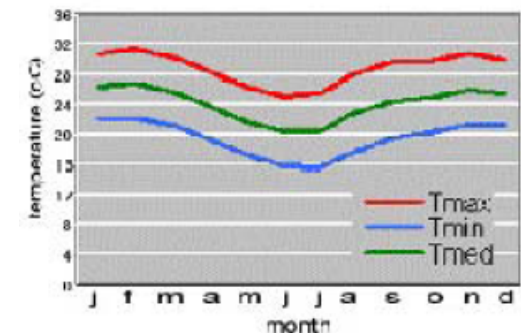


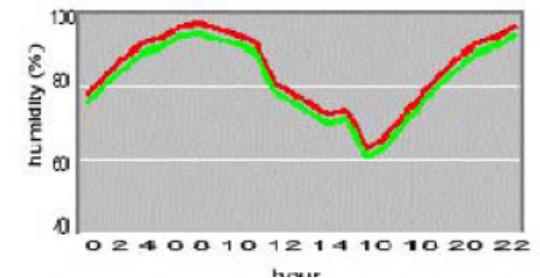
Figure1 - Landsat with the meteorological station sites in São Paulo.

Population: 19 million inhabitants
Total Area: 8051 km²

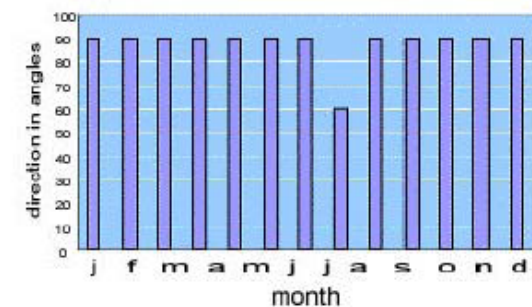
Temperature



Humidity



Wind Direction



CLIMATIC CONDITIONS – FIELD MEASUREMENT

SÃO PAULO EXPANDED CENTER



Paulista Avenue

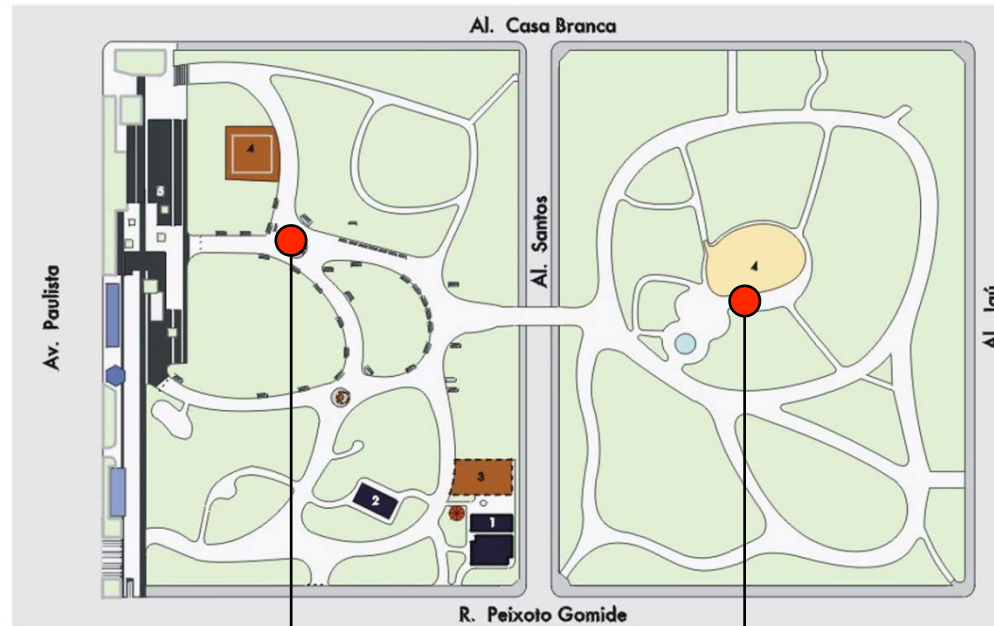


Trianon Park

Downtown Density: 61 people/ha

FIELD MEASUREMENT

Location of the two measurement points at Trianon Park



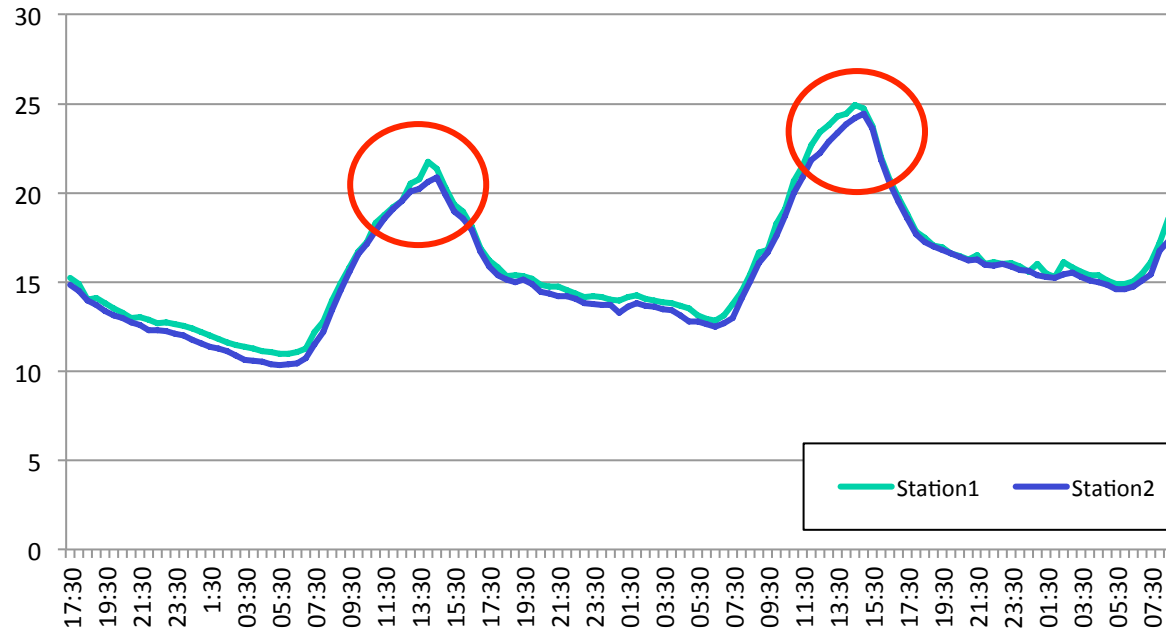
Meteorological
Station – Point 1

Meteorological
Station- Point 2



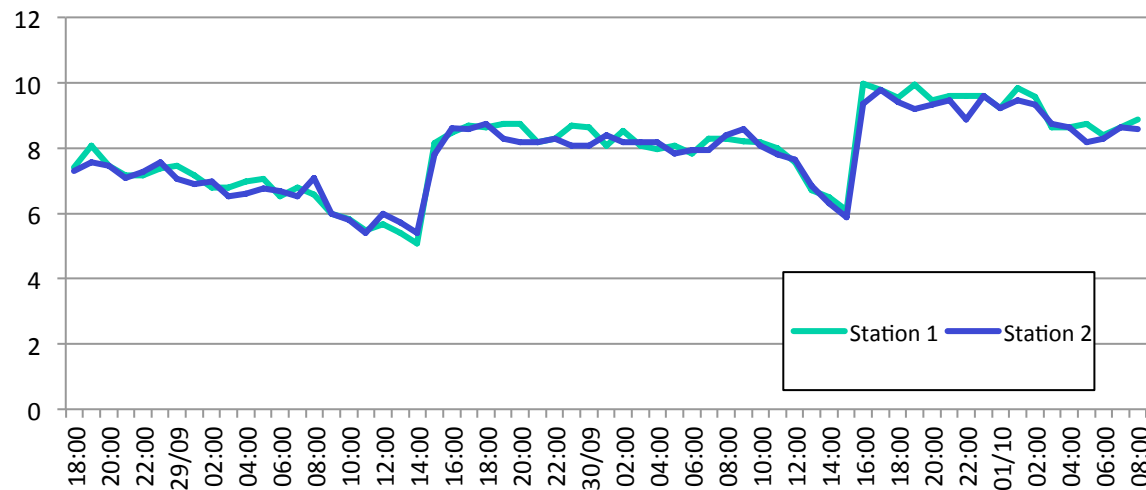
FIELD MEASUREMENT RESULTS

Air temperature
(°C)



Variation in
leaf density
(IAF)

Specific humidity
(g /kg)



TREE SELECTION



LAI-2000
EQUIPMENT

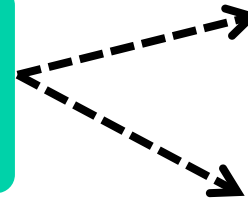
HEMISPHERIC
PHOTOGRAPHS
METHODOLOGY



TREE
SELECTION

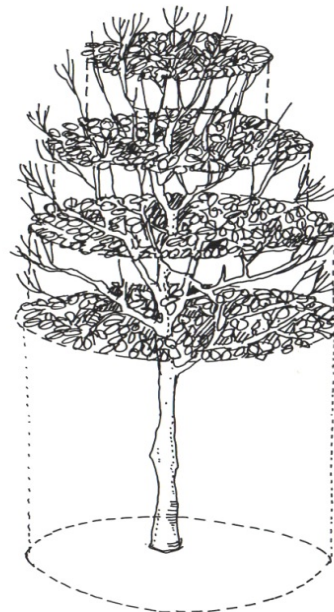


FIELD
MEASUREMENT
OF LAI VALUES

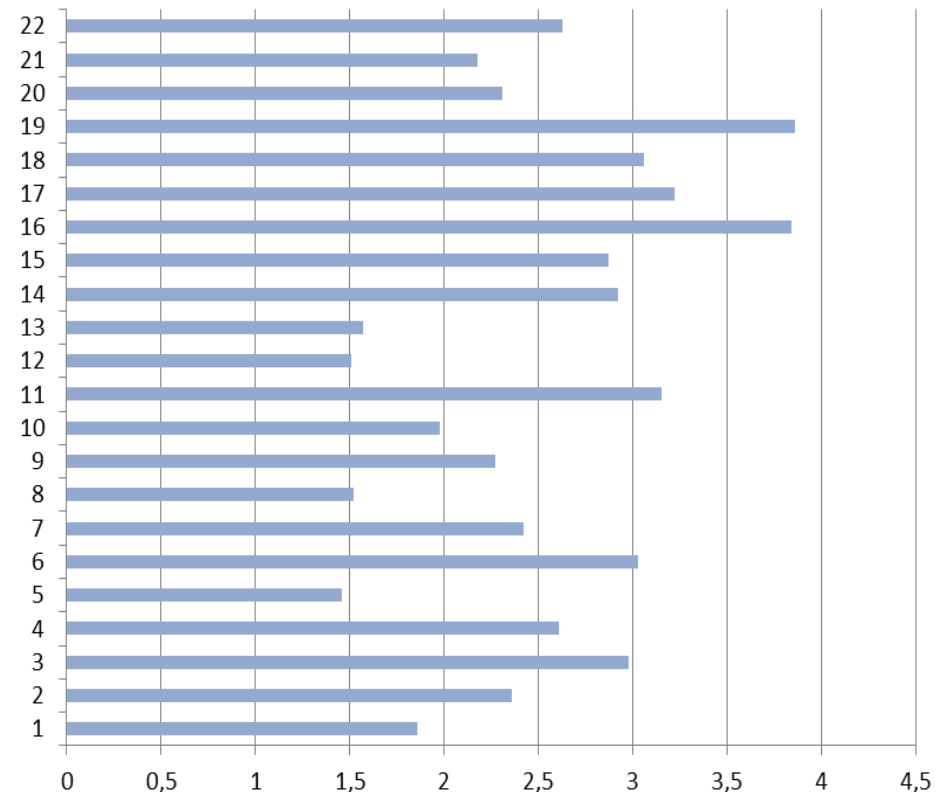
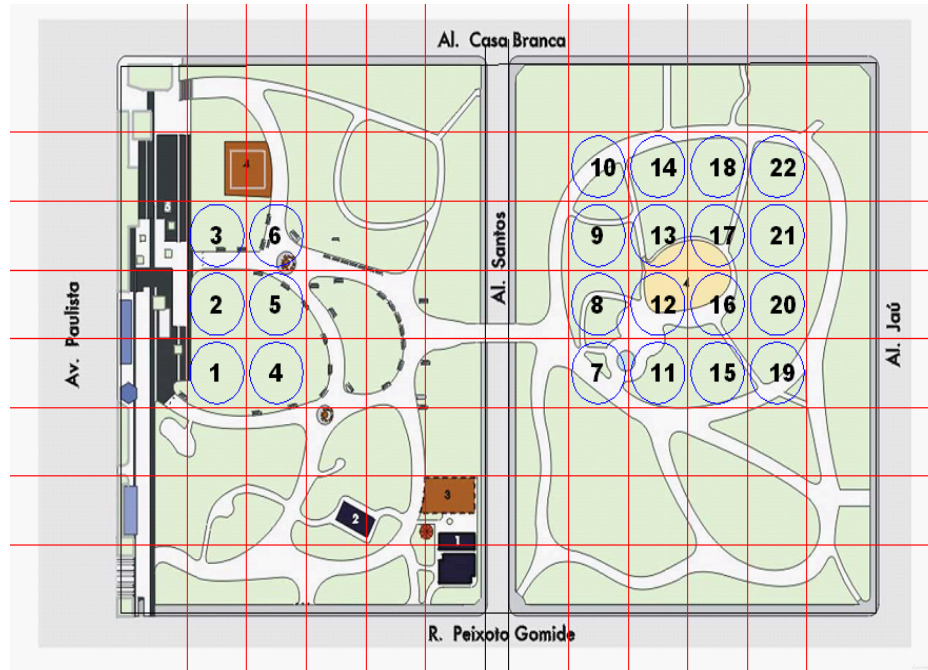


Native Species

Exotic Species



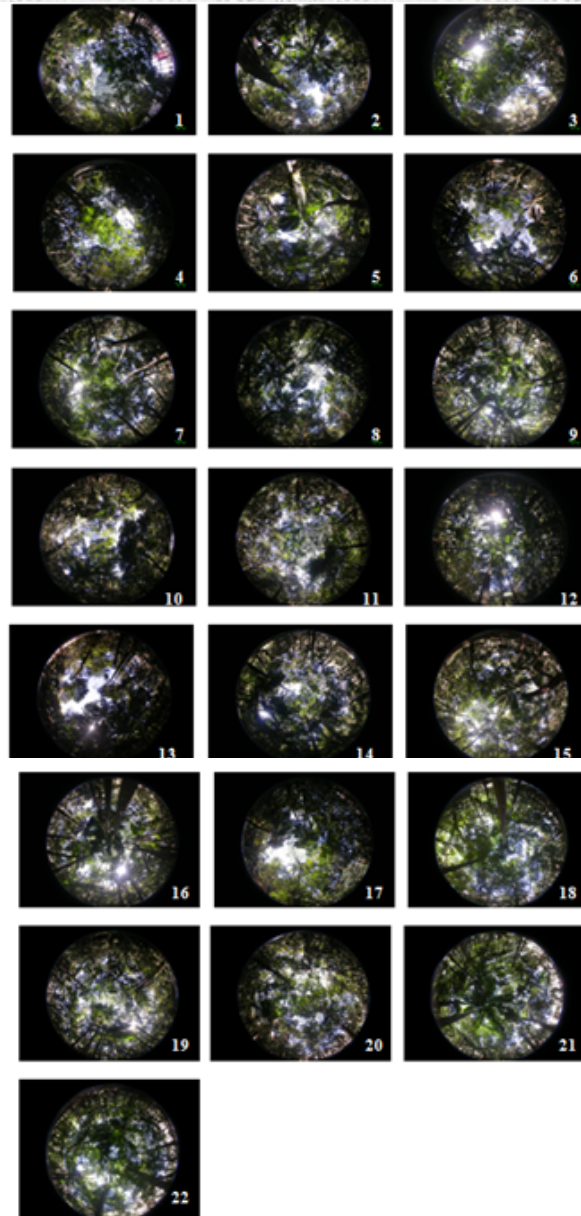
FIELD MEASUREMENT – LAI 2000 (LI-COR)



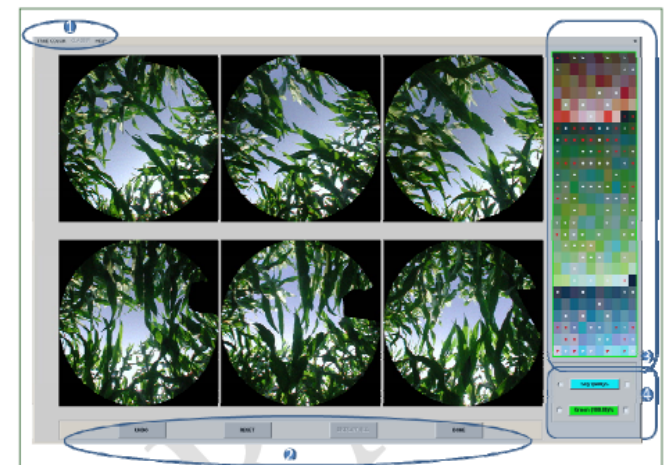
LAI variation between 1,46 to 3,86.

Average LAI for 22 points in the Trianon Park is 2,52.

FIELD MEASUREMENT – HEMISPHERIC PHOTOGRAPHS



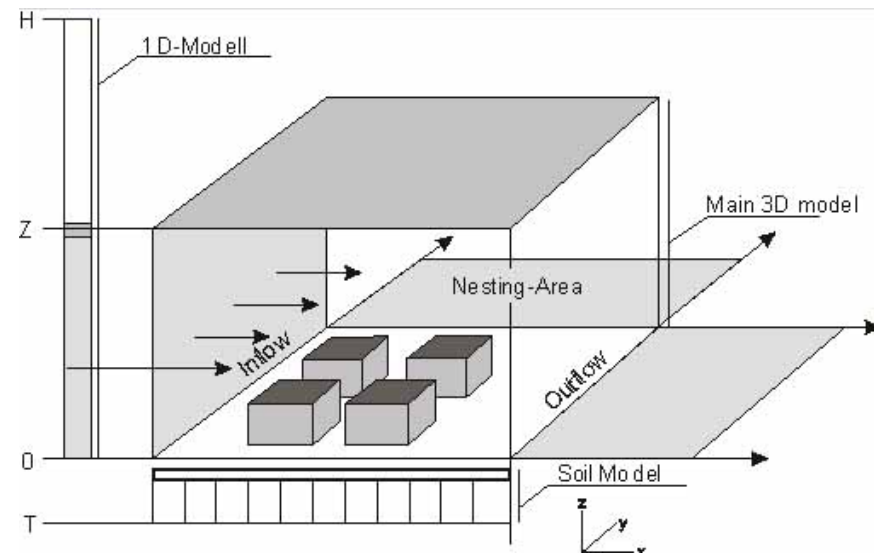
CAN-EYE MODEL



Average LAI for 22 points in the Trianon Park is 2,14.

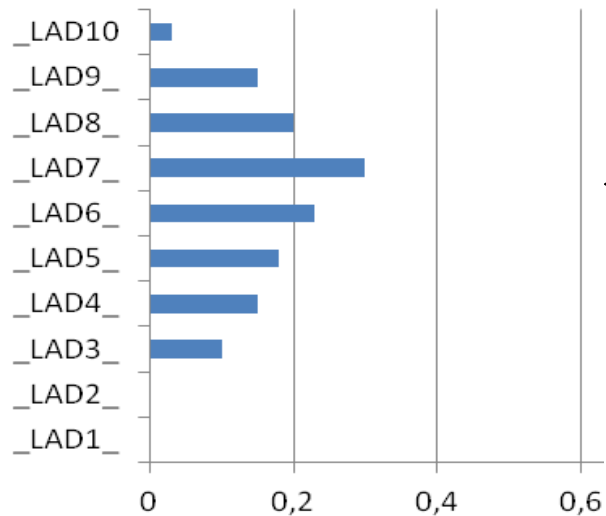
ENVI-MET MODEL

- Three dimensional model with advanced approach on plant-atmosphere interactions
- The numerical model simulates aerodynamics, thermodynamics and the radiation balance in complex urban structures with resolutions between 0.5m and 10.0m



ENVI-MET MODEL WITH VEGETATION

LAI CONVERTED TO LAD

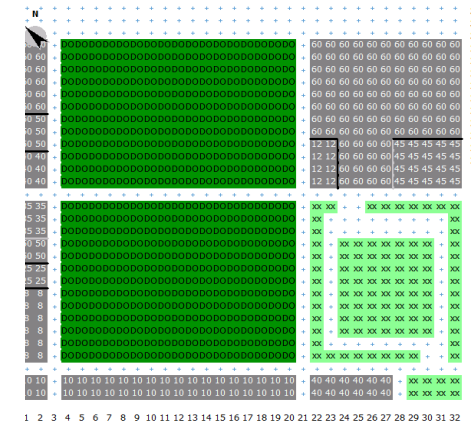


MODELLING
AREA

VEGETATION
INPUT DATA

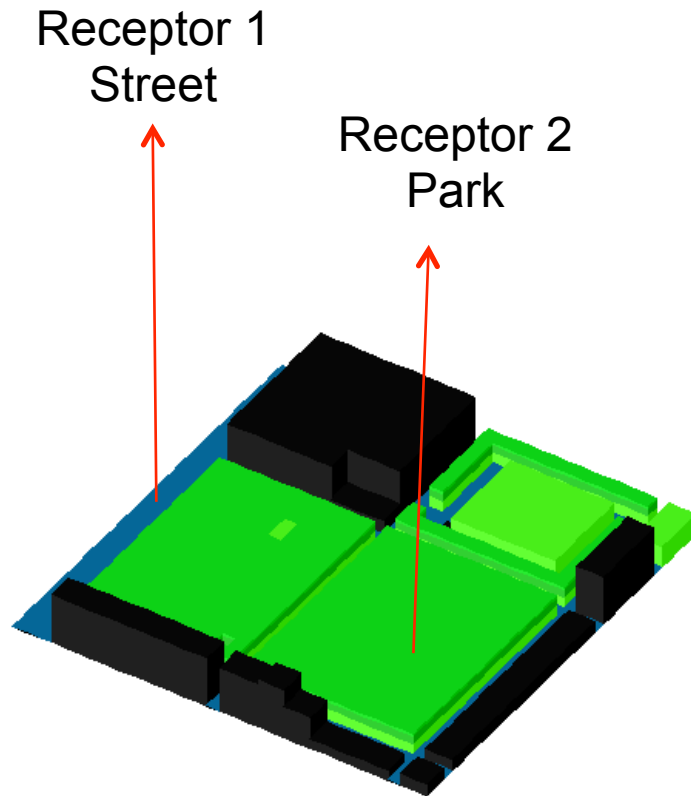
CLIMATIC
INPUT DATA

SIMULATION
ENVI-MET
BETA V 3.1

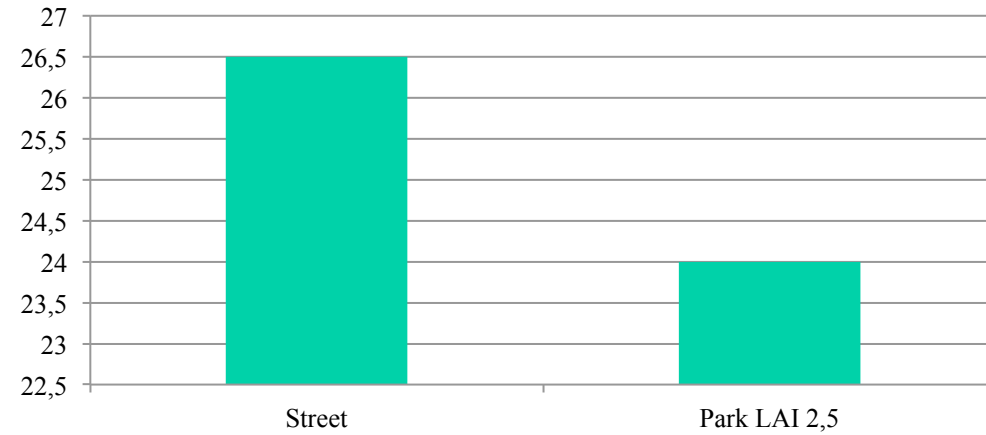


Start Simulation at day	28.09.2012
Wind Speed in 10m ab. ground [m/s]	0,1
Wind Direction (0:N/ 90:E/ 180:S/ 270:W)	200
Initial Temperature Atmosphere [K]	285,7 (12,7° C)
Specific Humidity in 2500m [g água/ kg ar]	9,5
Relative Humidity in 2m [%]	79
Soil Initial Temperature (0-20cm) [K]	287,6 (13° C)
Soil Relative Humidity (0-20cm) [%]	50

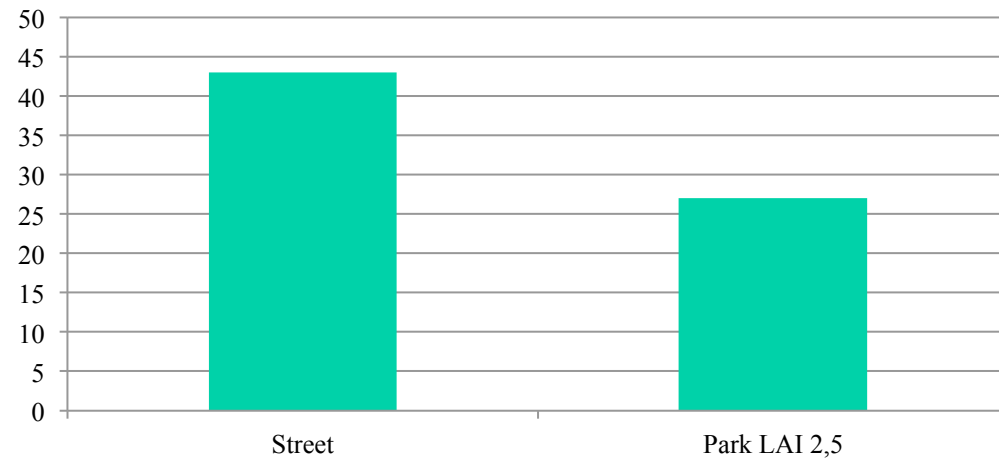
ANALYSIS OF RESULTS



Average air temperature in the street - 14h



Average surface temperature in the street - 14h



FINAL CONSIDERATIONS

INTENSITY OF EFFECT

Air temperature:

The average difference among air temperatures inside the green areas and the surrounding streets is about 2°C (LAI=2,5).

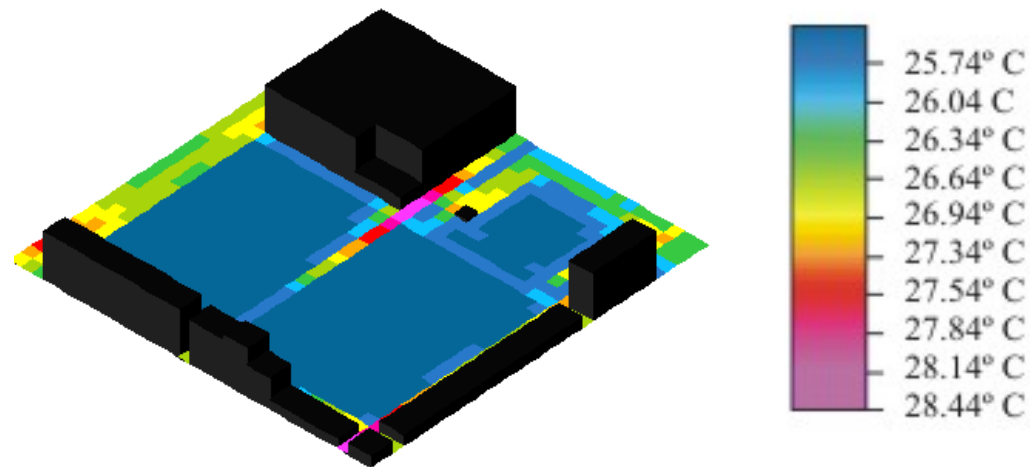
Surface temperature:

The tree shading has shown average differences of 29°C under the canopy.

FINAL CONSIDERATIONS

SPATIAL DISTRIBUTION OF EFFECT

Results show that the effect is very local, and the influence of green areas does not go very far from the green borders at pedestrian level. Measurements at Trianon Park showed that the effect for air temperature can be felt under the canopy and approximately 10m away from the canopy.



Extension of vegetation effect on the borders of the park.

THANK YOU !

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