

Best Practices Manual

Sustainable hotel gardens in Cyprus: Reducing water usage for landscaping and gardens



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1. Introduction

This guide has been commissioned by the Travel Foundation and the Cyprus Sustainable Tourism Initiative (CSTI). The project has been funded by money donated to the Travel Foundation by The Co-operative Travel's customers.

The project has been executed by **mSolutions** www.msolutions.gr, a company focused on the promotion and application of sustainability in all economic sectors but primarily in touristic units, through a myriad of projects ranging from Water Management, Energy Management, Waste Management, Beach Management to Fair Employee Relations.

The issue of water management is crucial for Cyprus and during recent years there have been major campaigns to promote water saving. The gardens of hotels in Cyprus make up a fundamental part of their facilities. It is apparent from an analysis of Cypriot building legislation and from the hotel regulations¹ set by the state that the aim is to ensure that gardens constitute an important part of a hotel's architecture.

The aim of the law makers when designing the regulations was to improve the aesthetic beauty of hotels but also to increase the foliage on the island as Cyprus being a touristic summer destination should combine, sun, beach and greenery along with exceptional services and relaxation.

Throughout August 2011, we conducted a survey on the level of satisfaction hotel managers had concerning the maintenance of their hotel gardens. The feedback we received was that it was clear that there was room for significant improvement, but that limited budgets allowed for little or no progress. The majority of the hotels had their own team of gardeners but very few collaborated with professional landscapers.

¹ The Hotels and Tourist Establishments (Complex of Tourist Villas) Regulations, 1993, and, The Hotels and tourist Establishments (General) Regulations, 1985 to 2002



From audits held in a number of 3 and 4 star hotels in Cyprus we concluded the following:

- Gardens are an important asset to hotels but there are numerous financial limitations.
- Gardens do not have a specific budgets and analytical costing of their maintenance is not carried out.
- In the majority of cases there are no records of actual planting and irrigation.
- In almost all cases separate water consumption meter readings are not made and consumptions are therefore not known.
- In very few cases the income that can be generated from renting out garden space for weddings, parties and other events has been calculated.
- The planning of maintenance and aesthetic improvements is not carried out based on a specific program.

After having approached the problem of garden maintenance in Cyprus and having conducted garden audits, it is clear that there is an urgent need for the introduction of a new philosophy and way of thinking when designing, creating and maintaining hotel gardens, the benefits of which are multiple, practical, environmental and financial. The sustainable management of gardens entails high aesthetic appeal, low maintenance costs, up to date management techniques and the use of indigenous plants and vegetation that require minimal irrigation.

Economic Benefits:

- Decrease in water costs through water conservation.
- Decrease in maintenance costs through organization.
- Increased revenues from the use of improved gardens for social functions.
- Increase in customer satisfaction.
- Decrease in the cost of planting new vegetation as the use of exotic plants is restricted.

Practical Benefits:

- Good maintenance practices that facilitate upkeep.



- Limited use of grass and creation of small gardens that generate many maintenance problems
- Better function of water supply network due to requirement limitations

Environmental Benefits:

- Water conservation
- Moderation of water use during period periods
- Preservation of underground water table levels
- Support of local plants and enhancement of biodiversity

Water management in gardens depends on many factors which are presented in brief within this report. The aim of this manual is to increase awareness of the need for good water management in hotels, particularly in garden areas, and demonstrate the methods that should be implemented in order to save water and protect the environment.

It forms part of a project whose goals are to save money and more importantly precious drinking water in order to make hotels on Cyprus more environmentally sustainable.

It is intended for employees whose main role is managing and maintaining a hotel irrigation system for optimum performance and should therefore be provided with full information about best practices. These practices not only work to conserve and protect water resources but also protect the owners' interests in a variety of ways.

Through good design and good irrigation the waste of water can be minimized, leading not only to financial savings but enhancing the hotel's image in the eyes of an increasingly eco-aware clientele and contribute to preserving the island's landscape.

A 'best practice' tool for hotel gardens' water management has been developed to help hotel gardening staffs reduce water consumption in the areas they manage. The software is designed using Microsoft Excel and can be easily and simply implemented.



2. Hotel Gardens in Cyprus

In Cyprus, hotel gardens are an important aspect of the tourist industry. With a climate that supports outdoor activities for many months, most of the island's hotels have large areas dedicated as gardens, which host activities for both residents and visitors.

All types of touristic accommodation in Cyprus, from small residential units to the biggest and most luxurious hotels have organized outdoor activities - varying, of course, according to the size of the unit, the area where it is located and its position in relation to the nearest beach.

In spite the fact that Cyprus is very rich in flowering plants, hotels currently use only a small proportion of them and these do not include endemics. The types and colours used are limited and the final product is not representative of the rich plant variety Cyprus has to offer. Apart from that, maintenance procedures do not follow best practice techniques and these results in high water consumption and maintenance costs. Finally, it is important to mention that most of the hotels do not keep planting records or have any specific action plan regarding the maintenance and design of their gardens.



Table 1: SWOT analysis of hotel gardens in Cyprus

Strengths <ul style="list-style-type: none"> - Extensive gardens - Hotel networks can be connected to SABA, the recycled water supplier 	Weaknesses <ul style="list-style-type: none"> - Low maintenance level and poor management, including watering at unsuitable hours and employing unskilled staff - Limited range of plants, particularly those endemic to Cyprus - Lack of originality. Gardens are designed to a set pattern all over the island
Opportunities <ul style="list-style-type: none"> - Facilities offered to tourists can be upgraded by improving gardens - The aesthetic appearance of the hotels will be improved - Achieving higher rates for executive-style rooms with individual gardens - Providing a showcase for endemic flowering species - Reducing water requirements by planting suitable species and employing the most efficient techniques - Giving the gardens an educational element by placing explanatory labels near each species of plant - Promoting the concept of sustainability 	Threats <ul style="list-style-type: none"> - Visitors have grown accustomed to the present type of garden and may object to possible changes (e.g., olive trees in place of palm trees) - Maintaining the gardens will be beyond the capacities of unskilled staff



The best practices proposed aim to lower water consumption yet improve gardens' appearance by implementing sustainability, while at the same time helping tourism. Using the United Nations Brundtland Report's definition of sustainable development as a model, The American Sustainable Sites Initiative defines sustainability in gardens as:

... design, construction, operations and maintenance practices that meet the needs of the present without compromising the ability of future generations to meet their own needs

by attempting to:

...protect, restore and enhance the ability of landscapes to provide ecosystem services that benefit humans and other organisms.

Some general techniques used in sustainable garden planning and operation try, amongst other aims, to achieve the following:

- Reducing consumption of imported or ground water.
- Making more water available for other domestic and community uses and the environment.
- Lowering the time and effort required for maintenance, making gardening simpler and less stressful.
- Reducing lawn mowing
- Optimum retention of rainfall through appropriate xeriscape planting design, soil grading and mulching.

It should also be noted that when water restrictions are imposed either by the municipality or considerations of sheer cost, xeriscape plants will tend to survive and thrive, while more ornamental plants may be unable to adapt.



3. Hotel garden typology

Inspection of the hotel gardens showed that they fall into a number of types, depending on the way a particular garden is used by hotel staff and residents. These typologies will be used as a tool to develop best practice methods for each garden, in a way that benefits the hotel financially and at the same time reduces the consumption of irrigation water.

Redesigning the gardens in hotels will have water-saving as its first priority but should still serve the operational needs for which each type of garden was designed. In this way we can in each case achieve a garden that is both sustainable and a more valuable asset to the hotel.

I. Passive recreation garden

Gardens of this type are areas reserved for passive recreation such as relaxing, sunbathing, and enjoying the warm summer in the hotel complex. They are the areas next to the pools and near the bars, furnished with sun beds, umbrellas and small tables and used for many hours each day.

These passive recreation areas make up a large percentage of the total size of the hotel garden. They are usually artificially shaded in part, with the rest exposed to the sun. They have a low biodiversity and mainly consist of lawn.



Photograph 1: Passive recreation garden showing signs of water stress



In most cases these passive recreation gardens are hard to maintain as they are in constant use throughout the tourist season and maintenance is prevented due to the scattered garden furniture which is often fixed to the ground and never moved, making it impossible for the lawn around the furniture to regenerate itself.



II. Active recreation garden

The active recreation garden is an area designated to host sports, games and outdoor activities. Due to this fact and for ergonomic reasons most of the area of these gardens is only covered with lawn. This means that the biodiversity in this part of the hotel is also very low.

Photograph 2: Grass in active recreation garden showing signs of water stress



Such gardens usually have rows of bushes or substantial plants around their borders to give a measure of privacy and in order to separate them from the passive recreation areas as well as other parts of the hotel gardens. As in the previous type of garden, maintaining the lawn has a high water irrigation cost and uses a lot of energy.



III. Beachfront garden

‘Beachfront gardens’ are commonly only used during the day for swimming and sunbathing and are usually deserted after sundown.

Photograph 3: Typical beachfront garden



What can also be seen in these seaside areas are slopes (sometimes quite steep) which have little to no use and in most cases are left unplanted. Often solid waste from the sea is washed onto these areas, making them look unsightly and neglected, particularly after the storms of the winter months. Unfortunately, all beaches in Cyprus fall under the jurisdiction of the local authorities, making any effective intervention such as protective barriers virtually impossible because of legal complications.



IV. Event garden

Event gardens are the parts of the hotel gardens that are used for hosting social functions. They are often very large areas, set somewhat apart from the hotel main buildings and commonly used for weddings, engagements, galas and other similar events involving large numbers of guests.

Photograph 4: Typical event garden



Event gardens are often regarded by the hotels as a significant asset because event tourism has become very popular. Weddings, in particular, bring in a large number of guests to the hotel and Cyprus in general.

Event gardens typically consist of lawn areas and scattered flowerbeds. It is important for them to look as attractive as possible as the events they host are invariably photographed or filmed, however their design often means that they are difficult to maintain, partly due to their design requiring large amounts of irrigation water.



V. Demonstration garden

Demonstration gardens are planted parts of the garden that are constructed for display purposes. They are usually near the entrances of hotels, next to footpaths and internal road networks or near the swimming pools and bars.

Photograph 5: Typical demonstration garden



Even though these parts of the garden play a demonstrable role they often lack biodiversity. The plants currently used are usually sub-tropical, with an emphasis on palm trees. They tend to be sited on small plots which are difficult to reach by guests and often hard to maintain.



VI. Children's garden

Children's gardens are typically located adjacent to the hotel's indoor day-care centre where parents can drop off their children for an hour or two. They usually consist of lawn and a few trees, sandy areas and play equipment,

They are necessarily functional, but could easily be made into something more visually appealing; yet not detract from the children's enjoyment.

Photograph 6: Typical children's garden



These lawns in these gardens are generally underused because the play equipment is the draw for the children. Lawns require substantial amounts of water to maintain them so there is an opportunity to save water in these gardens and provide additional stimulation for the children.



Photograph 7: Hotel playground example



If it is redesigned as an educational garden (which is a small but valuable investment) children can learn about plants, and particularly the native plants of the Mediterranean, in a way that an imaginative designer could make fascinating for young people, thus helping to develop their interest in nature and their awareness of the environment. Planting the children's garden in this ecologically rational way will also mean water expenses can be reduced drastically and the hotel's family-friendly nature emphasized at the same time.



VII. Private garden

‘Private Gardens’ are gardens attached to the executive rooms of the hotels so that guests in exclusive accommodation can enjoy their own small private space right outside their rooms. They are mainly used for passive recreation such as sunbathing and relaxing and thus possess some furniture for these purposes.

Photograph 8: Typical private garden



These isolated patches of garden typically have a small area of lawn in them and are given some measure of privacy by hedges but again are very challenging to maintain as they are not connected to the main irrigation system. However, the value of these assets to the guests could be enhanced if an attractive designed is used will enable the hotel to charge higher rates for executive rooms and suites. A well designed private garden will not only be attractive but also require less maintenance effort.



VIII. Parking lots

Even though parking lots are not often considered to be gardens in their own right, gardens they often have a variety of plants for shade and overall visual attractiveness.

Photograph 9: Typical hotel car park



Parking lots are usually located on the same side as the entrance to the hotel and thus seen by many people who walk, or drive, past, therefore the parking lot is the first impression guests get of the hotel, and it should aim to look as attractive as possible, whilst still maintaining its functionality.



4. Best practices

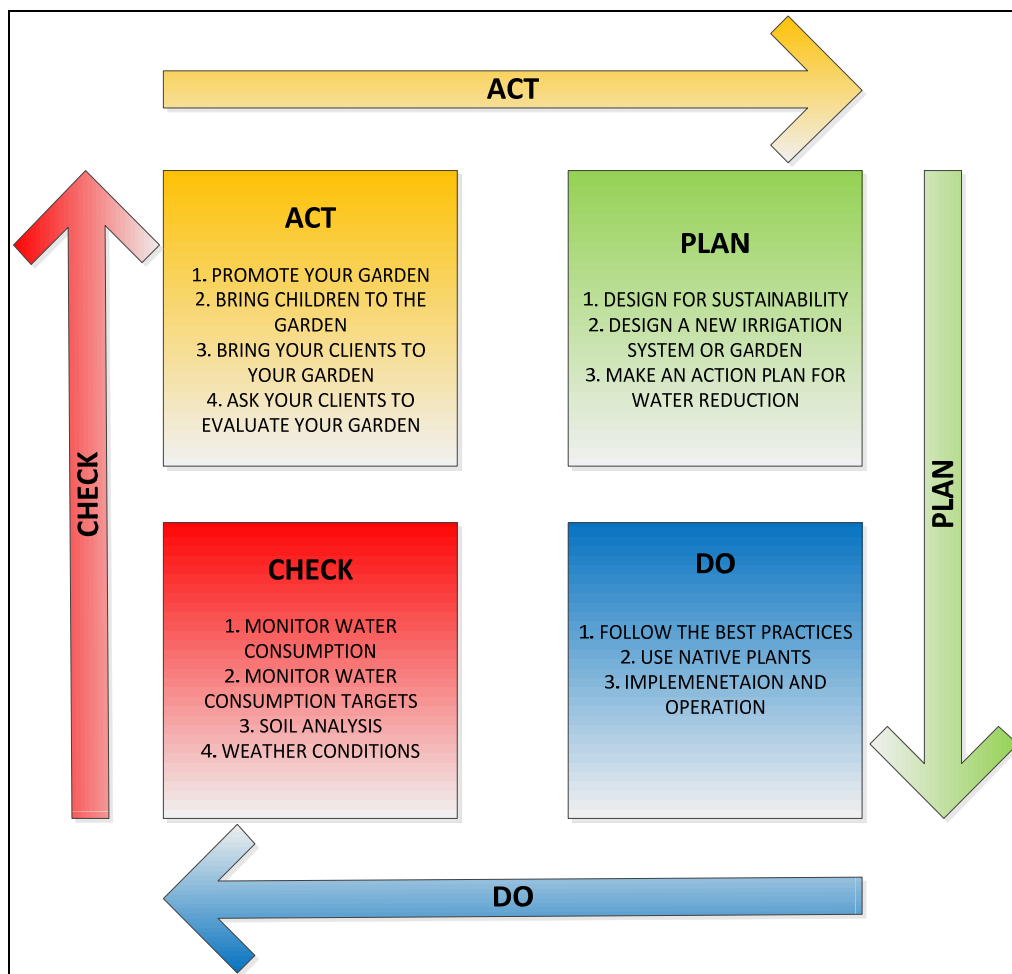
There are several ways in which hotel gardens can be improved, both to improve their attractiveness, but also to reduce their maintenance costs and impact on the environment of Cyprus:

- The overall garden design
- The irrigation system
- The species of plants used in the gardens
- The management of microclimatic factors (see Glossary)
- The soil type and quality
- Nutrients and fertilization
- Hardscaping
- Mulch
- Maintenance
- Composting

Starting a new improvement project and implementing a series of changes regarding the hotel gardens is surely not an easy process. A very useful and easy-to-remember tool is the PDCA (Plan–Do–Check–Act) cycle (Figure 1) which is a four–step model for problem solving and managing change, ensuring that ideas are appropriately tested before committing to full implementation. Just as a circle has no end, the PDCA cycle should be repeated again and again for continuous improvement.



Figure 1: The PDCA (Plan-Do-Check-Act) Cycle for hotel gardens





I. The garden design

Hotel gardens should be designed in a way that serves the needs of the hotel but keeps irrigation to the minimum (Table 2). Keeping that in mind, hotels need to organize the areas of the garden and the plants that they use according to a water consumption scale. The plants and combination of materials that consume large amounts of water should be kept to a minimum and only used where they cannot be avoided.

A good example of that practice is the reduction of lawn areas and their replacement with bushes and trees whenever possible. In areas where a lawn is considered a priority the turf species should be carefully selected so that the lawn needs the least possible amount of water and maintenance. A good example is buffalo or the Cypriot “Melisoxorto”

If strategically sited, plants can also serve in water management in terms of directing the water flow, exploiting exhaust water from air-conditioning units and any water that flows into planted beds from hard surfaces.

Table 2: Garden design best practices

Design
Define what you want from your garden. Choose a suitable typology from the list. Design for flexibility for the future.
Invest some time in getting to know gardens aspect and microclimate, particularly its exposure to sun and winds, and its slopes.
Reduce lawn areas and replace them with bushes, where there are opportunities to do so.
Select native plants with low and medium water needs to promote local landscape.
Divide the garden into watering zones (see Glossary). Group plants according to their water use needs.



It is easiest to group the plants into three main categories:

- High water use zone plants
- Medium water use zone plants
- Low water use zone plants

and organizing the water programme accordingly to the watering zones.

Try to find alternative watering sources such as water from a/c units, rainwater.

Monitor water consumption by installing water metres and using the Best Practices Tool.

Xeroscaping technique

Xeroscaping technique is a very effective method of landscape design that minimizes water use and it is suggested as a best practice for hotels. It was born in the US after a prolonged drought in Colorado in the 1980s led to water restrictions and in turn, the need to create green spaces that were increasingly efficient in their water use. The results are gardens that need less water and fewer human and material resources as well, since they do not require intensive maintenance or many fertilisers or pesticides.

To achieve this, xeroscaping consists of 7 phases or steps:

1. Garden planning and design

Garden planning and design consists of studying factors such as the climate, the terrain's orientation and sunny and shady zones according to season. Gardens are divided into three zones during this phase according to water consumption: low, medium or high. In order to achieve efficient gardens, high water consumption zone are reduced to the maximum and located in highly visible areas, such as swimming pools or pathways. These zones require intensive care, whereas medium consumption zones are watered less frequently. Finally, plants in the low consumption zone are watered by rain, except in quasi-desert zones, where they are watered sporadically.



2. Analysing the soil

Soil analysis consists of studying the soil's physical and chemical characteristics, since they are key factors when selecting plants to be used. The analysis helps us ascertain whether it is necessary to add organic matter to enrich the soil or level zones to prevent water from running off and eroding the soil along with it.

3. Selecting appropriate plants

Plants should be chosen according to a garden's general design and taking into account where they will be placed, as well as soil, light and temperature conditions. The following criteria are followed during garden design (especially in new gardens): adaptation to the zone's climate, hours of sunshine required by the plants, water consumption, resistance to disease or insect infestations and pollution resistance.

4. Optimising grassy lawn zones

In summer, each square metre of grassy lawn consumes between 7 and 10 litres a day in warm countries such as Cyprus, so we attempt to optimise lawn use by locating it in high value added zones, such as swimming pools and pathways, which are the areas guests enjoy most.

5. Irrigating efficiently

The efficient irrigation principle entails applying measures such as a leak repair process, managed irrigation times and the provision of water to gardens via independent water consumption zones.

6. Mulching

Mulching is one of the most beneficial practices that exist because it conserves the soil's humidity, cuts down on water losses from evaporation, decreases the need to supply water during dry spells, reduces the number of weeds (which also consume water and resources) and lastly, diminishes surface run-off and soil erosion. Mulching achieves all of this and improves a garden's appearance as well.

7. Maintenance



Maintenance is key, since proper maintenance allows us to take advantage of all of the benefits of xerogardening. Thus, irrigation should be adjusted according to rainy periods, atmospheric humidity and hours of sunshine. Dry plants should be removed, lawns should be properly mowed and plant cover maintained.

Best practice designs of various hotels are presented below.

Design 1: Demonstration garden design



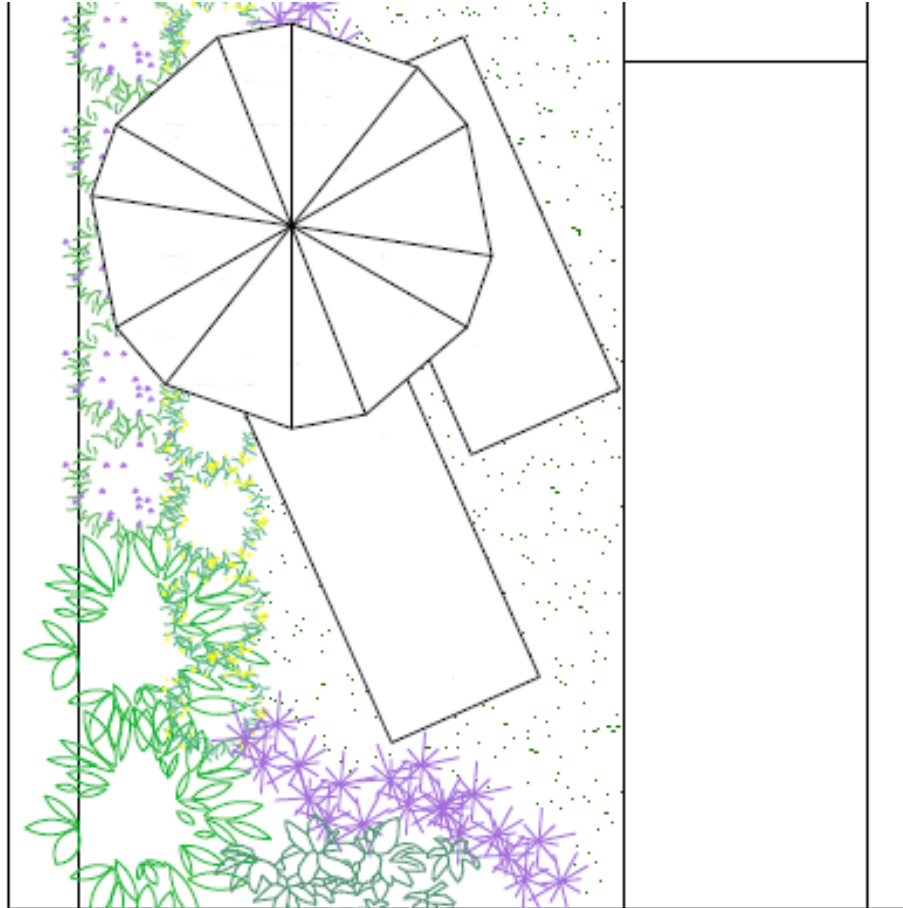


Design 2: Event garden design





Design 3: Private garden design





II. The irrigation system

The irrigation system is one of the most important factors in influencing how much water a garden needs to maintain it. Irrigation systems have the potential to waste water if they are poorly designed, operated and maintained.

Proper irrigation practices can lead to a 30% to 80% percent water savings around the hotel grounds. If a sprinkler system is already installed. Several aspects of the irrigation system should be considered when planning a garden that uses less water:

- If you do not have a sprinkler system and are just beginning to install a landscape, you can avoid the pitfalls of poorly designed and installed systems. A properly instructed professional irrigation company will be able to help.
- Make sure the system is designed to fit the landscape and the water needs of the plants and that it is zoned to reduce unnecessary applications of water. Coordinate the landscape design itself, selection of plants and the irrigation system to result in a sensible water-saving scheme.
- Check it for overall coverage. If areas are not properly covered or water is falling on paved areas, adjust the system. This may mean replacing sprinkler heads to more efficient ones or adding additional heads.
- With the system on, observe places that are receiving water where it is not needed. Overlaps onto paved areas or into shrub borders may result in considerable water waste. Overwatering trees and shrubs may lead to other problems.
- Irrigate turf areas differently than shrub borders and flower beds.
- North and east exposures need less frequent watering than south and west exposures.
- Apply water to slopes more slowly than to flat surfaces.
- Consider a drip irrigation system (see Glossary) for outlying shrub borders and raised planters, around trees and shrubs, and in narrow strips where conventional above-ground systems would result in water waste.



- Trees and shrubs separate from the lawn are best watered with deep root watering devices such as underground irrigation system in order for the water to reach the roots.

i. Types of irrigation systems

Depending on the site's geomorphological features (see Glossary) and on the weather conditions, especially wind, the type of irrigation system will play an important role in the consumption of water. As shown in Table 3, sprinkler, drip or underground irrigation systems work with differing efficiency according to their siting and conditions and therefore should be chosen on the basis of all the different features an individual garden has.

Table 3: Types and efficiency of various irrigation systems

Irrigation systems	
Soaker hoses	Soaker hoses are not recommended for efficient garden watering. Usually a hose delivers 20lit/min.
Sprinklers	Sprinkler systems vary enormously with the volume of water they distribute, depending on the brand and the type of the system. A flow of 6 lit/min is assumed in most cases. The efficiency is approx. 70-75%
Drip irrigation	A pressure compensated drip irrigation system enables water to flow at low volumes and low pressure through drip lines. The efficiency is approx. 80-90%. It allows regular, precise applications of water to target area. There are two types of drip systems, using "in-line" (4lit / hr.) or "on-line" products (2lit/hr.)
Underground irrigation	The efficiency is approx. 95% resulting in up to 70% water savings compared to soaker hoses. It is a method of artificially raining of water table to allow the



system	soil to be moistened from below the plants' root zone.
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ii. Design of irrigation system.

The irrigation system should be designed in a way that assures efficient and uniform distribution of water in each watering zone. Specific criteria that should be considered in the design include soil type, slope, root depth, plant materials, microclimates, weather conditions and water source which are explained further in Table 5, Paragraph IV. To conserve and protect water resources, the irrigation should be designed with the selection of appropriate equipment components that meet the site requirements.

iii. Installation of the irrigation system.

The irrigation system should be installed and tested according to the irrigation design specifications. To conserve and protect water resources the installed components should meet the irrigation design specifications, manufacturer's specifications, and site requirements.

iv. Maintenance of the irrigation system.

The irrigation system should be regularly serviced to maintain the performance of the system as designed (Table 4). Replacement components should meet the manufacturer's specification.



Table 4: Preventive maintenance of irrigation systems

Preventive maintenance
Flush the system every two weeks for the first 6 weeks after the installation of the system and check the water that is flushed out for cleanliness.
Establish a regular flush schedule for the future after these initial checks.
Flush the system well after any repairs are made.
Check the pressure at the supply and flush headers on a regular basis (every six months) and compare with the pressure readings taken right after installation.
'Winterize' the irrigation system by removing enough water to ensure that components are not damaged due to low temperatures.

v. Management of the irrigation system.

The irrigation schedule should be regularly and routinely adjusted as required, according to air temperature, humidity and hours of sunlight, to minimize the use of water, yet maintain a functional and healthy garden and landscape.



III. The species of plants used.

The plants used in gardens make a big difference to irrigation water consumption. Plant species vary in their needs for water and maintenance and should be chosen carefully. Native plants or plants that have flourished untended in the area for a satisfactory period of time are usually best in terms of water consumption. Xeroscaping and use of succulents can also play an important role in this.

Cyprus has a very rich variety of native plants which can be used to form attractive hotel gardens and yet often use less water than non-native species. A full list is presented in the supporting Tool.



IV. The management of microclimatic factors.

When designing a garden, microclimate plays an important role (Table 5). Parts of the garden that are subject to different local factors such as shading, moisture or water movement should be handled in a different way in order to get the best results possible.

On-site analysis is important to enable the landscaper to assess how to design the garden, choose the best possible plant species and design the most suitable irrigation system.

Table 5: Management of microclimate factors best practices

Sun	
	Generally the southern and the eastern sides of your hotel will be sunnier, warmer and more exposed to the elements, making the best place for low water use plants.
	Create shade through the design of your garden. Use trees, shrubs, windbreaks, climbing plants, pergolas or screens to make the garden cooler and require less water.
	Plant high water use or semi-shade tolerant plants on the north north-western side of the hotel.
Wind	
	Create windbreaks to reduce the impact of hot, dry winds, particularly from the south and east in the summer.
	Windbreaks should act as a filter rather than a barrier because in the second case turbulence and noise. That's why it's advised to use shrubs and trees as windbreaks instead of mass walls.
Slopes	
	Place high water use plants in garden beds at the bottom of the slopes where more water ends up.
	Avoid planting lawn on slopes as this can lead to water loss from run-off as the lawn's short roots are



not able to absorb all the water.



V. Soil quality.

When designing or upgrading a garden, the choice of any imported soil should be dependent on the type of plants that are going to be used and the type of irrigation system that will be installed.

The characteristics of soil in landscaped areas have an effect on irrigation water needs (Table 6). Soil can vary in its ability to retain water, allow water movement and in its reaction to irrigation. There are also differences in the amount of water various soil types can give to plants via roots. If the soil is heavy clay, for example, you should expect water losses through runoff. This can be avoided by using the "ideal" soil mixture as described below.

Proper soil preparation is an important aspect in successful water conservation. If the soil is very sandy, water and valuable nutrients will be lost due to leaching below the root zone. If your soil is heavy clay, you will lose water through surface runoff. A good soil, one that supports healthy plant life and conserves moisture, has a balance of rather coarse soil clusters (aggregates), sand and pore spaces. The "ideal" soil has as much as 50 percent by volume pore space, with the soil itself consisting of a good balance of sand, silt, clay and decomposed organic constituents.

Figure 2: Different soil qualities in Cyprus

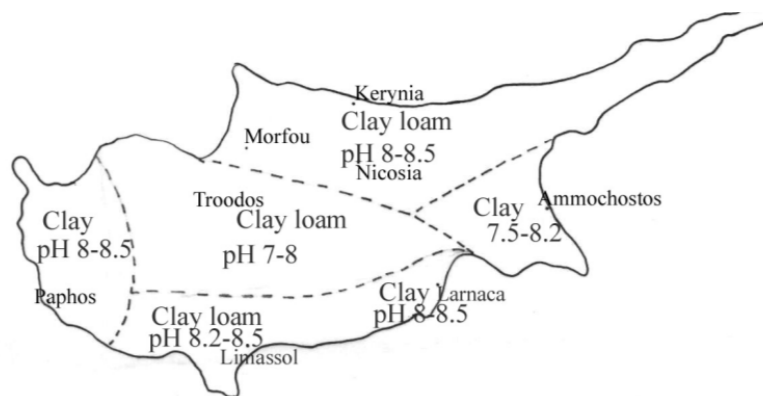




Table 6: Explanation of soil typologies

Type of soil	Description
Loam soil	Is the ideal soil for water retention and plant growth because it holds water and drains well.
Clay soil	Feels sticky, holds moisture for long periods, but can become compacted and impervious and it absorbs water slowly. So it's easy to waste water that will run off the surface rather than penetrate to the root zone.
Sandy soil	Feels gritty, has high water needs and will take in a lot of water but dries out quickly. Water can be wasted because it just drains away.
Improved soil	An artificially improved soil has the ideal texture for most plant growth. It has a sandy loam structure, improved with the addition of large amounts of organic materials. This soil retains moisture for plants.



VI. Nutrients and fertilization.

The amount of nutrients in the soil and water is a factor affecting the growth of plants. It is possible to reduce irrigation while keeping the plants in good condition if the hotel ensures that sufficient nutrients are available. Soil analysis should be regular and frequent (once a year) and fertilizers should be applied when needed. University or private laboratories in Cyprus will undertake such analyses at very reasonable cost.



VII. Hardscaping.

Increasing the proportion of hard surfaces in the outdoor areas of hotels is another way to limit irrigation water consumption in gardens, without necessarily lowering their aesthetic appeal; this technique is known as ‘hardscaping’.

Reducing the total size of the garden to save water cannot in itself be considered best practice but in most cases there are areas where hardscaping should not be avoided. Limited areas that usually serve as meeting points or parts of road or pathway networks and have a constant heavy load of traffic should be considered as candidates for hardscaping since they are almost impossible to maintain, merely adding significantly to water consumption without assuring the quality of the garden. Best practices regarding hardscaping are described in Table 7.

In cases like this the addition of hard surfaces or inert materials, carefully chosen for their visual appeal, can serve in terms of functionality and also be part of the wider concept of garden design. Examples of hardscaping are shown in Photographs 10 and 11.

Table 7: Hardscaping best practices

Hardscaping	
	Generally choose light coloured paving (and walls) that absorb less heat to minimize this effect. Making paved areas more permeable to allow rain to seep into soil and nearby plant roots can help save water.
	Make paths from organic and porous material such as gravel, pebbles, woodchips, sawdust or bark mulch, rather than using hard paving.



Photograph 10: Hardscaping example A



Photograph 11: Hardscaping example B





VIII. Mulch

Mulch is a protective layer placed over the soil to retain moisture, reduce erosion, provide nutrients, and suppress weed growth and seed germination. It is essential in any garden of Cyprus that aims to save water as it reduces water loss by reducing evaporation from soil. Mulch also keeps plant roots cool, prevents soil from crusting and reduces weed growth. Table 8 shows best practices for applying mulch.

Organic mulches, such as bark chips shown in Photograph 12, pole peelings or wood grindings, should be applied 6 to 10 cm deep. Organic fibre mulches such as straw and wood grindings, create a protective layer that is more resistant to wind and rain washout. Inorganic mulches such as rocks and gravel should be applied 6 to 8 cm deep.

Composting is the decomposition of plant remains and other once-living materials to make an earthy, dark, crumbly substance that is excellent for adding to plants or enriching garden soil. It is the ideal way to recycle the hotel's garden and kitchen wastes, and is a critical step in reducing the volume of garbage needlessly sent to landfills for disposal.

Photograph 12: Typical mulch





Table 8: Mulch best practices

Mulch	
Don't mulch too deeply, as it reduces soil water absorption and can stop your water reaching plant roots.	
Check the mulch regularly for compaction and loosen it if necessary to ensure water can get through.	
Use organic mulches (compost) but don't use wood chips or tree pruning from diseased trees.	
Don't confuse mulch with soil improvers.	
Using rocks as mulch makes the area hotter, so limit this practice even if it seems aesthetically appealing.	



IX. Garden maintenance

The maintenance requirements of a sustainable garden are generally less than those of a conventional one. This is due to a reduction in turf area and non-native or poorly adapted to the local climate plants that might have higher demands regarding insect control, watering and fertilizers. However, there is no such thing as a maintenance-free garden. In general, a properly maintained garden is hardier and better able to withstand drought, heat waves and pest problems.

For practical purposes, hotel gardens should, of course, include some areas of lawn. Water efficient lawn maintenance and watering practices are presented in Table 9.

Table 9: Water efficient lawn maintenance and watering best practices

Lawn	
	Use sprinklers that spray low large drops vs. high fine one. This lowers the overall surface area of the droplets for a given volume of water and therefore gives less opportunity for evaporation.
	Lawns should never be mowed less than 4cm. Proper mowing heights from 7cm to 9cm can help lawns use less water. Grass cut short dries out more quickly than grass which is maintained at a greater length because it reduces evaporation of water by shading the soil below from the sun.
	The grass should be mowed when it is about 1/3 higher than the desired height. Clippings should be left where they fall, which recycles nutrients from them into the soil.
	Watering at night is not recommended because the lawn stays wet for a long period of time which can promote diseases and affect the health of your lawn. The optimum time for watering is early in the morning.
	Don't use a fixed schedule for lawn watering. Apply water only when it is needed. Over watering can



promote diseases and affect the health of the lawn.

Water during the cool part of the day to minimize water lost to evaporation. Early morning hours (4 a.m. to 8 a.m.) are the best.

Adjust sprinklers to water only grass areas and not impervious surfaces such as streets, driveways and walkways.

A simple test for determining if grass needs water is to walk on the lawn. If you leave foot prints as indents in the grass, it is time to water the lawn.

Reduce the amount of foot traffic allowed on the lawn as much as possible using information signs.

5. IT Tool Development

The 'best practice' tool for hotel gardens' water management has been developed to help hotel gardening staffs reduce water consumption in the areas they manage.

The software is designed using Microsoft Excel and can be easily and simply implemented.

The best practices are presented in the tool according to the garden types described above. Depending on the garden typology that is selected by the user from a drop-down menu, different data will be requested. According to the selected garden type and the data values that are given by the user, the proper best practices will be presented.



Appendix I. Glossary

Drip irrigation is an irrigation method which saves water and fertilizer by allowing water to drip slowly to the roots of plants, either onto the soil surface or directly onto the root zone, through a network of valves, pipes, tubing, and emitters. It is done with the help of narrow tubes which deliver water directly to the base of the plant.

Geomorphological features are the features pertaining to landforms and geological structure.

In-line drip tubing contains drippers moulded into the tubing at regular intervals.

Irrigation efficiency (in %) is the part of water diverted through the scheme inlet which is used effectively by the plants.

Microclimate is a local atmospheric zone where the climate differs from the surrounding area. The term may refer to areas as small as a few square feet (for example a garden bed) or as large as many square miles.

On-line drip irrigation allows you to insert drip emitters into the irrigation pipe where you require them, to match your garden and plant needs.

SWOT analysis is a method to evaluate the **S**trengths, **W**eaknesses/Limitations, **O**pportunities, and **T**hreats involved in a project or in a business venture. It involves specifying the objective of the business venture or project and identifying the internal and external factors that are favorable and unfavorable to achieve that objective. Setting the objective should be done after the SWOT analysis has been performed. This would allow achievable goals or objectives to be set for the organization.

- **Strengths:** characteristics of the business, or project team that give it an advantage over others
- **Weaknesses** are characteristics that place the team at a disadvantage relative to others
- **Opportunities:** *external* chances to improve performance in the environment



- **Threats:** *external* elements in the environment that could cause trouble for the business or project

Watering zones are distinctive areas where plants with similar watering needs are planted together and so, water conservation is succeeded. It is an element of landscape irrigation design that allows to target water distribution with precision, thus cutting down on waste and saving you money.