



FREIE UNIVERSITÄT BOZEN

LIBERA UNIVERSITÀ DI BOLZANO

FREE UNIVERSITY OF BOZEN · BOLZANO

Fakultät für Naturwissenschaften
und Technik

Facoltà di Scienze
e Tecnologie

Faculty of Science
and Technology

Modelli ecosistemici di gestione degli spazi verdi

Alessio Russo & Stefan Zerbe

Vestire il Paesaggio, 26 – 27 giugno 2013

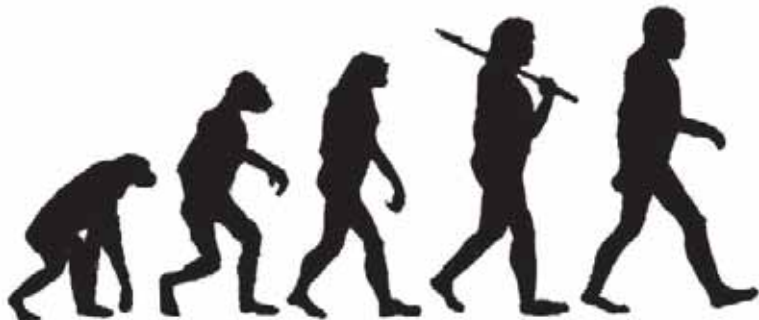
Styling Landscape , 26-27 June 2013

Ecosystem services

Servizi ecosistemici – servizi ambientali

“Ecosystem services are the **benefits that humans obtain from ecosystems**”

Millennium Ecosystem Assessment (2005)

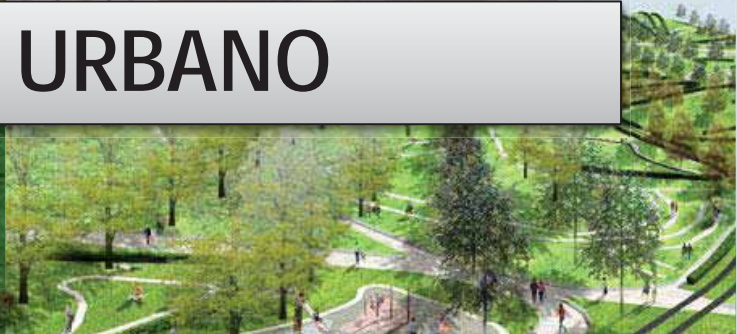


Quantificare i Servizi Ecosistemici





VERDE URBANO



URBAN GREENING

Source: West8

Modeling approach

Models are useful tools for ecosystem assessments (MA, 2005).



ENVI- met

Prof. Dr. Michael Bruse & Team
Johannes Gutenberg-
Universität Mainz



i-Tree



CUFR Tree Carbon Calculator

Developed by the Center for Urban Forest Research
Pacific Southwest Research Station
US Forest Service

In partnership with the California Department of
Forestry and Fire Protection



CITYgreen



i-Tree

Tools for Assessing and Managing
Community Forests

Get the Tools.



Google Custom Search

Search

Username

Password

Login

[Forgot Username or Password?](#)

Register



Home

About

Applications

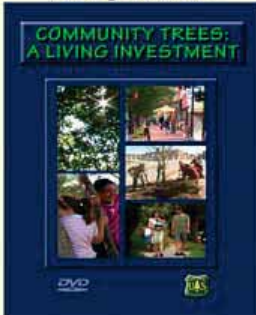
Utilities

Resources

Support

News

Community Trees:
A Living Investment



What is i-Tree?

i-Tree is a state-of-the-art, peer-reviewed software suite from the USDA Forest Service that provides urban forestry analysis and benefits assessment tools. The i-Tree Tools help communities of all sizes to strengthen their urban forest management and advocacy efforts by quantifying the structure of community trees and the environmental services that trees provide.

Since the initial release of the i-Tree Tools in August 2006, numerous communities, non-profit organizations, consultants, volunteers and students have used i-Tree to report on individual trees, parcels, neighborhoods, cities, and even entire states. By understanding the

What's New?

PA Joint Legislative Air and Water Pollution Control and Conservation Committee
[Environ. Synopsis Dec 2012>](#)

i-Tree version5 includes more Canadian content and smartphone integration
[Ontario Arborist Nov-Dec 2012>](#)

Mesquite, TX Urban Forest Ecosystem Analysis
[Mesquite, TX i-Tree Eco](#)

A stylized illustration on the left side of the slide. It features a large green tree with a brown trunk in the foreground. Behind the tree, there is a grey silhouette of a house with a chimney. The background is a solid blue color representing the sky.

Applications

- i-Tree Eco
- i-Tree Streets
- i-Tree Hydro (beta)
- i-Tree Vue
- i-Tree Design
- i-Tree Canopy

i-Tree Utilities

- i-Tree Species
- i-Tree Pest Detection Module
- i-Tree Storm
- i-Tree Mobile Data Collection
- Mobile Community Tree Inventory (MCTI)







i-Tree Streets Climate Zones



⊙ Reference Cities

Climate Zones

- | | |
|---|---|
|  North |  Inland Empire |
|  Interior West |  Tropical |
|  Temperate Interior West |  Central Florida |
|  Pacific Northwest |  Coastal Plain |
|  Inland Valleys |  South |
|  Southwest Desert |  Northeast |
|  Southern California Coast |  Lower Midwest |
|  Northern California Coast |  Midwest |



CUFR Tree Carbon Calculator

Developed by the Center for Urban Forest Research
Pacific Southwest Research Station
US Forest Service

In partnership with the California Department of
Forestry and Fire Protection



Figure 1

Project Data entry				
	Data name	Data entry	Units	Description
	Flag1	1		Tree dbh selected
	Flag2	1		Shade & climate selected
	Climate Zone	9 (Pacific Northwest)		Pacific Northwest
	Electricity CO2 emissions factor§	395	(kg/MWh)	
	Electricity CH4 emissions factor§	0,0030	(kg/MWh)	
	Electricity N2O emissions factor§	0,0017	(kg/MWh)	
	§required for energy project			

Figures 6 & 9

Tree and Building Data entry				
Enter Tree data below one tree at a time, then record results				
	Data name	Data entry	Units	Description
	Species code and scientific name	ACPL (Acer platanoides)		norway maple
	DBH (in)	19	DBH (in)	47 ft high
	Tree azimuth	1		N
	Tree distance class	1		Adj
	Building vintage	1		pre-1950
	air conditioning equip.	1		Central air/heat pump
	Heating equip.	1		natural gas
	Heating emissions factor, CO2	52.4	(kg/MBtu)	

BOLZANO BOZEN



- Population of about 100000 people;
- 50 square kilometres;
- Green areas represent about 3.9% of city's territory;
- 20 square metres of green space per person.



BOLZANO BOZEN



Covenant
of Mayors

Committed to local
sustainable energy



BOZEN. CO₂ NEUTRAL

BOLZANO. CO₂ NEUTRALE



Tree inventory

	A	B	C	D	E	F	G
1	ID_ALB	SP	ETA	VIA	VITA	ALT	CIRC_A
2	6420-001	Ulmus pumila	adulto	DON BOSCO parco	3	20-25	285
3	6420-002	Tilia x europaea	adulto	DON BOSCO parco	2	15-20	280
4	6420-003	Tilia x europaea	adulto	DON BOSCO parco	2	15-20	120
5	6420-004	Acer pseudoplatanus	adulto	DON BOSCO parco	2	15-20	160
6	6420-005	Betula pendula	adulto	DON BOSCO parco	2	5-10	88
7	6420-006	Betula pendula	adulto	DON BOSCO parco	2	10-15	110
8	6420-007	Betula pendula	adulto	DON BOSCO parco	2	15-20	87
9	6420-008	Betula pendula	adulto	DON BOSCO parco	2	10-15	60
10	6420-009	Betula pendula	adulto	DON BOSCO parco	2	5-10	47
11	6420-010	Betula pendula	adulto	DON BOSCO parco	3	5-10	75
12	6420-011	Betula pendula	adulto	DON BOSCO parco	2	10-15	85
13	6420-013	Tamarix gallica	adulto	DON BOSCO parco	3	<5	142
14	6420-014	Ulmus pumila	adulto	DON BOSCO parco	2	25-30	291
15	6420-015	Koelreuteria paniculata	adulto	DON BOSCO parco		<5	17
16	6420-018	Betula pendula	adulto	DON BOSCO parco	2	10-15	57
17	6420-022	Betula pendula	adulto	DON BOSCO parco	2	10-15	69
18	6420-024	Koelreuteria paniculata	nuovo impianto	DON BOSCO parco		<5	16
19	6420-025	Ulmus pumila	adulto	DON BOSCO parco	2	25-30	320
20	6420-026	Acer platanoides	giovane	DON BOSCO parco	2	5-10	52
21	6420-027	Acer platanoides	giovane	DON BOSCO parco	2	5-10	50
22	6420-028	Acer platanoides	adulto	DON BOSCO parco	2	5-10	52
23	6420-029	Aesculus hippocastanum	giovane	DON BOSCO parco	2	<5	45
24	6420-030	Aesculus hippocastanum	giovane	DON BOSCO parco	2	5-10	51
25	6420-031	Tilia x europaea	adulto	DON BOSCO parco	2	15-20	258



Catasto degli alberi Comune di Bolzano

C storage and sequestration

Tree biomass

- Allometric equations
- Models

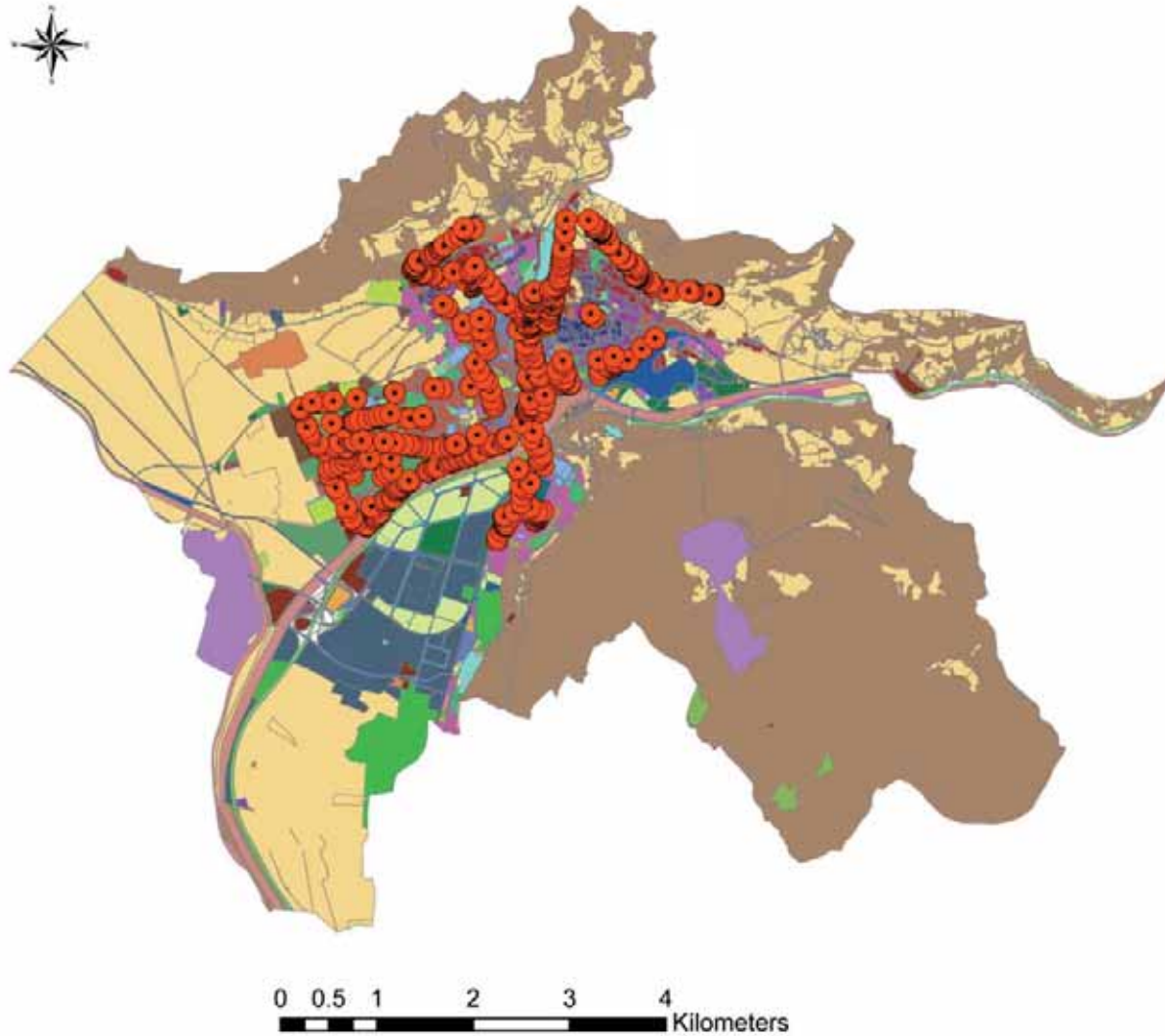
Carbon= biomass x 0.5

C sequestration

- Growth rates
- Tree height increment

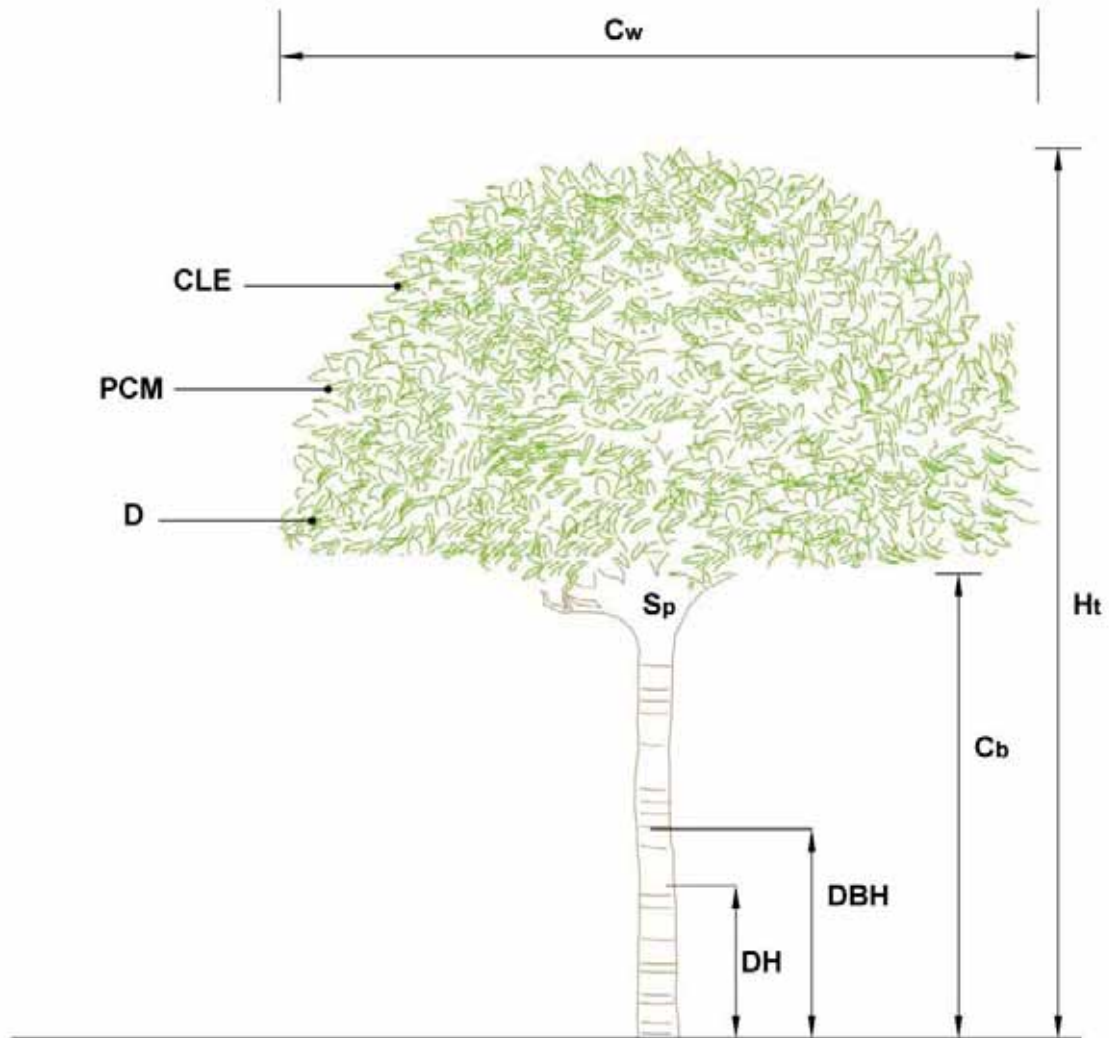


Field sampling





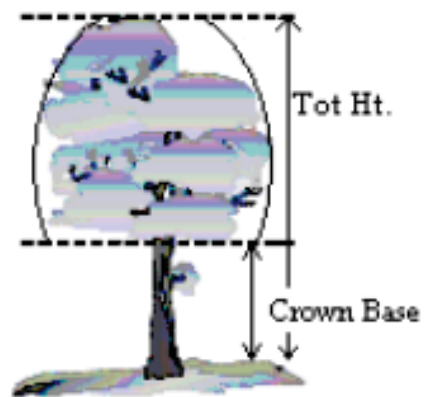
209



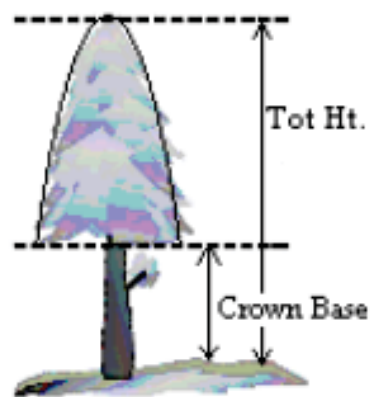
DBH 1.37 m
Diameter 1m



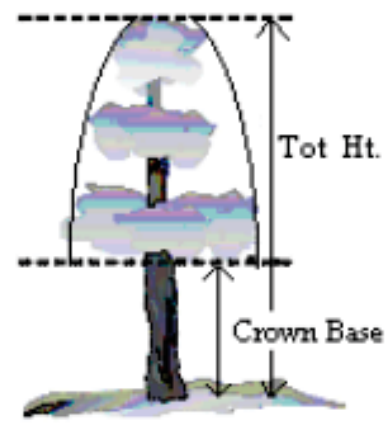




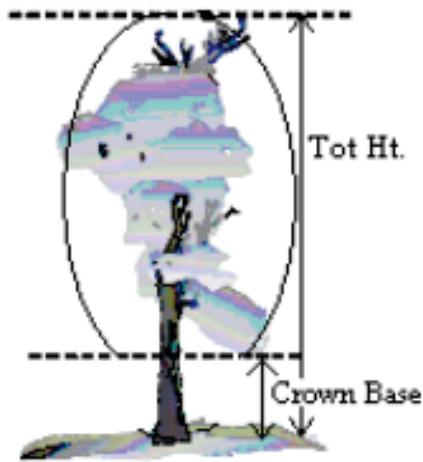
10% Canopy Missing



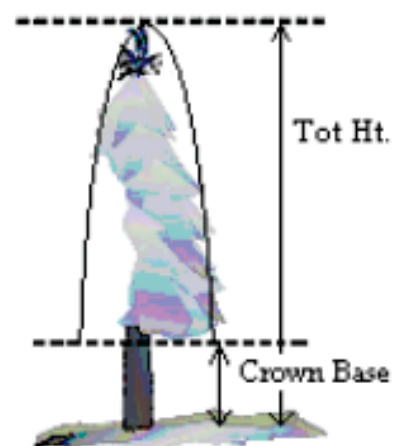
0% Canopy Missing



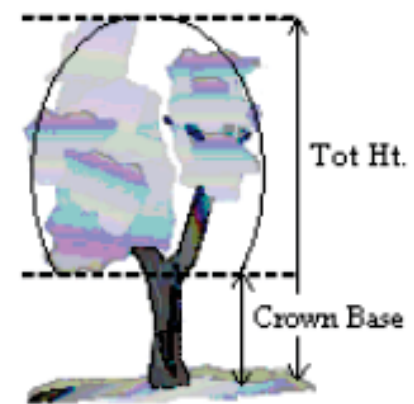
25% Canopy Missing



40% Canopy Missing



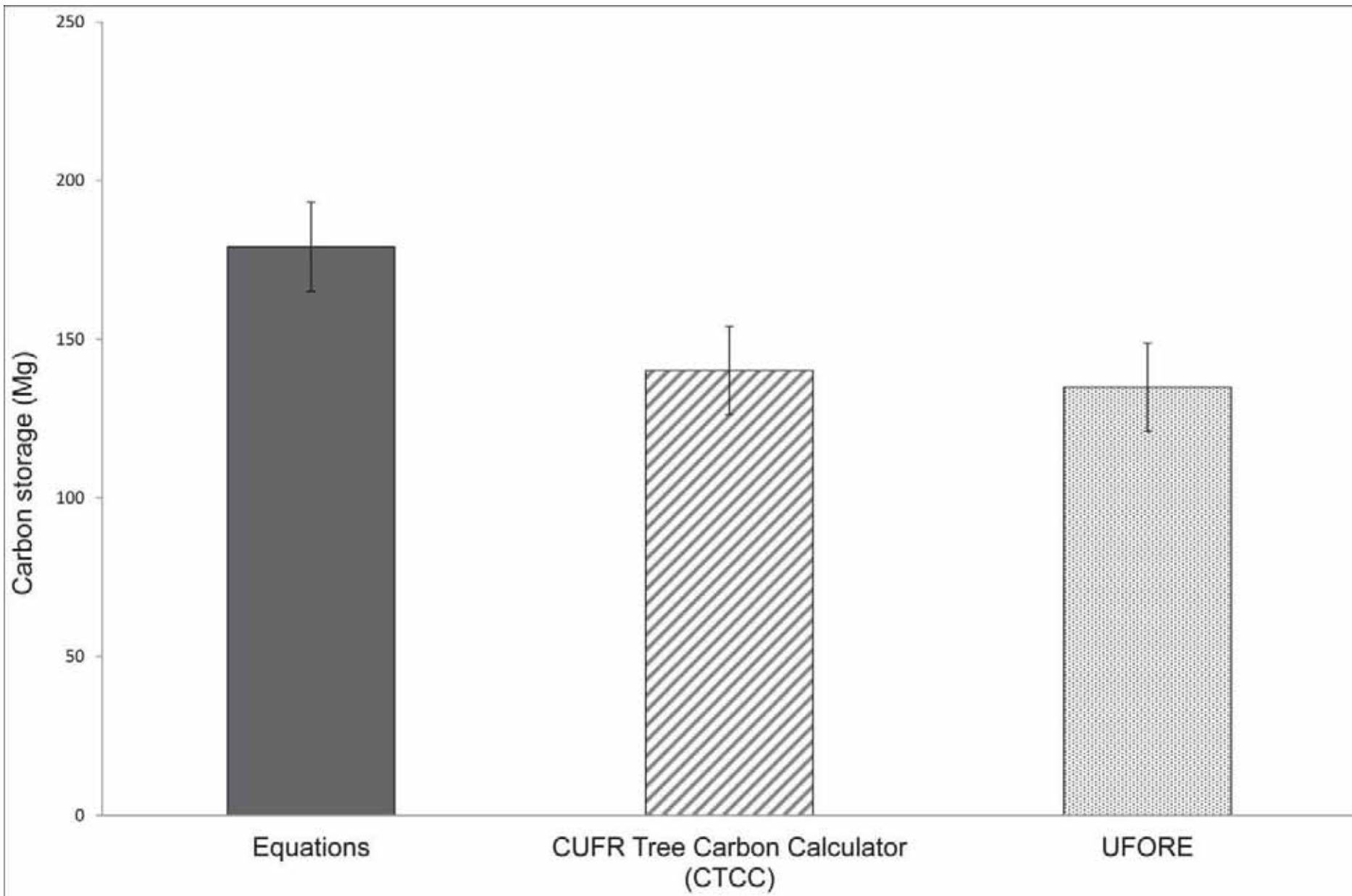
30% Canopy Missing

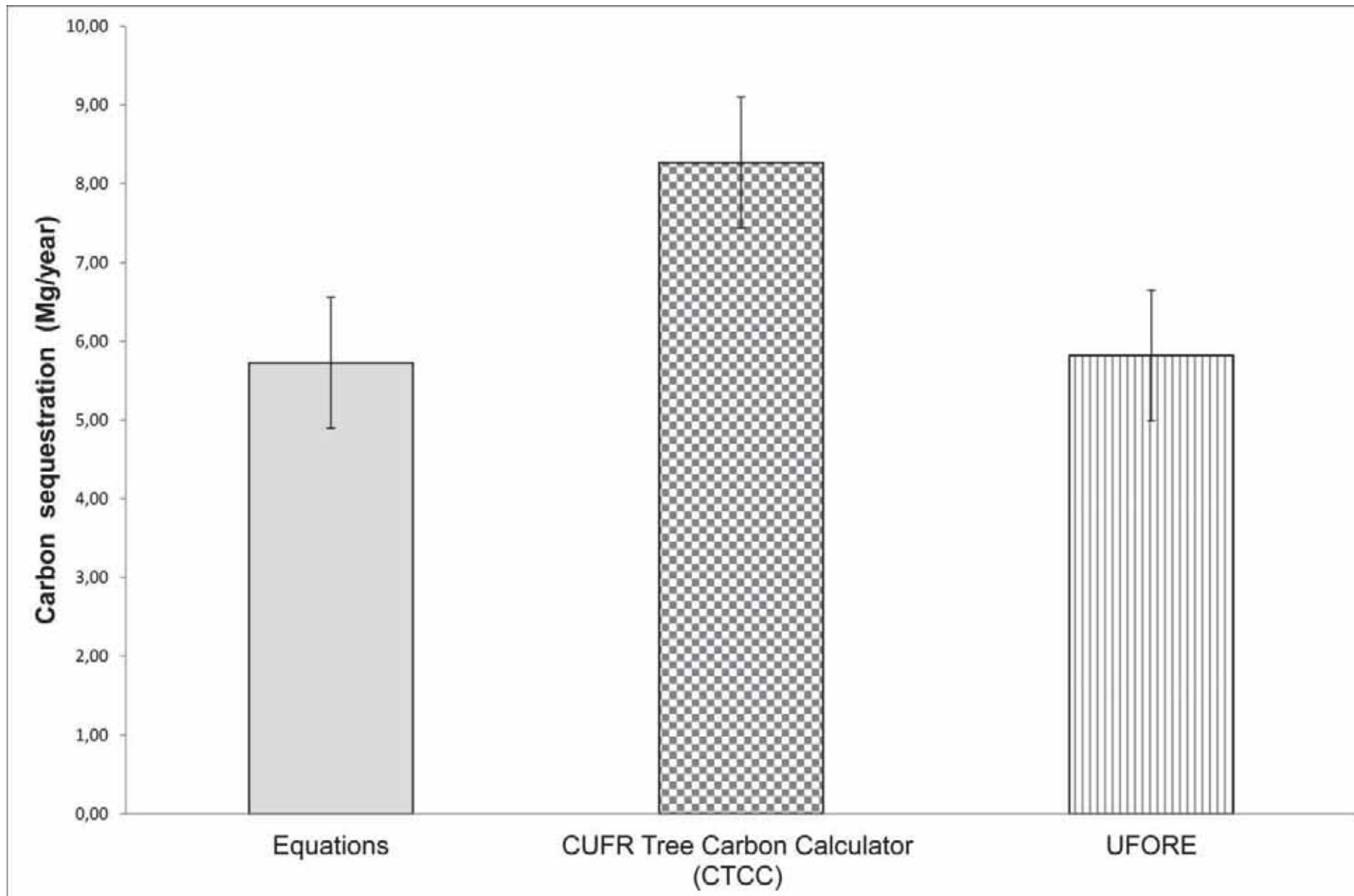


15% Canopy Missing

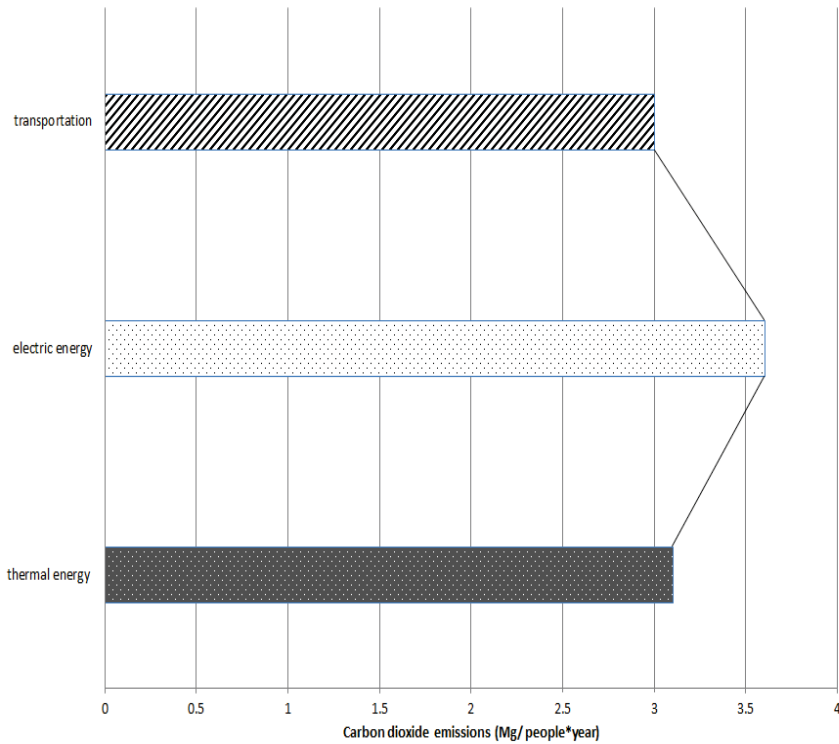


Figure 1. Crown Light Exposure

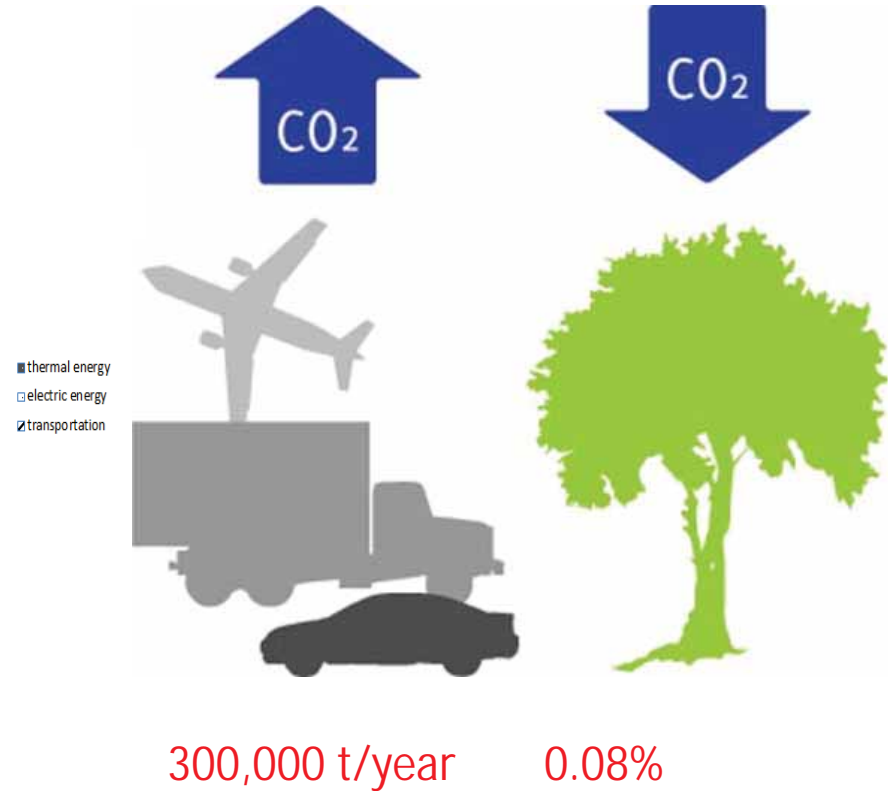


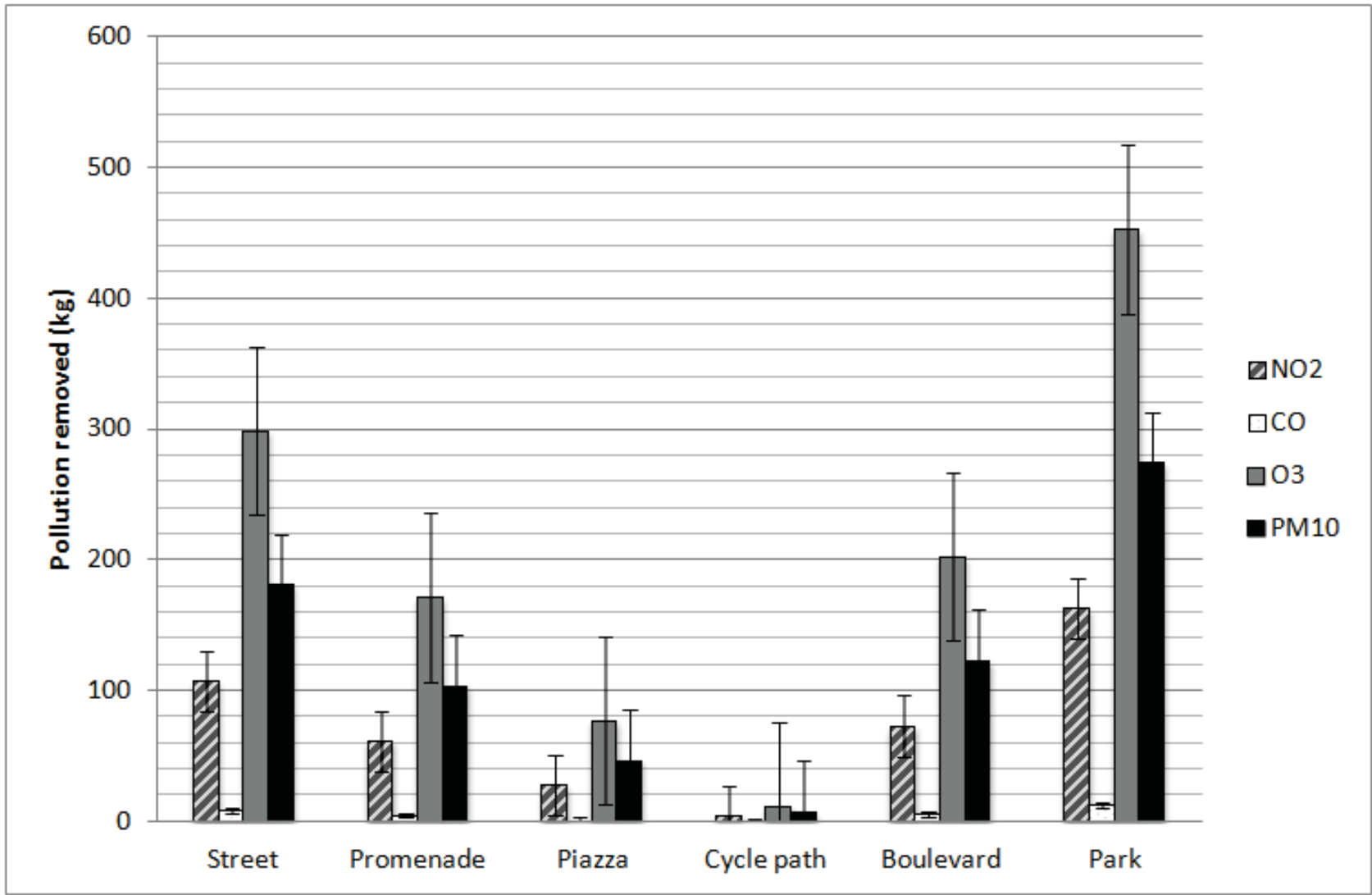


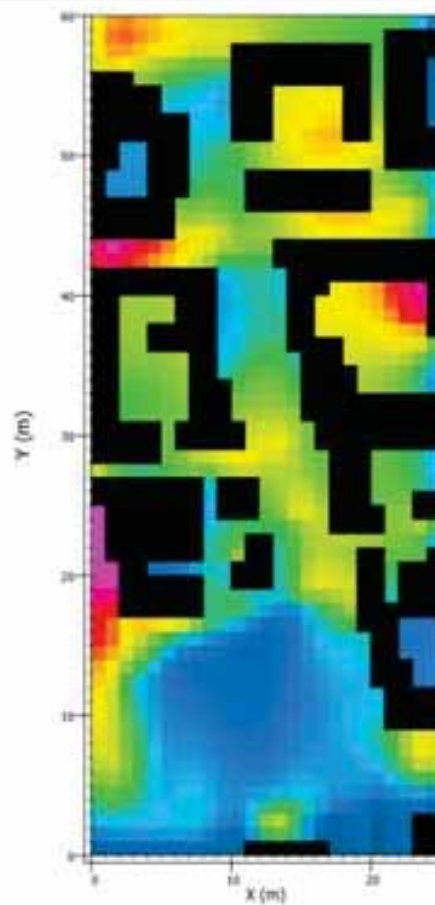
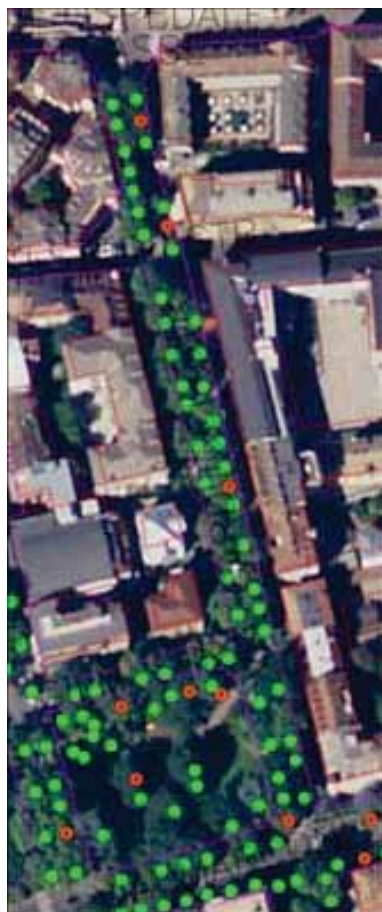
CO₂ Offsetting



Source: EURAC -Bolzano - towards a CO₂ neutral city

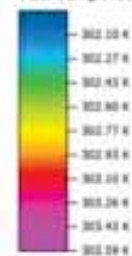






carducci 16:00:00 16.07.2010
(final)
UV out of view 2

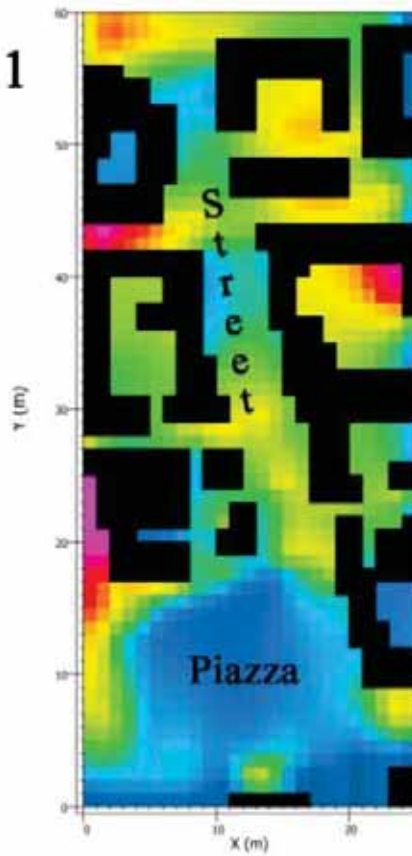
Pot. Temperature



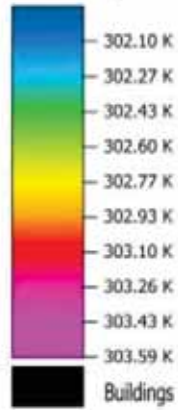
Closed LAD and Shelters



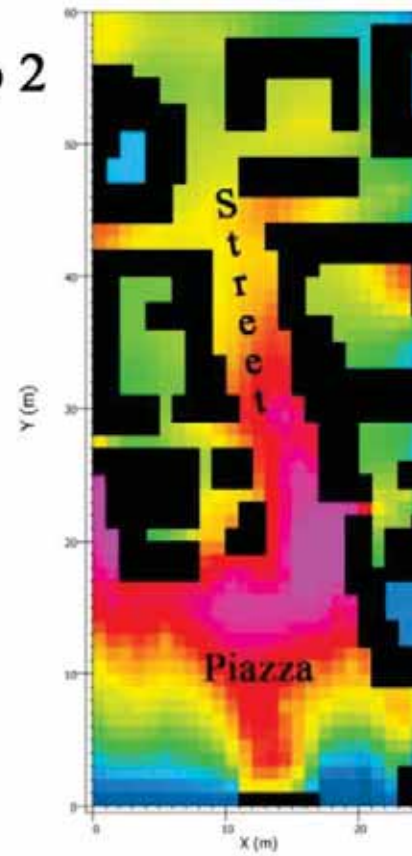
Scenario 1



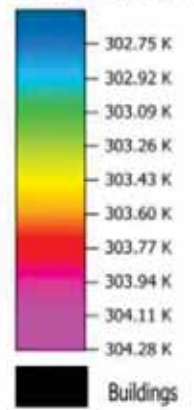
Pot. Temperature



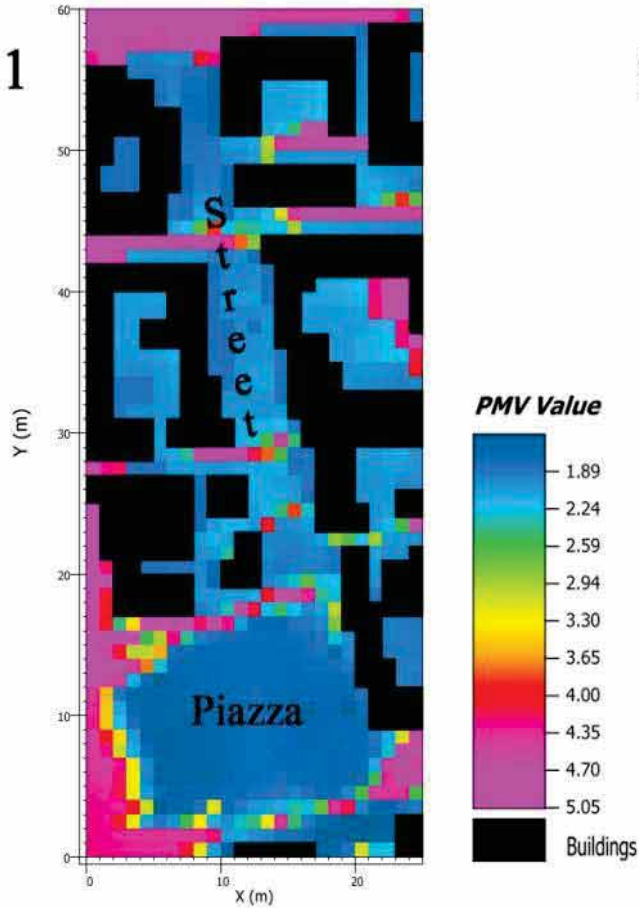
Scenario 2



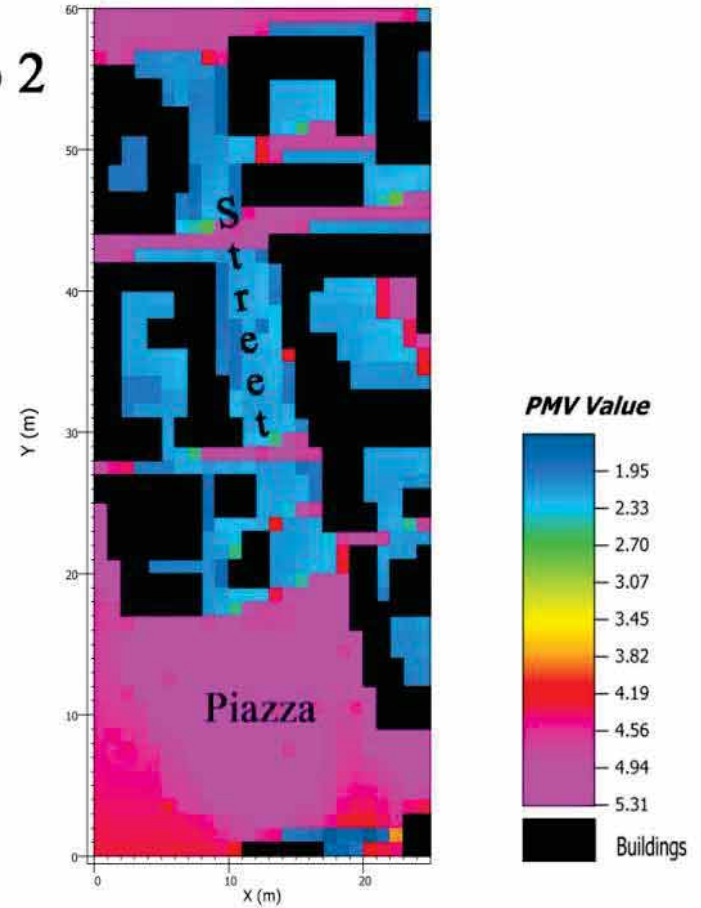
Pot. Temperature



Scenario 1



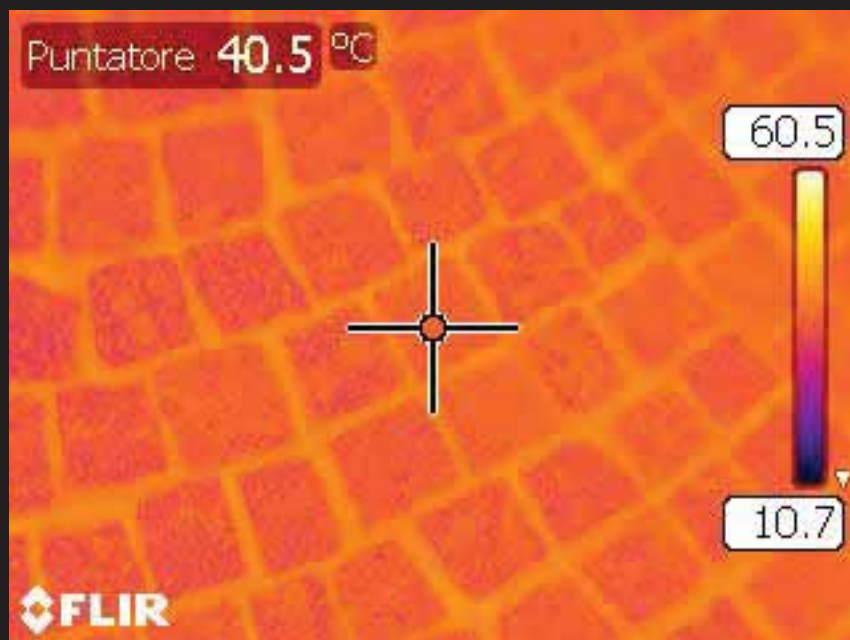
Scenario 2



PMV	PET (°C)	Thermal perception	Grade of physiological stress
-3.5	4	Very cold	Extreme cold stress
-2.5	8	Cold	Strong cold stress
-1.5	13	Cool	Moderate cold stress
-0.5	18	Slightly cool	Slight cold stress
0.5	23	Comfortable	No thermal stress
1.5	29	Slightly warm	Slight heat stress
2.5	35	Warm	Moderate heat stress
3.5	41	Hot	Strong heat stress
		Very hot	Extreme heat stress

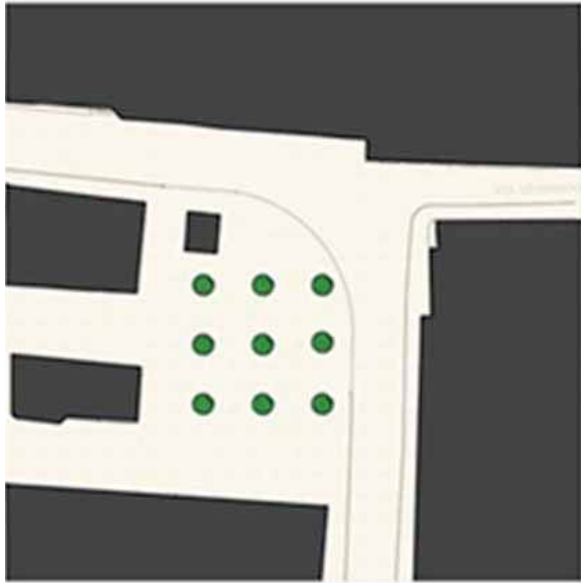




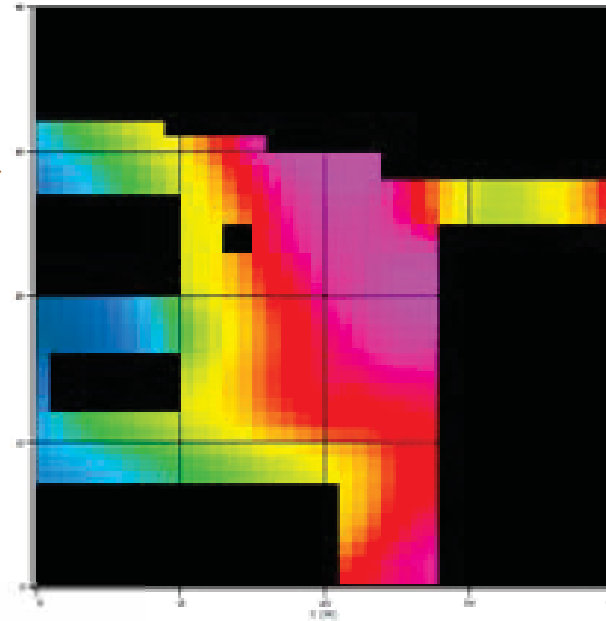




Simulazione con alberi

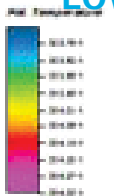


Simulazione
Ore 2:00 pm



Piazza 14/00/00 04.07.2010
04.07.2010

Low T



High T



Conclusion

- Planners, politicians and managers
- Low carbon cities
- Sustainable urban green streetscapes





FREIE UNIVERSITÄT BOZEN

LIBERA UNIVERSITÀ DI BOLZANO

FREE UNIVERSITY OF BOZEN • BOLZANO

Fakultät für Naturwissenschaften
und Technik

Facoltà di Scienze
e Tecnologie

Faculty of Science
and Technology

Russo

Dott. Agr. Alessio Russo, PhD

alessio.russo@unibz.it

t: (+39) 0471 017810