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PS 2.3 Changing Environment

Streamlining Tree Selection: Biodiversity, Ecosystem Services and Tree Needs in Padova (Italy)

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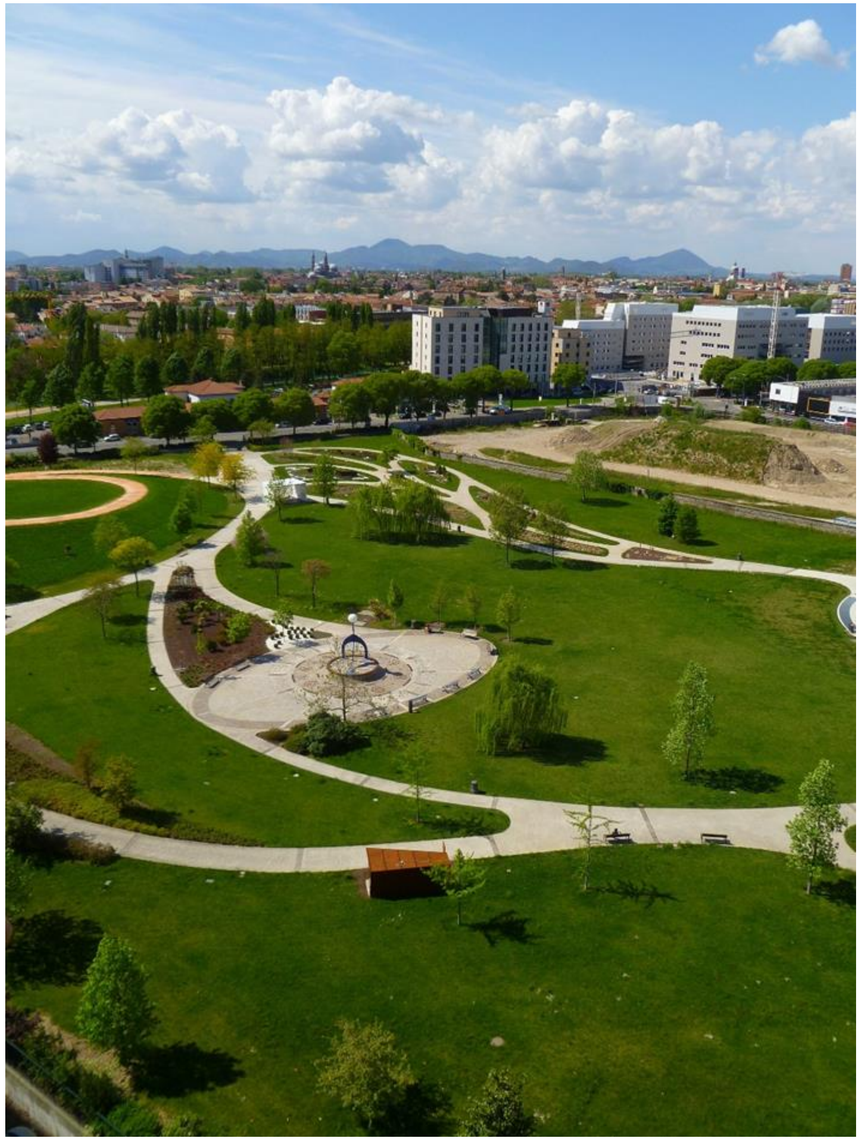
Padova, Italy



- 210,000 inhabitants
- > 47,000 public trees managed by the municipality
- 255 tree species, cultivar and selections

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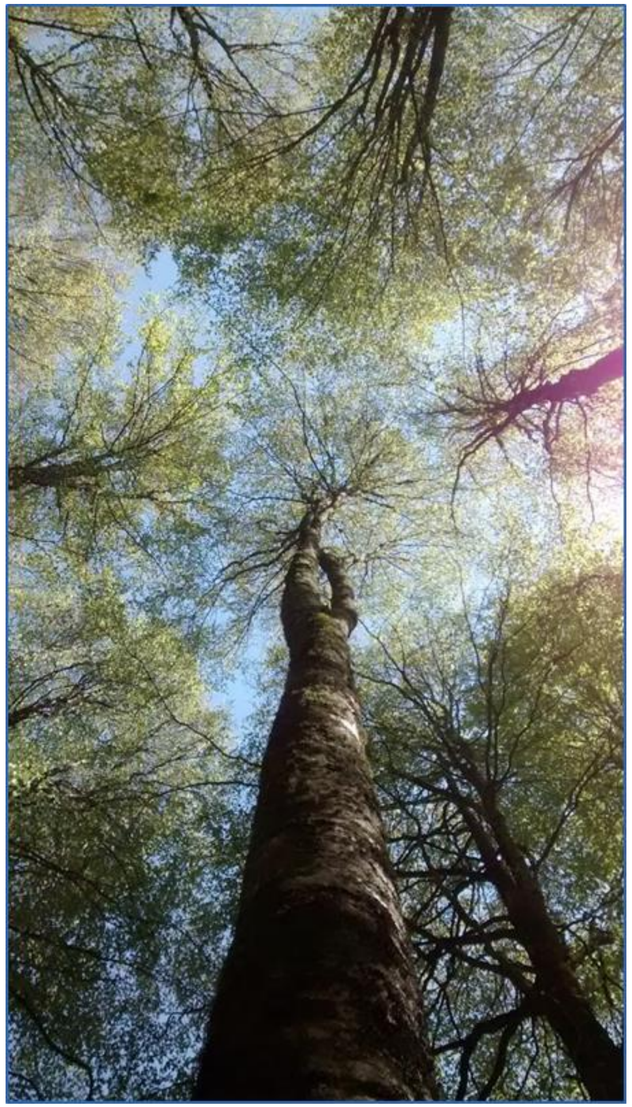
objectives



- understand whether ecosystem services and disservices form public trees are equally distributed across the city

- develop a tree selection system that delivers enhanced ecosystem services AND respects the tree needs

- maintain, and possibly improve, biodiversity

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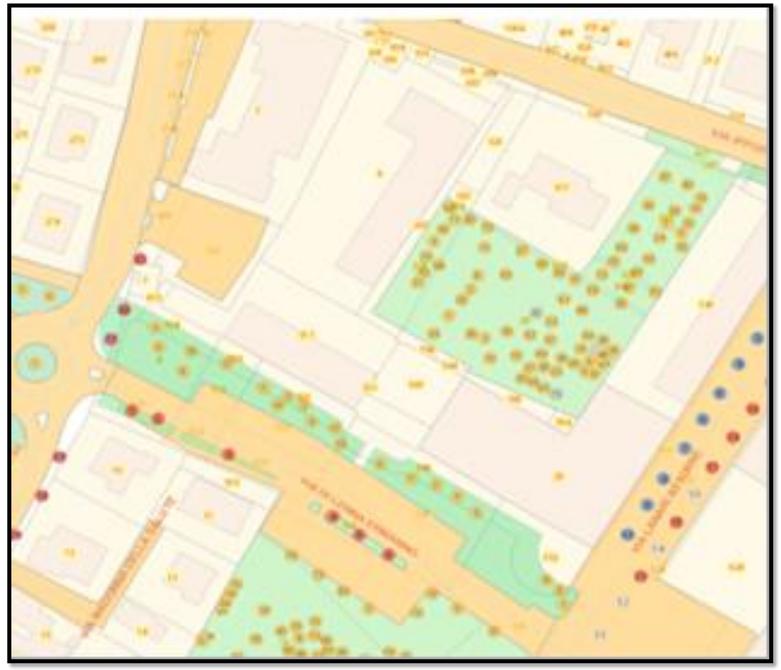
existing data

Continuously updated GIS database of public trees



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method

- Assessing of a set of key ES and ED, together with specific tree needs and morphological traits

- Integration of the existing database by linking tree species to selected functional traits

- Spatial analysis of the data in order to understand their distribution

- Assign every tree species to its most appropriate biotope

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ES and ED: review of scientific literature

TREE SPECIES	PM capturing	VOCs emission	BIODIVERSITY VALUE	GROWTH RATE	WOOD DENSITY
Acer campestre	++	+	++	+	+++
Acer platanoides	++	+		+++	++
Acer pseudoplatanus	++	+++	+++	+	+++
Aesculus hippocastanum	++		+	+	++
Alnus glutinosa		+	++	++	+
Carpinus betulus	++		+	+	+++
Catalpa bignonoides					+
Cedrus atlantica					+
Chamaeciparys lawsoniana		+			+
Corylus colurna		++	++	++	++
Pyrus calleriana chanticleer	++			+++	+++
Platanus hybrida			+	++	+++
Tilia x europaea		++	++	++	+

O'Sullivan et al., Optimising UK urban road verge contributions to biodiversity and ecosystem services with cost-effective management, J. E. M. , 2017

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tree needs and morphological traits

TREE NEEDS	MEASUREMENT SCALE
Overall maintenance requirements	Low/medium/high
Tolerance to drought	Low/medium/high
Tolerance to cold temperature	Low/medium/high
MORPHOLOGICAL TRAITS	
Size class (hight)	Low/medium/high
Stability risk	Low/medium/high/very high

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Ecosystem Services/Disservices

ECOSYSTEM SERVICES	MEASUREMENT SCALE
Honey	Yes/no
Bird feeding	Yes/no
Ornamental value	Low/medium/high
Cooling potential	Low/medium/high
ECOSYSTEM DISSERVICES	
Odour nuisance	Yes/no
Allergenic potential	Low/medium/high
Toxicity potential	Low/medium/high
Potential damage by roots	Yes/no

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Ecosystem Services/Disservices

ECOSYSTEM SERVICES	MEASUREMENT SCALE
Pollution removal (NO_2, SO_2, O_3,CO,$PM_{2,5}$)	Low/medium/high
Carbon storage	Low/medium/high
Cooling potential	Low/medium/high
ECOSYSTEM DISSERVICES	
VOC emission	Low/medium/high

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spreadsheet implementation

Tree species	Honey	Bird feeding	Ornamental value	Cooling potential	Odour nuisance	Allergenic potential	Toxicity potential	Damage by roots	Maintenance requirements	Drought tolerance	Cold T tolerance	Size class	Stability risk
Celtis australis	0	1	2	2	0	2	1	1	3	3	1	3	4
Cercis siliquastrum	1	0	1	1	0	1	1	1	3	3	1	1	2

+ experts’ opinion and scientific knowledge

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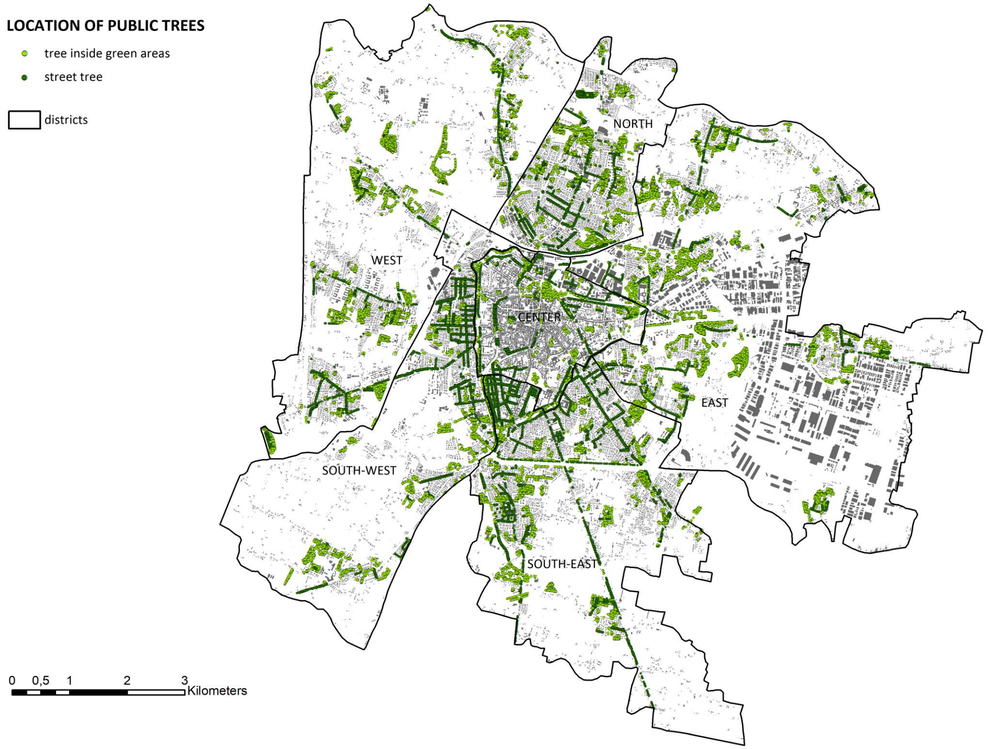
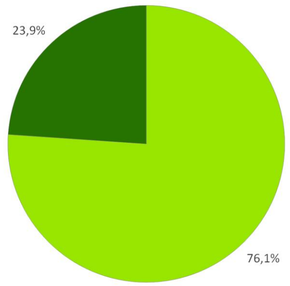
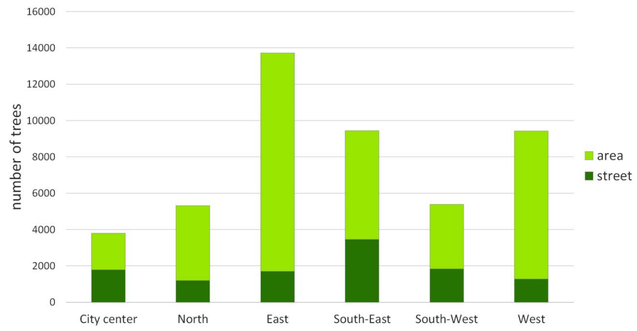
spatial analysis



Distribution of public trees in the city





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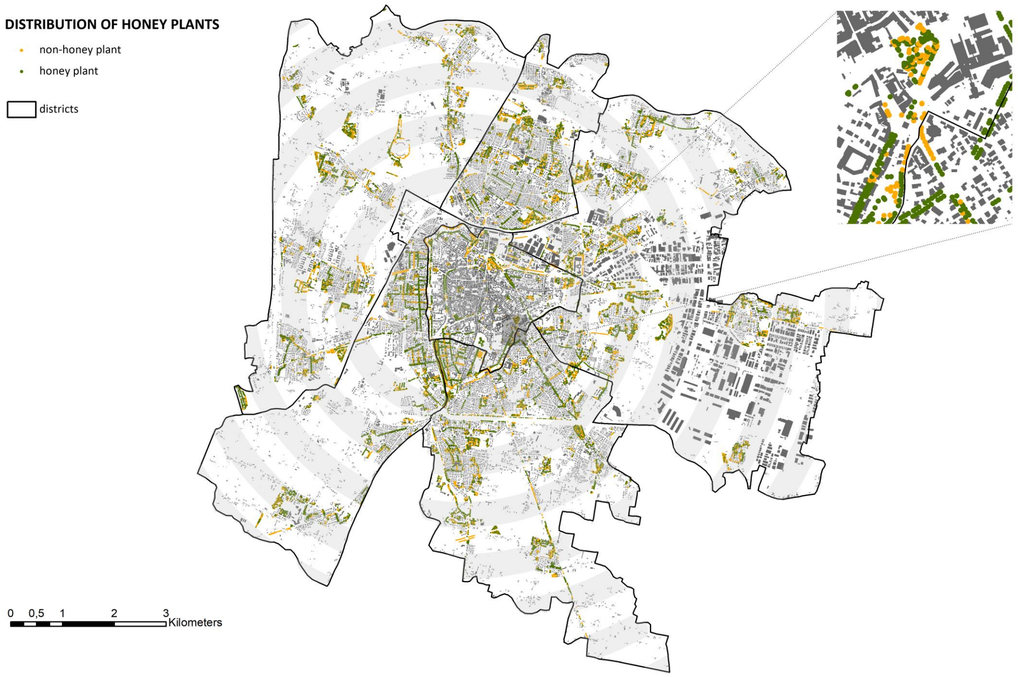
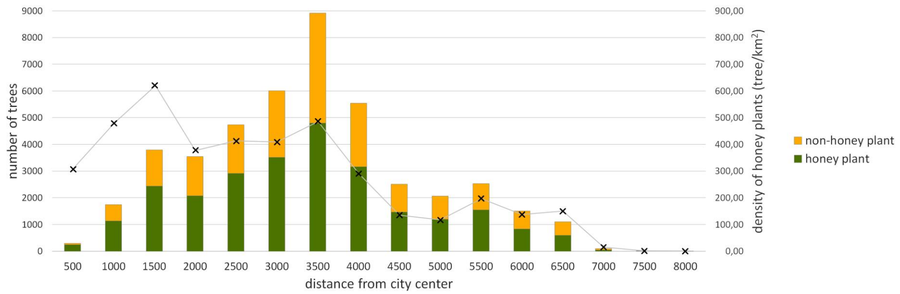
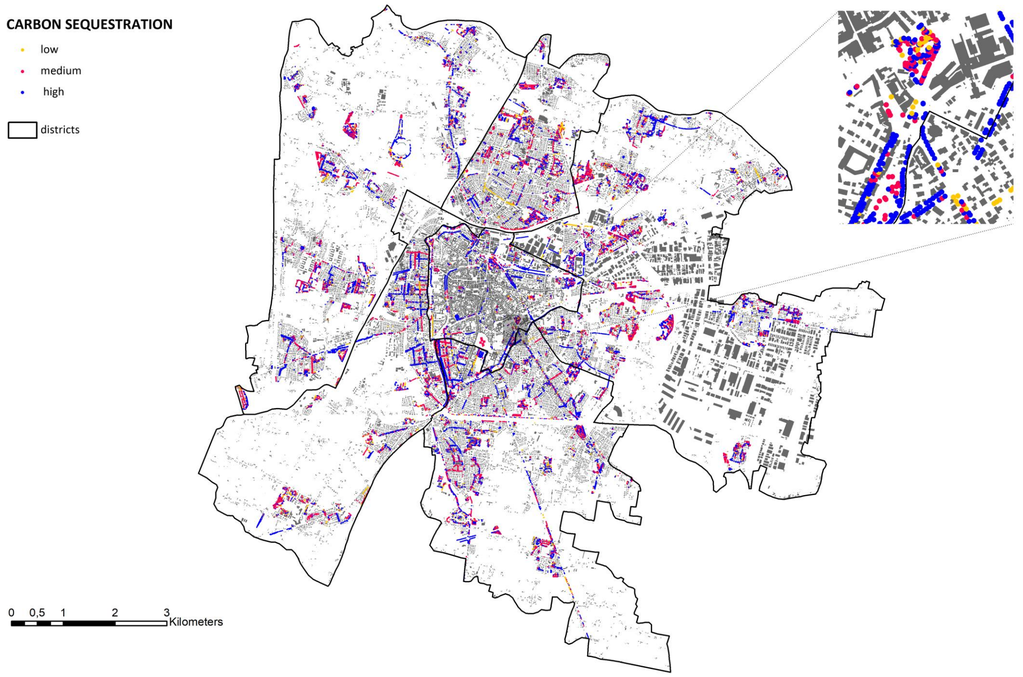
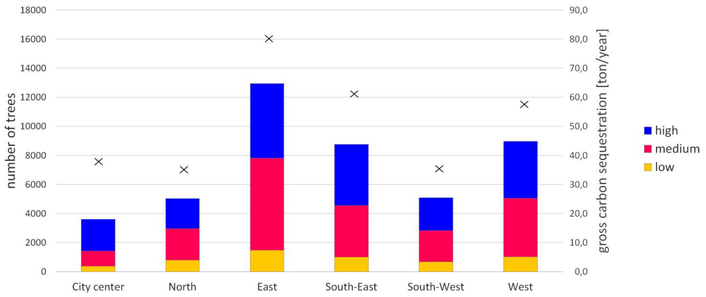
spatial analysis









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species selection process

Plant specific requirements:
Select factors for site conditions

Climatic conditions
(winter hardiness, sun exposure, heat risk...)
Soil conditions
(pH-value, soil compaction risk...)

Infrastructure human requirements:
Consider available space and potential risks

Space criteria
(tree hight, crown width, roots needs...)

Ecosystem services:
Select requested ecosystem services

Regulating
(carbon storage performance, pollination, VOCs emission....)

Ecosystem services:
Individual requests

Cultural
(sense of place, habitus, leaf and flower shape and colour...)

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the importance of space in selection criteria






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2018, summer: something changed

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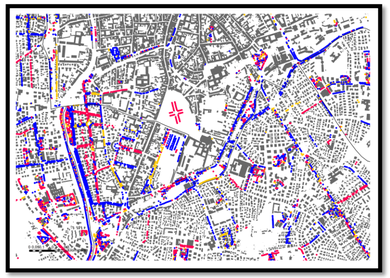
conclusions

- A constantly **upgraded database** is essential to organize management activities and is useful in planning a solid future development of Padova urban green infrastructure

- **Identifying specific goals** to achieve in different areas of the city can be a guide in selecting the appropriate tree species



- **Space criteria** are mandatory traits when selecting tree species: only healthy and vigorous trees can provide environmental benefits

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thank you

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