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Ecosystem services in Alpine towns:
Experiences of Bolzano (IT) and Lugano (CH)

R3GIS managing spaces
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Global scenery

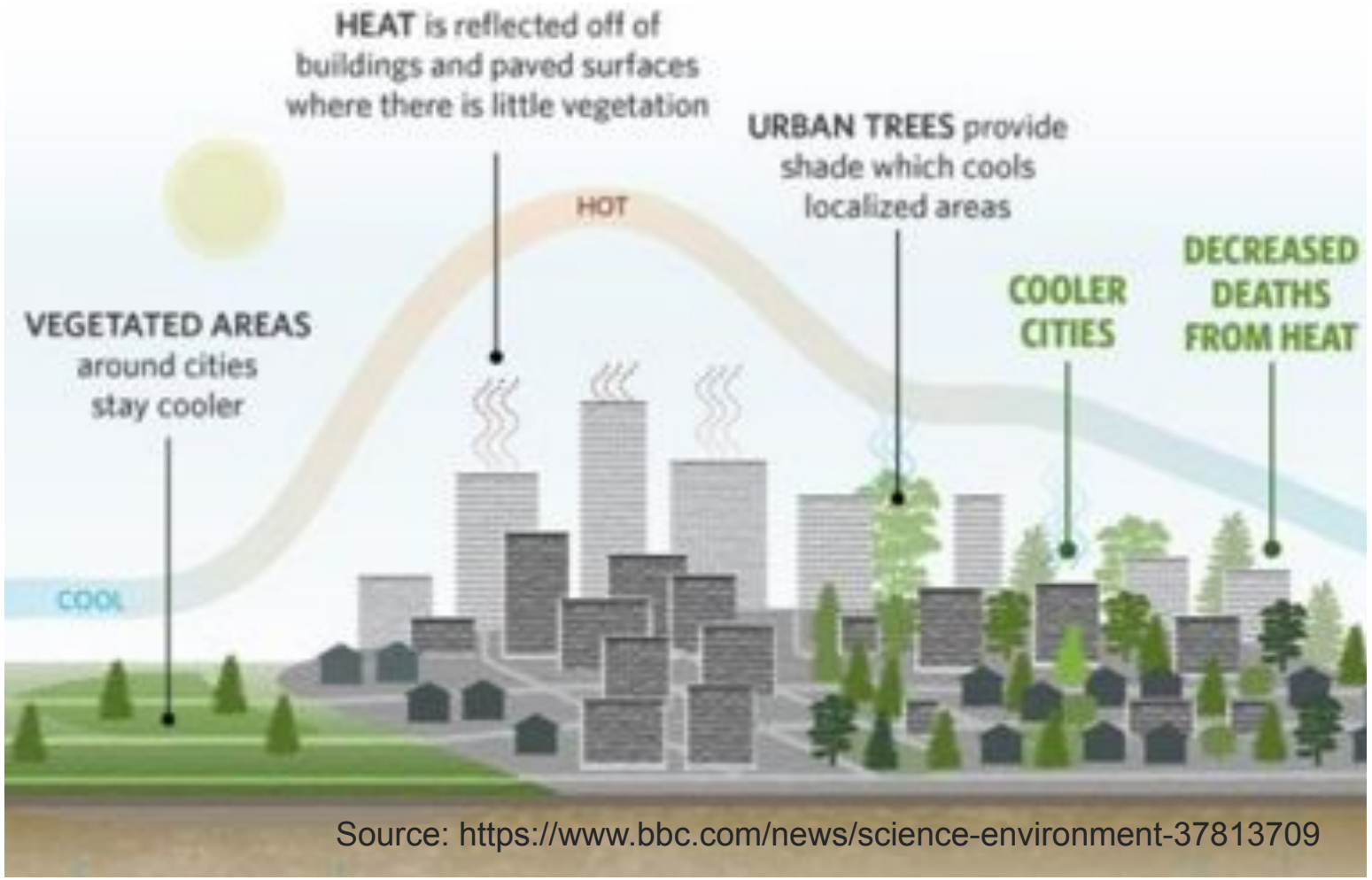
4 of 5 citizens live in cities

Climate change brings environmental challenges, which reflect on **life quality**.

- Heat islands
- Low quality of green areas
- Floods

Other **urban challenges**:

- Low air quality
- Ambient noise levels
- COVID-19 pandemic



Source: https://www.bbc.com/news/science-environment-37813709

Green areas are infrastructures of primary importance

The true value of urban green

A correct maintenance of urban green areas is important to maximise the positive contribution of trees and extend the life cycle (Hauer, 2015)

GreenSpaces: a planning tool with focus on ecosystem services

Help cities worldwide to manage their urban green areas efficiently, improving liveability, ensuring safety and mitigating effects of climate change

Innovation and research projects

BIODIVERSITY

CLIMATE STRATEGY

GREEN ECONOMY

ALPINE CONVENTION

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Bolzano (IT)
Lugano (CH)

Shrubs

ECOSYSTEM SERVICES

Life

LIFE URBAN GREEN

Rimini (IT)
Krakow (PL)

Trees

Importance of a data model - CAM (Minimum Environmental Criteria)

A standard data model ensures comparability, benchmarks, standard indexes, development of new tools.

Code	Description	Quantity [n]
P103108	Tree - Living tree	98
P103109	Shrub	1
P214250	Recreational equipment simple	1
P232464	Irrigation scheme connection	1
P232465	Irrigation shaft	2
P232466	Irrigatore	9
P232467	Adduttore	1

Code	Description	Quantity [n]	Quantity [m]
L103107	Living fence	2	61
L217307	Steel fence	17	690

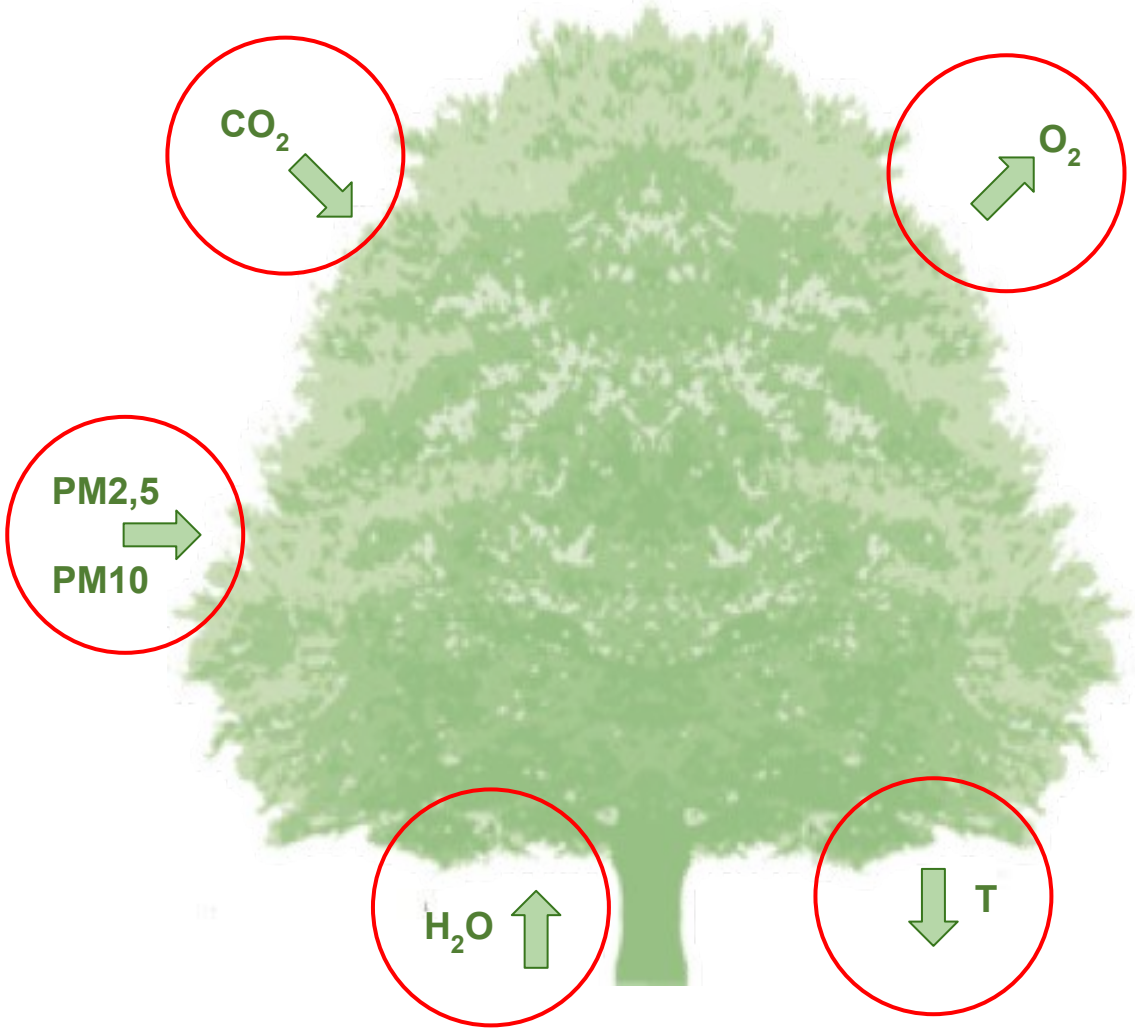
Code	Description	Quantity [n]	Quantity [m²]
S101016	Lawn	12	13.739
S103101	Shrub area	1	2
S204152	Water body fountain	1	66
S205002	Paving gravel	3	4.045
S212000	Building	1	38
S213212	Wall	1	42
S325502	Total area boundary	1	17.931

Activities can be planned, monitored, accounted for in a transparent way with the aim of reducing carbon footprint and management costs

Quantification of ecosystem services

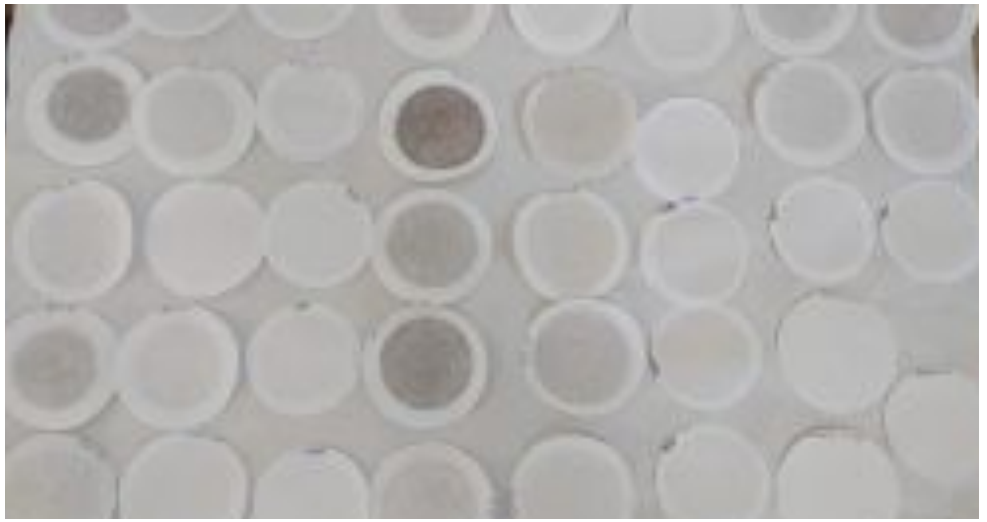
The Universities of Milan and Florence are measuring trees and shrubs in Bolzano, Lugano, Rimini and Krakow to gather data for the calculation of:

- CO_2 stocked and assimilated
- Air cooling due to shading and leaf transpiration
- Sequestration of air pollutants (PM10, PM2.5) by leaves
- Biodiversity (e.g. Naturalistic Index)
- Effects on hydrological cycle

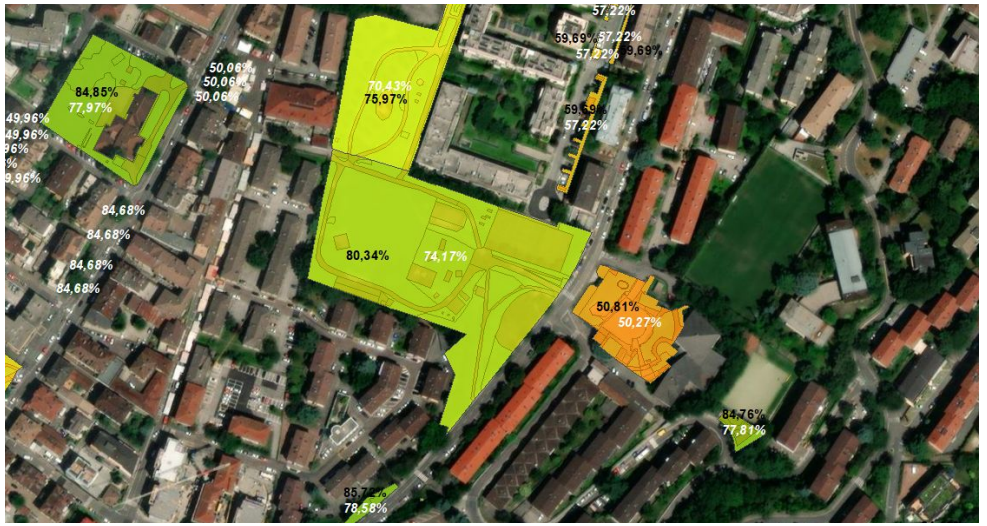


Measurements and Data Collection

Air Quality: Measurement of particulate sequestration by leaves to mitigate the effects of air pollution.



Infiltration capacity: Measurement of pavement permeability to prevent floods and droughts.



Measurements and Data Collection

CO2 Storage: Measurement of photosynthesis for CO2 assimilation and leaf transpiration for air cooling.

Tree sensor and satellite data: Measurement of tree environmental parameters.

Efficient management of green areas

Yearly tree benefits

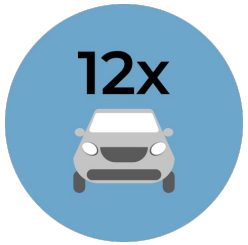
On a yearly basis this plane tree contributes with following ecosystem services to the urban environment:

1220 g/year

PM10 removed

PM10 emitted by 12 urban city cars (Euro 6) driving 20.000km/year

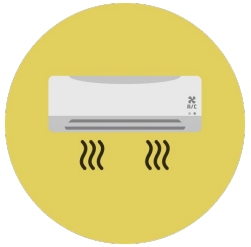
2520 kg/year



CO2 assimilated

CO2 emitted by an urban city car (Euro 6) driving 20.000km

893 kWh/year



Energy saved

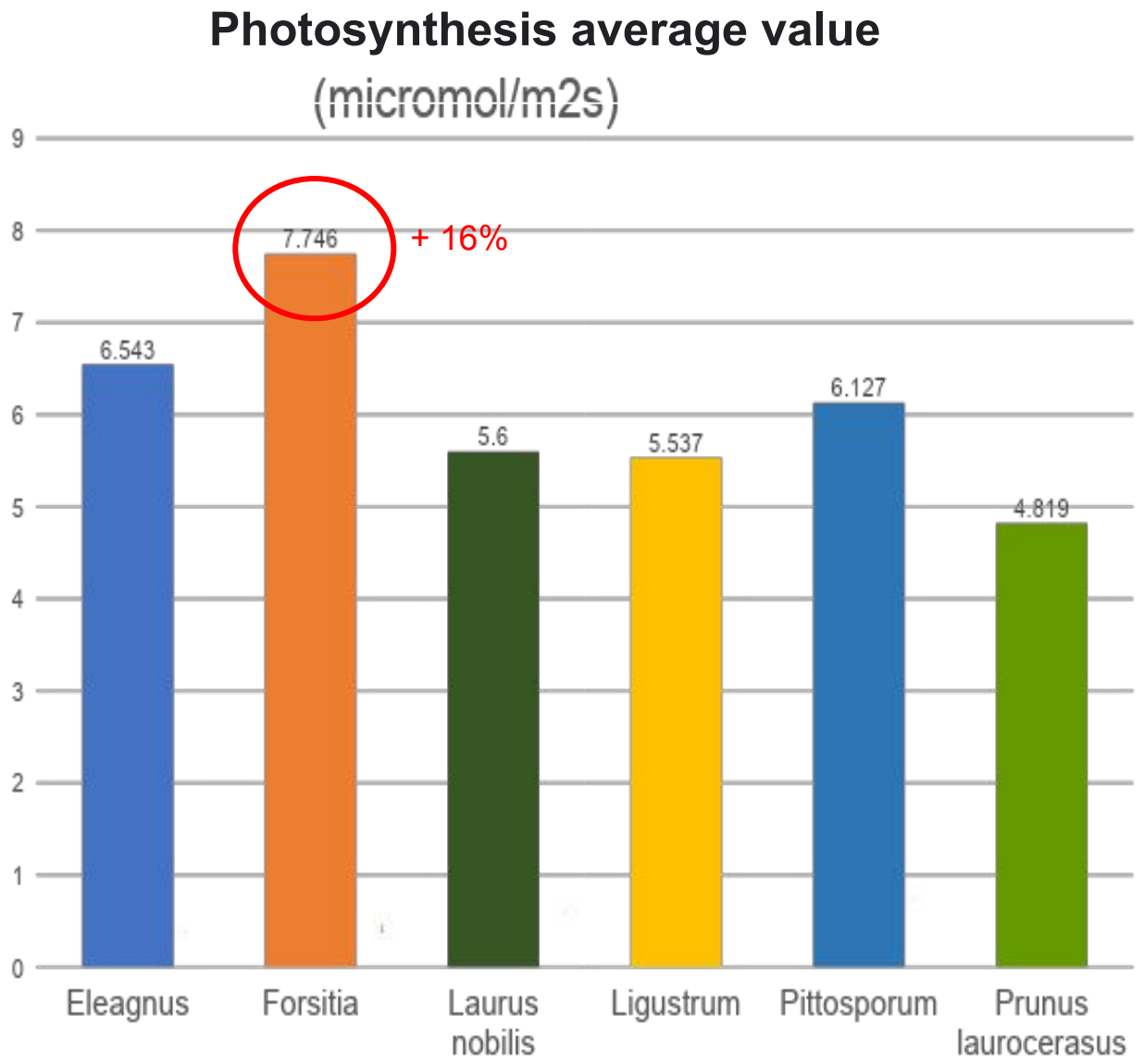
Energy consumed by an air conditioner in one year (500 hours of usage)

Efficient management of green areas

Species effects

Species keep their behaviour stable during seasons:

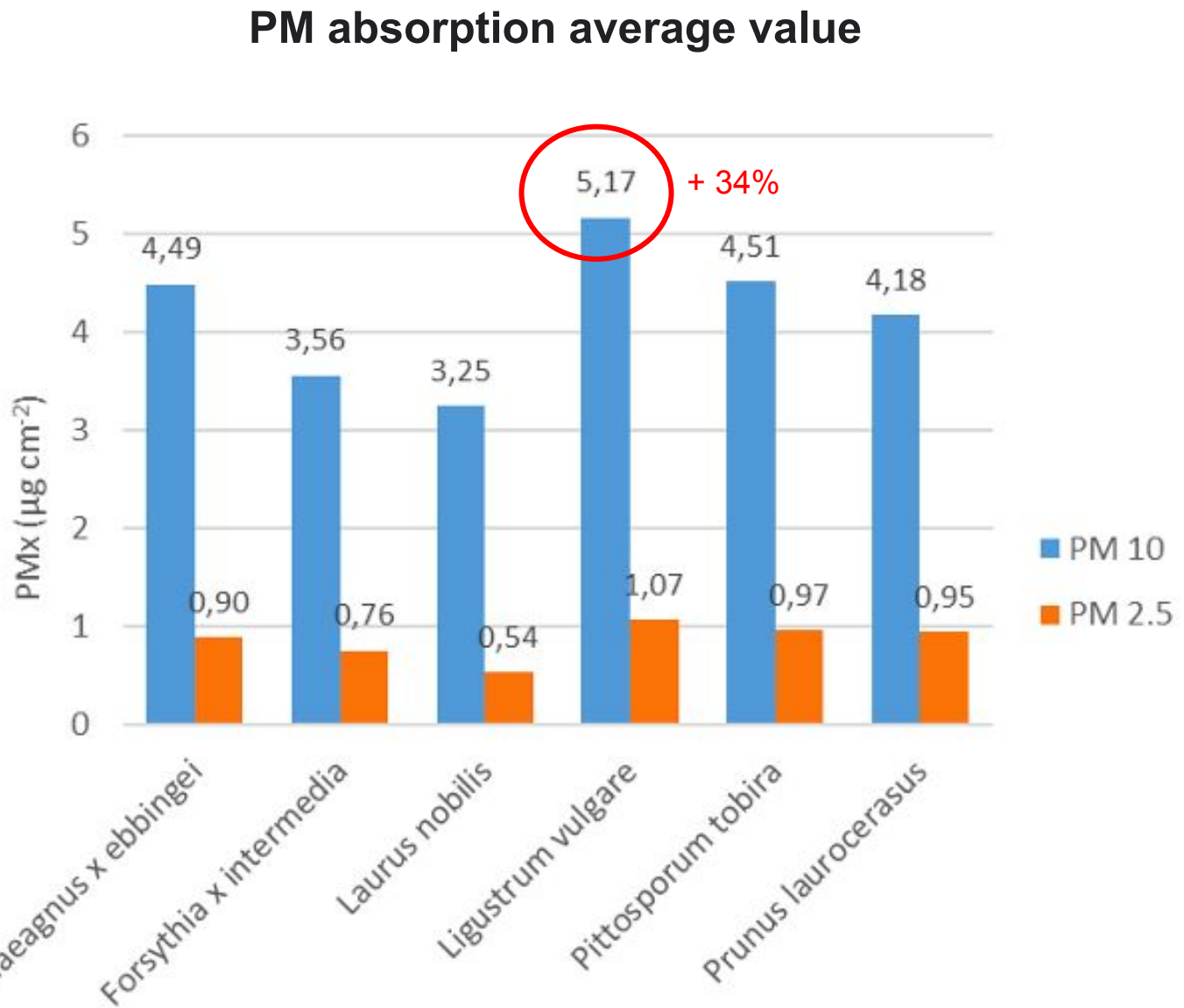
- On average *Forsythia viridissima* has a **CO2 absorption value** of 16% higher than the second most efficient species (*Eleagnus ebbingei*)
- *Prunus laurocerasus* is the least efficient in **photosynthesis**



Efficient management of green areas

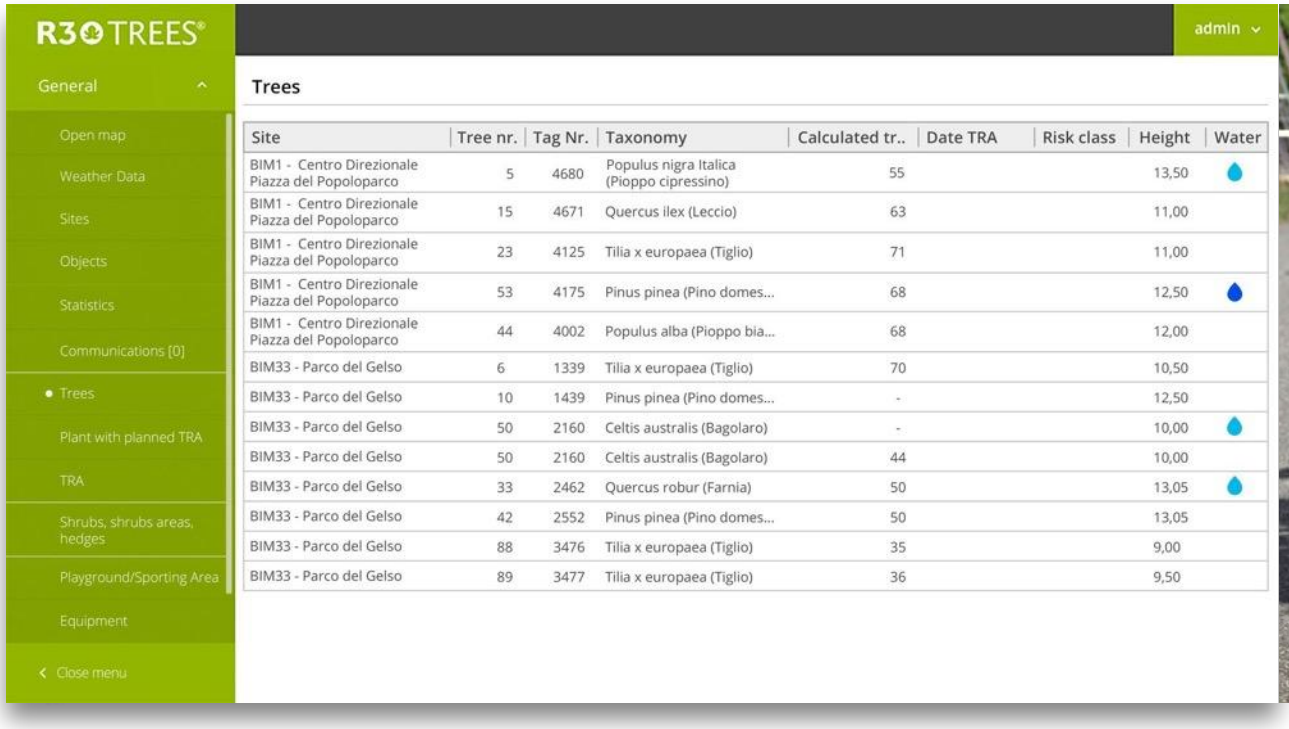
Species effects

- On average *Ligustrum vulgare* has **PM10 absorption value** of 34% higher than *Forsythia* x *intermedia and Laurus nobili,* which show the lower results
- **PM2.5 absorption value** does not show significant differences among species



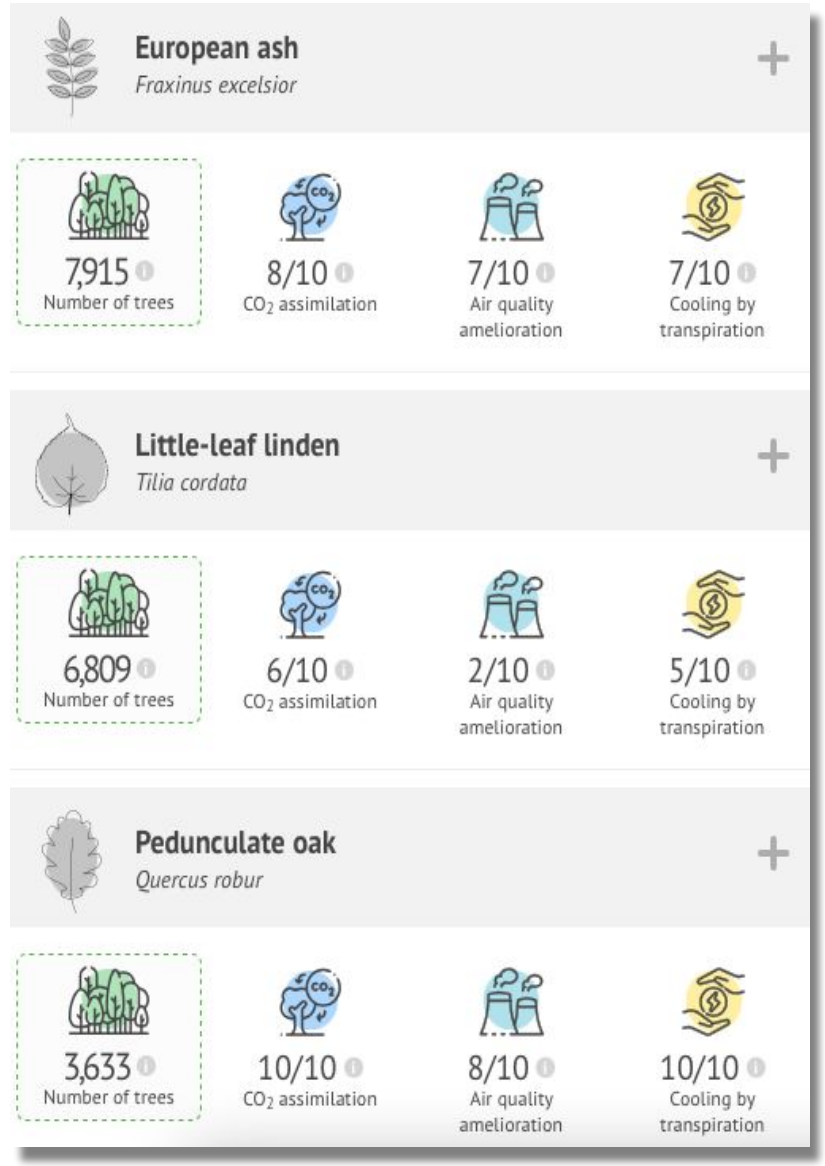
Smart Irrigation

Calculation of the need to irrigate young trees based on weather data (solar radiation, evapotranspiration), the water requirements of each species and expected rainfall.



Site	Tree nr.	Tag Nr.	Taxonomy	Calculated tr..	Date TRA	Risk class	Height	Water
BIM1 - Centro Direzionale Piazza del Popoloparco	5	4680	Populus nigra Italica (Pioppo cipressino)	55			13,50	
BIM1 - Centro Direzionale Piazza del Popoloparco	15	4671	Quercus ilex (Leccio)	63			11,00	
BIM1 - Centro Direzionale Piazza del Popoloparco	23	4125	Tilia x europaea (Tiglio)	71			11,00	
BIM1 - Centro Direzionale Piazza del Popoloparco	53	4175	Pinus pinea (Pino domes...	68			12,50	
BIM1 - Centro Direzionale Piazza del Popoloparco	44	4002	Populus alba (Pioppo bia...	68			12,00	
BIM33 - Parco del Gelso	6	1339	Tilia x europaea (Tiglio)	70			10,50	
BIM33 - Parco del Gelso	10	1439	Pinus pinea (Pino domes...	-			12,50	
BIM33 - Parco del Gelso	50	2160	Celtis australis (Bagolaro)	-			10,00	
BIM33 - Parco del Gelso	50	2160	Celtis australis (Bagolaro)	44			10,00	
BIM33 - Parco del Gelso	33	2462	Quercus robur (Farnia)	50			13,05	
BIM33 - Parco del Gelso	42	2552	Pinus pinea (Pino domes...	50			13,05	
BIM33 - Parco del Gelso	88	3476	Tilia x europaea (Tiglio)	35			9,00	
BIM33 - Parco del Gelso	89	3477	Tilia x europaea (Tiglio)	36			9,50	

Public portal



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Thank you

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