A botany and arboriculture handbook

ROOT CARE

Nicola Noè

starting from the roots

ROOT CARE
A BOTANY AND ARBORICULTURE HANDBOOK

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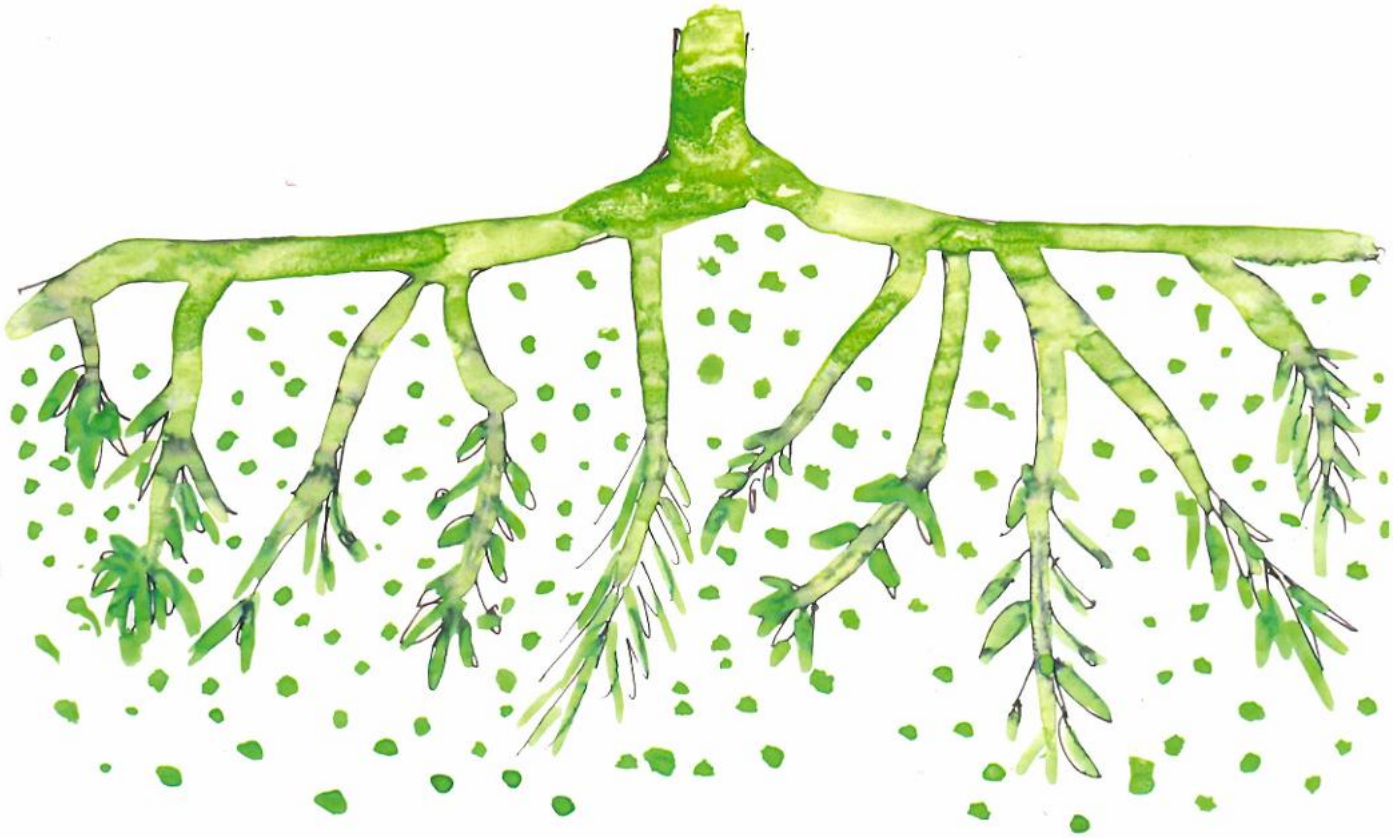
Progetto grafico, foto 2a e 3a di copertina, disegni pag. 1, 5, 12 di Barbara Gerosa
Foto pag. 2, 4, 6, 11, 14, 15, 20 di Nicola Noè



Root care: protecting trees in urban environments

The first step in working around a tree is to check whether there is a bylaw regarding the use of green spaces and the protection of trees in that location.
Local regulations often govern tree protection, ensuring that interventions do not harm root systems.

The principle in any regulation should be that the ground is not the place for underground or superficial artefacts and underground services, which must be placed on already sealed surfaces (pavements and roads).

Urban green ordinance and tree protection - Model regulations for root zone protection
To prevent serious damage to trees, certain activities are prohibited usually within a 2.5-meter radius of the root zone:
- Excavations (deep or shallow).
- Depositing materials (soil, debris, chemicals).
- Pouring salts, oils, acids, or other harmful substances.
- Removing soil for paving or construction.

Excavations and masses of material

Milan Green Spaces Excavation Dispositions

THE FOLLOWING ARTICLE OF THE REGULATIONS FOT THE USE AND PROTECTION OF PUBLIC AND PRIVATE GREEN SPACES (2021) IS IN FORCE IN MILAN, FOR EXAMPLE.

“ ARTICLE 46.

Underground works near public and private trees.

46.1. The minimum distance from the clear edge of any excavation to the edge of the trunk must not be less than:

a. 5 metres for monumental or valuable specimens with a circumference greater than 250 cm and for Platanus specimens with a circumference greater than 120 cm;

b. 3.00 metres for first-size plants not included in the previous point.

c. 2.50 metres for second-size plants.

d. 2.00 metres for third-size plants.

e. 1.50 metres for fourth-size plants.

f. 1 metre for shrubs.

46.2. he municipal administration may, with justification, increase the distances indicated in the previous paragraph in the case of trees or tree-lined avenues of historical, monumental, botanical or landscape value.

46.3. Any exceptions to the minimum distances indicated may be granted by the municipal administration for ducts and cable conduits in the following cases:

- for excavations necessary for routine and extraordinary maintenance and to restore the functionality of technological systems for traffic management and mobility equipment that in previous years were located within tree protection zones;
- for excavations necessary for the construction of a new technological system or extraordinary maintenance on an existing system, where the size of the pavements and the position of the trees or hedges do not allow compliance with the tree protection zones;
- for adjustments or interventions required by current or newly introduced regulations or for reasons of public safety.

Exemptions may only be granted on condition that excavations in the vicinity of the root systems are carried out using equipment or machinery that cannot damage the trees in any way, giving preference to manual excavation and initially locating the shape and position of the root system concerned using high-pressure blowers or vacuum cleaners in order to enable its correct identification, protection or pruning and disinfection.

46.4 Excavations for the installation of underground technological systems (e.g. pipes, gas, electrical and/or telephone lines, sewers) must observe distances and precautions such as not to damage the root systems. Larger roots (i.e. with a diameter greater than 10 cm) must be bypassed with pipes by hand without causing damage and must be protected against drying out with regularly moistened jute.

46.5. Excavations in the tree area must not remain open for more than a week. If work is interrupted, the excavations must be temporarily filled in or kept moist. Alternatively, the roots must be protected with a special mat and, in any case, kept moist. If there is a risk of frost, the walls of the excavation in the root area must be temporarily covered with insulating material. Levelling work in the root area must be carried out by hand. If roots with a diameter greater than 10 cm are cut, the cut surface must be coated with special disinfectant solutions. ”

Tree root protection and excavation guidelines

Minimum distance requirements for excavation near trees.
To avoid damaging tree root systems, clear excavation openings must maintain specific minimum distances from tree trunks.
However, excavation distance should not be solely based on species classification,
it must also consider the individual tree's size at the time of excavation.
For example, digging 2.8 m away from a newly planted Sycamore (7 cm trunk diameter)
won't harm its roots system (but is prohibited by the current regulation if are used mechanical means. Manual excavation is permitted only after authorization). Doing the same for an 18 m tall Celtis or Aesculus with an 80 cm trunk diameter may cause significant damage.

Distinguishing excavation types
Excavations near trees can be categorized into:

1. Repairs of existing underground structures (e.g., water pipes, electrical lines, sewers).
Roots may bypass disturbed areas as they grow over time.
2. Installation of new underground structures with backfilling.
Permanent occupation of small root zones can be tolerated.
When installing gas, water, electricity, or sewer systems, proper distancing and protective measures must be taken to avoid root damage.
3. Construction of underground structures (e.g., tanks, retaining walls, foundations).
Prohibited within critical root zones due to permanent impact on root systems.

Installation of new underground structures (drinking water pipe) with backfilling

Large excavation around group of trees

Large construction sites or infrastructure projects often interfere with exiting vegetation.
Excavating methods in large areas:
Open pit excavation
Palisade excavation

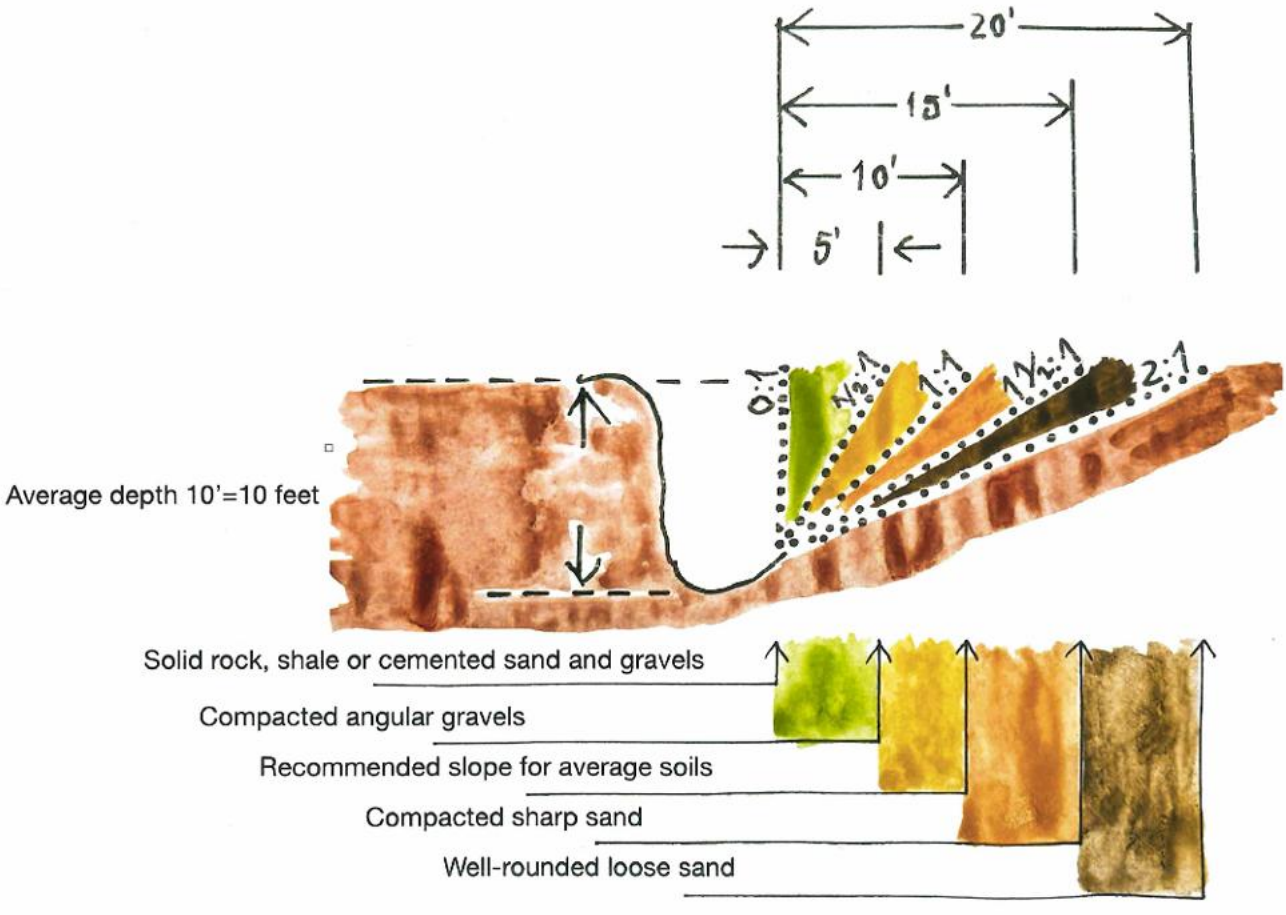
Open pit excavation around trees

Approach:
Large-scale removal of soil around a wide area.
Trees within the excavation zone are usually damaged because the method prioritizes constructions.
Impact on Trees:
Roots are cut or exposed, destabilizing the tree.
Trees are often cleared before excavation begins.
Not always suitable if the goal is to preserve trees.

Palisade Excavation Around Trees

Approach:
Narrow trenches or post-holes are dug, often in linear patterns.
Excavation is more localized compared to open pit.
Impact on Trees:
If trenches are dug near trees, roots may be cut, but the tree itself can remain standing.
Less destructive than open pit, though root damage can still stress or
kill trees if trenches are too close.

How to calculate the slope of the excavation based on the type of soil



Estimating and preventing root damage

Legal compliance is just the starting point. A truly responsible park manager and landscape professional goes further by actively safeguarding the root systems that anchor and nourish trees: protecting tree root systems is vital for both plant health and public safety.

Understanding root damage risks

When working near trees, two types of root damage must be considered:

- Immediate damage: Disruption to roots that causes visible decline in health, such as wilting, leaf drop, or dieback.
- Delayed structural damage: Even if the tree appears healthy, severing key roots can destabilize it, increasing the risk of unexpected collapse during storms or high winds.

Roots are damaged. This causes immediate damage to the tree

Estimating the root size

In the scientific forum, there are different estimates of the radius of the root system required to ensure adequate anchoring of the tree and regular biological function.
Two popular methods have been used in arboriculture to estimate the radius of the root system (Rw). The root system radius is a crucial factor in ensuring tree stability, but scientific estimates can vary significantly.

1. Claus Mattheck's Formula is Developed based on forest tree stability assessments.

- Rw = 64 × R^0.42 (where R is trunk radius).

Dr Claus Mattheck was born in Dresden, Germany, and obtained a PhD in theoretical physics in Dresden in 1973. He habilitated in failure analysis at the University of Karlsruhe in 1985 and is a professor of biomechanics.

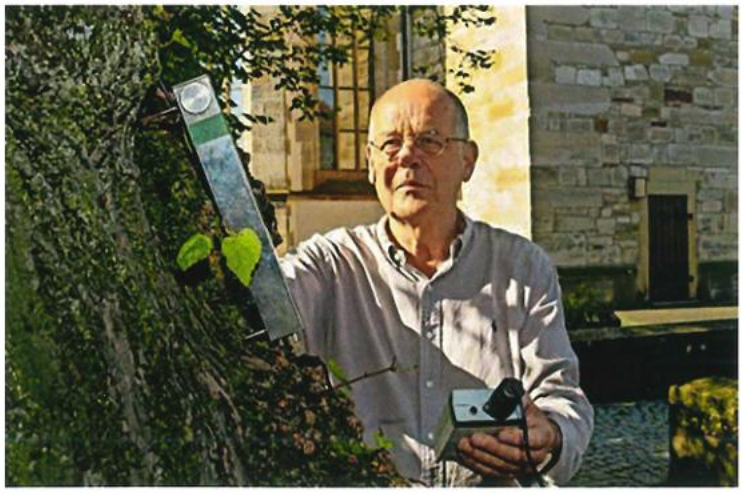
2. Lothar Wessolly's Formula is based on urban tree stability measurements

- Rw = 1.5 × 2R (where R is trunk radius).

Lothar Wessolly studied aerospace engineering at the University of Stuttgart and obtained a doctorate, but since the 1990s he has worked exclusively in the field of tree statics, which he helped to establish by transferring strength control methods used in other engineering disciplines to the problem of tree control.

Let's find the Rw (in cm) applying the two formulas to a Platanus x acerifolia of 17.0 m heigh and trunk diameter of 60.2 cm. Rw (in cm) is therefore the distance from the centre of the trunk within no excavation should be done, accordly to Claus Mattheck's Formula or Lothar Wessolly's Formula. The root respect area estimated (Rw) for the same tree show significant differences between the two ways to calculation.

Dr. Claus Mattheck and right Lothar Wessolly



Why the differences?

Wessolly's Model uses SIM (Static Integrated Method) to measure tree stability in urban areas and focuses on breaking strength and tipping resistance.

Mattheck's Model also based on SIM but applied to forest trees and accounts for natural root expansion in non-urban settings.

The Static Integrated Method (SIM) is an instrument-based approach that measures both the breaking strength and the tipping strength of trees. It was developed by Sinn and Wessolly (Sinn, Wessolly, 1989) to provide accurate data on the response of a tree to an artificially applied load.

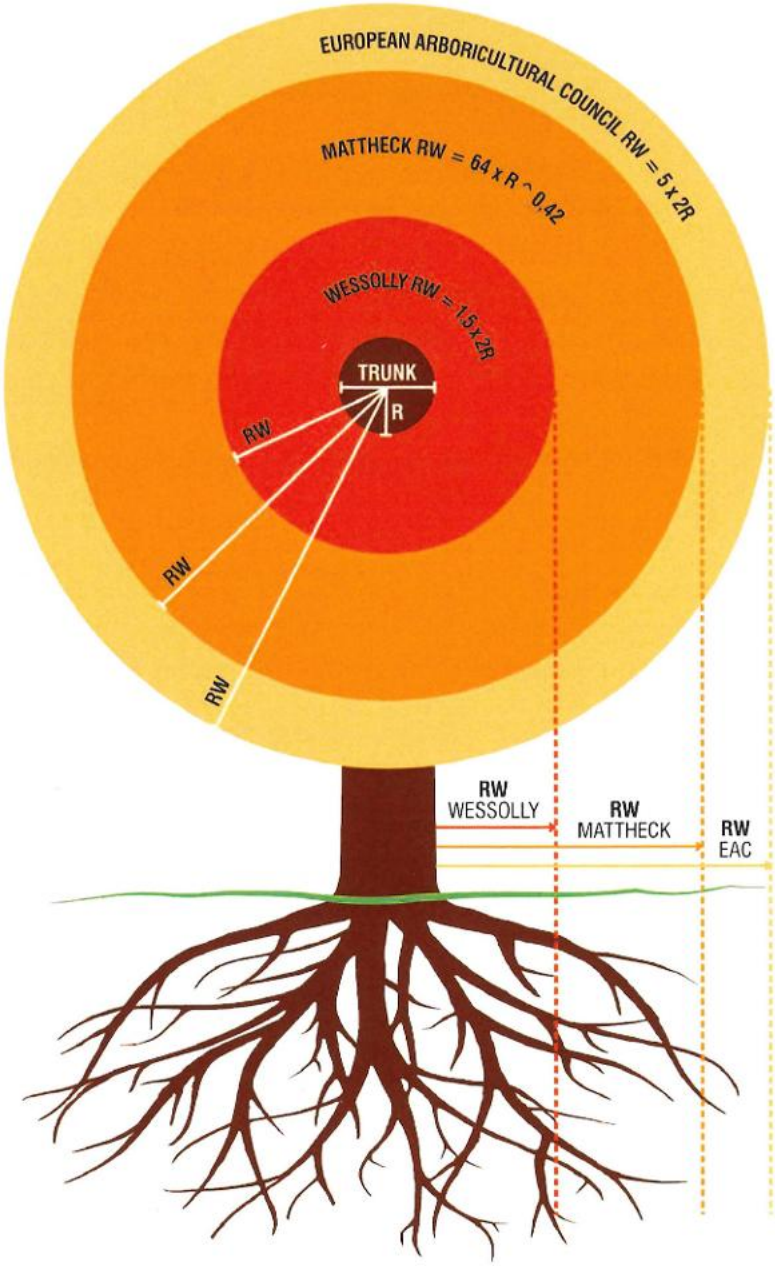
Both models primarily consider static safety aspects, but root systems also serve a trophic function, absorbing water and minerals.

Therefore, consider one more model related to the physiology of the plant, and particularly those related to the physical spaces in which all the roots are located, which guarantee the absorption of water and minerals present in the soil. Roots have a mechanical and trophic function.

The European Arboricultural Council (EAC) recommends a root protection zone of 5 × trunk diameter, offering a more conservative approach to excavation safety.

Table: Comparing estimation radius for protection of the root system (Rw) in case of works nearby a Platanus x acerifolia (London Plane Tree) with trunk diameter of 60 cm

Rw	Wessolly's Formula	Mattheck's Formula	European Arboricultural Council EAC's Formula
60 cm	89 cm	266 cm	301 cm



How to estimate a tree's root size

The digging distance from the trunk required to preserve the root system (Rw) and ensure adequate anchoring of the tree, as estimated by Dr Wessolly and Dr Matteck, as well as regular biological function, as estimated by European Arboricultural Council (N. Noe).

More methods have been proposed to estimate a tree's root size; here are just a few examples.

Method 1: Based on trunk diameter (for young trees). Measure the diameter of the trunk in inches. Multiply the diameter by 38. This is the approximate root spread in feet.

Method 2: Based on crown (canopy) radius. Measure the radius of the tree's crown (half of the diameter).
Multiply the crown radius by 2 to 7 to get a range for the root spread.

Method 3: Using the drip line. Locate the drip line, which is the outer edge of the tree's canopy. Remember that the roots typically spread past the drip line.

Method 4: within the British Standards 5837:2012 – Trees in relation to design, demolition and construction – recommendations (BS.5837:2012), it states that in order to determine the Root Protection Area (RPA), or the area where the most important rooting activity is taking place you should calculate this as follows:
"For single stem trees, the RPA should be calculated as an area equivalent to a circle with a radius 12 times the stem diameter".

The above calculation means a tree with a diameter of 50cm DBH has a calculated RPA of 6m radius surrounding the tree and the total area encompassing the RPA is 113m2.
A much larger tree with a DBH of 100cm would have a calculated RPA radius of 12m and a total area of 452m2.

This simple calculation gives an estimate of the RPA of the trees; however, it does not consider site or species-specific information such as impacts to root growth such as utilities, buildings etc.

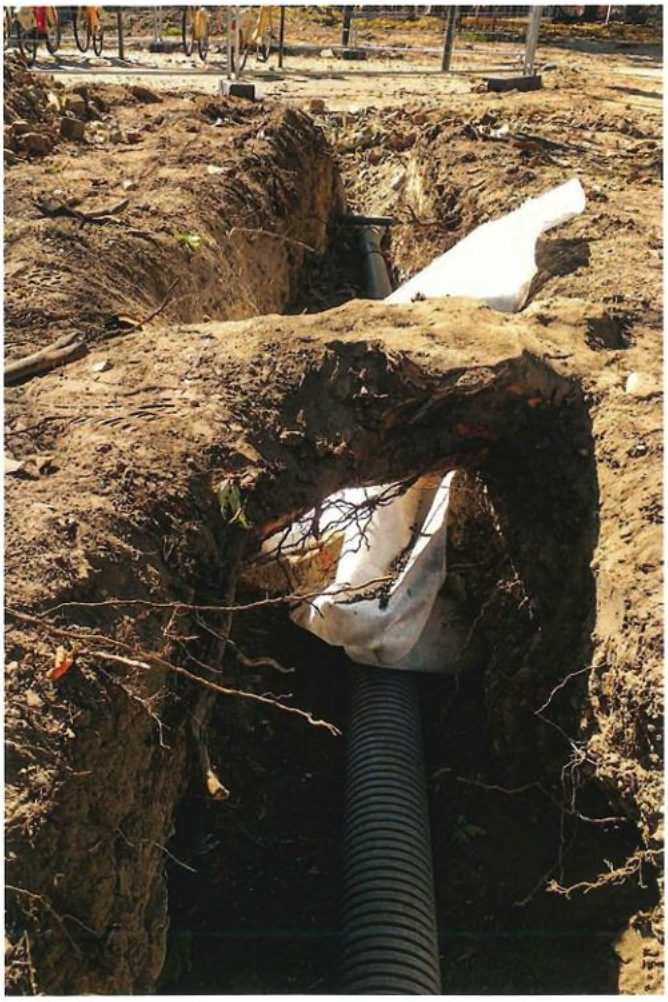
Tree root failure and excavation precautions

We do not have complete knowledge of biology in general. Plant biology is very complex and there are many variables that can influence the development of a tree's roots, endogenous and exogenous variables, including anthropic interventions. It is therefore not possible to predict with absolute certainty the development of roots on site and therefore the extension of root systems. The figures given above are used as a guide to assess and take the most appropriate measures to limit damage to root systems when excavating near trees. Since tree root biology is complex, absolute predictions of root system development are impossible.

However, guidelines help minimize excavation damage:
- Follow root protection distances based on tree health and species.
- Avoid deep excavations (> 20 cm) near trees to prevent instability and nutrient loss.
- Monitor tree response after soil disturbances.

It is therefore proposed: the minimum distance from the clear excavation opening to the edge of the trunk cannot be less than 5 times the diameter of the trunk measured at a height of 1.3 m from the ground (to adopt a calculation derived from the elaboration of various literature in an urban environment). The prohibition is absolute with mechanical means.
Manual excavation, which must be authorised, is permitted, provided that the excavation involves only limited parts of the root ball.

Excavating around trees requires special care

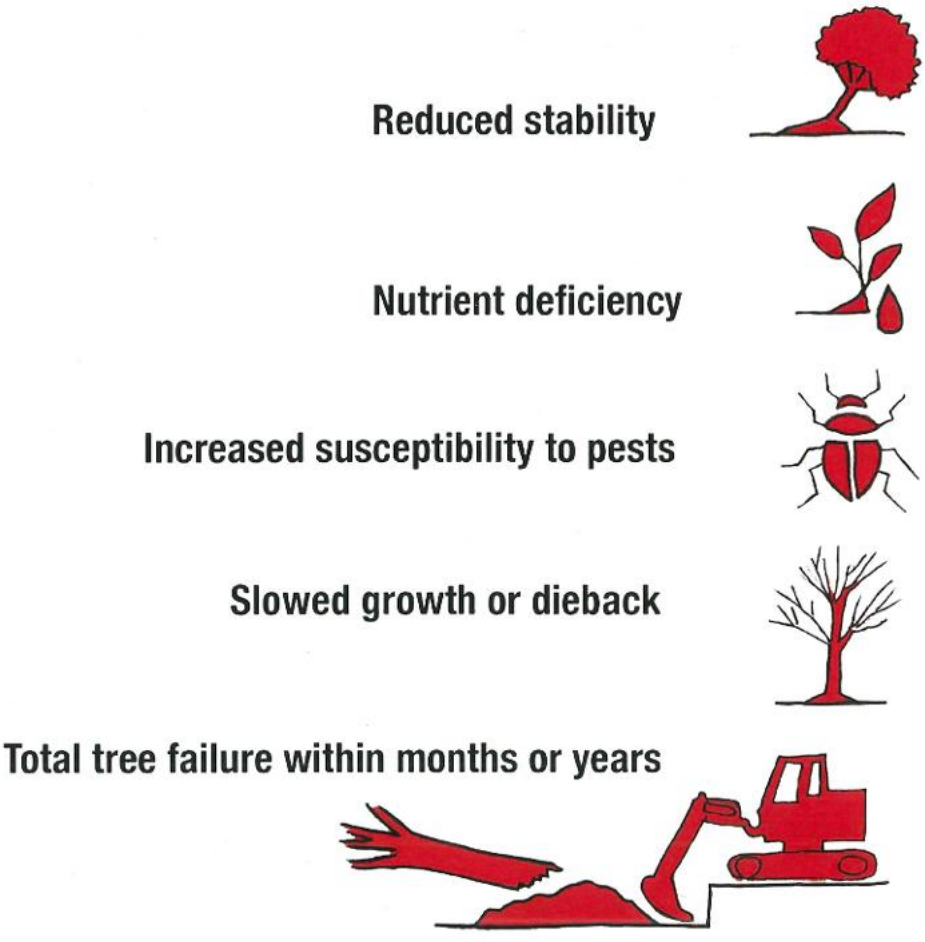


Additional prohibitions for underground structures

It should be noted that the excavation distance cannot be a function of the size class of the species but, in the case of excavations involving only parts of the plot around the tree, of the size of the tree at the time of excavation. It is then necessary to distinguish between excavations for the repair of existing structures (underground services) or for the installation of new underground services with backfilling and subsequent permanent occupation of small parts of the rooting zone which the roots can bypass as they grow over time, and the construction of structures which permanently occupy large parts of the rooting zone (in the case of underground tanks, underground retaining walls, foundations, etc.).

The construction of any new vertical underground structure that could impede the future growth of the tree's roots is prohibited within a shorter distance:
- **8** metres for monumental or valuable specimens with a circumference greater than 250 cm;
- **5** metres for Platanus specimens with a circumference greater than 120 cm;
- **5** metres for large plants not included in the previous category.
- **4** metres for second-size plants.
- **3** metres for third-size plants.
- **2** metres for fourth-size plants.
- **1.5** metres for shrubs.

Risks of excavating too close to a tree



TREE STABILITY: Tips and considerations

To correctly assess the stability of a tree and therefore its resistance after any excavation in the soil nearby, other parameters must be considered, such as:

Soil conditions: roots tend to spread out wide rather than deep, but they will go as deep as the soil conditions allow. They will also not grow into solid clay or other substrates that do not allow for air penetration.
Tree dimension: height, trunk diameter, crown diameter and shape (sail effect).
Location: the same species of tree can be planted in a forest, park, large flowerbed or on a street.
Exposure to wind: the method used should be tailored to the specific conditions of the site.
Planting: when planting a tree, the hole for the root ball should be two to three times its own diameter.
Mature trees: for very large or mature trees, spreading past the drip line is the most practical method of estimation.
Root volume is estimated to be about two-thirds of crown volume.
Species-Specific Considerations. Conifers generally withstand root disturbance better, cedars have deeproot systems, making them more resistant to felling.

Case Study 1

Excavation Method in a Historic Park near Milan

The compatibility of the underground garage in the project for the park around a historic villa near Milan with the preservation of the existing green spaces and the conservation project for the green areas themlselves.

In this example, the project for the park around a historic villa near Milan,
I show the ompatibility of the underground garage in with the preservation of the existing green spaces and the conservation project for the green areas themselves.
The project area was classified by the Municipality of Desio's General Regulatory Plan as a protected garden/park zone within the Historic Core, requiring strict compliance with regulations safeguarding trees of high environmental, botanical, and historical value.
During the review process, the design of the underground garages and excavation methods was repeatedly adjusted to minimize impacts on the root systems of existing trees.
The project was ultimately deemed environmentally compatible because:
the lawn was fully restored above the garage slabs as a green roof; no trees were removed;
the layout of the garages and construction site respected the strictest requirements for structural safety and protection of nearby tree roots.

The work involved building the palisade into the soil by planting the poles

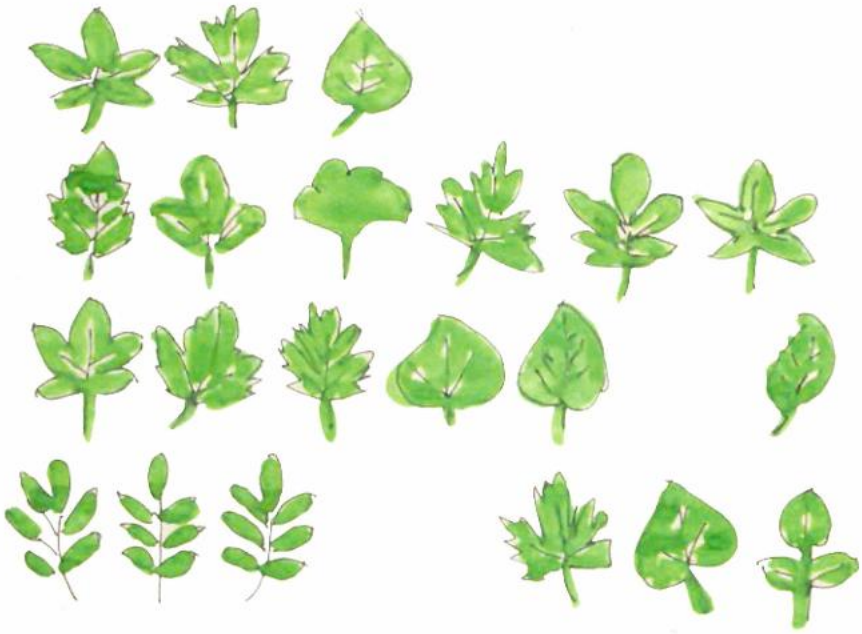
Before

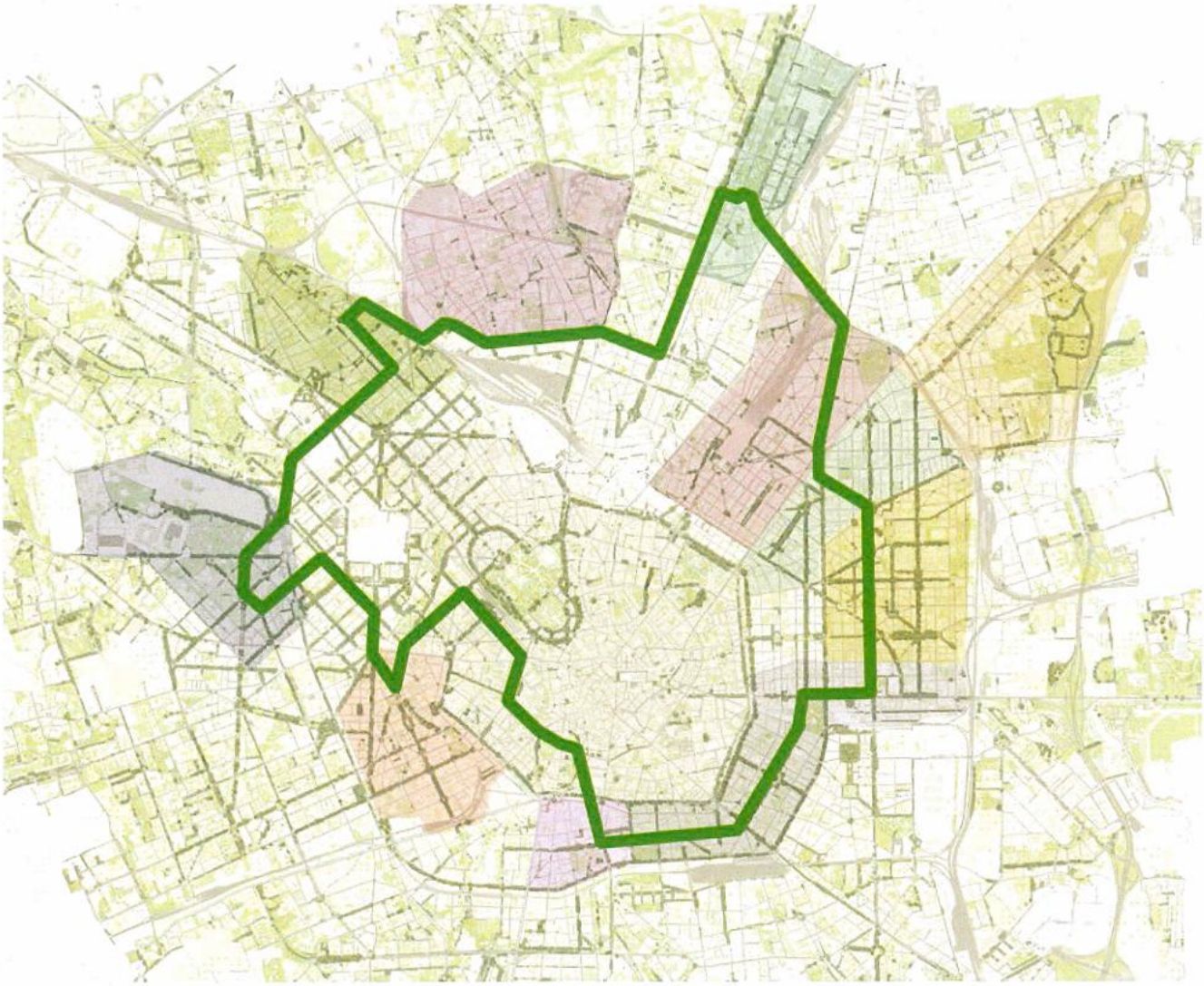
During construction, palisade digging took place

Afterwards, all the trees were saved

Case Study 2
Milan Street Trees

The city as seen from the rhizosphere
The project highlights the importance of caring for the roots for the health of street trees.
The rhizosphere is not just a technical detail, but a condition for having beautiful, stable, long-lived and safe street trees.
Observations conducted as part of Milan Street Trees show that most of the issues visible in the canopy, such as reduced growth, asymmetry, drying out and instability, originate in the soil.
Inadequate soil volumes for the correct development of the root system, soil impermeabilisation or surface compaction lead to a lack of oxygen, structure and resources, or root asphyxia due to waterlogging, which prevents the roots from performing their physiological functions.
To improve the conditions of the rhizosphere, the project has highlighted that targeted intervention is necessary.
Decompaction, performed using low-invasive techniques, restores porosity and favours gas exchange.
The integration of high-quality organic matter and beneficial microorganisms contributes to rebuilding the biological component of the soil, increasing its capacity to retain water and its fertility.
The design of the root volumes must ensure sufficient space for the development of the root system, using structural soils or cell-based systems when necessary, which reconcile bearing capacity and ecological functionality.
In the first years after planting, careful water management reduces acute stress and supports the establishment.
The Milan Street Trees experience confirms that effective urban tree management must be root-centred.
Investing in the rhizosphere means reducing early failures, containing replacement costs and ensuring safer, longer-lived trees. Soil care is not an accessory intervention, but a necessary condition for building truly functional green infrastructure in the long term.





Internship Report - Landscape Architecture - Land, Landscape and Heritage Master's Programme at Politecnico di Milano

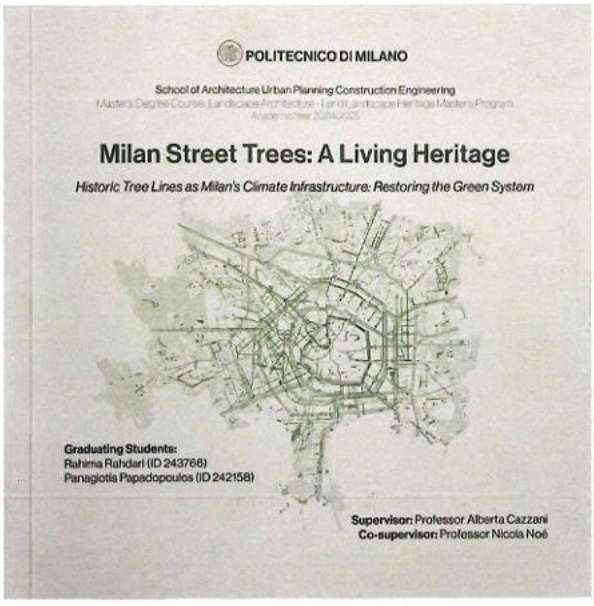
The Milan Street Trees internship was carried out in 2024-25 within the Landscape Architecture – Land, Landscape and Heritage Master's Programme at the Politecnico di Milano.
Supervisors: Professor Nicola Noè and Professor Alberta Cazzani.
The project aimed to analyse, document, and reinterpret the role of street trees within the urban fabric of Milan, with a particular focus on ecological connectivity, environmental performance, and cultural identity.
Green Urban Corridors in Milan represent a fundamental component of Milan's ecological and social infrastucture. Their functions can be grouped into three main categories:
1 Reconnect – Spatial and Social Connectivity: Linking fragmented green areas, Strengthening ecological corridors and Supporting active mobility networks.
2 Resilience: Mitigating urban heat through air cooling, Improving air quality, Enhancing biodiversity and Contributing to CO_2 sequestration.
3 Revive – Culture and Identity: Encouraging public life and social well-being, Creating continuous tree-lined itineraries, Reinforcing urban memory and local identity.

The research covered 13 areas of the city, resulting in the survey of **1,432 streets**, of **which 222** were identified as tree-lined (15.5%). **Methodology and Work Structure**: the internship activities were organised in these main components: Tree Census Data Analysis, QGIS Mapping and Spatial Analysis, Historical Research, Field Research and Design Proposals and Ecosystem Services Assessment.

Design Proposals. As part of the internship, students developed conceptual proposals for reimagining and enhancing Milan's tree-lined streets.
These proposals explore opportunities for improving ecological performance, pedestrian comfort and the overall landscape quality of Milan's streets.
The selected streets and squares include: Via dei Mercanti, Corso Buenos Aires, Viale Edoardo Jenner, Via Monreale, Via Foppa, Via Odoardo Tabacchi, Viale Corsica, Viale Regina Giovanna, Viale Sarca,Via Sidney Sonnino, Piazza Leonardo da Vinci, Via Tito Livio and Via Feltre.

International Internship Group: Dong Yuchen (China), El Masri Talal (Lebanon), Jaison Pooja (India), Joshi Digant Pavani (India), Kottummel Joy Anu (India), Kalakandathil Jiyas (India), León Alméciga Yesica Alejandra (Colombia, Luna Catalán Adriana María (Guatemala), Mohammad Sirkhot Sohel Sara (Thailand), Papadopoulos Panagiotis (Greece), Rahdari Rahima (Azerbaijan), Terracciano Vittoria (Italy) and Wang Han (China).

Two abstract from Master's Degree Course by Rahima Rahdari and Panagiotis Papadopoulos: Milan street trees, a living heritage


POLITECNICO DI MILANO

School of Architecture Urban Planning Construction Engineering

Master's Degree Course: Landscape Architecture - Land Landscape Heritage Master's Program

Academic Year 2024/2025

Milan Street Trees: A Living Heritage

Historic Tree Lines as Milan's Climate Infrastructure: Restoring the Green System

Graduating Students:
Rahima Rahdari (ID 243766)
Panagiotis Papadopoulos (ID 242158)

Supervisor: Professor Alberta Cazzani
Co-supervisor: Professor Nicola Noè

Case Study 3

Corso Sempione parterre in Milano

Interference analysis between Platanus rows and the construction works for the cycle path and pedestrian walkway (2018-2022)

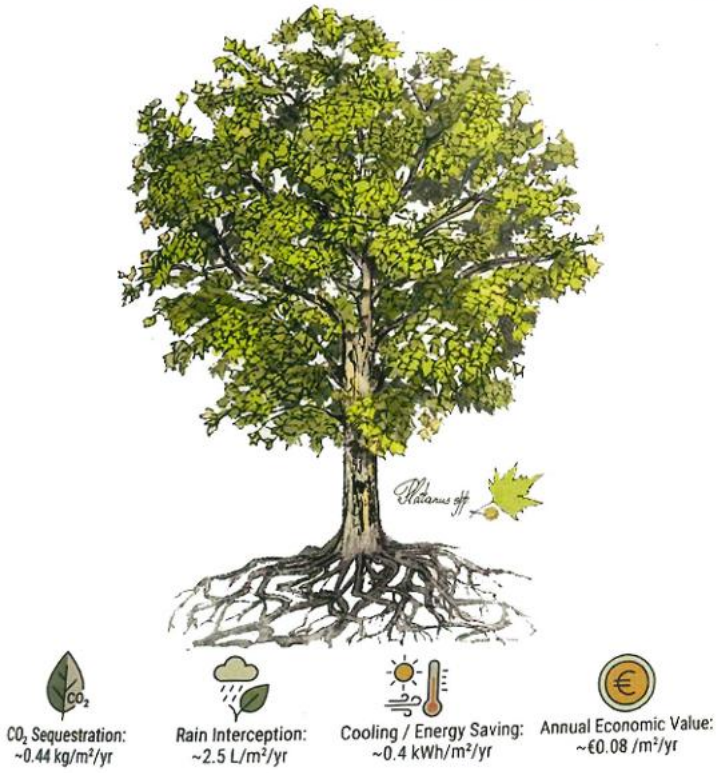
Introduction

This document presents a comprehensive analysis of the potential interference between the planned construction of a new cycle path and pedestrian walkway along Corso Sempione (Milan) and the double rows of London plane trees (Platanus sp.) that constitute the principal morphological and landscape structure of the boulevard. The requalification project, promoted by the Municipality of Milan in collaboration with MM, extends from the intersection of Via Canova / Via Melzi d'Eril to Via Emanuele Filiberto.

Given the direct interaction between the proposed works and the existing green infrastructure, a detailed assessment of the arboreal and shrub heritage was required to evaluate both the compatibility of the interventions and the necessary protective measures.

Initial surveys were conducted between 2018 to 2022 to specifically address the implications of the planned drainage trench excavations.

Left image taken from "Milan Street Trees: a living heritage" thesis by Rahima Rahdari and Panagiotis Papadopoulos.
Right, interference between roots of ancient Platanus rows and the construction works for the new cycle path and pedestrian walkway



Project Description

Among the design alternatives examined with the municipal technical departments, the configuration deemed most functionally appropriate involves relocating the cycle path to the position of the existing pedestrian walkway situated between the two plane-tree rows. A new pedestrian path is planned within the green parterre, beyond the double row. This spatial reconfiguration necessitates excavation works in close proximity to the trees, thereby requiring a rigorous interference analysis to ensure: compliance with regulatory constraints, preservation of the structural and physiological integrity of the trees and integration of appropriate mitigation measures into the final design.

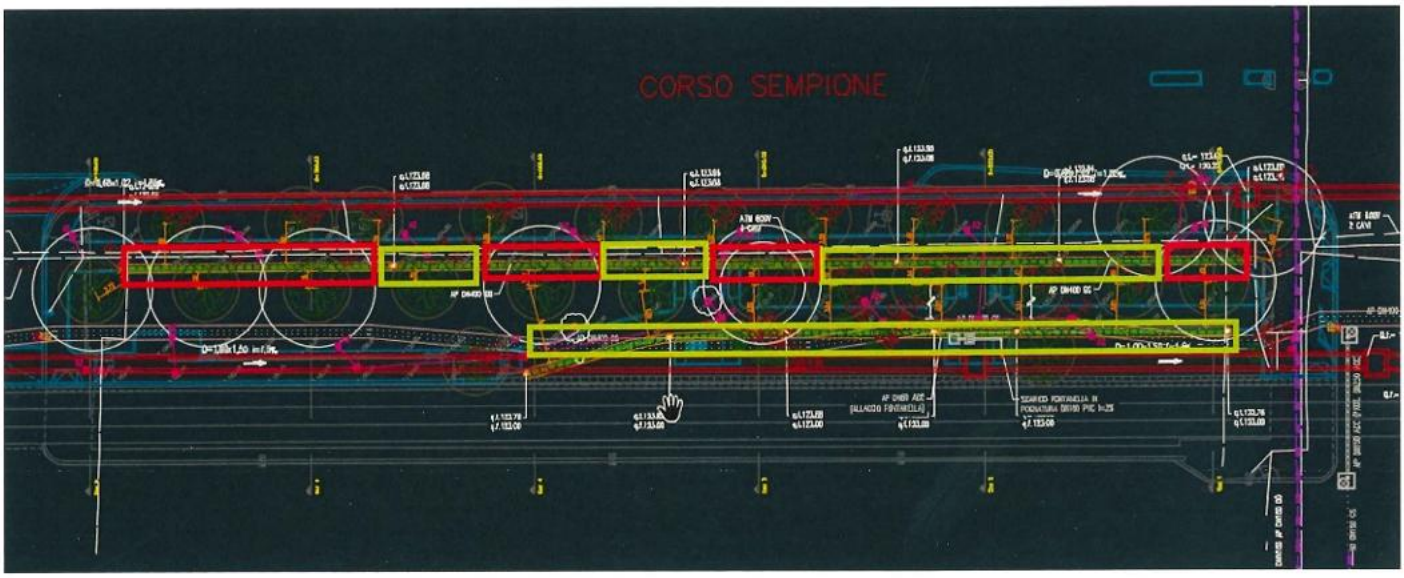
Categories of Interference

Three principal categories of interference were identified:

1 Root-system interference (primary focus of this study);

2 Crown interference due to the transit of construction machinery and Interference with other tree and shrub species. The present document addresses exclusively the drainage-trench excavations.

Below, drainage trench excavations established by Comune di Milano and MM for the new green parterre of Corso Sempione



Methodological Approach

The planned trench layout was superimposed on the detailed tree survey to determine:

- the net distance between each trunk and the excavation line,
- compliance with regulatory minimum distances,
- and the degree of encroachment into the root protection area (RPA).

Estimation of root-zone radius

To estimate the likely extent of the root plate (Rw), three reference methodologies were applied:

Wessolly (SIM method)

Rw = 1.5 × 2R

Mattheck

Rw = 64 × R^0.42

European Arboricultural Council (EAC)

Rw = 5 × trunk diameter

The EAC method, being the most conservative, is widely adopted for excavation-compatibility assessments.

For the majority of trees, the planned excavation distance exceeds the root-zone radius estimated by Mattheck and, more importantly, by the EAC method.

Nevertheless, several high-criticality points remain.

Criticality Classification

A 1–5 criticality scale was adopted to classify the severity of interference:

5 – maximum criticality

4.5 – high criticality

4 – medium/high

3 – medium

2.5 – limited/medium

2 – limited

1.5 – limited/low

1 – low

Criticality classification legend

LEGEND		Trunk circumference (cm)	Interference Criticality Index (0–5) according to EAC (cm)	
		circ. < 120 cm	0	> 150
xxxx	West Row	circ. 120-200 cm	1	> 150
xxxx	East Row	circ. 200-300 cm	1,5	150-200
		circ. 300-400 cm	2	100-150
		circ. > 400 cm	2,5	100-150
			3	0-100
0	tree trunk		4	< - 50
	drainage trench along pedestrian path		4,5	-50-100
	drainage trench along cycle path		5	> - 100
	Incompatibility between the drainage trench and the tree root zones			

Interpretation of Interference Mapping
The graphical analysis distinguishes two principal conditions:
Green: interference of absent or limited criticality, manageable through impact-mitigation measures during excavation, in accordance with the Green Regulation.
Red: interference of high criticality, where excavation would significantly compromise the root system and cannot be mitigated. In such cases, the size and monumental value of the tree become decisive factors: the loss of a large, historic specimen entails a substantially greater impact on the landscape than the replacement of a smaller tree.

Tree-Protection Requirements
Given the proximity of the works to the trees, strict adherence to arboricultural best practices is essential.

Protective measures include: minimizing excavation within the RPA, preventing soil compaction and mechanical stress, preserving soil permeability, avoiding damage to trunk and crown, ensuring that temporary site installations do not encroach upon root zones and reporting any accidental damage immediately to the site supervisor.

Protection of the root plate is critical, as damage may result in: immediate decline, delayed structural failure or long-term physiological deterioration.

Conclusions
The interference analysis demonstrates that:
For most trees, the planned excavations fall outside the critical root-zone radius according to the most restrictive methodologies.

Several high-criticality situations persist, requiring design modifications or alternative construction solutions.

The monumental and landscape value of many plane trees necessitates maximum cautionand full compliance with both the Municipal Green Regulation and regional phytosanitary requirements.

The study provides the technical foundation for integrating tree-protection strategies into the final design of the cycle path and pedestrian walkway.

Corso Sempione: mapping of interference between Platanus rows and cycle/pedestrian paths

A	B	C	D	E	F	G	H	I	J
Tree code	Trunk circumference (cm)	Assessment of the compatibility	Pedestrian path	(A) Distance from tree to excavation line (outer edge of pedestrian path) (cm)	(B) Wessoly estimate – tree–excavation compatibility distance (cm)	(C) Mattheck estimate – tree–excavation compatibility distance (cm)	(D) EAC estimate – tree–excavation compatibility distance (cm)	Criticality index based on EAC estimate	London plane tree row – West–West (WW)
0601	65	II		411	379,95	240,21	307,50	0	0
0602	29	II		336	322,15	214,31	289,82	0	0
0603	362	II		392	219,07	40,69	-184,43	5	0
0604	399	II		359	168,39	-6,97	-276,35	5	0
0605	26	II		318	305,58	201,77	276,60	0	0
0606	297	II		417	275,12	93,71	-55,93	3	0
0607	369	II		375	198,73	20,85	-212,58	4,5	0
0608	142	II		372	304,17	134,86	145,89	3	0
0609	226	II		376	268,04	87,75	16,13	3	0
0610	240	II		491	376,35	195,39	108,83	2	0

The analysis along the 2,5 km of Corso Sempione parterre in Milan was divided in subareas (picture left).
Below, for example, the detailed trees census of Quadrante 3

QUADRANTE 3

AREA 17

FILARE OVEST

stringa		circonf tronco (cm)	altezza albero (m)	note
P07701	Platanus sp.	386	25	
P07702	Platanus sp.	62	7	
P07703	Platanus sp.	83	10	
P07704	Platanus sp.	117	15	
P07705	Platanus sp.	77	15	
P07706	Platanus sp.	59	13	
P07707	Platanus sp.	342	25	
P07708	Platanus sp.	199	27	
P07709	Platanus sp.	470	30	
P07710	Platanus sp.	136	19	
P07711	Platanus sp.	107	18	
P07712	Platanus sp.	50	15	
P07713	Platanus sp.	113	20	
P07714	Platanus sp.	109	15	
P07715	Platanus sp.	85	15	
P07716	Platanus sp.	70	14	
P07717	Platanus sp.	254	25	

FILARE EST

stringa		circonf tronco (cm)	altezza albero (m)	note
P07785	Platanus sp.	90	13	
P07786	Platanus sp.	22	4	
P07787	Platanus sp.	84	10	
P07788	Platanus sp.	43	9	
P07789	Platanus sp.	127	15	
P07790	Platanus sp.	222	19	
P07791	Platanus sp.	104	17	
P07792	Platanus sp.	115	17	
P07793	Platanus sp.	119	17	
P07794	Platanus sp.	90	16	
P07795	Platanus sp.	109	17	
P07796	Platanus sp.	41	10	
P07797	Platanus sp.	166	18	
P07798	Platanus sp.	99	14	
P07799	Platanus sp.	52	13	
P07800	Platanus sp.	143	16	

QUADRANTE 3

AREA 12

FILARE OVEST

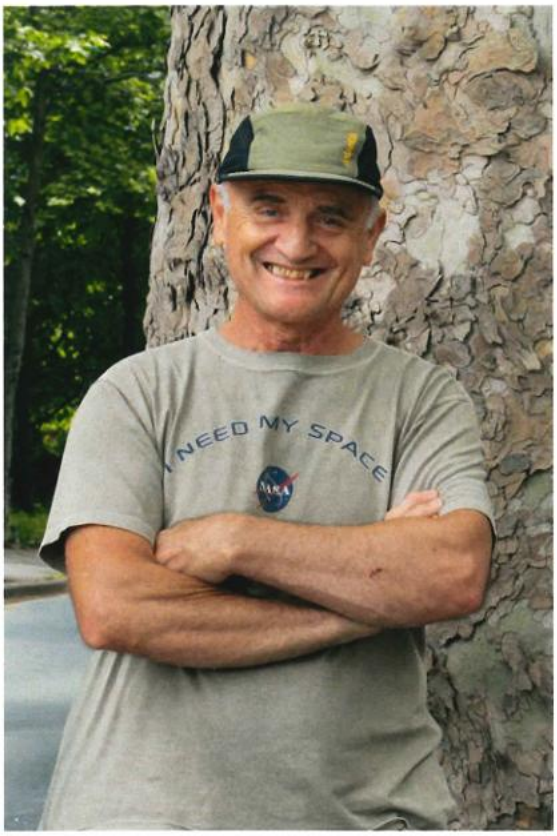
stringa		circonf tronco (cm)	altezza albero (m)	note
P11230	Platanus sp.	60	12	
P11229	Platanus sp.	50	12	
P11228	Platanus sp.	141	20	
P11227	Platanus sp.	40	7	
P11226	Platanus sp.	112	16	
P11225	Platanus sp.	109	16	
P11224	Platanus sp.	106	16	
P11223	Platanus sp.	110	15	
P11222	Platanus sp.	176	23	
P11221	Platanus sp.	153	22	
P11220	Platanus sp.	152	22	
P11219	Platanus sp.	85	10	
P11218	Platanus sp.	128	19	
P11217	Platanus sp.	92	16	
P11216	Platanus sp.	130	19	
P11215	Platanus sp.	84	13	

FILARE EST

stringa		circonf tronco (cm)	altezza albero (m)	note
P11231	Platanus sp.	167	20	
P11232	Platanus sp.	104	17	
P11233	Platanus sp.	454	29	
P11234	Platanus sp.	37	10	
P11235	Platanus sp.	263	23	
P11236	Platanus sp.	17	3	impianto 2022
P11237	Platanus sp.	26	8	
P11238	Platanus sp.	59	15	
P11239	Platanus sp.	111	20	
P11240	Platanus sp.	190	22	
P11241	Platanus sp.	125	19	
P11242	Platanus sp.	160	22	
P11243	Platanus sp.	206	21	
P11244	Platanus sp.	190	19	
P11245	Platanus sp.	137	18	

Nicola Noè

Born in Milan, he holds a degree in Agricultural Sciences from the University of Milan, where he later completed a PhD in Biology and Productivity of Cultivated Plants.
His academic path led him to become an Adjunct Professor of Botany and Arboriculture at the Politecnico di Milano, where he teaches in the international master's programme Landscape Architecture. Land, Landscape and Heritage.
He currently serves as the Guarantor of Greenery, Soil and Trees for the Municipality of Milan, a role that reflects his long-standing commitment to environmental protection and sustainable territorial management.



Areas of Expertise

His professional and scientific work spans a wide range of plant and environment related fields, including design of urban and territorial green spaces, in vitro plant cultivation, agronomic evaluation of small fruit varieties, research on mountain apple tree quality and management and care of indoor and outdoor ornamental plants.

He is a founding member of AGER (www.agercoop.it), sits on the editorial board of ACER magazine (www.ilverdeeditoriale.com), and has collaborated with the urban planning studio Urbanstudio (www.urbanstudio.it).

He previously served as a Council Member of the Order of Agronomists and Forestry Doctors (ODAF) of Milan and on the Board of Directors of the Agricultural School of the Monza Park.

Professional and International Experience

His career includes both academic research at the University of Milan's Faculty of Agriculture and corporate experience as a marketing manager for a multinational company based in Milan.

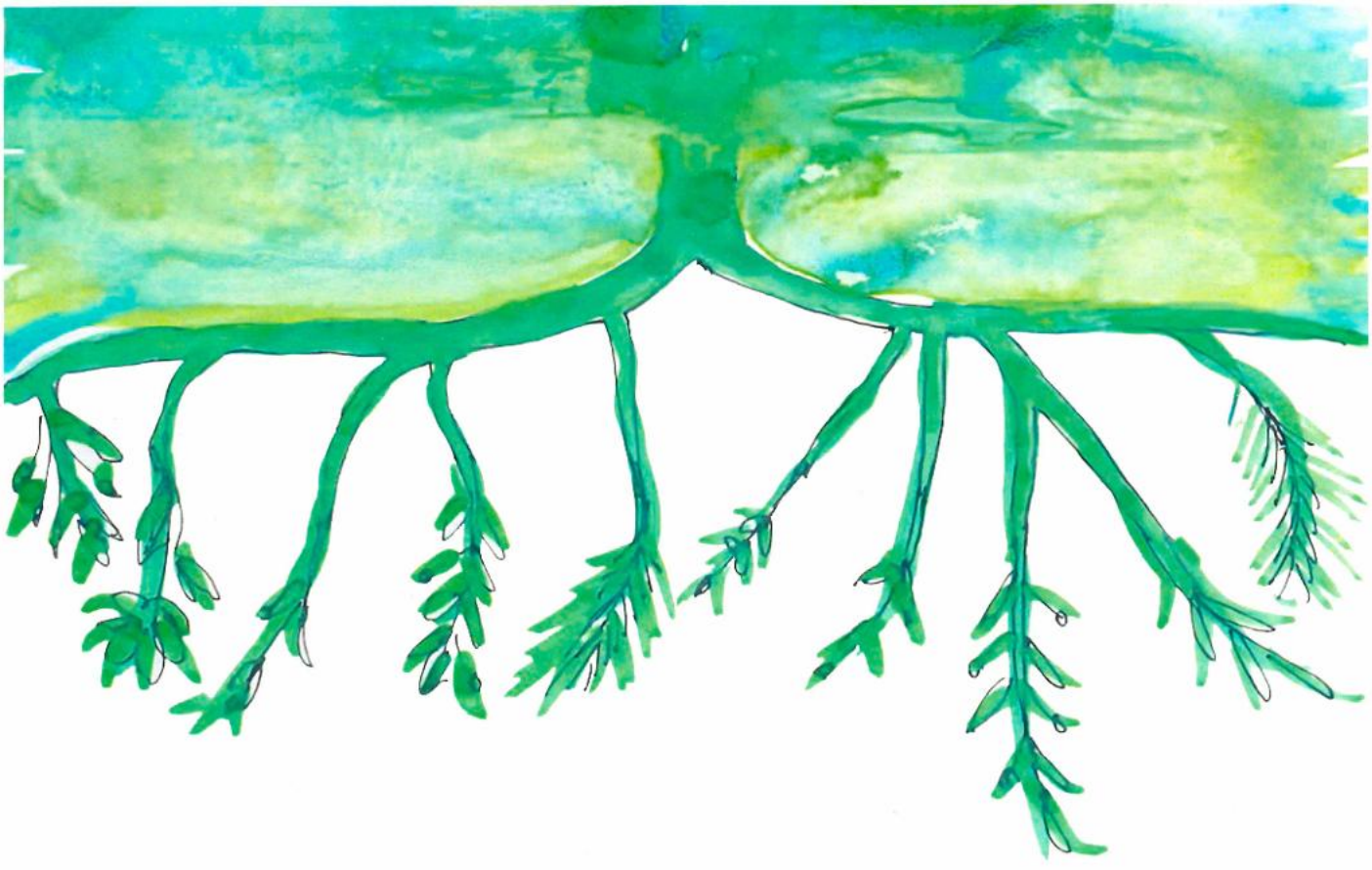
He spent two years at the company's headquarters in New York City (United States) working on a major technology transfer project from the U.S. to Italy. This project involved identifying innovative American products and technologies, assessing their technical and economic value, and evaluating their potential transferability to Italian and European contexts.

The work required extensive engagement with industry leaders, university researchers, institutions, and professional associations across the United States.

His research interests include urban green systems, plant nutrition, small fruits, tissue culture, and the management of urban and sports turf.

Today, alongside his university teaching, he works as a freelance agronomist specialising in the design of large-scale green areas in urban environments.

His work consistently aims to protect the landscape and promote environmental sustainability.



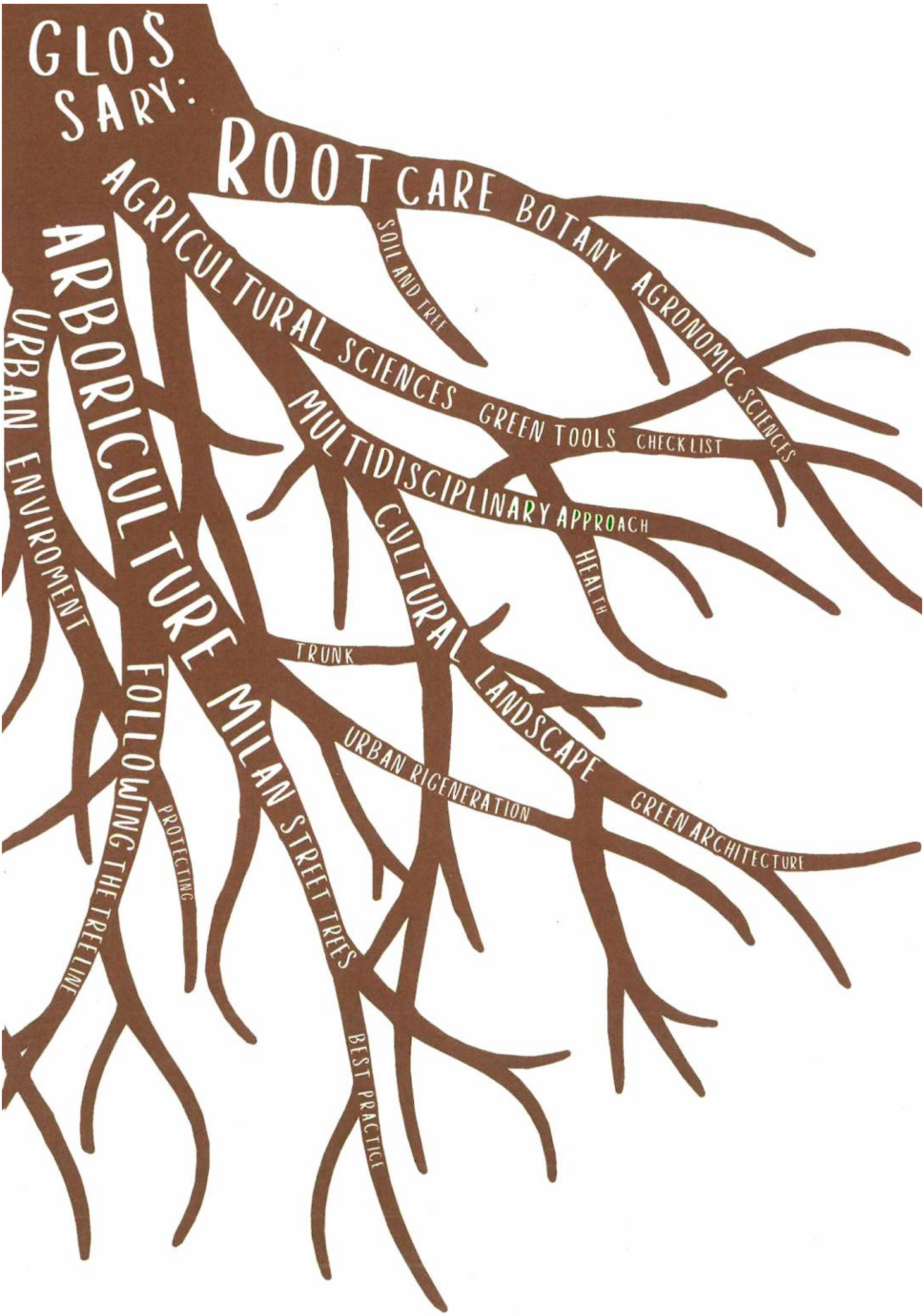
Publications & Awards

He is the author of numerous scientific publications in national and international journals on the design and management of urban and territorial green spaces, fruit growing, and in vitro plant propagation. He was awarded the "Agronomist and Forestry Doctor – Sustainable Food Designer Award" for his project "The Digital Green Cadastre" at the 16th National Congress of Agronomists and Forestry Doctors, Perugia, 2017.

He has published scientific articles in journals such as Physiologia Plantarum, Scientia Horticulturae, Biologia Plantarum, and Acta Horticulturae, and has written extensively for specialized magazines in environmental protection, gardening, and mountaineering. Since 1992, he has collaborated with various journals in the ornamental horticulture sector (ACER, Garden & Green, Flortecnica) and in fruit growing, contributing both technical and editorial articles.

He has co-authored books on public parks and gardens and recently published two volumes: Noè, N. (2019). The Digital Green Cadastre – Open Data and Ecosystem Services. Lambert Academic Publishing and Ghezzi, M. & Noè, N. (2023) Organic and Integrated Cultivation of Small Fruits. Edizioni Accademiche Italiane.

The Digital Green Cadastre published in many different languages: English, Russian, Polish, Portuguese, French, Italian, Dutch, Spanish


GLOSSARY:
ROOT
CARE
BOTANY
AGRONOMIC SCIENCES
SOIL AND TREE
AGRICULTURAL SCIENCES
GREEN TOOLS
CHECKLIST
ARBORICULTURE
MULTIDISCIPLINARY APPROACH
URBAN ENVIROMENT
CULTURAL LANDSCAPE
HEALTH
TRUNK
FOLLOWING THE TREELINE
MILAN STREET TREES
URBAN RIGENERATION
GREEN ARCHITECTURE
PROTECTING
BEST PRACTICE

starting from the roots