Università di Firenze - Dipartimento di Architettura Corso di laurea magistrale in Architettura – curriculum Architectural Design iCad - International Curriculum on Architectural Design - Master Program Architecture and Town Lab Module Urban Landscape Design

# Urban Landscape Design

# trees

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neu Antres Hills Antres & Colors & Russian

# Why we need trees?

The Benefits of Trees

Trees and forests in and around cities provide a **wide range of goods and ecosystem services**, and they make major contributions to the livelihoods and quality of life of urban dwellers

## Guidelines on urban and peri-urban forestry Pag. 6



VALUING LONDON'S URBAN FOREST Results of the London i-Tree Eco Project

and well being.

screening undesirable views.

# FAO Guidelines\_benefits p.5

# TABLE 2. Potential benefits of urban forests

Urban issue	Potential benefits of urban forests
Food security	Provide food, clean water and woodfuel
Urban poverty	Create jobs and increase income
Soil and landscape degradation	Improve soil conditions and prevent erosion
Reduced biodiversity	Preserve and increase biodiversity
Air and noise pollution	Remove air pollutants and buffer noise
Greenhouse gas emissions	Sequester carbon and mitigate climate change, improve local climate and build resilience
Extreme weather events	Mitigate local climate and build resilience
Energy shortage	Save energy through shading/cooling, and grow woodfuel
Heat island effect	Cool the built environment through shade and evapotranspiration
Limited accessible green space	Provide more accessible natural and green space
Public health	Improve the physical and mental health of residents
Flooding	Mitigate stormwater runoff and reduce flooding
Limited recreational opportunities	Provide opportunities for recreation and environmental education
Exposure	Provide shelter
Limited water resources	Enable infiltration and the reuse of wastewater
Lack of community and social cohesion	Provide distinctive places for formal and informal outdoor interaction



Urban forests can be defined as networks or systems comprising all woodlands, groups of trees, and individual trees located in urban and peri-urban areas;

they include, therefore, forests, street trees, trees in parks and gardens, and trees in derelict corners.

Urban forests are the backbone of the green infrastructure, bridging rural and urban areas and ameliorating a city's environmental footprint. There are many ways to classify urban forests, but this document adopt five simplified reference types (Table 1).

Guidelines on urban and peri-urban forestry Pag. 2

TABLE 1. Main urban forest types



Peri-urban forests and woodlands. Forests and woodlands surrounding towns and cities that can provide goods and services such as wood, fibre, fruit, other non-wood forest products, clean water, recreation and tourism.



City parks and urban forests (>0.5 ha). Large urban or district parks with a variety of land cover and at least partly equipped with facilities for leisure and recreation.



Pocket parks and gardens with trees (<0.5 ha). Small district parks equipped with facilities for recreation/ leisure, and private gardens and green spaces.



Trees on streets or in public squares. Linear tree populations, small groups of trees, and individual trees in squares and parking lots and on streets, etc.



Source: FAO (2016)

Other green spaces with trees. For example urban agricultural plots, sports grounds, vacant lands, lawns, river banks, open fields, cemeteries and botanical gardens.

# DIFFERENT FUNCTIONS OF URBAN GREEN SPACES:

- 1. ECOLOGICAL-ENVIRONMENTAL regulation of micro-climate, soundproofing and visual isolation, reduction of pollution
- 3. **SOCIAL-THERAPEUTICAL** horticulture and gardening have been always used for socialization
- 4. **CULTURAL-DIDACTIC** parks are the mirror of the human culture
- 5. **PROTECTION** the roots fight the soil impermeability
- 6. AESTHETIC-ARCHITECTONICAL decorative aims
- 7. **RECREATIVE** for sport, leisure, playing





The effectiveness of the urban open space design depends on the identification of the different functions that trees can express.

For example, **a row of trees** can be used to identify a road space,

but it can act as a "scale mediator of image" between the public dimension of the road and the private one of the buildings; or it can contribute to the microclimate conditioning (temperature, humidity, wind, solar radiation, natural lighting) and containment of pollution conditions of road space (gas, dust). Tree-lined streets have therefore the opportunity to pay more types of services, within the specific dimensional,

morphological, and finally economic and financial constraints.



Trees can be **efficient and effective sustainable development partners** of urban landscape design.

As living organisms, **they need appropriate planting and growing conditions**, which are often deficient.

**The soils are mostly strongly compacted** and asphyxiated, as well as **densely crossed by technological service networks**. The **surfaces are usually paved** with a massive drainage and transpiration deficit.

The collars often suffer involving also the growth

Thus, there is a high probability of disease and expensive maintenance requirements,

that could be prevented or contained through **better living conditions**, which would cause thus cost savings, but also benefits for the development of the plants and their consequent better environmental and visual performances.





## What is a TREE?

A perennial plant that bears **only one woody stem** at ground level, the high depends on the variety

# What is a SHRUB?

A perennial plant which bears **several woody stems** at or close to ground level, they have a vast range of colours and size, usually chosen for the foliage and flower more than shape

(a mature shrub may be only 5 cm high or tall as 7 m.)

Plants are divided into taxonomic groups: class, order, family and species

A tree has a common name and a scientific name (<u>it is written in latin</u>) the scientific name contains two names:

the first name (with capital letter) is the genus and it is shared by several species,

The second name (with small letter) is the specific name.

# It is always written in italic letter

example: black pine is Pinus nigra

# A third name is the variety

example: the black pine from Corsica is Pinus nigra var. maritima

example: Pinus sylvestris L., abbreviation "L." means Linnaeus

Deciduous trees have no leaves in winter period

evergreen trees have leaves during all the year

# Trees are different by:

- **Shape** (columnar, conical, pyramidal....)
- Increase (rapid or slow)
- Size (high or low trunk)
- Leaves (colour, flowers, fruits...)
- Foliage (deciduous or evergreen)

**SHAPE** is an extremely important to choose trees:

columnar, conical, pyramidal, round-headed, open, weeping, prostrate, globular, horizontally-branched

**COLUMNAR TREES** are used in a narrow space, isolated or in a little group to create a contrast situation as they underline horizontal lines and plain surfaces (like hills and basin of water)

### to catch the attention on one point

for close plantation because they have a barrier effect (to avoid visual or acoustic impact)

to make a complex and moved scene (underline slopes, interesting points...)

**ROUND HEADED** are used to create a mass of green, if isolated the tree creates a contrast effect and underlines pain surfaces **OPEN** are used to give a sense of calm, to create a contrast effect, to underline horizontal lines and plain surfaces **CONICAL or PYRAMIDAL** to create in the landscape a sense of tension and power **WEEPING** to suggest calm and melancholy used in row or isolated near by basin of water to reflect into the water





# **INCREASE (rapid or slow)**

Rapid growth when a tree does more than 50 cm in a year

Slow growth if it is less

The speed of growth varies from tree to tree

The choice of tree depends on the shape and dimension that plant will be

adequate distance from buildings, height...

in 10 years a tree doubles its dimensions

Usually a tree with columnar shape are more quicker than open trees that spend all their energies to grow in horizontal

## SIZE

Usually a tree are divided into 3: 1° size (more than 20 meters) 2° size (10-20 m) 3° size (5-10 m)



A tree in its own landscape reaches the maximum size in height, if there are hard environmental conditions it doesn't

# LEAVES

Leaves have different shapes: simple border, with waves, irregular...

different colours: white, blue-green, golden, copper-coloured, red, purple...

different surface: smooth or rough

# English common name and latin name

Index

Common nar	mes	Fie		
Alder	34	Gootwillow	49	Pines
Alder buckthorn	81	Goat willow	51	Pomegranate
Aleppo pine	24	Grey alder	33	Privet
Almond	6.9	Grey poplar	56	Purging buckth
Apple	40	Grey willow	53	Pyrenean oak
Ash	00	Guelder rose	91	Red gum
Aspen	50	Hawthorn	6.5	Red oak
Ariat carine	36	Hazel	38	Rhododendron
Ray Increal	10	Himalayan birch	36	Rowan
Baach	31	Holly	79	Scots pine
Rinnik	37	Holm oak	41	Sea buckthorn
Rind channe	33-37	Hornbeam	38	Sessile oak
Black multi-	03	Horse chestnut	82	Silver birch
Sheek angles	20	Indian bean tree	89	Silver gum
Black poplar	36	Japanese larch	14	Sicka spruce
DIACK Walling	84	Japanese white pine	21	Sloe
ciackingm	6.6	Judas tree	71	Small-leafed lime
oog myrde	72	Juniper	14	Smooth-leafed e
CICIX	80	Laburnum	70	Spanish fir
California redwood	26	Large-leafed lime	45	Spindle
Cedar of Lebanon	2.2	Lawson cypress	12	Scone pine
Cherry laurel	69	Lime	45	Strawberry tree
Cherry plum	67	Lodgepole pine	19	Sweet chestnut
Cider gum	74	London plane	32	Sycamore
Coase redwood	26	Maidenhair cree	29	Tamarisk
Common lime	45	Manna ash	88	Tasmanian blue g
Common paler	55	Maritime pine	20	Tree of heaven
Consican pine	22	Mediar	62	Tulip tree
Crab applie	61	Midland hawthorn	64	Turkey oak
Crack willow	52	Mountain ash	62	Walnut
Cirey alidier	33	Mountain gum	73	Wayfaring tree
Dawn redwood	27	Myrobalan plum	67	Weeping willow
Deodar cedar	10	Narrow-leafed ash	86	Wellingtonia
Diogwood	76	Norway maple	84	Western heminek
Douglas fir	25	Norway spruce	17	Western red ceda
Downy birch	36	Caks	41-44	Western vellow o
Dwarf willow	55	Oleaster	77	Weymouth pine
Elder	90	Olive	86	White poplar
English eim	48	Oriental plane	33	White spruce
English calk	43	Pacific dogwood	76	White willow
European larch	15	Paper birch	37	Whitebeam
European silver fir	16	Pedunculate cak	43	Wild cherry
Field maple	82	Pin ozk	44	Wild cotoneaster

Wild pear	60
Wild plum	67
Wild service tree	64
Willows	51-55
Witch hazel	30
Wych elm	47
Yew	28

19-24

Scientific name	Fraxinus excelsior		
Abies alba	16	Fraxinus ornus	8
Abies pinsapo	16	Gingko bilobo	2
Acer compestris	82	Hamamelis virginiana	30
Acer platanoides	84	Hippophae rhamnoides	77
Acer pseudoplatanus	83	llex aquifolium	79
Aesculus hippocastanum	82	Juglans nigra	84
Ailanthus altissima	71	Julgons regia	85
Alnus glutinosa	34	Juniperus communis	14
Alnus incana	33	Laburnum anagyroides	70
Arbutus unedo	59	Larix decidua	15
Betula papyrifera	37	Larix Kaempferi	14
Betula pendula	35	Laurus nobilis	31
Betula pubescens	36	Ligustrum vulgare	88
Betula utilis	36	Liviodendran tulipifera	27
Buxus sempervirens	80	Malus domestica	60
Carpinus betulus	38	Molus sylvestris	61
Castanea sativa	40	Mespilus germanica	62
Catalpa bignonioides	89	Metasequoia	
Cedrus atlantica	10	glyptastroboides	27
Cedrus deodora	10	Morus nigra	50
Cedrus libani	11	Myrica gale	72
Cereis siliquastrum	71	Olea europaea	86
Chamaecyparis		Picea abies	17
lawsonniona	12	Picea glauca	18
Cornus nuttallii	76	Picea sitchensis	18
Cornus sanguinea	76	Pinus contorto	19
Corylus avellana	38	Pinus halepensis	24
Cotoneoster integerrimus	64	Pinus nigra	22
Crotoegus laevigata	65	Pinus parviflara	21
Crotaegus monogyna	65	Pinus pinaster	20
Eleagnus angustifalia	77	Pinus pinea	19
Eucolyptus comuldulensis	74	Pinus ponderosa	21
Eucolyptus cordata	72	Pinus strobus	22
Eucalyptus dalrympleana	73	Pinus sylvestris	23
Eucolyptus globulus	75	Platanus orientalis	33
Eucolyptus gunnii	74	Platanus x hispanica	32
Evonymus europoeas	78	Populus olbo	57
Fagus sylvatica	39	Populus nigro	56
Faxinus ornus	88	Populus tremulo	58
Ficus corico	49	Populus x conescens	56
Frangulo alnus	81	Prunus avium	68
Fraxinus angustifalia	86	Prunus cerasifera	67

\$3

\$3

\$2

\$5

Prunus domestico

Prunus laurocerasus

Pseudotsugo menziesii

Prunus dulcis

Prunus padus

Prunus spinoso

Punica granatus

Pyrus pyraster

Quercus cerris

Quercus ilex

Quercus polustris

Quercus petroeo

Quercus robur

Quercus rubro

Solix albo

Salix caprea

Solix cinerea

Salix fragalis

Salix herbacea

Solix viminalis

Salix x sepulchralis

Sequoia sempervirens

Sombucus nigra

Sequoiadendron

giganteum

Sorbus aucuparia

Sorbus torminalis

Tomarix gollico

Taxus bocceta

Thujo plicoto

Tilio cordioto

Tino europoed

Ulmus glabra

Ulimus minor

Ulimus procero

Vibernum opulus

Viburnum Iontono

Tilio plotyphylies

Tsugo heterophyllo

Sorbus aria

Scots pine

Quercus pyrenaica

Rhamnus catharticus

Rhododendron ponticum 58

## CORRISPONDENZE FRA NOMI

Corrispondenze tra i nomi volgari od erronei delle principali specie vegetali ed i loro corretti nomi scientifici.

#### Abete argentato Abete bianco Abete del Caucaso Abete greco Abete rosso Acacia di Costantinopoli Acacia rosa Acero argentato Acero canadese Acero giapponese Acero montano Acero napoletano Agnocasto Agrifoglio Alaterno Albero dei coralli Albero dei 40 scudi Albero dei rosari Albero dei tulipani Albero della morte Albero della nebbia Albero della vita Albero del paradiso Albero di Giuda Albero di Sant'Andrea Alchechengi Alloro Amorino Amor nascosto Ampelopsis veitchii<sup>1</sup> Astro della Cina Azalea<sup>2</sup> Bagolaro Balsamina Bambū

Nomi volgari

Barba di capra Begli uomini Bella di giorno Bella di notte Berretta da prete Biancospino Bignonia radicans Botton d'oro Brugo Bucaneve Cachi Calicanto Campanellino Canna comune

Capelvenere Caprifoglio Carpino nero Carrubo Castagna d'acqua Nomi scientifici

Picea pungens 'Glauca'

Abies nordmanniana

Abies cephalonica

Albizia julibrissin

Albizia julibrissin

Acer saccharinum.

Acer monspessulanum

Acer pseudoplatanus

Pyracantha coccinea

Vitex agnus-castus

Rhamnus alaternus

Erythrina crista-galli

Liriodendron tulipifera

Acer saccharum

Acer palmatum

Acer platanoides

Ilex aquifolium

Ginkgo biloba

Melia azedarach

Taxus baccata

Cotinus coggygria

Thuja occidentalis

Diospyros lotus

Laurus nobilis

Reseda odorata

Aquilegia vulgaris

Callistephus sinensis

Impatiens balsamina

Impatiens balsamina

Convolvulus tricolor

Euonymus europaeus

Crataegus monogyna

Campsis radicans

Calluna vulgaris

Galanthus nivalis

Leucojum vernum

Chimonanthus praecoz

Phragmites communis

Lonicera caprifolium

Ostrya carpinifolia

Ceratonia siliqua

Trapa natans

Adiantum capillus-veneris

Diospyros kaki

Arundo donax

Trollius europaeus

Arundinaria spp.

Phyllostachys spp.

Aruncus dioicus

Mirabilis jalapa

Sasa spp.

Rhododendron spp.

Celtis australis

Ailanthus altissima

Acer opalus

Abies alba

Picea abies

Nomi volgari Cedro licio Chamaecerasus Ciavardello Ciliegio a grappoli Ciliegio canino Ciliegio selvatico Ciliegio tardivo Cineraria<sup>1</sup> Cinquefoglio Cipresso calvo Cipresso di Lambert Cipresso di Monterey Cirmolo Coda di lepre Corbezzolo Corchorus japonicus Cotogno Cotogno giapponese Crespino Cytisus laburnum Desmodium penduliflorum Douglasia Erba benedetta Erba delle Pampas Erba gatta Erba trinità Falsa acacia Falso cipresso Falso pepe Parthenocissus tricuspidata Farnia Felce aquilina Felce maschio Fiamma Fiordaliso Fior di loto Fior di stecco Fiore della passione Frangola Fusaggine Garofano Gattice Gelso Gelso della Cina Geranio dei fioristi Gine-tra Ginestra dei carbonai Ginestrone Girasole Giunchiglia Giunco fiorito Glicine Gynerium argenteum<sup>1</sup> Ippocastano Kaki Lantana

### Nomi scientifici

Juniperus phoenicea Lonicera spp. Sorbus torminalis Prunus padus Prunus mahaleb Prunus avium Prunus serotina Senecio x hybrida Potentilla reptans Taxodium distichum Cupressus macrocarpa Cupressus macrocarpa Pinus cembra Melissa officinalis Lagurus ovatus Kerria japonica Cudonia oblonga Berberis spp. Laburnum anagyroides Lespedeza thunbergii Pseudotsuga menziesii Quercus ilex Geum spp. Cortaderia selloana Nepeta cataria Hepatica triloba Robinia pseudoacacia Chamaecyparis lawsoniana Schinus molle Quercus frainetto Quercus robur Pteridium aquilinum Athyrium filiz-foeming Dryopteris filiz-mas Phloz spp. Centaurea cyanus Nelumbo spp. Daphne mezereum Passiflora coerulea Rhamnus frangula Euonymus europaeus Dianthus spp. Populus alba Morus spp. Broussonetia papyrifera Pelargonium spp. Genista spp. Spartium spp. Cytisus scoparius Ulex europaeus Helianthus annuus Narcissus jonquilla Butomus umbellatus Wisteria sinensis Cortaderia selloana Aesculus hippocastanum Diospyros kaki Viburnum lantana

Legno giallo Lentaggine Libocedrus decurrens Lillà Lillà delle Indie Limoncina Liquirizia Luppolo Maggiociondolo Malva reale Malvone Mandorlo Margherita Margheritina Mazzasorda Melograno Mesembryanthemum<sup>1</sup> Millefoglio Mimosa Mirabolano a foglia rossa Mirtillo nero Mirtillo resso Monete del Papa Mortella Mughetto Nasturzio dei giardini Nespolo comune Nespolo giapponese Noce Noce americano Noce nero Non-ti-scordar-di-me Olea fragrans Olivello spinoso Olivo di Boemia Olmo siberiano Ontano napoletano Ontano nero Ontano verde Oppio Ortensia Pado Palla di neve Pallon di maggio Palma da datteri Palma di San Pietro Palma maggiore Palma nana Papavero blu Papavero di California Papiro

Ornithogalum umbellatum Prunus laurocerasus Viburnum tinus Quereus ilez Viburnum tinus Calocedrus decurrens Syringa vulgaria Melia azedarach Glycyrrhiza glabra Humulus lupulus Laburnum anagyroides Lavatera arborea Althaca rosea Prunus dulcis Chrysanthemum leucanthemum Bellis perennis Typha latifolia Punica granatum Il genere è stato smembrato in numerosi generi diversi, come Carpobrotus, Lampranthus, Achillea millefolium Acacia dealbata Prunus cerasifera 'Pissardii' Vaccinium myrtillus Vaccinium vitis-idaea Lunaria annua Myrtus communis Convallaria majalis Tropacolum mains Mespilus germanica Eriobotrya japonica Corylus avellana Juglans regia Juglans nigra Myosotis spp. Osmanthus fragrans Nerium oleander Hippophaë rhamnoides Eleagnus angustifolia Ulmus pumila Alnus incana Alnus cordata Alnus glutinosa Alnus viridis Acer campestre Hydrangea spp. Prunus padus Viburnum opulus Viburnum opulus Phoenix dactylifera Chamaerops humilis Trachycarpus excelsa Chamaerops humilis Meconopsis spp. Eschscholzia californica Cyperus papyrus

Corrispondenze (ra nomi

Nomi scientifici

### Nomi volgari

Pino da pinoli Pino di Corsica Pino di Weymouth Pino giapponese Prous excelsor Pisello ornamentale Pratolina Prunus amygdalus Pungitopo Rhynchospermum Rosa delle Alpi Rovere Roverella Salice plangente Scopa Sigillo di Salomone Speronella Spino di Giuda Statice Stella alpina Sughera Tasso barbasso Toona Tritoma<sup>1</sup> Uva ursina Verga d'oro Violaciocea Violaciocea gialla Virgilia lutea' Vitalba Vite americana Vite del Canada

#### Nomi seienistief

View man

PLANE BUPPE "Lastated Pinne supra Taririn Pinus strong Scindapitys and in them Pinna weilinhound Populas signa Italica Latherna and Certainstingmat planning mander Atriplez halimon Rellis permate Prusess spinore Rhown opp. Prochelencermon monther Rhododendron doerrap concern Halleborns sugar Ginkon helaber Dulphinium same Amelanchian valgaria RAMMINGS POLISTICS L'imonium spp. Cordancion thurman Kniphofic and Larrisdonation tractore owne Arotostaphydos 16 16 18 18 Measthroug spran Cherrauthus America Tomates vitalbas Parthonic and The Marganite the Partheningenes manymethics

1. Questi nomi botanici sono usati commencento ma von veno oconder. 2. Questi nomi corrapondono sia a nomi bolarica sia a nome company comunemente usati ma non corresta

### 334

Nomi volgari

Latte di gallina



### Tilia x europea

Pinus pinea

E Platanus x acerifolia

Olea europea

Quercus ilex

Cupressus sempervirens

Fraxinus

Celtis australis

Cedrus atlantica

Populus alba

Altri

### Tiglio Tilia x europea L Il Tiglio è la specie più

rappresentata nel patrimonio arboreo cittadino. Le foglie sono a forma di cuore col margine dentato. I fiori, piccoli, gialli e riuniti in mazzetti, nella prima metà di giugno spandono nell'aria un inebriante profumo. È un albero resistente, longevo che può raggiungere i 25-30 metri di altezza.



### Pino domestico Pinus pinea L.

Originario delle coste del Mediterraneo è uno dei simboli del paesaggio italiano. Comunemente chiamato "Pino domestico" è un albero maestoso (può raggiungere anche i 30 metri di altezza) e di aspetto inconfondibile. Preferisce i terreni sabbiosi e freschi, non tollerando, invece, quelli troppo compatti e lo acquitrinosi.



### Cedro Cednus atlantica L.

Confiera originaria del monti Atlante in Algeria e Marocco è stata introdotto in Italia nel XIX secolo. Arrive a toccare 125-30 metri di alterra per 10-30 di amplezza della chioma. Ha aghi molto corti e pigne a barilotto che si desquemeno sulla piente prime di cedere.



### Frassino Proprietate

Platano

Della famiglia delle Olascese è originario della zone temperate dell'emisfeto settentrionale. Ha una crescita rapida, riuscendo a sopravvivere in conditioni ambiental difficil come zone inquinate, con salaedine o forti venti, resistendo bene anche alle basse o elevate temperature.



### Bagolaro Celtiz australiz

La specie è nativa del Turopa meridionale, Africa del Nord e Asia minore. E' un grande albero, alto sino a 20-25 m anche se l'alterna media è di 10-12 m. Attecchisce facilmente. sviluppendo un apparato redicale profondo inoltre è molto longevo, divestando plurisecolare e con crescita



Platanus occidentalis e il Platanus orientalis, si contraddistinque per inconfondibili caratteri: la conteccia maculata che al distacca in grandi plastre e i frutti sferici che al uniscono e grappolo. Con Il suo portamento mastodontico ma slanciato, si ritova lungo la strade di paesa, i parchi o lungo i viali delle grandi città.

Olivo Oles europes L.





Leccio

Specie sempreverde caratteratica della zona mediterranee, ha un grande alle eizero eletremento erolev sus chioms di un bel colore verde lucido e alle sua corteccia scura. Il un albero longevo, forte e resistente che raggiunge i 15-

In the city of Prato, around 45% of the trees registered they are of European origin and about 18% Asian.

The three most represented species are the **Tiglio (Lime)**, il Pino domestic (Pine) and the Platano (Plane Tree), respectively with 17.8%, 14.9%, and 6.2%.

The ten species most widespread represent 68.8% of the total tree population.







Cipresso Cupressus sempervirens L.



Originerio del bacino orientale del Mediterraneo, questo magnifico albero che in alcune zone d'Italia come la Toscana reporterents un elemento datintivo del paesaggio, è tollerante al treddo e può

reggiungere dimensioni rilevanti. È una planta resincea che rilascia un profumo distintivo, erometico e gradevole.



Pioppo



natura, de sempre implegato sia in ambienti urbani sis, grazie al suo apparato radicale esteso ed articolato, per il consolidamento