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Guidelines for maintenance operators





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1-1-Project Description and purpose of the document

The Viridis Loci (VL) project aims to provide specialized training in VET/skills transfer in the correct management of green areas and parks in municipalities to public technicians and private entities interested in addressing advanced professional management of urban nature in three European islands: Sardinia, Balearic Islands and Madeira.

The Czech Republic will contribute to the development of the project as a European country where "the culture of well-managed green areas in cities as providers of ecosystems and social services for the whole community" is deeply rooted, also considering the role and presence of the Czech partner.

The project partners come from four European countries, Italy, Spain, Portugal and the Czech Republic. The Italian partners are ANCI Sardegna (project leader), Fitoconsult and ATM Consulting; the Spanish partner is FELIB (Federation of Municipalities of the Balearic Islands); the Portuguese partner is AREAM (Regional Agency for Energy and Environment of the Autonomous Region of Madeira). The Czech partner is ABA International (an international non-profit training association and certification body).

The consortium submitted this project for three main reasons:

1) Environmental sustainability and combating climate change: It highlights the role of well-managed green areas/parks within cities and municipalities in general as providers of ecosystem services (benefits that people obtain from nature, e.g. climate regulation, CO2 capture, air quality improvement, cultural values, public health and biodiversity conservation).

2) Increasing inclusion. The project will operate in three island contexts in Southern Europe, which due to their geography, tend to be isolated and at a permanent economic disadvantage compared to other regions of the continent

3) Overcoming the knowledge gap with the use of ICT technologies to impart a highly technological and innovative working methodology.

The project will operate in three island contexts in Southern Europe, which due to their geography, tend to be isolated and at a permanent economic disadvantage compared to other regions of the continent. Islands tend to lag behind in economic terms and innovation processes have a negative impact on the communities that reside there. Unemployment rates in the three islands are high with dramatic peaks among young people and in all cases above the respective national averages: Sardinia (18% -



youth unemployment around 45%), Balearic Islands (youth unemployment 17% - around 40%) and Madeira (10% - 50.5% youth unemployment).

These guidelines have been designed with the overall aim of promoting high-quality and sustainable management of urban green spaces in different European contexts.

By providing clear and actionable instructions based on best practices, the guidelines seek to equip maintenance operators with the knowledge and tools needed to ensure the health, safety and usability of parks and green areas.

The primary objective of these guidelines is to establish a standardised approach to urban green maintenance that is environmentally sustainable and adaptable to the specific needs of different local environments.

The guidelines emphasise the importance of understanding plant physiology, adopting sustainable practices and complying with relevant legislation on safety and supply. In this way, they contribute to the creation of green spaces that are not only visually appealing, but also environmentally resilient and accessible to all citizens.

For maintenance operators, these guidelines serve as a practical handbook that can be seamlessly integrated into their daily activities. Whether preparing a site for new plantings, managing irrigation schedules, or performing routine pruning, operators can rely on these guidelines to inform their decisions and actions.

A focus on sustainable practices, such as efficient water use and integrated pest management, helps operators minimize environmental impact while maintaining the vitality of green spaces.

The guidelines also provide operators with essential knowledge on workplace safety and compliance with procurement laws, ensuring that their work adheres to legal standards and promotes a safe working environment. The inclusion of information on government funding opportunities, such as the Green Bonus, also provides operators with the information needed to mobilize financial support for innovative projects.

Ultimately, the VIRIDIS LOCI guidelines are a comprehensive resource designed to improve the competence and efficiency of maintenance operators, ultimately leading to the development and preservation of urban green spaces that enrich the lives of communities.

2-Introduction

Today, the value attributed to public green spaces has evolved significantly, now including elements related to the environment, landscape, territory and quality of life.

This change is driven by the growing environmental awareness that has highlighted the different functions of urban green spaces, whether they are lawns, trees or tree-lined streets.

These spaces play a variety of roles, from eco-environmental and architectural to social, recreational, cultural and educational; they also contribute to hydrogeological protection, health and hygiene.

Urban green spaces are now recognized not only for their aesthetic and landscape value, but also as essential protection elements against the impacts of climate change, industrialization and urbanization. In addition, they promote social interaction and help preserve urban wildlife that could otherwise risk extinction.

Various types of green spaces can be identified in urban areas. The most common are decorative green spaces, including urban parks, historic gardens, roadside and riverside greenery, tree-lined streets, traffic islands, roundabouts, and neighborhood green spaces.

Next, functional green spaces are designed for specific purposes, such as sports, education, healthcare, cemeteries, and even urban gardens. Finally, private and residential green spaces are becoming more common, including emerging forms such as vertical and hanging gardens. For example, green building facades are a growing trend in urban greening.

Urban greenery is a crucial element in the push to develop new Smart Cities through technological innovation: however, maintaining and managing these green spaces presents unique challenges.

The urban environment, with its pollution and poor soil quality, is not naturally conducive to plant growth. As a result, plants, especially trees, tend to grow slowly and are more vulnerable to pests.

This requires an in-depth understanding of vegetation health, which often requires new methodologies and non-invasive tools for accurate assessment. Correct maintenance, both ordinary and extraordinary, depends on this knowledge.



Knowledge of the correct methods of maintenance and implementation of interventions, the basis for the design and programming of green works, is also very important for operators who are called upon to carry out maintenance and implementation of green works.

Understanding the mechanisms underlying the technical choices and the prescriptions and indications to be implemented improves the implementation of operations and the success of the works.

3- General aspects of plant life and basic notions of plant physiology

The management of urban greenery is based on two fundamental principles:

-A tree is a living organism that must be considered and respected based on its life cycle: it is born, grows, dies and its life cannot be prolonged at our pleasure.

-The city is an artificial environment, which means that trees cannot be managed as if they were growing in a natural forest. For this reason, urban trees require a higher level of care than those in natural environments. Since we cannot wait for a tree to die naturally at the end of its life, intervention is necessary to remove potentially dangerous trees before they show extreme signs of decline, such as the fall of large branches or the collapse of the entire tree.

Understanding the basic physiology of plants is essential for those responsible for the maintenance of public parks and green areas but also for gardeners and operators in general.

This knowledge helps to ensure the health, growth and appearance of plants, trees, lawns and flowers.

The material operations carried out in the maintenance of greenery must always be inspired by these principles, even in manual construction.

Below are some essential concepts of plant physiology tailored for maintenance work in public spaces.

3.1- Photosynthesis

Photosynthesis is the process by which plants produce their own food using sunlight, carbon dioxide (CO₂) and water (H₂O). The process occurs in chloroplasts, mainly in leaves, where chlorophyll (a green pigment) captures sunlight.

3.2- Respiration

Respiration is how plants convert sugars produced during photosynthesis into energy. This energy is used for growth, maintenance, and reproduction. Unlike photosynthesis, which only occurs with light, respiration occurs day and night.

3.3- Transpiration

Transpiration is the process of water movement through the plant and its evaporation from leaves, stems, and flowers: this helps absorb nutrients from the soil and cool the plant.

3.4- Water and nutrient absorption

Plants absorb water and nutrients through their roots. These are transported upwards through the xylem to various parts of the plant. Nutrients are essential for growth, flower production, and overall plant health.

3.5- Growth and development

Plant growth is regulated by hormones such as auxins, gibberellins, and cytokinins. Growth occurs in specific areas called meristems, located at the tips of roots and shoots.

The interventions planned and prescribed in the design phase take these aspects into account and therefore in the maintenance and construction phase of the works the executions must strictly comply with the prescriptions

3.6- Flowering and reproduction

Flowering is the reproductive phase in the life of a plant. Plants can reproduce sexually through flowers, seeds or vegetatively through cuttings and other methods.

Pollination of flowers occurs through pollinating insects or through the action of other animals, or through the wind or the mechanical action of other factors.

Pollinating insects play a fundamental role in the environment and therefore their existence must be preserved by avoiding the use of harmful substances such as insecticides.

3.7- Soil structure and composition

Soil is more than a cultivation substrate because it provides plants with essential nutrients.

Different types of soil (clay, sandy, clay) have different properties and greatly influence the health and life of plants.

3.8- Stress and adaptation of plants

Plants can suffer stress due to environmental factors such as drought, high temperatures, pests or diseases.

More and more often, due to poorly performed pruning or even the use of pollarding, great stress is created on the plants which are then weakened

Stress affects the survival of plants

3.9-Instructions for operators

-Correct exposure to light is essential. It is essential that plants receive enough sunlight according to the needs of their species. Plants that tolerate shade and love the sun must be positioned accordingly.

These aspects must be taken into account when carrying out pruning and planting operations.

-Leaves must be kept clean and free of dust to optimize the absorption of sunlight.

-Soil health affects root respiration, so water stagnation that limits the availability of oxygen must be avoided.

-Correct pruning allows for better air circulation around leaves and branches, promoting respiration: pruning must be carried out in such a way as to create good air circulation around leaves and branches.

-Regular irrigation ensures that plants have enough water to maintain transpiration, but excessive irrigation must be avoided.

-Mulching can help reduce water loss through evaporation, especially during the warm months.

-Make sure the soil is well aerated and has the right pH level for nutrient availability.

-Make sure that plants are fertilized regularly based on their specific prescribed nutritional needs (nitrogen, phosphorus, potassium).

- Make sure that prescribed irrigation programs are well executed so that adequate water supply and correct water absorption are guaranteed.
- Removal of spent flowers should be carried out because it encourages new blooms in many flowering plants.
- Proper pollination (by insects, wind or manually) is essential for fruit production and for the environment in general: as far as possible, the use of insecticides should be avoided and biological control should be carried out in order to preserve pollinators.
- In the case of prescription of insecticides, the dosage and methods of distribution must be strictly respected.
- Soil tests foreseen in the projects and maintenance plans must be carried out to verify the pH and nutrient content. The soil must then be adjusted as needed with organic matter or specific fertilizers.
- Improvement of the soil structure must be sought by adding compost or mulch, encouraging root growth and the correct degree of water retention
- Water stagnation or drought stress must be avoided
- Proper drainage and runoff of rainwater must be guaranteed.
- Regular monitoring of plants must be carried out to detect any signs of stress (wilting, yellowing leaves, stunted growth).
- Pest and disease control must be carried out, including biological options or biological controls.

4. General principles of plant maintenance

4.1- Pruning and plant management

Pruning is essential to maintain the shape and health of trees, shrubs and flowers. It helps remove dead or diseased parts, promotes growth and improves aesthetics.

4.2 Plant health and diseases

Plants are susceptible to various diseases caused by fungi, bacteria, viruses or environmental conditions. Maintaining plant health requires preventive care and early diagnosis.

4.3-Instructions for operators

-Pruning should be done according to instructions in order to stimulate new growth and maintain plants at the desired size.

-The expected spacing between plants should be maintained in order to ensure that they do not compete for light, nutrients and water.

-Use the correct pruning technique depending on the plant species (for example, cutting just above a node).

-The timing of pruning is crucial: some plants should be pruned in winter (dormant phase), while for others it is better to prune after flowering.

-Avoid excessive pruning, which can stress the plant and reduce photosynthesis and absolutely avoid resorting to pollarding.

-When pruning, avoid creating imbalances in the crown of the plants that would lead to its weakening.

-A specialist inspection should be requested for signs of disease (leaf spots, discolored leaves, mold) to prevent large-scale infestations.

-Tools should be cleaned and disinfected after pruning to prevent the spread of disease between plants.

5-Maintenance operations and instructions for operators

Proper site preparation is essential to create and maintain healthy urban green spaces.

Below are the key stages of site preparation.

5.1-Site assessment and planning (if not operating following a predefined design or planning)

It is essential to assess the site and plan the works: this phase allows the understanding of the physical, environmental and functional aspects.

5.1.1-Soil test

To determine the composition, pH, drainage and nutrient content of the soil.

5.1.2-Analysis and considerations on environmental conditions

To evaluate the amount of sunlight, exposure to wind, availability of water and local climatic conditions.

5.1.3-Analysis and considerations on the use of space

Serves to identify how the space will be used (for example, for recreational, aesthetic or wildlife support activities) and plan the selection and arrangement of plants; in this phase the operators must comply with the contents of the design documents, without making changes on site without the authorization of the works manager.

5.1.4-Instructions for operators

-Be aware of the presence, on the site of planting of trees or shrubs, of any underground services or potential conflicts with infrastructure such as sidewalks or roads.

-Map irrigation systems, paths that will serve to manage growth and future needs.

5.2-Clear and clean the area

The site must be cleared of debris and unwanted vegetation to properly manage planting or transplanting, this operation must be carried out with care.

All weeds, grasses and other unwanted plants, rubbish, rocks and any construction material that could hinder the growth of plants or represent a danger must be removed.

5.2.1-Instructions for operators

-Use mechanical methods of weeding, avoiding chemical weeding (see appendix)

5.3- Soil preparation

Healthy soil is essential for the long-term success of urban green areas. Proper soil preparation involves improving the structure and fertility of the soil to support plant growth.

5.3.1-Tillage and aeration

Loosen the soil to improve root penetration and aeration; aeration of the soil ensures good oxygen flow and reduces soil compaction.

5.3.2-Soil amendment

Always add compost, organic matter or other soil amendments to improve soil fertility and water retention.

5.3.3-Leveling the soil

Make sure the area is flat to avoid drainage problems, with gentle slopes where necessary to avoid waterlogging.

5.3.4-Instructions for operators:

- Over-tillage should be avoided, as this can damage soil structure and lead to erosion.
- Use a soil test to determine the exact nutrients needed and apply fertilizers or amendments accordingly.
- Mulch the newly prepared soil to retain moisture and suppress weed growth so as to use as little chemical weed control as possible.

5.4-Irrigation system construction

Water is a key element in maintaining urban green areas and an efficient irrigation system ensures that plants receive adequate moisture without waste.

5.4.1-Irrigation system parts construction

Verify that the system, built as designed, covers all areas of the park or garden, considering the needs of different plant species.

5.4.2-Drip or sprinkler installation

Install drip irrigation systems for precise water delivery or sprinklers for large open areas, in a manner consistent with the design specifications and verify the correct functioning of each element.

5.4.3-Water source management

Ensure that water sources (such as mains water, rainwater harvesting or recycled water) are available.

5.4.4- Instructions for operators:

- Inspect irrigation equipment to avoid leaks, water waste or inconsistent water distribution.
- Pay attention to compliance with the water needs of plants or groups of plants.

5.5- Planting the plants

The actual planting phase involves placing trees, shrubs and ground covers in the designated spots; the use of appropriate techniques ensures the health and longevity of the plants.

5.5.1-Preparing the hole

It is necessary to dig holes larger than the root ball of the plant, thus allowing the roots to spread easily.

5.5.2-Planting trees and shrubs

Trees and shrubs should be positioned at the correct depth, ensuring that the root collar is level with the surface of the soil.

5.5.3-Spacing

Verify that the distance between the plants is as expected, and in any case adequate to allow for growth and prevent excessive density of adult plants.

5.5.4-Initial irrigation

Water abundantly after sowing or transplanting

5.5.5- Instructions for operators

-Sowing or transplanting should be done during the appropriate season to avoid stress from extreme temperatures.

-It is advisable to use stakes or supports for newly planted trees to help them stay upright during strong winds or heavy rains; in any case, it is advisable to use systems that do not provide for a non-elastic anchoring of the trunk to the supports.

-In any case, avoid using wired plants or plants that in normal conditions (without wind) are not able to support themselves: such plants would have problems in their life even with the use of tutors.

-The ties to the supports should be carried out taking care that the trunk never touches the support but is isolated by elastic ties.

-It is advisable to add mulch around the base of trees and shrubs to retain humidity and regulate the temperature of the soil.

5.6-Mulching and ground cover management

Mulching offers many benefits, including moisture retention, temperature regulation and weed suppression.

5.6.1-Mulch application

A layer of organic mulch (e.g. wood chips, bark or compost) should be applied around trees, shrubs and flower beds.

5.6.2-Ground cover planting

For large open areas, the ground is often covered with grass seeding or climbing plants at the design stage: this serves to reduce soil erosion

5.6.3-Instructions for operators

-Mulch should not be piled directly against tree trunks or plant stems, as this can cause rot and disease.

-Mulch should be refreshed annually to maintain its effectiveness.

5.7-Maintenance and Monitoring

Once the site has been prepared and planted, ongoing maintenance is essential to ensure the success of the landscaped area.

5.7.1-Regular Irrigation

Ensure that young plants receive adequate water, especially during periods of drought.

5.7.2-Weed Control

Weeds should be checked and removed regularly to prevent competition for nutrients and water.

5.7.3-Fertilization

Fertilizers should be applied as needed based on soil tests and plant growth stages.

5.7.4-Pest and Disease Control

Monitor for signs of pests or diseases and take appropriate measures (such as pruning, pest control treatments, or biological solutions).



5.7.5-Instructions for operators:

-A routine maintenance program should be rigorously established and implemented, including pruning, fertilizing, mowing and monitoring.

-Environmentally friendly and sustainable methods of pest and weed control should be used where possible.

-All maintenance personnel should be adequately trained.

6 Fertilization

Proper fertilization is essential to maintaining the health of plants, trees and lawns in urban green spaces because it provides the necessary nutrients that plants may not receive naturally from urban soils.

By following a well-structured fertilization plan, gardeners and maintenance workers can help ensure the long-term health and beauty of green spaces.

The first step in any fertilization plan is to test the soil: soil analysis identifies nutrient deficiencies, pH levels and overall soil health, helping to customize the fertilization approach.

Soil samples are collected from different areas of the site in an orderly manner and the sampling points are marked; sampling must be carried out at a depth that is neither excessive nor too superficial and the number of samples must be representative of any different situations and conditions of the soil.

The samples must be analyzed at specialized laboratories to verify the presence of nitrogen (N), phosphorus (P), potassium (K) and pH levels.

Plants, trees and urban lawns require specific nutrients at different times of the year.

Fertilization must be scheduled based on the growth cycles of the plants and the type of fertilizers used.

6.1- Key Stages

Spring: This is the most active growing season for most plants. Fertilizing in early spring provides the nutrients plants need for rapid growth.

Summer: Fertilizing during the summer focuses on maintaining plant health, especially during periods of heat stress.

Fall: Fall fertilizing helps prepare plants and lawns for winter by strengthening roots and storing energy for the dormant season.

Winter: In most cases, fertilizing is not necessary during the winter since plants are dormant. However, some trees and evergreens may require minimal nutrients.

6.2-Application of Fertilizer

6.2.1-Application Methods

Application methods vary depending on the type of plants, the size of the area, and the type of fertilizer used (organic or synthetic). Proper application ensures even distribution and avoids nutrient imbalances.

The main application methods are as follows

Broadcasting: Common for lawns and large planting areas, this method uses spreaders to evenly distribute granular fertilizers across the surface.

Spot feeding: Used for specific plants, trees or shrubs that require targeted nutrients. Fertilizers are applied directly to the root zone.

Foliar feeding: A liquid fertilizer is sprayed onto the leaves of plants, allowing nutrients to be absorbed through the foliage. This method is useful for quick nutrient correction.

Deep root feeding: Inject liquid fertilizers directly into the soil around trees and large shrubs to ensure nutrients reach the deepest roots.

6.3-Types of Fertilizers

6.3.1-Organic Fertilizers

Organic fertilizers are derived from natural sources such as compost, manure, and bone meal.

They improve soil structure, enhance microbial activity, and provide slow-release nutrients.

Compost: Adds organic matter, improves soil texture, and releases nutrients slowly.

Manure: Rich in nitrogen and other nutrients, although it should be well-aged to avoid burning plants.

Bone meal: Rich in phosphorus, bone meal is useful for root development and flowering.

Seaweed extract: Provides trace minerals and promotes overall plant health.

6.3.2-Synthetic (Chemical) Fertilizers

Synthetic fertilizers are chemically formulated to quickly deliver specific ratios of nutrients (N-P-K).

They are easy to apply and offer precise control over nutrient levels.

Granular Fertilizers: Available in slow- or fast-release formulas, these are commonly used for lawns and large planting areas.

Liquid Fertilizers: These are applied through irrigation systems or as foliar sprays for faster nutrient uptake.

Water-Soluble Fertilizers: Dissolve in water for quick plant uptake, ideal for container plants and foliar feeding.

6.3.3-Choosing Organic and Synthetic Fertilizers

The choice between organic and synthetic fertilizers depends on the specific needs of the site and the objectives of the project and is based on the following considerations

Environmental impact: Organic fertilizers are more environmentally friendly and sustainable, but synthetic fertilizers can provide immediate results.

Soil health: Organic fertilizers improve soil health in the long term, while synthetic fertilizers provide a short-term supply of nutrients but can degrade soil structure over time.

Cost and availability: Synthetic fertilizers tend to be more cost-effective in the short term and are widely available, while organic fertilizers are often more expensive but contribute to the ecosystem.

6.4-Using mulches to improve fertilization

Mulching can help improve the effectiveness of fertilizers by retaining soil moisture and preventing nutrient leaching.

Good practice is to apply a layer of mulch (2-3 inches) around trees, shrubs and flower beds after fertilizing, use organic mulch such as wood chips, straw or leaves, which also contribute nutrients as they decompose, keep mulch away from the base of tree trunks to avoid rot and disease.

6.5-Instructions for operators

-It is a good idea to perform soil tests every year to adjust fertilization methods as needed.

-It is advisable that the analyses are carried out at specialized and certified laboratories, possibly public facilities or alternatively facilities that demonstrate membership in organizations that operate according to rigorous rules; the use of a laboratory just because it is closer or by virtue of other considerations should be avoided. Often the results of the analyses are difficult to read or are even discordant if repeated at different laboratories. The reliability of the laboratory must be absolute.

-It is good to use slow-release fertilizers in spring and summer to provide constant nutrients, avoid fertilizing before heavy rains to avoid nutrient runoff, follow the specific growth cycles of plants in the urban area (annuals, perennials, trees).

-It is good to apply organic fertilizers in spring and autumn, when soil microorganisms are most active.

-It is best to avoid applying fertilizer on windy days to reduce drift and waste.

-The fertilizer spreaders must be well calibrated to ensure uniform coverage and avoid over-fertilization.

-It is good to water the area after fertilizing to help the nutrients penetrate the soil and reach the roots.

-Compost should be used in every possible situation, to enrich the soil and retain moisture in the flowerbeds.

-When using organic fertilizers, it should be kept in mind that they act more slowly because they take time to decompose, so you have to wait for the results within the expected times.



-When using synthetic fertilizers, you should carefully follow the instructions on the label to avoid over-fertilization, which can lead to nutrient runoff and environmental damage.

-When using synthetic fertilizers, it is best to use slow-release ones to reduce the need for frequent applications.

-Over-fertilization should be avoided because it can lead to nutrient runoff, which damages nearby water sources and damages plants. Too much fertilizer can also cause plants to grow excessively, making them more susceptible to disease and requiring more frequent maintenance; for this reason, it is necessary to follow the recommended doses.

-Fertilization should be adapted to the needs of the plants, because different plants have different nutritional requirements. (For example, flowering plants may need higher levels of phosphorus, while leafy plants benefit more from nitrogen)

-It is very important to fertilize according to the weather and seasons. The timing of fertilization is crucial, avoiding fertilizing in extreme weather conditions, such as heavy rain or intense heat, which can wash away or burn nutrients,

-It is good to remember when fertilization should or should not be done: never before a storm, good in the early morning or late afternoon, and use fertilizers sparingly in periods of drought and intense heat to avoid stressing the plants.

7-Irrigation

Effective irrigation is essential for the health and sustainability of plants, trees and lawns in urban green spaces.

Water management not only ensures the survival of plants, but also helps conserve water, a critical resource in many urban environments.

7.1-Irrigation system management

Irrigation system management must ensure that water is distributed efficiently throughout green spaces without wasting water.

This is why it is good to set up irrigation zones for different types of plants and areas, install pressure regulators to ensure uniform distribution of water across large areas, use rain sensors or humidity sensors to automatically adjust the system based on weather conditions, avoid overspraying hard surfaces such as paths or roads.

7.2 -Irrigation needs

Irrigation needs vary depending on the season, with plants requiring more water during the dry and hot months and less during the cooler and wetter periods.

Spring: As plants emerge from dormancy, gradually increase watering to encourage new growth.

Summer: Maintain regular watering, especially during heat waves, but avoid overwatering.

Fall: Reduce watering as plants prepare for dormancy; trees may require deep watering.

Winter: Minimize or stop watering for dormant plants and lawns.

7.3-System Monitoring and Maintenance

Regular monitoring and maintenance of the irrigation system should be performed to ensure efficient operation and prevent water waste due to leaks or system malfunctions.

7.4-Irrigation Methods

7.4.1-Drop irrigation

Drop irrigation delivers water directly to the base of plants through a system of pipes and emitters. This method minimizes water waste and provides precise irrigation for plants.

It is ideal for: flower beds, shrubs and trees, plants with deep roots or in areas with poor water retention.

Its advantages: it reduces water loss due to evaporation or runoff, limits weed growth by directing water only to the roots of plants, promotes deep root development with slow and constant irrigation.

7.4.2-Sprinkler irrigation

Sprinkler systems cover large areas, making them ideal for lawns and large green spaces. They simulate natural rainfall, spraying water evenly over the surface.

It is ideal for: lawns, ground cover and open green spaces, areas that require uniform distribution of water.

It has the following advantages: Provides wide coverage for large areas, is easy to set up with adjustable spray patterns and timers.

7.4.3-Hose irrigation (perforated hose etc)

Hoses release water slowly along their length, making them ideal for flower beds, trees and shrubs. They allow water to gradually penetrate the soil, reaching the roots efficiently.

It is ideal for: flower beds and shrubs, densely planted areas or along tree lines.

It has the following advantages: Allows for deep irrigation with minimal water loss through evaporation, is easy to install and reposition as needed.

7.4.4-Smart irrigation systems

Smart irrigation systems use sensors, weather data and timers to optimize water delivery based on real-time conditions.

These systems help reduce water waste and improve plant health by automatically adjusting water schedules.

It is ideal for: large urban parks or green areas with multiple types of plants, areas where water conservation is a priority.

It has the following advantages: it automatically adjusts based on weather conditions, preventing over-watering, reduces manual effort in monitoring and adjusting programs, can be controlled remotely via apps or smart devices.

7.5-Instructions for Operators

-It is a good idea to adjust the irrigation program based on seasonal weather changes (more frequent in summer, less in winter).

-If this is not present, apply mulch around trees and shrubs to retain soil moisture during dry periods.

-In cold climates in winter, protect the irrigation system to prevent freeze damage.

-Regular inspections of pipes, emitters, heads, nozzles, etc. should be performed to check for leaks, blockages and irregular distribution of water.

-It is necessary to clean the sprinkler heads, drip emitters and filters to maintain the efficiency of the system.

-Soil moisture should be tested regularly to ensure that plants are receiving adequate water.

-A routine should be set up to check the irrigation system at the beginning of each season and timers should be used whenever possible.

-In the case of drip irrigation: the drippers should be cleaned regularly to avoid clogging, and the emitters should be adjusted as the plants grow to ensure that the water reaches the entire root zone.

7.6-Good practices for carrying out irrigation of urban green areas

Watering in the early morning

Watering in the early morning (between 4 and 9 am) reduces evaporation loss and ensures that the plants have moisture during the hottest part of the day.

It also helps prevent disease by allowing the foliage to dry quickly.

Avoid watering in the evening

This reduces the risk of fungal infections and mold on the plants.

Deep watering encourages strong roots

Deep watering is achieved by allowing the water to penetrate at least 30-40 cm for plants and at least 15 cm for lawns.

Instead of frequent shallow watering, aim for deep watering, which encourages the plants to develop a strong root system.

This makes plants more resistant to drought and other stresses.

Use mulch to retain moisture

Mulch (a 3- to 3-inch layer around trees and away from the trunk) helps reduce evaporation, keeps the soil cool, and prevents weeds, which compete with plants for water.

Group plants by water needs

Grouping plants with similar water needs together allows for more efficient watering.

This is called "hydrozoning," and ensures that water is not wasted on plants that don't need it.

Adjust watering in wet or dry conditions

It's a good idea to adjust your watering schedule based on seasonal rainfall and temperature changes. During wet seasons, reduce watering to avoid waterlogging, and during droughts, increase deep watering for large trees and shrubs.

Use of rainwater collection systems

The use of tanks, cisterns, barrels to collect rainwater for irrigation during periods of drought is not only ethically correct but also economically and qualitatively convenient: rainwater is qualitatively superior to water from wells or pipes, and it costs nothing.

It is only necessary to direct the drainage of water from flat surfaces or roofs towards the collection tanks.

There are closed tanks on the market that do not allow evaporation of the collected water and make it available for the dry season; these tanks are flexible and available in different sizes.

Regularly maintain irrigation systems

Regular checks of the system are essential to prevent water waste due to leaks, blockages or broken components.

In particular, it is recommended to:

- Inspect irrigation systems at the beginning of each season for any damage.
- Clean filters, sprinkler heads and emitters regularly to ensure adequate water flow.
- Test system coverage to ensure even distribution in all areas.

8-Sustainable Pruning

Pruning is a key aspect of maintaining healthy and aesthetically pleasing urban green spaces.

Sustainable pruning practices focus on improving plant health, longevity and environmental resilience, while reducing resource waste. stress.

It is always recommended to use clean and sharp tools to make precise cuts and prevent disease entry.

8.1-Pruning Phases

8.1.1-Evaluation and Planning

Before starting any pruning, it is essential to evaluate the condition of the tree or shrub and determine the specific objectives of the pruning.

This phase ensures that the pruning is carried out with purpose and sustainability in mind.

8.1.1.2-Instructions for Operators

- The species of the plant, its growth habits, must be well identified.
- The reason for pruning must be clear (e.g. safety, health, aesthetics).
- Dead, diseased, or damaged branches that need to be removed should be identified.
- The time of year should be considered to ensure that pruning will not interfere with the growth or flowering cycles of the plant.
- Understand the natural growth pattern of the species before pruning and avoid unnecessary pruning that can stress the plant or lead to excessive regrowth.
- Pruning should be planned during the dormant season of the plant (late fall or winter for most species)

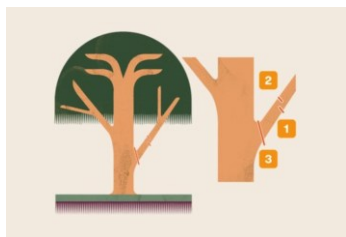
8.1.2-Execution Phase

During the execution phase, pruning cuts should be made precisely to avoid unnecessary damage to the plant.

Proper technique minimizes damage and promotes healthy growth.

8.1.2.1-Guidelines for Operators

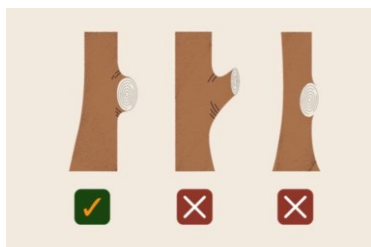
- Clean, sharp tools should be used to make precise cuts.
- Dead, dying, or diseased branches should be removed to improve plant health.
- Always be concerned with improving air circulation and light penetration.
- Avoid pinching or harsh pruning, which can lead to weak regrowth and stress to the plant.
- Be careful to make cuts just outside the branch collar (the swollen area where a branch meets the trunk) to encourage proper wound healing.
- Remember to use the "3-cut method" for large branches to avoid tearing the bark.



3-cut method, source: www.Fiskars.it

- Pruning no more than 25% of a tree's crown in a single session to avoid stressing the tree.
- Never leave stumps of cut branches

-Make the cut by moving downwards with a slight outward inclination: this will facilitate the disposal of rainwater and avoid excessive stagnation in the cutting area.



how to cut, source: www.Fiskars.it

8.1.3-Post-pruning phase

After pruning, plants may require additional care to ensure they recover properly.

This phase involves monitoring the health of the plant and ensuring that pruning cuts are healing well.

8.1.3.1-Instructions for operators

- Always monitor the plant for signs of stress or disease.
- Ensure that the plant receives adequate water and nutrients during its recovery.
- Ensure that there is mulch around the base of the tree or shrub to retain moisture and reduce competition from weeds: preferably apply organic mulch.
- Avoid using wound dressings or varnishes, as they can trap moisture and lead to decay.
- Regularly inspect the plant for pests or infections that may enter through pruning wounds.

8.1.4-Pruning Monitoring and Maintenance Phase

Sustainable pruning is not a one-time activity.

Regular monitoring of trees and shrubs ensures that they maintain their shape and health over time.

This phase involves periodic inspections and light corrective pruning as needed.

8.1.4.1-Instructions for Operators

- Schedule annual inspections to assess plant health and structural integrity.
- Perform light corrective pruning when necessary, such as removing dead or damaged branches.
- Adjust pruning techniques over time based on plant growth and environmental conditions.
- Prun strategically to promote strong branch structure, reducing the need for frequent pruning.
- Monitor trees for signs of storm damage or structural weakness that may require pruning.
- Work with the goal of training young trees to develop strong branch structure early.

8.2-Sustainable Pruning Methods

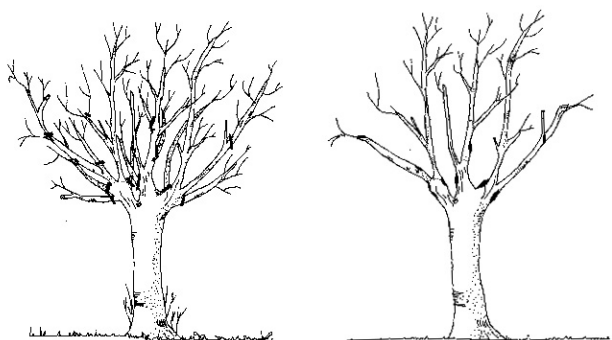
8.2.1-Canopy Thinning

Canopy thinning involves selectively removing branches from the canopy to improve light penetration and air circulation.

This method helps reduce wind resistance and promotes healthy growth while maintaining the tree's natural shape.

It is ideal for large, mature trees in public spaces, trees prone to storm damage or strong winds.

Its benefits: reduces the risk of broken branches during storms, improves the health of interior branches by increasing light and airflow, encourages balanced and healthy growth.



source: <https://treeclimbing.it>

8.2.1.1-Instructions for Operators

- When pruning, focus on removing smaller, weaker branches rather than large limbs.
- Excessive thinning should be avoided as it can stress the tree and lead to excessive regrowth.
- Ensure that the natural shape and structure of the tree is maintained.

8.2.2-Canopy Raising

Canopy raising removes the lower branches of a tree to provide space for pedestrians, vehicles or buildings.

This method is commonly used in urban environments where space is limited.

Ideal for: Street trees or trees in high-traffic urban areas, trees near sidewalks, paths or roads.

Benefits: Improves visibility and safety in public spaces, increases light penetration into understory plants or grasses, improves aesthetics by creating a well-balanced tree.

8.2.2.1-Instructions for Operators

- Gradually remove lower branches, avoiding removing too many at once, which can destabilize the tree.
- Retain at least two-thirds of the total height of the tree as a crown to ensure a strong structure.
- Remove only those branches that interfere with human activity or safety.

8.2.3-Canopy Reduction

Canopy reduction involves reducing the height and/or spread of a tree's crown.

It is used to reduce the size of a tree for safety reasons without resorting to the harmful practice of topping.

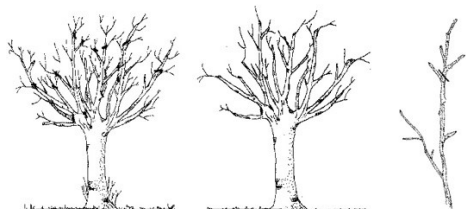
Ideal for: Trees that are too large for their location or near power lines, Trees with structural problems that require a reduction in size for safety.

Benefits: Reduces the overall size of a tree while preserving its natural shape, Maintains the health of the tree by allowing selective removal of branches rather than cutting off the entire top, Useful for trees with weak or declining limbs that pose a hazard.

8.2.3.1-Instructions for operators

- Make reduction cuts on lateral branches that are at least one-third the diameter of the limb to be removed.
- Avoid "topping" or making cuts that leave large, exposed sections of the trunk, as this weakens the tree.

-Canopy reduction should be done gradually, over several pruning cycles, to minimize stress to the tree.



source: <https://treeclimbing.it>

8.2.4-Selective Pruning

Selective pruning targets specific areas of the plant for corrective or health reasons: this may include removing diseased, dead or crossing branches to promote healthy, sustainable growth.

Ideal for: Ornamental shrubs and trees, plants with irregular or dense growth that need shaping.

Benefits: Reduces the spread of disease by removing infected parts, Improves air circulation and light availability to prevent fungal infections, Helps shape the plant for aesthetic purposes without stressing the entire tree or shrub.

8.2.4.1-Instructions for operators

- Always sterilize pruning tools between cuts to prevent the spread of disease.
- Use selective pruning as a means of encouraging natural, healthy growth patterns.
- Perform regular light pruning rather than waiting until heavy pruning is needed.

8.3- Intervention Methods: Best Practices

Pruning During Dormancy

Pruning during the dormant season of the plant (usually late fall to winter) helps reduce stress and promotes healthy regrowth in the spring; it also minimizes sap loss and exposure to pests and disease.

Prune most trees and shrubs in late fall or winter.

Avoid pruning during the growing season, especially when the tree is flowering or bearing fruit.

Use the Right Tools

The right tools ensure clean cuts, reducing the risk of damaging the plant or spreading disease.

Use sharp, clean tools for all pruning activities.

For large branches, use a pruning saw; for smaller branches, use bypass pruners or loppers.

Sterilize tools between cuts, especially when working with diseased plants.

Minimize heavy pruning

Heavy pruning places a lot of stress on plants and can lead to weak regrowth or long-term damage; light, corrective pruning is best to maintain plant health over time.

Remove no more than 25% of a tree's canopy at a time; if necessary, spread heavy pruning over several seasons.

Encourage natural growth patterns rather than forcing unnatural patterns.

Avoid topping

Topping, or cutting the top off a tree, is a damaging practice that weakens the tree and can lead to long-term health problems. Instead, use canopy reduction to manage the tree's height.

Use appropriate canopy reduction techniques to maintain the tree's shape and structure.

Promote healthy growth

Pruning should enhance the plant's natural growth pattern, not hinder it. By encouraging strong, healthy branch structures, plants are better able to resist disease and environmental stress.

Prune young trees to establish a strong branch structure early.

Remove crossing branches that may rub and cause damage over time.

Aim for an open canopy that allows light and air to penetrate.



Dispose of debris properly

After pruning, dispose of branches, leaves and other debris sustainably – this helps prevent the spread of disease and pests.

Compost healthy plant material to recycle nutrients into the soil.

Dispose of diseased or infested material by burning or removing it from the site to prevent contamination.

Chop and mulch small branches to use as organic mulch around trees and shrubs.

9-Plant Disease Interventions and Phases of Plant Disease Management

Plant disease interventions involve the management of plant diseases and pests to maintain the health and vitality of trees, shrubs, lawns and other plants in urban green spaces.

In public parks and green spaces, where many plant species are exposed to environmental stresses, diseases can spread rapidly if not managed properly.

By understanding common plant diseases, using sustainable interventions and applying preventive measures, operators and maintenance workers can preserve the aesthetic and ecological value of these spaces.

9.1-Evaluation and identification

The first step in any plant disease intervention is the diagnosis of the plant disease or pest. Early diagnosis and accurate identification are essential to implementing the right treatment strategy.

9.1.1-Instructions for operators

- Document symptoms and disease onset patterns to track potential outbreaks.
- If necessary, consult local plant health services or trained arborists for an accurate diagnosis.
- Monitor weather conditions, as diseases often spread more quickly under certain conditions (for example, warm, humid environments encourage fungal growth).
- Regularly inspect plants for disease symptoms such as leaf discoloration, wilting, abnormal growth, or pests.
- Identify common pathogens (fungi, bacteria, viruses) and pests (insects, mites) that affect urban plants.
- Use diagnostic tools, such as magnifying glasses or laboratory tests, to confirm the cause of symptoms.

9.2-Prevention of diseases

Prevention is the best strategy for managing plant diseases in urban green areas.

Reducing stress on plants, maintaining proper hygiene and improving biodiversity can significantly reduce the risk of epidemics.

9.2.1-Instructions for operators

-Ensure adequate spacing of plants to allow adequate air circulation, reducing the spread of airborne diseases.

-Select disease-resistant plant varieties suited to the local climate and environmental conditions.

-Implement crop rotation or plant species diversity to reduce pest and disease pressure.

-Apply organic mulch to improve soil health and prevent waterborne pathogens from splashing onto plants.

-Encourage the presence of beneficial insects such as ladybugs, which can control pest populations.

-Use clean tools and equipment to prevent the spread of pathogens between plants.

9.3-Disease Control Methods

In urban green areas, non-chemical or biological control methods are preferred as they minimize environmental impact and maintain ecological balance.

9.3.1-Non-chemical control

Cultural control: modifying growing conditions to make them less favorable to pests and diseases, such as adjusting irrigation schedules to avoid waterlogging or pruning infected branches to prevent the spread of disease.

Mechanical control: physically removing infected plants, leaves or pests to prevent the spread of disease.

Biological control: introducing natural predators, parasitoids or pathogens that specifically target harmful pests, such as using nematodes to control soil-borne pests.

9.3.1.1-Instructions for operators

-Use compost and organic matter to improve soil health and make plants more resistant to pathogens.

- Use trap plants or barriers to keep pests away from valuable plants.

-Rotate mulch and plant debris regularly to interrupt pest life cycles.

9.3.2-Chemical control (when necessary)

Although non-chemical methods are preferred, there are times when chemical interventions are needed to control serious disease outbreaks.

These should be applied carefully and sustainably to minimize harm to the environment and non-target species.

9.3.2.1-Instructions for operators

-Use targeted pesticides or fungicides only when necessary, following local pesticide use regulations.

-Opt for environmentally friendly or organic products when possible, such as neem oil or insecticidal soaps.

- Apply chemicals at the right time and in the correct doses to maximize effectiveness and reduce the risk of resistance.
- Always follow the manufacturer's instructions when applying pesticides or fungicides to ensure safe and effective use.
- Apply treatments early in the morning or late in the evening to avoid harming pollinators such as bees.
- Rotate chemical classes to prevent pests or pathogens from developing resistance to treatments.

9.4-Post-treatment monitoring and maintenance

After treatment, ongoing monitoring and maintenance are essential to ensure that the treatment is effective and that new outbreaks do not occur.

9.4.1-Instructions for operators

- Continuously monitor treated plants to assess the effectiveness of the treatment and check for signs of disease recurrence.
- Perform follow-up treatments as necessary, but avoid over-application of chemicals.
- Keep a detailed record of treatments, including the type of disease or pest, treatments applied and results observed.
- Check irrigation and soil conditions, as improper irrigation is a common cause of disease recurrence.
- Promote plant health through proper nutrition, mulching and pruning to improve resistance against future infections.
- Share best practices and observations with other gardeners or operators to promote a collective approach to disease management.

9.5-Common Plant Diseases in Urban Green Areas

9.5.1-Fungal Diseases

Fungal pathogens are among the most common plant diseases in urban green areas, thriving in humid environments.

Examples:

Powdery Mildew: White, powdery spots on leaves and stems, common in trees and shrubs.

Leaf Spot: Dark, circular spots on leaves caused by various fungal species.

Rust: Orange or rust-colored spots on leaves, especially affecting ornamental plants.

Prevention and Treatment:

- Promote good air circulation by pruning and spacing plants appropriately.
- Water plants at the base to avoid wetting the foliage, which encourages fungal growth.
- If necessary, use organic fungicides such as copper treatments or sulfur sprays.

9.5.2-Bacterial Diseases

Bacterial diseases are often spread through infected water, soil, or tools, causing symptoms such as wilting or rotting.

Examples:

Bacterial leaf scorch: Browning of the edges of leaves, often seen in trees such as oaks and maples.

Fire blight: Affects fruit trees and shrubs, causing blackened leaves and wilting.

Prevention and treatment:

- Avoid overhead watering and prune infected branches during dry conditions to reduce spread.
- Disinfect pruning tools between cuts with alcohol or a bleach solution to prevent contamination.
- Remove and dispose of infected plant material properly.



9.5.3-Viral Diseases

Viral infections in plants can cause stunted growth, mottled leaves, or unusual coloration. They are typically spread by insect vectors such as aphids or leafhoppers.

Examples:

Mosaic virus: causes mottling and discoloration of leaves.

Tomato spotted wilt virus: affects both ornamentals and vegetables, leading to deformed leaves and fruit.

Prevention and treatment:

-Control populations of insects that spread viruses using biological or chemical methods.

-Remove and destroy infected plants, as there is often no cure for viral diseases.

-Use virus-resistant plant varieties when available.

9.6-Integrated Pest Management (IPM) Strategies

Integrated pest management (IPM) is a holistic approach to managing plant health that combines multiple control methods while minimizing environmental impact.

It involves careful monitoring, using non-chemical methods first and using chemicals only when absolutely necessary.

9.6.1-Monitoring and identification

-Regularly scout urban green spaces for early signs of disease or pest infestation.

-Precisely identify the pest or pathogen to ensure the correct treatment is applied.

9.6.2-Prevention

-Maintain plant health through proper soil management, irrigation and nutrition.

-Use disease-resistant plant varieties and diversify plant species to reduce susceptibility.

9.6.2.1-Control strategies

Cultural controls: Altering environmental factors such as soil health, plant selection and spacing.

Mechanical controls: Hand picking of pests or physical removal of diseased plant parts.

Biological controls: Introducing natural enemies such as ladybirds, predatory mites or parasitic wasps to reduce pest populations.

Chemical controls: When non-chemical methods are insufficient, use targeted pesticides or fungicides with minimal environmental impact.

9.7-Good practices for phytopathological interventions

Prioritize plant health

Strong, healthy plants are more resistant to diseases and pests; fertilization, irrigation, and proper soil management help plants build resilience.

Use organic fertilizers to improve soil quality and plant health.

Water deeply but infrequently to promote deep root growth and prevent water-borne diseases.

Promote biodiversity

A diverse plant ecosystem reduces the risk of disease spread by limiting the host plants available to pathogens and pests.

Plant varieties and species with different growth habits and resistance levels.

Promote the presence of beneficial insects that help control pest populations.

Use chemical treatments responsibly

When chemical interventions are necessary, choose environmentally friendly products and apply them judiciously to avoid damage to beneficial organisms and the surrounding ecosystem.

Apply treatments during periods of low pollinator activity (early morning or late evening).

Follow all safety guidelines and use the lowest effective dose.

Keep equipment clean

Pathogens and parasites can easily spread through contaminated tools and equipment.

Make sure tools are cleaned and sterilized between tasks.

Always use a disinfectant solution on pruning shears, shovels, and other equipment between uses.

Store tools in a clean, dry place to avoid contamination.

10-Safety at work

Gardeners and in general operators responsible for the management and maintenance of urban green spaces are exposed to a variety of potential dangers during the performance of their work.

To ensure their safety and well-being, various laws and regulations are in force to minimize risks.

In each work site it is mandatory to have a Safety Plan and the requirements in that Plan must be complied with in work activities.

The Safety Plan is drawn up on the basis of the specific risks present and what is set out below cannot replace the indications and requirements of the Plan: the guidelines listed below are only a general information framework

In the appendix are some reference documents drawn up by INAIL and useful for the safety at work of operators.

10.1-Risks

The risks at work depend on the operations being carried out, the machinery used and the context in which the activity is carried out.

In general, the main risks for the green operator consist of:

- Possibility of broken limbs, head trauma, spinal trauma, paralysis and death due to falls from a height
- Fractures and trauma following objects falling from a height
- Wounds and cuts caused by portable equipment
- Sunstrokes from exposure to high temperatures
- Frozen from exposure to low temperatures
- Burns from contact with hot parts of machines or from contact with a corrosive agent
- Severing of fingers, hands, etc.
- Involvement by moving mechanical means
- Involvement in rotating parts of machines
- Back injuries or trauma due to manual handling loads
- Crushing by moving mechanical means or parts
- Damage to the skin or eyes due to prolonged exposure to the sun



All the risks listed are foreseen in the risk assessment document that must be drawn up and available before carrying out the work, whether the work is carried out by the owner's staff or if it is carried out by external companies.

If some work is carried out by external companies, in addition to the site risk assessment document, the risk assessment document must be drawn up by the company awarded the contract for its employees.

In most countries, workplace safety in urban green areas is regulated by occupational health and safety laws, such as the Occupational Safety and Health Act (OSHA) in the United States or similar laws in other regions.

These regulations establish the general duties of employers to provide a safe working environment.

10.2-Duties of the employer:

- Provide safe equipment and tools.
- Train employees on safe practices and emergency procedures.
- Identify and assess risks and take preventative measures.
- Ensure the availability of first aid and emergency medical care.
- Conduct regular safety inspections and audits.

10.3-Duties of employees:

- Follow safety instructions and wear personal protective equipment (PPE).
- Report dangerous conditions or accidents.
- Attend training sessions on safety and use of equipment.

10.4-Personal protective equipment (PPE)

It is necessary and mandatory for green workers to be equipped with PPE (Personal Protective Equipment): it is the employer's responsibility to provide the protective equipment required by law and also to provide them with correct information on its use.

To purchase PPE, you need to rely on specialized companies and not on general or occasional retailers: you should not use these devices only as a formal act, you need to equip yourself with devices that can really protect the health of the worker.

Relying on a specialized retailer is important to purchase high-quality, resistant, robust and long-lasting material.

It is also easy to check the best brands producing PPE online and then ask the retailers for that product or demand it when awarding a contract

The use of PPE is a fundamental requirement for workers who deal with gardening.

Employers must provide and guarantee the correct use of the following PPE based on the tasks and associated risks:

Head protection: helmets or hard hats are necessary when working in areas at risk of falling objects (e.g. tree pruning).

Eye and face protection: Safety glasses, face shields or visors should be used when cutting, trimming or using chemicals to protect against debris, dust and hazardous substances.

Hand protection: Appropriate gloves for the task (cut-resistant, chemical-resistant or heat-resistant gloves) should be worn to protect the hands from cuts, punctures and chemicals.

Foot protection: Steel-toed shoes with non-slip soles are recommended to protect against sharp objects and slipping.

They should be water-repellent to ensure the operator has maximum moisture resistance and very high climate insulation, which keeps away the cold of the ground. In winter, and especially when it rains frequently, it is preferable to choose practical and comfortable boots.

Body and limb protection: Trousers and overalls should be comfortable and functional, possibly with practical and convenient side pockets to hold frequently used objects such as scissors, shears and more.

Pockets are a great ally for always having everything you need at hand, without the need for bulky bags or backpacks.

Overalls with dungarees are a valid alternative to trousers.

You need to pay attention to the quality of the material, which must be durable and resistant to tears and wear.

It is advisable to always use cut-resistant trousers and overalls, and in any case cut-resistant trousers are mandatory when the operator carries out activities with cutting objects or chainsaws and similar.

Hearing protection: earplugs or headphones must be used when using noisy machinery, such as lawnmowers, chainsaws or leaf blowers.

Respiratory protection: masks or respirators are necessary when working in areas with dust, pollen, spores or when handling chemical substances such as pesticides or herbicides.

If you carry out work where there are risks to the respiratory tract, it is necessary to delimit the affected area to ensure that it is accessible only to workers equipped with adequate personal protective equipment.

Those who must carry out work in the risk area can wear specific protections such as masks and respirators equipped with appropriate filters.

The personal protective equipment can concern only the respiratory tract and can therefore be useful only to protect the mouth and nose, or it can also include protection for the eyes and face, such as face masks.

It can be designed to protect against dust, gases or both.

The personal protective equipment must be used according to the instructions for use, so as not to compromise its functioning and therefore also its protective function.

10.5-Equipment safety and maintenance

10.5.1-Machinery and tool safety

Employers must ensure that all machinery (e.g. chainsaws, hedge trimmers, lawnmowers) is in good working order and regularly inspected.

Workers must be trained in the correct operation, cleaning and maintenance of machinery.

Guards, shields and safety features on machinery must be in place and in working order.

Equipment must be switched off and unplugged before carrying out maintenance or adjustments.

10.5.2-Chemical safety

For those using pesticides, herbicides or fertilisers, compliance with hazardous substances regulations is essential

Workers must be trained in how to handle chemicals safely, including how to read safety data sheets (SDS) and use protective equipment.

Chemicals must be stored in labelled containers, away from food, water sources and flammable materials.

Follow safe pesticide application practices, including wind direction, dilution, and avoiding application near public areas.

10.6-Ergonomics and Manual Handling

Manual handling regulations: Many landscaping tasks involve heavy lifting or repetitive movements that can cause strains and injuries.

Workers should be taught proper lifting techniques (for example, lifting with the legs, not the back).

Equipment such as wheelbarrows, carts, or lifting aids should be used to transport heavy objects, such as bags of soil, plants, or equipment.

Workers should take breaks to prevent fatigue and overexertion, especially during hot weather or repetitive tasks such as pruning or mowing.

10.7-Hazardous working conditions

10.7.1-Working at heights

Landscaping workers often need to work at heights to trim trees or maintain elevated landscapes.

Ladders or properly secured raised platforms should be used.

The use of fall protection devices such as harnesses or guardrails must be ensured when working at significant heights; harnesses must be individual and of an appropriate size.

Working at heights in adverse weather conditions (rain, wind, etc.) must be avoided.

10.7.2-Working near roads or public areas

Workers maintaining road parks or urban green spaces near traffic must take additional precautions; high-visibility clothing must be worn at all times.

Barriers or cones must be used to establish safe work zones.

Signage must be used to alert the public to work in progress.

10.7.3-Excessively hot conditions

Since much of the work is done outdoors, workers are at risk of heat-related illnesses.

Employers must provide access to drinking water, shaded rest areas and allow frequent breaks during hot weather.

Workers should be trained to recognize the signs of heat exhaustion or heat stroke and know how to respond to these emergencies.

Flexible work schedules should be considered during peak heat hours, allowing workers to start their day earlier to avoid the midday heat.

10.7.4-Cold and wet conditions

During colder seasons, employers should ensure that workers have access to warm clothing, gloves and appropriate equipment to stay dry in wet conditions.

Regular warm-up breaks are essential to prevent hypothermia or frostbite.

10.7.5-Noise and vibration exposure conditions

Regular exposure to noisy machinery can cause hearing loss.

Employers should monitor noise levels and, if necessary, provide hearing protection if noise levels exceed regulatory limits.

Task rotation or time spent using noisy machinery should be limited to reduce the risk of hearing damage.

Frequent use of vibrating tools such as hedge trimmers can lead to hand-arm vibration syndrome (HAVS), so exposure to vibration should be limited by rotating tasks and using anti-vibration gloves or tools designed to reduce vibration.

10.8-Biological and chemical risks for the green operator

In addition to the dangers just listed, the risk to the respiratory tract should not be underestimated, especially that connected to the spread of dust.

This is the biological risk for gardeners, which can be caused by the use of poisons, herbicides or even by a simple activity such as gathering foliage, which can raise a quantity of dust that is risky for the respiratory tract.

The biological risk for green maintenance is frequent and also concerns the pruning and felling of tall trees, an operation that can cause serious or even fatal injuries.

Before carrying out these jobs, each company must have made an accurate assessment of the specific risks of the gardener, as required by Legislative Decree 81/2008.

Carrying out activities for preparing the ground, such as milling and harrowing, or cutting bushes and shrubs, generates dust that can be inhaled by the operator.

However, dust is not the only source of risk for the respiratory tract: inhaling products necessary for plants can also be dangerous for human health.

The chemical risk of the gardener is therefore always lurking.

Let's think for example of the spreading of fertilizers, fertilisers, insecticides and other products aimed at protecting the health of plants.

These products can be inhaled if the necessary precautions are not taken.

10.9-Emergency procedures

10.9.1-First aid

each team must have access to a first aid kit and workers must be trained in basic first aid.

Emergency contact information should be readily available and workers should know how to report an incident.



Workers operating alone should have communication devices in case of emergency.

Protocols must be established to deal with chemical spills, including evacuation procedures and containment measures.

10.10-Training and Awareness

Regular safety training: Workers should undergo regular training sessions to stay up to date on safe work practices, changes in legislation, or the introduction of new equipment or chemicals.

Accident reporting: Workers should be encouraged to report near misses or unsafe conditions without fear of retaliation. This can help identify and address hazards before they cause injury.



11-Conclusions

These guidelines serve as a comprehensive framework for the maintenance of urban green areas and parks within the countries participating in the VIRIDIS LOCI project.

By adhering to these principles, maintenance operators can contribute to the creation of sustainable, healthy and accessible green spaces that improve the quality of urban life.

The Guidelines are integrated, in the APPENDIX, by documents and links to sites of interest for green operators.

12-Appendix

12.1-INAIL (IT) : INSTRUCTIONS FOR SAFELY CARRYING OUT WORK ON TREES WITH ROPES

<https://www.inail.it/portale/prevenzione-e-sicurezza/it/come-fare-per/migliorare-la-salute-e-la-sicurezza/linee-guida/linea-guida.2016.07.istruzioni-esecuzione-in-sicurezza-di-lavori-su-alberi-con-funi.html>

An ad hoc working group set up at Inail has developed specific instructions with the aim of illustrating the safety measures for carrying out work on trees in the case of access and positioning using ropes, and of providing information for the oriented choice of personal protective equipment and work equipment.

Work on trees can expose operators to particularly serious risks for their health and safety. In particular, reference is made to the risk of falling from a height which unfortunately causes a significant number of accidents every year with often fatal consequences.

The phenomenon in all its gravity emerged from the study carried out by the Observatory on fatal and serious accidents in the agricultural and forestry sector, managed by the research sector of Inail which, in carrying out the related activities useful for detecting and processing the information regarding the accidents that occurred to all workers in the sector of interest - including those for whom Inail insurance coverage is not available - makes use of the reports of the Territorial Surveillance Bodies (Ausl), as well as the consultation of the main media (newspapers and press agencies).

Therefore, the Observatory data, although not exhaustive of the accident phenomenon in agriculture - as the data collection method does not derive from mandatory reporting - can provide a general overview of accidents that occurred even outside the main work activity.

In particular, the extracted data relating to work on trees showed that in 2015, 38 accident events caused by falls from trees were recorded, of which 11 had fatal consequences. It is clear that many of these accidents involved inexperienced subjects and while they were carrying out fruit harvesting or tree pruning operations in clear non-compliance with the provisions set out in Chapter II of the Title of Italian Legislative Decree 81/2008.

Therefore, the need arises to conduct in-depth analyses of the phenomenon to fully define the set of elements that contribute to correct risk management, obviously

keeping in mind the clear distinction between what is reasonably foreseeable incorrect use and the real risk situations that arise in work at height on trees. In fact, there are some problems that are difficult to resolve if risk management is independent of the operational conditions in which the work is carried out. It is necessary to carefully consider the typical constraints of tree work that intervene by significantly altering the working conditions and generating risk situations for the safety and health of operators that cannot always be standardized and traced back to those, for example, of work at height in the construction sector. The detailed analysis of the typical operational variables of tree work is an essential element for the correct management of risk, the identification and use of the necessary safety and protection devices, as well as the development of behavioral procedures.

Given the problem, an ad hoc working group set up at Inail has developed specific instructions with the aim of illustrating the safety measures for carrying out tree work in the case of access and positioning using ropes, and of providing information for the oriented choice of personal protective equipment and work equipment.

The working group was attended by the Ministry of Labor and Social Policies, the Ministry of Agricultural, Food and Forestry Policies, the technical coordination of the Regions, representatives of the main employers' and trade unions' associations in the sector, experts from the academic world and training institutions.

These instructions, whose application is voluntary, do not replace the provisions of the aforementioned Chapter II of the Title of Legislative Decree 81/2008, representing a useful guideline for the obliged entities.

12.2-Alternatives for sustainable weed control- AIAB - Biodistrict of Valle Camonica

12.3-SAFETY ENVIRONMENT HEALTH AGRICULTURE: GUIDELINES FOR SUSTAINABLE USE OF PHYTOSANITARY PRODUCTS

(R. Bassi, A. Bernard, F. Berta (Syngenta Crop Protection S.p.A.) - M. Calliera (Università Cattolica del Sacro Cuore, Istituto di Chimica Agraria ed Ambientale),



E. Capri (Università Cattolica del Sacro Cuore, Centro di Ricerca sull'agricoltura sostenibile OPERA) - T. Galassi, F. Mazzini, R. Rossi (Regione Emilia-Romagna, Servizio Fitosanitario) - P. Meriggi (Horta s.r.l. spin-off dell'Università Cattolica del Sacro Cuore)

12.4-SUSTAINABLE WEEDING IN URBAN AREAS “Guidelines for the correct management of weeds in cities”

12.5-SUSTAINABLE MANAGEMENT OF URBAN WATER. URBAN DRAINAGE MANUAL. Gibelli G., Gelmini A., Pagnoni E., Natalucci F., 2015- Regione Lombardia - Ersaf, Milan