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Med_net Working Group
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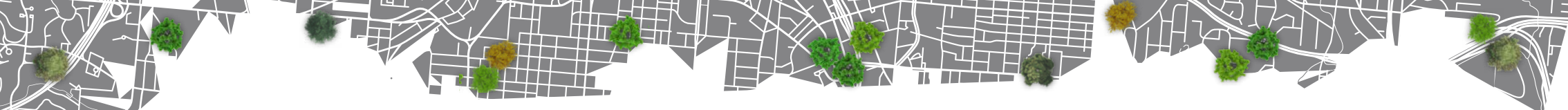
AIAPP
Associazione Italiana di Architettura del Paesaggio

TREES IN THE MEDITERRANEAN CITY

**Beyond climate change:
good rules for a new coexistence
between humans and trees**

DESIGNING CHANGE





// We would like to dedicate this edition to our memorable friend Ariane Delilez, who passed away this year. She has contributed a lot to this work. Ariane was the former Executive Director of the French Landscape Federation, actively involved as observer with EFLA (European Foundation for Landscape Architecture) and then IFLA EUROPE (European Region of International Federation of Landscape Architects) for some twenty years, and a fantastic counselor and founding member of the Med_net working group. //

Designing Change

**Trees in the Mediterranean City – Beyond climate change:
good rules for a new coexistence between humans and trees**

Realized with the scientific contribution of the AIAPP (Associazione Italiana di Architettura del Paesaggio) working group ALBERI

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- *The tree and the city* – Fabrizio Cembalo Sambiase, agronomist
- *Trees and the soil* – Alessia Brignardello, botanist, landscape architect, doctor of natural sciences
- *Tree management in the city* – Saverio Lastrucci, forestry engineer and landscape architect; Andrea Pelleriti, agronomist and landscape architect
- *The tree as a witness of time* – Annachiara Vendramin, agronomist + Carlo Schisaro, architect
- *The right tree in the right place* – Simone Amantia Scuderi, agronomist and landscape architect, (Member ISA International Society of Arboriculture)

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FOREWORD

I am pleased to be able to write the foreword of the 2nd IFLA Europe publication of the series “*DESIGNING CHANGE*” under the topic “Trees in the Mediterranean City”.

The edition collects realized Landscape Architecture projects from countries that border the Mediterranean, showing the importance of trees in the cities and the relationship between trees and human beings. It is the product of a collective work from the Med_net, a transregional working group within IFLA Europe, which includes countries that are part of IFLA Europe, IFLA Middle East and IFLA Africa. The aim is to present an international overview of the role and importance of trees in the cities, as well as an open forum about practical landscape projects in the Mediterranean area. The theme on “TREES” is related to the broader activities of IFLA Europe, such as the 2022 IFLA Europe Exhibition “Re-considering nature”.

Trees are complex organisms, and just like the human body their good health is dependent on general awareness and specialist intervention when necessary. Landscape Architects can significantly contribute through planning, design and management to safeguard the trees, an important legacy for future generations, encourage and promote overall green concepts for our cities, and create synergies with other disciplines for a nature based strategic sustainable development. Trees constitute essential elements of the landscape and are living artifacts of local history and culture. Urban trees especially, according to the FAO (Food and Agricultural Organization of the United Nations) help to mitigate some of the negative impacts and social consequences of urbanization, and thus make cities more resilient. However, many problems arise due to incorrect design and planning, mismanagement, loss of respect towards the trees. The urban landscape can be a harsh environment, extraneous to a tree's natural growing conditions. Therefore, trees should have a special place in any national strategy as cultural landscapes/elements of special character, which express a unique sense of place and are expressions of local identities, that tell us the story of the territory.

I would like to thank the creators of these projects and the National Associations, the members of the ALBERI and the Med_net working groups, one by one, and especially Uta Zorzi Mühlmann chair of the working group. I would also like to express my gratitude to our Executive Secretary Daniela Micanovic-Franckx and our Secretary General Diana Culescu, for their valuable assistance and for sharing experiences during the meetings and annual conference of the Med_net working group.

Katerina Gkoltsiou, *IFLA Europe President*

ABOUT TREES

► by Simone Amantia Scuderi

Today like never before, the tree has become a necessity for Man, an indispensable ally. Indeed, the tree plays a key role in mitigating the effects of Climate Change¹, urban population² and related phenomena such as soil and air pollution. However, precisely in this historical phase, which is essential for the future, the relationship between man and tree turns out to be altered: from an unconditional love we have moved to an excess of anthropocentrism, which wants the tree to be totally adapted to the needs of man, reaching phenomena of real “dendrophobia”, of irrational and unjustified fear.

Therefore, for a healthy relationship between man and tree, it is necessary to know it, to understand its architecture, morphology and physiology and to realize its vital needs. Only then can we enjoy its indispensable services.

1. Global Warming of 1.5°C – Intergovernmental Panel on Climate Change (IPCC) – 2019.
2. World Urbanization Prospects – United Nations – 2018.



This knowledge becomes even more important when it comes to trees in the city. In the natural environment, in fact, a tree does not need any intervention to live well; it is the coexistence with humans and their works that puts it in a stressful situation that risks compromising its health and natural balance.

Too often we see urban tree management that goes against the criteria of modern arboriculture, damaging the tree by worsening its performance and risk profile. Above all, we do not see systematic, consistent and shared policies to achieve measurable

goals on the various fronts on which our tree ally is engaged: improvement of urban microclimate, absorption of CO₂ and particulate matter (PM10 and PM2.5), extraction of pollutants from the soil, contribution to erosion and stormwater management, and other numerous ecosystem services.

All this without forgetting another fundamental service performed by trees over time: the creation of an identity landscape of a place, the creation and development of a deep bond that unites us and involves both aesthetic and psychophysical well-being, reminding us every day of who we are and where

Reinterpretation of the “row of trees” using different species, Leon Štukelj Square, Maribor, Slovenia, 2012. (BRUTO d.o.o. – Matej Kučina, Urban Švegl, Eva Prosen). © Miran Kambič, Matej Kučina.

we come from. From this premise comes the idea to produce this short guide that introduces the complexity of the tree organism, its importance to humanity and the rules for proper coexistence between the tree and the man-made environment.

The purpose is not to provide exhaustive information – there would be too many vast topics to review – but to sensitize stakeholders at all levels of land, urban, and environmental policies to a greater awareness of the most relevant issues, specific details, and the big picture. This is in order to adopt norms, policies, practices, and quality standards appropriate to the challenges ahead.

The hope is that the topics discussed will support decision-making towards rethinking more comfortable urban environments for all, finding new and more appropriate forms of coexistence, always keeping in mind that while we cannot do without them, conversely, they, the trees, would live just fine without us. 🌳

THE TREE ECOSYSTEM

A tree is never just a tree, it is a collection of life forms that provide beauty and well-being

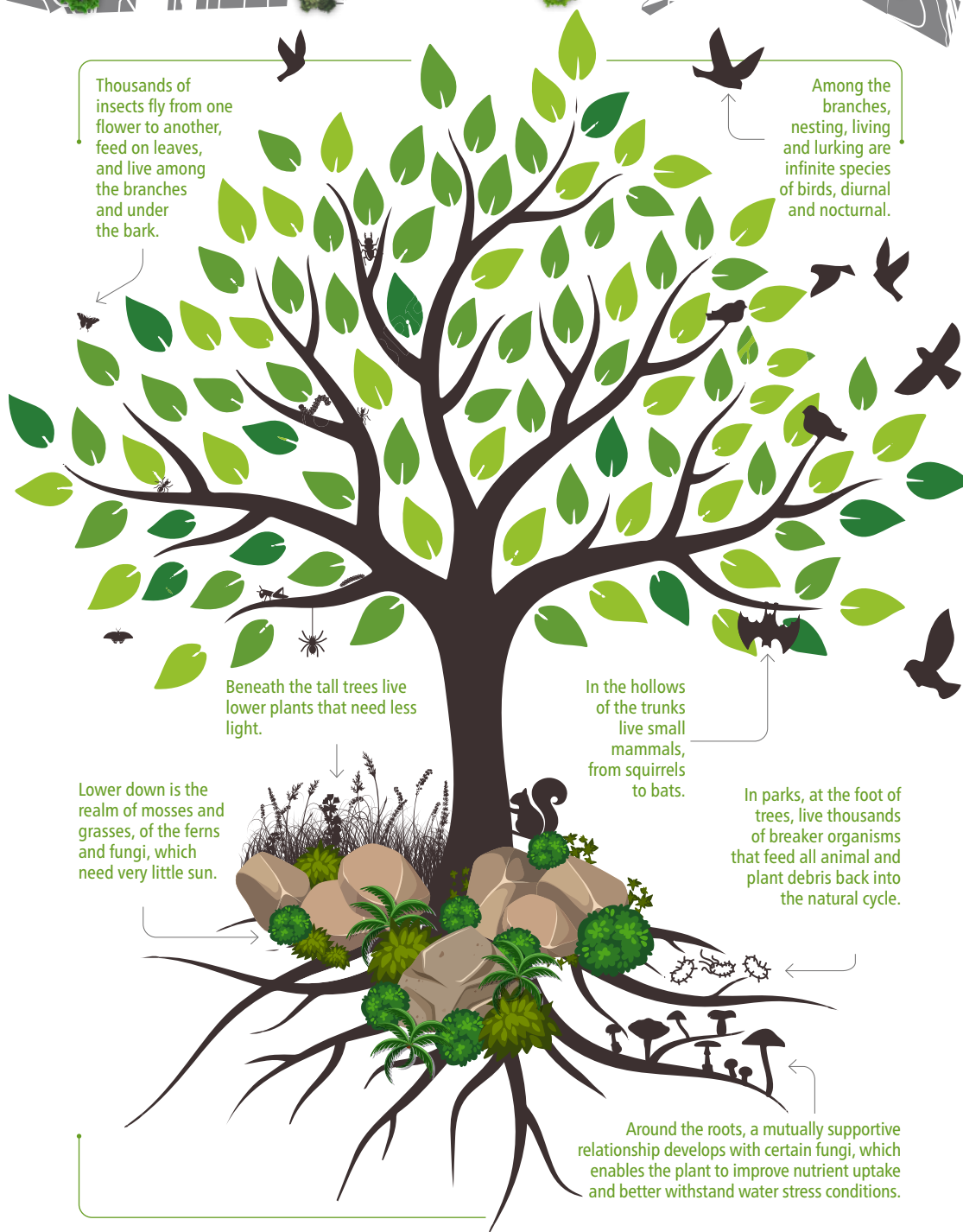
Trees are complex organisms and as with us humans, each species has its own characteristics and each specimen is different from the other. Each has its own shape, certain ramifications, its own "architecture", its own specific foliage.

Trees are generators of ecosystems and cradles of biodiversity. If they are of a certain age and size and if they occur in groups or form forests, even in large city parks, they create entire landscapes: generators of health and well-being, beautiful to see and experience, and interesting to study. Each tree, with its own growth, which differs from species to species and depending on the environmental situation, from an element of the ecosystem ("ecoid") becomes itself an ecosystem in which so many living things live or depend upon. 🌿

THE THREE AGES OF A TREE

1. In a vigorously developing **young tree**, sap flows into every crevice. At this stage, aphids can invade its shoots, and bees and butterflies will be attracted to the flowering. (To better manage a young tree, see pp. 16-21).
2. In **adulthood**, life explodes: birds find nesting space among branches or in wood cavities, and insects of all kinds, also nesting or just looking for food, are in turn food for other insects, birds, reptiles and small mammals, as are the eggs in the nests. The shaded parts become covered with lichens, and the roots form a cradle network of fungi and spores.
3. On the **old tree**, the fervor of adult life intensifies until insects and fungi arrive to produce the breakdown of lignin; then comes the hour of the 'Rod Wood Beetles', which eat away at the bark. Voids are created that call for new hosts: a nocturnal raptor, a bat, small mammals setting up homes. (To better manage an old tree see pp. 16-21).

«Humans derive endless benefits from the tree ecosystem, even in the city. We discuss this in the next few pages...»



THE TREE AND THE CITY

Microclimate,
biodiversity, air quality,
noise pollution

The city is our habitat; this applies to most of the world population. Cities offer opportunities and services, recreation and work, but the price to pay is a sometimes hostile microclimate, due to both pollution caused by human activities and the presence of surfaces that alter the air temperature; factors exacerbated by the ongoing climate change. The care and development of green areas in cities and of so-called "urban forests" ^{*} is one of the main solutions to achieve an improvement in the quality of life and in the comfort of citizens.

More greenery, less heat

Grey buildings, asphalt and concrete surfaces, glass and metals absorb and/or reflect sunlight and contribute to elevating city temperatures. It is a well-known phenomenon, defined as "Urban Heat Island" (UHI). Urban



Givatayim City Square, upgrading of public realm and shading, Gush Dan, Israel central metropole, 2019. (Studio Zura Landscape Architecture). © Shachar Zur.

greenery acts as an antidote against this phenomenon, thanks to the shading of trees, creating a "bubble of penumbra", influencing air humidity due to "evapotranspiration", that is, the amount of water that evaporates from the soil and leaves.

Trees are not all the same

- If the city is very hot and a lot of shade is needed in all seasons, then evergreen trees with a wide, fit foliage are to be preferred.
- If there are large differences in temperature in the different seasons, deciduous trees, which organize shade in the warm months and give room for the sun in winter, are the best choice.

Economic benefits as well

In addition to greater climatic comfort and increased biodiversity, trees offer several economic benefits, for example lower energy use for air conditioning, which translates into lower costs and less pollution. In other words: more trees in the city trigger a virtuous circle in which people live better, spend less, and pollute less. 🌿

^{*}FAO guidelines define "urban forests" as a network or system that includes forests, groups of trees, and individual trees found in urban and peri-urban areas; they are the spine of green infrastructure, linking rural and urban areas.

Controlling particulate matter

Traffic and factories, waste disposal plants and heating/refrigeration plants, these are some of the main activities that produce pollution and contribute to the presence of particulate matter (PM), the pollutant of greatest impact in urban areas. We are talking about so-called “fine dust”, a mixture of solid and liquid particles whose major components are sulfate, nitrate, ammonia, sodium chloride, carbon and mineral dust.

Fine dust is a health hazard, not only to humans and animals. Even plants

suffer for their presence, a sufferance that is expressed by early leaf loss and a reduction in the life cycle of the entire plant, yet there are trees that can fight it. Particulate matter is deposited on leaves. Therefore, to reduce the presence of this pollutant, it is preferable to choose trees with leaf characteristics that allow the particulate matter to be trapped on the leaf itself, for example rough, hairy, scaly leaves that produce wax or resin, which make the leaf sticky.

Please note: contrary to what you might think, small or narrow leaves work better for particulate matter control than broad leaves. For example, conifers—such as pines, firs, and cypresses—are a good choice (and as evergreens, they purify the air year-round, even during the winter months). 🌿



«More trees in the city trigger a virtuous circle in which we live better, spend less, pollute less»



Urban renewal of a neighborhood on slabs, Saint-Etienne, France, 2018. (Emmanuel Jalbert / In Situ Atelier de Paysages et d'Urbanisme). © In Situ.



Vegetal noise barrier and pollution filter, Zorlu Center, Istanbul, Turkey, 2013. (Landscape design: DS Architecture). © Karaoğlu Landscape.

More green, less noise

Living in the city also means living with noise, a continuous source of stress and discomfort, not only psychological. In this regard too, urban greenery plays a valuable role as a “vegetal noise barrier”. But planting a tree is not enough to achieve the desired effect.

Just as in apartment buildings a simple wall is not enough to silence annoying neighbors, similarly, outside our homes, it is necessary to artfully design and build layered bands of vegetation to degrade external noise.

Please note: the noise-reduction effect is multiplied if in addition to trees there are shrubs and other vegetative and/or organic ground cover, including the most innovative permeable pavements or other vertical barrier elements. 🌿



Madrid Río – Salón de Pinos, along the Manzanares River, Madrid, Spain, 2010. (West8. Burgos+Garrido). © Jeroen Musch.

TREES WITH HIGH CAPACITY OF ABSORPTION OF PARTICULATE MATTER

All conifers and some broadleaf trees, such as: red maple (*Acer rubrum*); silver linden (*Tilia tomentosa*); American elm (*Ulmus americana*); field maple (*Acer campestre*); white hornbeam (*Carpinus betulus*); common hawthorn (*Crataegus monogyna*); American sturgeon (*Liquidambar styraciflua*); tulipier (*Liriodendron tulipifera*); flowering apple tree (*Malus 'Evereste'*); pagoda tree (*Parrotia persica*); Turkey oak (*Quercus cerris*).

Problems & solutions

POLLEN AND ALLERGIES

Pollen from some tree species, dispersed by the wind, can lead to allergies; a problem that climate change amplifies, because less rainfall and less cold weather limit its maceration.



SOLUTIONS:

- using trees with male clones, or only species with female or male-sterile flowers, which do not produce pollen;
- choosing trees that by origin and climate limit the duration of their flowering.

Water bombs and flash floods



Specially designed green spaces are designed to successfully cope with weather phenomena extremes triggered by climate change. More info in “Designing Change – Stormwater management – Climate change and new solutions for managing water in cities” produced and distributed throughout Europe by AIAPP and IFLA Europe. The English version is available here: <https://bit.ly/3VdWa76>

TREES AND THE SOIL

Roots, health and safety: planting well to grow well and without doing harm

The coexistence between human and nature is not always easy; this is particularly true in the city. The roots of trees, for example, have a need to expand in order to nourish the plant and support and stabilize the canopy, but the subsoil of modern metropolises is an intricate system of services and technological facilities that must not be damaged. Therefore, in designing a tree-lined boulevard or any other urban green space, administrators and landscape architects must consider the vital needs of the plants and the spaces available, including those underground, so that the plant can thrive without doing damage.

Things that are best to know

- If there are impediments or diaphragms, the roots will stop and the foliage also does not grow any more.
- Ninety percent of the roots are found in

the first 70 cm of soil; most of the roots' absorbents are found in the first 15-30 cm, where there is more oxygen.

- Soil texture is important: roots are deeper in sandy soils and less extensive in compact soils.
- Reduced space, reduced oxygen and the presence of pollutants weaken plants. Therefore, to have trees that are healthy, it is necessary to invest in the choice of nursery material, in the techniques of planting, in the size of the space allocated to the roots, and in the quality of the soil.

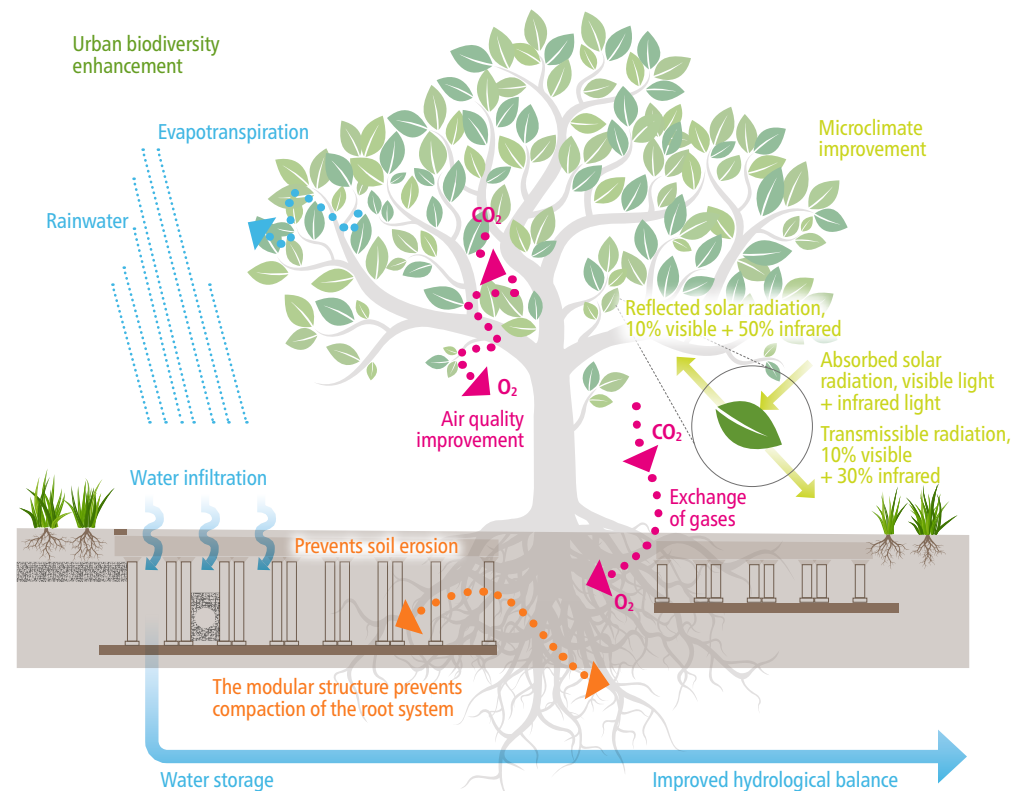
Root blocking barriers

They can be physical (deflect the root) or chemical (they stop its growth); physical ones can be linear (rigid panels), wrapping (flexible geomembranes that wrap around pipes, for example, to protect them) and three-dimensional (layer of 15 cm thick gravel underneath, for example, on a sidewalk). 🌳



«Let's reverse the vision: instead of cutting down trees, let's start removing asphalt»

Functional diagram of the drainage and root protection system implemented in Paseo de México, Retiro Madrid, Madrid, Spain, 2022. (Ayuntamiento de Madrid; Ana Luengo). © ayuntamiento de madrid



Rehabilitation by installing a technical floor to prevent soil compaction and improve drainage allowing the infiltration of rainwater and preventing runoff on the surface of the promenade, Paseo de México, Retiro Madrid, Madrid, Spain, 2022. (Ayuntamiento de Madrid; A. Luengo). Photo left © Licuas Joaquín Molpeceres; photo right © ayuntamiento de madrid.

A good beginning...

The ideal trunk circumference for a tree to be planted is 16-18 cm. The root ball should have these proportions*:

- diameter between 2.5 and 3 times the circumference of the stem measured at 100 cm height.
- height of the root ball equal to 2/3 of its diameter.

The sod must not have cut roots that have a diameter greater than 3 cm; it should be wrapped with iron mesh and jute and handled with care; on the construction site it should be covered to prevent the

★ Guidelines for choosing nursery material for city trees and definition of quality standards "Italian Society of Arboriculture – 2016" and "Best Management Practices" – International Society of Arboriculture (I.S.A.).

capillary roots from becoming dehydrated. The root system should appear rich in small ramifications and fresh and healthy capillary roots.

For container plants

No to coiling ("spiraling") roots, because once planted, they would continue to grow in a spiral fashion, reducing the stability of the tree.

The planting hole

It must be at least twice as wide as the sod and be the same depth; the collar should not be buried; an embankment should be created to be able to water abundantly, so as to eliminate air pockets near the roots, and to not waste water. Before planting, the soil should be tilled and fertilized; irrigation, drainage and any root barriers should be arranged.

THE ART OF TUTORING

Tutoring helps anchoring the roots and after two vegetative seasons it should be removed: the number and position of the stakes change depending on the size and type of plant. They range from 1 to 4 stakes, fitted with elastic ties and a protection against bark rubbing; the fixing point is at most 1/3 of the height of the tree or even lower (even at 50 cm) to clamp the sod but allow the trunk to swing.

How much space for the roots?

It must be proportional to the size of the adult plant. One of the first standards was the British Standard 5837 of 2012, which defines the area of root protection as the "minimum space necessary to meet the daily needs of a normal and healthy tree". From a geometric point of view, it is described as a circle (with the tree in the center) with a radius of 12 times the diameter of the stem, measured 1.5 m above the ground. The maximum radius for an area of root protection (excluding century-old trees) is limited to 15 m. 🌳

Problems & solutions

TREES, ROADS AND SIDEWALKS

To prevent soil compaction and thus root asphyxiation...

- Use metal gratings in turnpikes, with a mulch underneath. Caution: it is necessary to adjust the size of the grating to the growth of the stem, to avoid dangerous choking.
- Along sidewalks: suspended pavements can be provided, which also allow the diffusion of rainwater.
- In more natural areas, structural soils can be used: a mixture of large-diameter crushed stone, topsoil crop and hydrogel as a glue.
- Sidewalks can be made of composite wood planks, draining concrete, and porous asphalt.
- A structural intervention that can be used in the construction of sidewalks is that of soil-bearing cells, made with prefabricated dome-shaped cells that distribute the load, allowing the soil underneath to remain well ventilated. Over these cells a concrete CLS slab is poured with infiltration trenches, which allow water to reach the roots. Then, on top of the slab, the final pavement is constructed.



Experimental garden, in view of a large urban redevelopment, with the vocation to test the response of plants to real environmental conditions in the face of climate change and to experiment different soil re-naturalization systems, Pirmil-Les-Isles, France, in progress. (Sylvanie Grée / D'ici là). © D'ici là.



TREE MANAGEMENT IN THE CITY

Ordinary and extraordinary care for a “peaceful” coexistence between trees and the city



But are trees really a danger to citizens? And what is the level of risk posed by their presence? To try to understand this, without being misled by hearsay and the clichés of misinformation, let us begin with considering what is meant by “danger” and what is meant by “risk”. In fact, anything can be more or less “dangerous”: a gun as well as a house, and the “risk” that this danger translates into harm varies depending on the context, the use

and the care that is applied in handling it. Applied to trees, the danger may be present or absent, depending on their management and it is possible to reduce it or even eliminate it with the appropriate interventions; as for the “risk” this originates in the presence of a hazard and is related to the possibility that this case can produce damage. It is therefore a complex concept, arising from the combination of several elements.



«No tree is a hazard if it is evaluated and managed in the appropriate way»

STABILITY ASSESSMENT

VTA* (*Visual Tree Assessment*) is the most widespread and recognized method for assessing the stability of trees. VTA considers the possibility of total or partial collapse, distinguished by the assignment of a “Class of tree failure”, and considers the consequences of collapse for property or persons that may be affected. The professional, in possession of the legal requirements, in charge of assessing the stability, on the basis of what is found after the visual assessment of the situation, may decide to carry out instrumental investigations, including sonic hammer, impulse tomograph, penetrometric examinations and tensile tests, all useful for assessing the actual stability and safety of the shaft. (*The VTA assesses the hazard and only then can a ‘risk assessment’ be carried out, which would otherwise be a null assessment).



Tree anchorage, Anatolia College, Thessaloniki, Greece, 2022. To protect the historic Cypresses from a 10 meters building trench, a technique for supporting big trees was used: ‘preparation’ of the tree 1,5 years before the trench dig up with plastic antiroot membrane against root growth towards the future trench; a system of wooden posts, steel struts and straps were placed to prevent the tree from falling over. (Design Team: Lena Athanasiadou with the aid of Topiodomi). © Lena Athanasiadou.

Let's make an example:

- a tree falls and damages a parked car;
- the tree represents the element of potential danger;
- the presence of the parking lot generates the risk;
- eventual defects in the tree, disease, and defects in its planting or maintenance may determine the increased probability of the occurrence;
- the damage to the car is the consequence.

In other words...

The risks associated with the presence of trees (not only in the city) are closely related to human behavior and are not different

from the risks associated with most of our activities. To say it all: even cooking or going to work involves a percentage of risk and even not leaving the house. Therefore, the possible risks that involve trees must be rationally assessed, properly communicated, professionally managed and even, to some extent, accepted.

Please note: such a management for a large number of trees should be based on the data management, using ITC technologies, in this context, recording and updating of all the properties and ecological performances of the trees in question with the unique ID of each tree. 🌳

Risk assessment

Risk assessment is the tool that allows those who manage public green spaces (but also private citizens) to reduce to the minimum the probability of damage happening, with a due assessment of the risk, planning the measures necessary to everyone's safety.

Please note: risk assessment associated with trees is a complex topic that must be studied and discussed with competence and moderation and that requires specific knowledge of arboriculture, so as to be able to choose among the various protocols available.

Arboricultural risk assessment means quantifying the risk of collapse of one or more trees in relation to their vulnerability and the location where they are situated. The method also allows us to assess the costs and benefits of any



Execution of survey for the verification of the tree stability with tomography instrumentation.
© Saverio Lastrucci.

care and maintenance interventions (in other words: is it worth intervening? How does the risk assessment change after intervention?)

Why is it worthwhile?

Risk assessment allows, for whoever is responsible for it, to define a tree management plan and to certify its safety condition. Thanks to this risk assessment you can eliminate maintenance – or felling – interventions that may be unnecessary and economically unjustifiable.

Also valid by law

For example, in several countries the QTRA (Quantified Trees Risk Assessment – System of quantification of tree risk) is used as a method for the assessment of risk related to the presence of trees

considered reliable, also recognized by the Law, thanks to the principle of maximum reasonableness (ALARP: As Low As Reasonably Possible). 🌿



Soil regeneration intervention to contain an attack of the cariogenic fungus Armillaria and drainage of the site. Excavation with air spade. © Simone Amantia Scuderi.

Tree risk quantification system

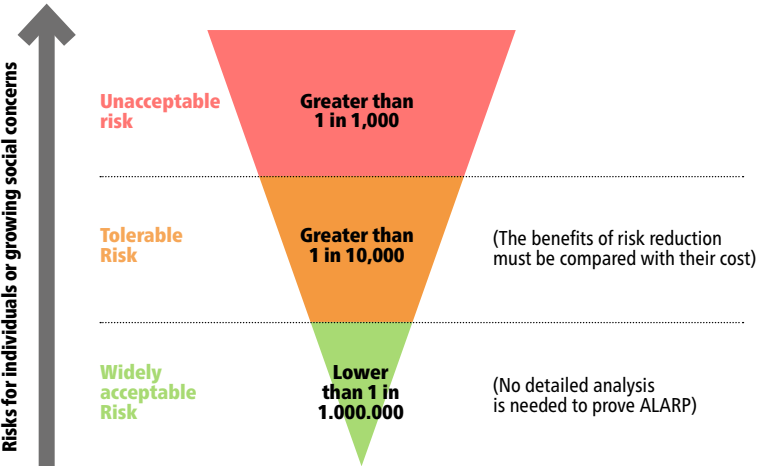


Image adapted from "Tolerability of risk framework" – HSE 2001.

QTRA risk warning thresholds

THRESHOLDS	RISK DESCRIPTION	THINGS TO DO
1/1.000	Unacceptable risk These risks should not normally be tolerated.	Check the risk situation.
1/10.000	Unacceptable risk (if imposed on third parties) These risks normally should not be tolerated. Tolerable (by agreement) Risks can be tolerated if those exposed to the risk accept it or if the tree has exceptional value.	- Check the risk situation. - Review the risk. - Control the risk situation unless there is broad agreement between the parties involved or the tree has exceptional value. - Review the risk.
1/1.000.000	Tollerabile (if imposed on third parties) Risks are tolerable if ALARP, viz. are as low as reasonably possible).	- Assess cost/benefit of controlling risk. - Control risk only if it is possible to obtain benefits. - Review the risk.
	Broadly acceptable The risk is already ALARP.	- No action is needed at this time. - Review the risk.

The care of trees

The tree is a living being, its care begins with birth, it then goes from cultivation to planting and continues throughout the life of the plant. It means that the nursery/forestry products must be of quality, properly chosen and properly planted (we discussed this further on page 14), watered, fertilized and pruned, not forgetting any phytopathological care.

Tree morpho-physiology

“Morpho-physiology” is the study of tree form (architecture of the tree and relationships between different parts) based on the normal developmental sequence of each species. Knowledge of morphophysiology helps us understand the space occupation and resource utilization strategy of each individual tree.

Correct planting*

The planting of trees should be done according to the design requirements and in relation to the finished design quotas, taking care that the plants, as they settle, do not have uncovered roots or that the collar is buried.



1. Aprilia, Italy, in progress: the Construction Company, to increase the value of building land, created an arboreal infrastructure before the construction of the buildings.

The digging of holes and soil working, specific for planting, shall be carried out prior to planting the plants, in the places identified by marking and staking, taking care not to tamper with or obstruct the walls or the bottom of the excavations.

The suitability of the planting locations, in relation to soil quality and any possible problems, such as excessive presence of stones, aggregates, waste or unsuitable soil, should be checked, informing the Construction Management. The installation of drainage, anchors, mulch, protective collars, irrigation system and anything else required by the project must be concurrent with the planting of the trees.



2. Upon arrival of the trees on site, pending planting, it is necessary to protect the clods to prevent drying out.

Proper pruning*

The best pruning is NOT pruning, and this is achieved through good planning. In any case, pruning should be performed by specialized personnel, preferably with the guidance of an agronomist/forestry professional. Sterilization standards for tools should always be followed, as making clean cuts, properly angled to drain water. Remember that from a physiological point of view, trees do not need pruning, but if pruning is done, it must respect the natural forms and bearing of the species on which you are intervening, or maintain the forms originally imprinted. Of course, if some branches are damaged or unstable timely interventions are needed.

Root protection

Especially in cities, it is important to avoid damaging root systems, so proper design

* from Qualiviva: AIAPP (and others) research project for quality certification of nursery products and professionals for the implementation of sustainable green spaces.



3. Placement in a “nursery” waiting for the right moment for the final planting. (F. Masotta, S. Amantia Scuderi, E. Massaccesi). © Fabio Masotta.

is needed. If you have to intervene with inspections or excavations near a tree, you will have to take the appropriate steps to protect the roots, again following the guidance of professionals. 🌿

Problems & solutions

MINIMUM ENVIRONMENTAL CRITERIA (MET)*

MET are an implementation of the GPP (Green Public Procurement) and the European Directives (2009/28/CE, 2014/23/UE, 2014/24/UE, 2014/25/UE) that are widely adopted in Europe, even if not yet legally implemented in the single countries. In Italy they are binding by law for public green management and the supply of green care products. They state for example: the plant material must be in exact accordance with the project and must be subject to a “rooting guarantee”, with definitive acceptance of the plant material products only after this test period. The maintenance of the trees during this 2 years period is mandatory, practicing appropriate care and replacement of non-rooted material. Ordinary maintenance is subsequent to the warranty period and includes the execution of all indispensable interventions for maintenance and development over time of the project, allowing a pleasant and safe, constant and lasting use of the green area, while reducing the need for extraordinary maintenance.



«The tree is a living being, its care begins with birth and continues throughout the life of the plant»

THE TREE AS A WITNESS OF TIME

From historic gardens to myth, the tree goes beyond the landscape and becomes a living monument of the culture and history of each country

Since the origins of our species, there has been a complex relationship between humans and trees. From time immemorial we have used them for shelter, for food, for defense, as wood to keep us warm and as material to build everything from weapons to cathedrals. Seed collection, the initiation of agriculture, involved the trees that we now call "fruit trees".

Ancient rural landscapes

Trees are a constituent element of rural landscapes. Although strongly

simplified by the transformations of the last century, it is still possible today to recognize traces of the ancient landscape that has characterized for centuries the Mediterranean countryside, even in the peri-urban areas of our cities. Today we are accustomed to seeing fields where trees of only one species are cultivated, while in the past it was possible to observe fields full of different trees, where trees, vines and cereals grew together, so as to have more productivity in a small area.

In addition to fruit, trees were cultivated to produce the material needed for agricultural life, such as wicker used for baskets or mulberry trees whose leaves fed silkworms, for consolidating river banks or retaining the soil along the edge of embankments, not to forget the many tree species used to feed cattle, sheep and goats.

The birth of the "garden"

The birth of the first gardens can be traced back to the planting of apple, pear and peach trees: a space where trees, along with other plants, were cultivated to give food and delight, spaces in which man learned to regulate the forces of nature; centers for refreshment, meditation and spirituality.



«The journey of plants from one continent to another has marked from times long past our own history»



Public space with wooden flooring built around two historic Ficus trees, Samir Kassir Square, Beirut, Lebanon, 2004. (Vladimir Djurovic Landscape Architecture). © Marlène Chahine.

Formal gardens, where trees and plants make up real rooms, landscape-type gardens, in which the composition arises from the juxtapositions of different species, enhancing shapes and colors and gardens with the inclusion of rare species from distant countries, which became a source of pride and fame for their owners, while the journey of plants from one continent to another has been marking our own history since ancient times.

Think of citrus fruits, which came to us from India via Alexander the Great and the Middle East, through epic migrations of plants and essences evidenced by very ancient artefacts, such as the carvings from the temple of Hatshepsut in Deir el-Bahari,

Egypt, dating back to 4000 years ago, depicting the transport of incense trees.

Symbols of spirituality

These ancient trees, whose lives span back many generations, played an important role in the lives of communities and carried a sacred meaning: in ancient mythologies they represent a link between men and deities, such as the oak tree sacred to Zeus or the sacred forest of the "Cedars of God", in Lebanon, a UNESCO World Heritage Site. For this reason, trees also represent a cultural heritage, valuable not only as green monuments or for their botanical importance, but also for the traditions and testimonies they preserve. 🌿

"Nature" available to all

Even in cities, the presence of trees is linked to different aspects: in the past, some areas were devoted to vegetable gardens and orchards, or they housed the gardens of palaces. It is only with the modern age that the trees became an important element spatially and organizationally. In fact, after the first examples in France and England, many cities in Europe and the Mediterranean basin, in order to be "modern", realized numerous tree-lined avenues, where they could devote themselves to "strolling", according to the fashion of the time. In time, these avenues were associated with the first large public parks, to which all citizens had access. These spaces of



Insertion of ancient fruit species, the taste of their fruits acting as a trigger of childhood memories for the residents, Orchard of Memory, Caprotti Zavaritt Rest Home, Gorle, Italy, 2020. (F. Neonato, L. Pirola). © F. Neonato.

"nature" became essential during the industrial revolution, which dyed the sky the grey color of coal fumes. It is then that parks became the lungs of the city, privileged places of hygiene and health, in which to breathe clean air.

The "lesson" of the pandemic

The use of outdoor space is always subject to fashions and changes in society, today



Entry square to the Begunje Hospital, integration of the old existing tree with new trees, Begunje, Slovenia, 2011. (Landscape architecture: BRUTO d.o.o., M. Kučina, U. Švegl, E. Prosen, M. Božič, B. Gibičar). © Matej Kučina.



The olive tree as an evocative identity tree becomes the protagonist of the public space, La Perle du Lac, Tunis, Tunisia, 2020. (AleaOlea Architecture & Landscape). © aleaolea.

just as yesterday. Consider the changes in the ways of perceiving and enjoying green spaces in the city, and how they have seemed to us to be so valuable in the wake of the Covid-19 pandemic. This is why it remains important to have contemporary gardens, parks and contemporary squares appropriate to city life, as it is here and now in the different areas of the planet.

Tools of cultural identity

At the same time, however, the protection of historical parks remains fundamental, parks that hold true monuments as witnesses of time that tell us our own history. Integrating new elements and young trees into an existing space with old trees requires a very sensitive project. Not surprisingly, in every country, ways of protecting monumental/historical trees can vary, but all the laws and regulations concerning 'green heritage' recognize their cultural value and identity for the places and populations that live there. 🌿

Problems & solutions

MAINTENANCE OF THE HISTORIC GARDEN

Historic gardens, such valuable and complex landscapes, require maintenance interventions capable of considering the evolution of the vegetation, changes in the spatial relationships between the different plants, and the transformations/manumissions that have occurred over time, expressions of fashions and new aesthetic theories, and the practices required to cope with ongoing climatic change.

The latter, in particular, represent a real emergency: recent periods of drought and the parallel violent rainfalls are compromising the compositional elements of historic gardens that, in order to be safeguarded, require planned maintenance increasingly urgently.

If woodland elements are compromised, due to old age or disease, they need to be replaced gradually over time, even over several seasons, with elements of the same species. The renewal of the original trees will require the reproduction of the trees intended for their replacement, and, in order to safeguard the genetic heritage of historic plants, it will be increasingly important to have a supporting nursery business.

If, due to climate change, the trees originally used turn out to be no longer suitable, it will be necessary to proceed, through a careful historical-philological and arboricultural research, with the selection of different species to re-propose an image appropriate to that of the original planting.

The care given to the management of the oldest and monumental trees should include, if necessary, pruning that respects the conformation of the tree. Also useful are biostimulant interventions, particularly the insertion of mycorrhizal fungi, to enrich the roots and prevent disease, optimize the use of fertilizers and increase the trees stress tolerance.

Should the monumental tree present static problems, support or shoring techniques will assume a particular significance in the conservation operations. Operations that will allow, for educational and formative purposes, the reading of the original design of the park, and, for sustainability purposes, a valuable enrichment to biodiversity.

THE RIGHT TREE IN THE RIGHT PLACE

Choosing the species, or cultivar, of the tree to be planted is always a difficult moment, because this choice depends both on objective characteristics of the tree and the site and on the questions (needs) that man poses towards it.

The criteria for this choice concern at least five macro areas:

1. **Intrinsic characteristics of the tree.**
2. **Characteristics according to use.**
3. **Ecosystem performance.** (Its ability to absorb CO₂ and fine particles, the absorption of heavy metals, etc. – see page 8 to 11).
4. **Cultural value and consistency with the planting site.**
5. **Aesthetic features and their use in composition.**

As can be seen, the elements to be evaluated are many and this can be disorienting. To avoid mistakes, one must start from some indispensable points and either build up a **database** over time or trust some existing reliable

databases that take into consideration the fundamental elements.

The characteristics of the tree

Regarding the intrinsic characteristics of the tree, the essential elements to consider are:

- the species or cultivar in the correct Latin form;
- the shape of the crown (expanded, globose, pyramidal, etc.);
- the hardiness zone to which the plant belongs (USDA climate zones), identified primarily on the basis of local average minimum temperatures;
- the need for exposure to sunlight and



"Villages of the South" themed plantation with lilac-flowering *Melia azedarach*, Landscaping of Domain Noria in Chrifia, Marrakesh, Morocco, 2012. (Carey Duncan Design, Landscape Architects). © Carey Duncan.

tolerance to conditions of partial or total shade;

- the season of interest for flowering, the coloration of the leaves or the presence of fruit;
- the height and width at maturity (average values);
- the plantings spacing (i.e. the distance between one tree to another);
- irrigation requirements.

The characteristics to be considered can increase and be customized, adding, for example:

- the type of soil required (frank, sandy, loamy, clayey);
- the depth of soil required;
- the resistance to salt spray;
- the resistance to specific plant pathologies.

In urban environments the characteristics that influence the use of plants are very important. For example:

- the presence of thorns or stinging hairs;
- the presence of toxic parts;



Pond with trees suitable for moist soil. Housing Brdo, Ljubljana, Slovenia, 2014. (Landscape architecture: BRUTO d.o.o. – Dekleva Gregorič Architects). © M. Kučina.



The "graphic" shape of the trees and the choice to diversify the species of the individual rows reinforce the lines of the project. Parco Talenti, Rome, Italy, 2016. (M.C.Tullio, S. Polci, D. Dallari, S. Cinti). © S. Polci.

- the vigorous and superficial growth of the roots and collar;
- allergenicity;
- the presence of fruits, berries or flowers whose fall can stain the pavement.

Cultural Value

A further discussion concerns the cultural and evocative character of the tree in addition to its affinity with the context of the development. This choice is related



The "tree passport" is an official label used for the movement of plants in the EU which certifies compliance with specific phytosanitary conditions. © Saverio Lastrucci.



131 trees of 19 species chosen for their different characteristics: the expanded canopy of *Celtis bungeana* makes it ideal for shading parking lots, Regional Council 'Hevel Modiin' Campus in Shoham, Israel, 2015. (Ir J. Eilon, L.a.). © J. Eilon.

to a site analysis and the design criteria of the intervention. The designer may, in fact, decide to go along with the character of the site by targeting species that are already a part of that urban, peri-urban or rural landscape, or by choosing cosmopolitan species because of their high ornamental characteristics or their specific performance.

Aesthetics

The architecture, the shape, the height, the density of the crowns; the shape, color and lustre of the leaves; the color and texture of branches and bark; the scent of the flowers and resins, the sound produced by the fluttering of the leaves... each of these elements play a fundamental role in structuring landscapes and gardens.

With a knowledge of their characteristics, the trees are used as elements to compose a space. For example, they can become



The oaks chosen for the square are a direct reference to the nature of the park behind the space, establishing an ideal connection between existing green and new public space, Ivana Brlić Mažuranić Square, Slavonski Brod, Croatia, 2004. (M. Kranjc, Ž. Perković). © D. Perković Bošnjak.

a natural wall that closes off a view, or emphasize visual openings to the landscape. Additionally, the rows of trees can guide one's gaze, form backdrops, or even build a veritable sort of leaf ceiling, letting light filter in with different intensities.

In any case, once the species has been chosen, it will be necessary to choose the most suitable nursery product. For example, choose between sod or potted tree, height staking, stem circumference and compliance with quality standards (see also p.14-15). 🌿

Please note:

When placing new trees, it is important to consider the existence of underground services and not to obstruct emergency routes and exits of buildings.

BEST PRACTICES

(in alphabetic order)

Croatia

• Ivana Brlić Mažuranić Square

Location: Slavonski Brod, Croatia
Authors: architect Mihajlo Kranjc (author of the concept) – architect Željka Perković (project manager)
Construction date: 2004
© Darija Perković Bošnjak

France

• Urban renewal of a district on slabs

Location: Saint-Etienne
Authors: Emmanuel Jalbert / In Situ atelier de paysages et d'urbanisme
Construction date: 2018
→ <https://www.f-f-p.org/projet/le-renouvellement-urbain-dun-quartier-sur-dalles-retrouver-un-sol-et-la-pleine-terre/>
© In Situ

• Primil-Les-Isles: the urban project as a research tool

Location: Primil-Les-Isles
Authors: Sylvanie Grée/D'ici là
Construction date: in progress
→ <https://www.f-f-p.org/projet/pirmil-les-isles-le-projet-urbain-come-outil-de-recherche/>
© D'ici là

• Construction of industrial and commercial spaces, Begreen commercial area, St-Parres-aux-Tertres

Location: St-Parres-aux-Tertres
Authors: Métamorphose
Construction date: 2013
→ <https://www.f-f-p.org/projet/zone-commerciale-begreen-a-st-parres-aux-tertres/>
© Métamorphose

Greece

• Redevelopment of the 18th October Street and Granikos Square in Edessa (Structural Soil in tree rows and rain gardens in pavement design)

Location: City of Edessa
Authors: Dimitrios Metaxas and Municipality of Edessa
Construction date: 2015
© Courtesy of Dimitrios Metaxas and Municipality of Edessa

• Tree anchorage at Construction Site, Anatolia College – New Pinewood Building and Historic Garden

Location: Anatolia College, Thessaloniki
Authors: Lena Athanasiadou with the aid of Topiodomi
Construction date: 2022
© Lena Athanasiadou

Israel

• Givatayim City Square, renewal and shading

Location: Gush Dan, Israel central metropole
Authors: Studio ZurA Landscape architecture
Construction date: 2019
© Shachar Zur

• Regional Council 'Hevel Modiin' Campus in Shoham

Location: Shoham
Authors: Ir J. Eilon, L.a.
Construction date: 2015
eilonj@bezeqint.net
© J. Eilon

• Renewing Begin Boulevard – from traffic artery to urban street

Location: Shidrat HaKiryat, Tel Aviv-Yafo
Authors: Studio ZurA Landscape architecture
Construction date: in progress
© Shachar Zur

Italy

• System of River Parks:

Magliana, Tiberis and Marconi

Location: Rome
Authors: M. Cristina Tullio – Studio PAESAGGlepaesaggi (with Simone Amantia Scuderì, Elisa Monteduro, Matteo Polci, Mattia Proietti Tocca, Gianni Celestini, Sandro Polci)
Construction date: 2014 – 2020 – 2022
→ www.paesaggiapaesaggi.com
© Cristina Tullio

• Talenti Park – two separate lots and project for unification of design

Location: Rome
Authors: M. Cristina Tullio – Studio PAESAGGlepaesaggi, Sandro Polci, Daniele Dallari
Construction date: 1997 – 2008 – 2016
→ www.paesaggiapaesaggi.com
© Sandro Polci

• Country House Villadorata

Location: Noto, Sicily
Authors: Francesca Neonato, PN Studio
Construction date: 2019
→ www.pnstudio.net
© Mattia Aquila

• **Orchard of Memory, Therapeutic Garden, Caprotti Zavaritt Retirement Home**

Location: Gorle
Authors: Luigino Pirola, Francesca Neonato
Construction date: 2020
→ www.pnstudio.net
© Francesca Neonato

• **Value increase of building land through creation of arboreal infrastructure**

Place: Aprilia
Authors: Fabio Masotta, Simone Amantia Scuderi, Emilia Massaccesi
Construction date: in progress
→ www.fabiomassotta.it
© Fabio Masotta

Lebanon

• **Samir Kassir Square**

Location: Beirut
Authors: Vladimir Djurovic Landscape Architecture
Construction date: 2004
→ <https://www.akdn.org/architecture/project/samir-kassir-square>
© Marlène Chahine

See also: Marlène Chahine, *Beirut – Streetscape in contemporary concepts*

→ <http://www.aracneeditrice.it/index.php/publicazione.html?item=9788825523850>

More about Cedrus libani:

→ https://www.conifers.org/pi/Cedrus_libani.php

Morocco

• **Landscaping of the A3 urban motorway**

Location: A3 Motorway, Casablanca
Authors: Carey Duncan Design, Landscape Architects and Crearchi
Construction date: 2019
→ <https://bit.ly/3T12WEl>
© Hicham Lyazidi

• **“Southern Villages” themed landscaping of Domain Noria**

Location: Chrifia, Marrakesh
Authors: Carey Duncan Design, Landscape Architects
Construction date: First phase completed 2012, project is ongoing
→ <https://bit.ly/3RKVZgA>
© Carey Duncan

• **A network of recreational spaces for Oued Zem**

Location: Oued Zem
Authors: Carey Duncan Design, Landscape Architects; CID, Engineers
Construction date: 2014
Link: Oued Zem African Landscape Network
© Hakim Chqaf

• **Peninsula Promenade**

Location: Dar Bouazza, Casablanca, Morocco
Authors: Carey Duncan Design, Landscape Architects; Universal Engineering, Engineers
Construction date: 2020
Link: Peninsula Promenade, ALN
→ <https://www.youtube.com/watch?v=WaEpVkB3Ys&t=9s>
© Mohamed Bsibes

• **Landscaping of Tamda, Amda and Tamourrit residential complexes**

Location: Taghzout Bay
Authors: Carey Duncan Design, Landscape Architects
Construction date: 2022
© Mohamed Bsibes

Portugal

• **FCULresta – From A Lawn to A Small Biodiverse Wood**

Location: Faculty of Sciences of the University of Lisbon, Lisbon, Portugal
Authors: Coordinator: David Avelar
Construction date: 2021
→ <https://ciencias.ulisboa.pt/en/fulresta>
© David Avelar

Slovenia

• **Housing Brdo**

Location: Ljubljana
Authors: Landscape architecture: BRUTO d.o.o. (Matej Kučina, Urban Švegl, Eva Prosen); Dekleva Gregorič Architects; Dekleva Gregorič Architects, Multiplan Architects, Bevk Perovič Architects
Construction date: 2014
→ <https://bruto.si/en/projects/orchard/>
© Miran Kambič, Matej Kučina, Urban Švegl

• **Leon Štukelj Square**

Location: Maribor
Authors: Landscape architecture: BRUTO d.o.o. (Matej Kučina, Urban Švegl, Eva Prosen); Architecture: Prinčič & Partners
Construction date: 2012
→ <https://bruto.si/en/projects/tree-line/>
© Miran Kambič, Matej Kučina

• **Entrance square to Hospital Begunje**

Location: Begunje
Authors: Landscape architecture: BRUTO d.o.o. (Matej Kučina, Urban Švegl, Eva Prosen, Meta Božič, Barbara Gibičar); Architecture: Marko Smrekar st.
Construction date: 2011
→ <https://bruto.si/en/projects/courtyard/>
© Matej Kučina

Spain

• **Rehabilitation of the Paseo de México at the Retiro Madrid**

Location: Madrid
Authors: Ayuntamiento de Madrid (Citera, Ana Luengo)
Construction date: 2022
→ <https://diario.madrid.es/blog/notas-de-prensa/madrid-recupera-el-acceso-mas-emblematico-del-parque-de-el-retiro-el-paseo-de-mexico/>

→ https://www.madridiario.es/fotos/editor/470075/1562885019_SistemaArbolesRetiro.jpg
→ https://joaquinmolpeceres.com/wp-content/uploads/2021/04/Joaquin-Molpeceres-Licuas-Paseo-de-Mexico-Jardines-del-Buen-Retiro-Madrid-Obra-3-In-scale-2_00x.jpg
→ https://joaquinmolpeceres.com/wp-content/uploads/2021/04/Joaquin-Molpeceres-Licuas-Paseo-de-Mexico-Jardines-del-Buen-Retiro-Madrid-Obra-2-In-scale-2_00x.jpg
→ <https://joaquinmolpeceres.com/wp-content/uploads/2021/04/Joaquin-Molpeceres-Licuas-Paseo-de-Mexico-Jardines-del-Buen-Retiro-Madrid-Obra-800x533.jpg>
→ <https://jardinmovil.com/wp-content/uploads/2021/04/8.jpg>
→ https://jardinmovil.com/wp-content/uploads/2021/04/PARQUE-DEL-RETIRO_-JARDI%CC%81N-MO%CC%81VIL%CC%81AE-1536x1022.jpg
© ayuntamiento de madrid

• **Jardin Giner de los Ríos**

Location: Madrid
Authors: Teresa Gali Izard
Construction date: 2004
→ <https://arquitecturaagronomia.net/proyectos/giner-de-los-rios-garden/>
© José Hevia, amid.cero9, AqAg

• **Madrid Río, Salon de Pinos**

Location: Madrid
Authors: West8 and Burgos+Garrido
Construction date: 2010
→ <https://landezine.com/madrid-río-by-west8-urban-design-landscape-architecture/>
© Jeroen Musch + mrío arquitectos asociados y West 8

• **Masterplan and management plan for urban trees and green areas in the city of Cieza. City Council of Cieza. Murcia. 2015. (Plan director y de gestión del arbolado urbano y de zonas verdes de la ciudad de Cieza. Ayuntamiento de Cieza. Murcia. 2015)**

→ http://www.cieza.es/portal/2015ElAyuntamiento_IA01.jsp?seccion=2015_s_fdoc_d4_v3A.jsp&contenido=15251&tipo=5&nivel=1400&layout=p_129_final_Contenedor9.jsp&codResi=1&language=es
chrome extension: <http://efaidnbmnnnibpcajpcgclefin.dmkaj/>
→ http://www.cieza.es/portal/RecursosWeb/DOCUMENTOS/1/0_15682_1.pdf

• **Masterplan for tree plantation in Malaga. City Council of Malaga. 2016) (Plan director del arbolado de Málaga. Ayuntamiento de Málaga. 2016)**

→ <chrome-extension://efaidnbmnnnibpcajpcgclefin.dmkaj/>
→ <https://parquesyjardines.malaga.eu/opencms/export/sites/parques/.content/galerias-html/anuncios/anexo-i-protocolo-plantacion.pdf>
→ <https://parquesyjardines.malaga.eu/es/documentos-destacados/noticias-dt/Plan-Director-del-Arbolado-de-la-ciudad-de-Malaga/#.YtArqnYzaUl>

• **See also: two publications by the Spanish Association of Arboriculture:**

→ <https://aeaboricultura.org/tienda/todos/recomendado-para-etw/el-arbol-urbano-gestion-municipal-del-arbolado-urbano-en-la-ciudad/>

→ <https://aeaboricultura.org/tienda/todos/recomendado-para-etw/el-arbol-en-la-ciudad/>

Tunisia

• **Landscaping of the Perle du Lac subdivision**

Location: Tunis
Authors: Aleaolea Architecture & Landscape
Construction date: 2020
→ www.aleaolea.com
© Aleaolea

Turkey

• **Ankara Atatürk Model Urban Agriculture and Recreation Project**

Location: Ankara
Authors: Mustafa Kemal Atatürk
Construction date: 1925
→ <https://www.aoc.gov.tr/Portal/Kategoriler/tarihce/49>
→ <http://cdm21054.contentdm.oclc.org/cdm>

• **Zorlu Center**

Location: Istanbul
Authors: DS Landscape & Architecture
Construction date: 2013
→ <https://www.ds-la.studio/work/zorlu-center/>
→ <https://blog.karaoglu.com.tr/en/gallery/shopping-mall-landscaping-zorlu-center>
© Karaoğlu Landscape



IFLA Europe Med_net working group...

... is a network that brings together countries bordering the Mediterranean or that share its climatic, cultural and environmental characteristics.

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Uta Zorzi Mühlmann

Chair IFLA Europe Med_net working group

