

A Design Guide for Parks in the Mediterranean Context

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1. Introductory notes

This guide aims at helping municipal staff members and other relevant public sector employees develop public gardens / parks in a manner that best supports the needs of local populations in terms of providing public open green spaces, connections to nature, as well as places for relaxation, leisure, and recreation. The guide may also benefit architects, landscape architects, and urban designers involved in designing public open green spaces.

The guide addresses a number of issues. It provides information on site assessment, presents various design guidelines and tips, and addresses budgeting needs, not only for realizing a given public open green space, but also for its upkeep and maintenance. It also discusses the engagement of the public and various stakeholders in ensuring the success of these spaces. Moreover, it presents tools for achieving water conserving solutions for these spaces, and provides a list of water conserving plants.

The information provided in this guide is aimed at addressing a wide audience with different levels of knowledge and experience. Although some readers / users may find some of the information basic or general, and others may find some of the information technical or difficult to apply, the authors have attempted to strike a balance in order to serve as wide an audience as possible.

2. The micro vs. the macro scales

Introduction

This guide essentially deals with the micro-scale, i.e., that of neighborhoods, and possibly districts, in the city. The development of gardens and parks nonetheless should also be viewed within the larger macro-scale of the city as a whole. Before moving into the micro-scale that this guide addresses, we would like to make a few comments regarding the macro-scale of the city. As a municipality or another public planning authority works on developing a specific public open green space, i.e., as it works on the micro-level, it also should keep an eye on the macro level, i.e., the scale of the city, and on how to address the already existing network of such spaces in the city and the spaces that may come into being, or that may need to come into being. No public open green space can be viewed in isolation of the overall urban fabric.

For example, if certain districts of the city are not served by such spaces, then the inhabitants of these districts may very well start frequenting spaces in other parts of the city, thus exerting more pressure on them than their capacity can accommodate. In addition, if a city expands horizontally or vertically (i.e., through increased density), additional public open green spaces will need to be developed to serve the corresponding growth in area and in populations. Add to this that if land-use changes take place in certain parts of the city (e.g., from primarily residential to primarily commercial), then the function of any public open green spaces that may exist in such parts will be affected and may need to be reconfigured.

Moreover, there will always be a hierarchy of such spaces in the city, and its larger ones will serve populations and areas that extend beyond those inhabiting a single neighborhood to serve the population of a district of the city, or even the whole city. Public open green spaces of different scales are needed to serve different functions and activities ranging from intimate ones to those involving large crowds, and it is important that all are distributed across the city in a balanced and equitable manner.

Developing an inventory of green open spaces in the city

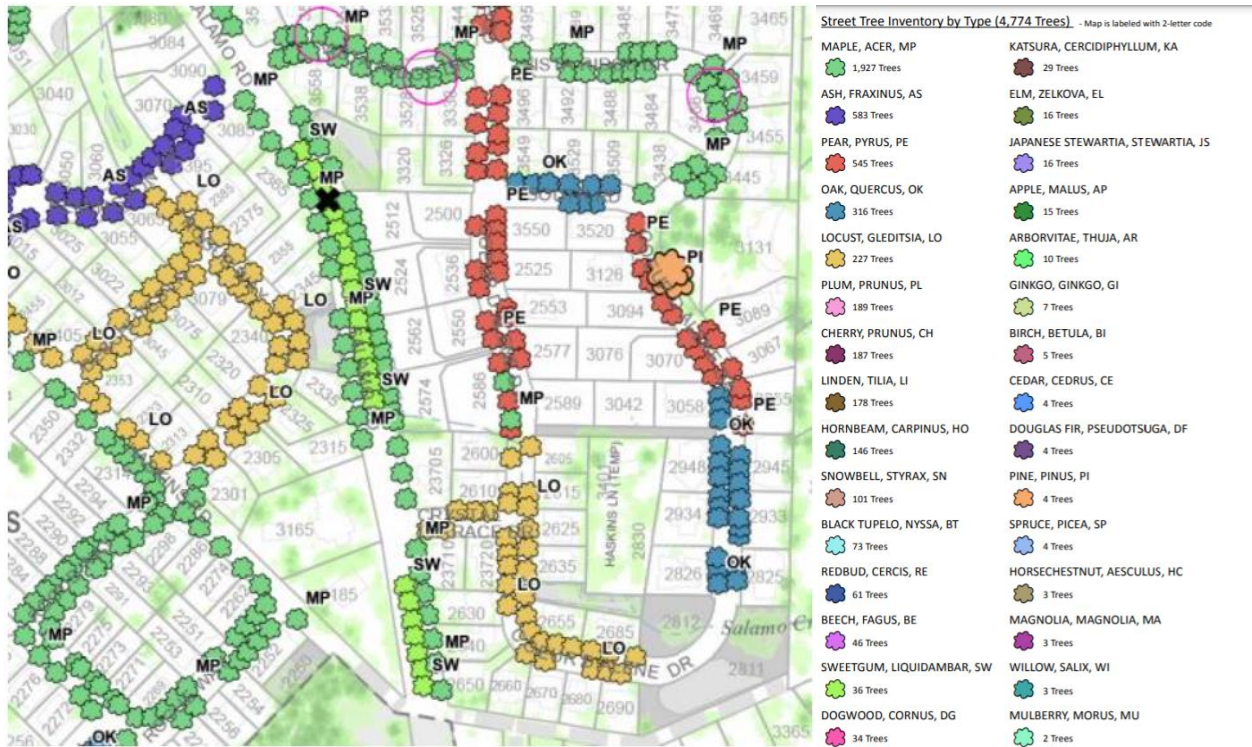
An important step that needs to be carried out in order to achieve a comprehensive understanding of and how the city is served by open green spaces is developing an inventory of them, which also may be referred to as an inventory of the city's "green infrastructure." Defining the various types of open spaces involves a considerable amount of elasticity, and there is no set of 'correct' definitions. It is important, however, to clarify what is meant by the terms being used, as for example is explained in this guide regarding the definitions of 'park' and 'garden' provided below. This inventory would include both private and public spaces, and would cover a wide typology including sidewalks, roundabouts, private gardens, school yards, and public parks. Developing such an inventory is a time-consuming procedure, and accordingly should be treated as an ongoing, long-term process.



An example illustration of the road layout and green infrastructure in the master plan for new town Milton Keynes in England (1969).

Source: https://www.researchgate.net/figure/illustration-of-the-road-layout-and-green-infrastructure-in-the-master-plan-for-new-town_fig3_275955043.

Many cities around the world also conduct an inventory specific to trees. Trees are a vital part of a city's green infrastructure, and their protection and preservation should be a priority for municipalities. Not only do trees contribute to clean air, moderate micro-climates, and enhance overall well-being, but studies have shown correlations between the presence of street trees and increased property values (see the University of Washington's Urban Forestry / Urban Greening Research: Green Cities: Good Health; https://depts.washington.edu/hhwb/Thm_Economics.html) and lower crime rates (see, Eric Jaffe, "Can Trees Actually Deter Crime?" [City Lab](https://www.citylab.com/equity/2012/05/can-trees-actually-deter-crime/2107/), May 25, 2012; <https://www.citylab.com/equity/2012/05/can-trees-actually-deter-crime/2107/>). Tree inventories typically document the species type, size, canopy, location, and condition.



Summary of Street Trees by Type and Size

COMMON NAME	GENUS	MAP CODE (LABELED ON MAP)	DIAMETER (INCHES)	NUMBER OF TREES	%	COMMON NAME	GENUS	MAP CODE (LABELED ON MAP)	DIAMETER (INCHES)	NUMBER OF TREES	%
MAPLE	ACER	MP	6	1191	24.9%	LINDEN	TILIA	LI	24	7	0.15%
MAPLE	ACER	MP	12	639	13.4%	SPRUCE	PICEA	SP	6	4	0.08%
PEAR	PYRUS	PE	6	429	9.0%	LINDEN	TILIA	LI	18	4	0.08%
ASH	FRAXINUS	AS	6	326	6.8%	PEAR	PYRUS	PE	18	4	0.08%
ASH	FRAXINUS	AS	12	195	4.1%	DOUGLAS FIR	PSEUDOTSUGA	DF	24	4	0.08%
OAK	QUERCUS	OK	6	163	3.4%	CEDAR	CEDRUS	CE	6	3	0.06%
LOCUST	GLEDITSIA	LO	6	144	3.0%	WILLOW	SALIX	WI	6	3	0.06%
HORNBEAM	CARPINUS	HO	6	142	3.0%	BIRCH	BETULA	BI	12	3	0.06%
OAK	QUERCUS	OK	12	140	2.9%	HORNBEAM	CARPINUS	HO	12	3	0.06%
PEAR	PYRUS	PE	12	111	2.3%	SWEETGUM	LIQUIDAMBAR	SW	18	3	0.06%
PLUM	PRUNUS	PL	12	108	2.3%	HORSECHESTNUT	AESCULUS	HC	36	3	0.06%
SNOWBELL	STYRAX	SN	6	101	2.1%	BIRCH	BETULA	BI	6	2	0.04%
LINDEN	TILIA	LI	12	92	1.9%	MAGNOLIA	MAGNOLIA	MA	6	2	0.04%
CHERRY	PRUNUS	CH	12	83	1.7%	PINE	PINUS	PI	6	2	0.04%
MAPLE	ACER	MP	18	77	1.6%	APPLE	MALUS	AP	12	2	0.04%
LINDEN	TILIA	LI	6	73	1.5%	PINE	PINUS	PI	18	2	0.04%
BLACK TUPELO	NYSSA	BT	6	72	1.5%	PLUM	PRUNUS	PL	24	2	0.04%
LOCUST	GLEDITSIA	LO	12	69	1.4%	SWEETGUM	LIQUIDAMBAR	SW	24	2	0.04%
REDBUD	CERCIS	RE	6	59	1.2%	LINDEN	TILIA	LI	30	2	0.04%
CHERRY	PRUNUS	CH	6	57	1.2%	KATSURA	CERCIDIPHYLLUM	KA	6	1	0.02%
PLUM	PRUNUS	PL	6	55	1.2%	MULBERRY	MORUS	MU	6	1	0.02%
ASH	FRAXINUS	AS	18	48	1.0%	BEECH	FAGUS	BE	12	1	0.02%
BEECH	FAGUS	BE	6	45	0.9%	BLACK TUPELO	NYSSA	BT	12	1	0.02%
CHERRY	PRUNUS	CH	18	35	0.7%	CEDAR	CEDRUS	CE	12	1	0.02%
DOGWOOD	CORNUS	DG	6	33	0.7%	DOGWOOD	CORNUS	DG	12	1	0.02%
KATSURA	CERCIDIPHYLLUM	KA	12	28	0.6%	MAGNOLIA	MAGNOLIA	MA	12	1	0.02%
PLUM	PRUNUS	PL	18	24	0.5%	MULBERRY	MORUS	MU	12	1	0.02%
MAPLE	ACER	MP	24	18	0.4%	HORNBEAM	CARPINUS	HO	18	1	0.02%
SWEETGUM	LIQUIDAMBAR	SW	6	17	0.4%	REDBUD	CERCIS	RE	18	1	0.02%
ELM	ZELKOVA	EL	6	16	0.3%	LOCUST	GLEDITSIA	LO	24	1	0.02%
JAPANESE STEWARTIA	STEWARTIA	JS	6	16	0.3%	OAK	QUERCUS	OK	24	1	0.02%
SWEETGUM	LIQUIDAMBAR	SW	12	14	0.3%	PEAR	PYRUS	PE	24	1	0.02%
ASH	FRAXINUS	AS	24	14	0.3%	REDBUD	CERCIS	RE	24	1	0.02%
APPLE	MALUS	AP	6	13	0.3%	CHERRY	PRUNUS	CH	30	1	0.02%
LOCUST	GLEDITSIA	LO	18	13	0.3%	MAPLE	ACER	MP	30	1	0.02%
CHERRY	PRUNUS	CH	24	11	0.2%	OAK	QUERCUS	OK	30	1	0.02%
ARBORVITAE	THUJA	AR	6	10	0.2%	MAPLE	ACER	MP	36	1	0.02%
OAK	QUERCUS	OK	18	10	0.2%	OAK	QUERCUS	OK	36	1	0.02%
GINKGO	GINKGO	GI	6	7	0.1%						

An example of a street tree inventory map for the city of West Linn, Oregon in the United States.

Source: <https://westlinnoregon.gov/maps/street-tree-inventory-map>.

Categorizing green spaces in the city

There is a multiplicity of categorization systems used by those involved in the planning, designing, and upkeep of green spaces, and there is no one definitive system. This results in considerable open-endedness, an overlap between different categorization systems, and even ambiguity. Existing categorization systems are affected by issues including size, function, location within or in relation to the city, and accessibility to the public, among other factors. For example, the following categorization of open spaces draws primarily on that provided by the public organization Historic England and the Nonpoint Education for Municipal Officials (NEMO) of the University of Connecticut's Center for Land Use Education and Research (CLEAR) (<https://research.historicengland.org.uk/Report.aspx?i=15236> (see particularly, pp. 45-62); and https://nemo.uconn.edu/publications/open_space_fsCollection.pdf).

These sources are used to illustrate common categorizations of open space, and are not necessarily the only ones which one can use:

- Public garden and park.
- Private garden or grounds (private gardens; school grounds; institutional grounds ...).
- Amenity greenspace (amenity - residential; amenity - Business; amenity - transport ...).
- Play-space for children and teenagers.
- Sports areas (playing fields; golf courses; tennis courts; bowling greens ...).
- Green corridors (green access routes; riparian routes; trails; bike paths ...).
- Natural / semi-natural greenspaces (woodland (forests); open semi-natural; open water; river corridors; floodplains; ridges; wetland preserves; wildlife habitats ...).
- Allotments and community growing spaces.
- Burial grounds (churchyards; cemeteries ...).
- Other function greenspaces (caravan parks; fair grounds ...).
- Civic space (urban plazas; city squares ...).

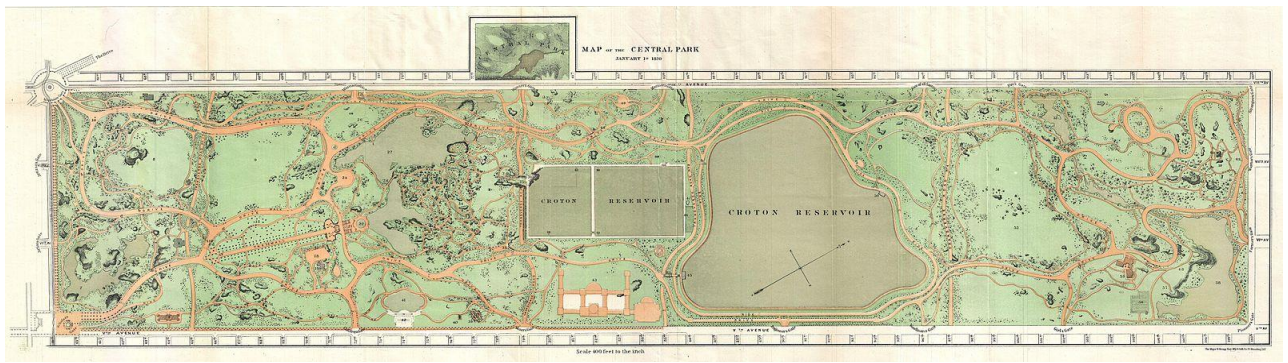
Open space may also include water bodies and beaches, vacant lots, scenic vistas, farmland, and buffer strips.

Public gardens and parks

The guide will concentrate on a specific set of open green spaces rather than attempt to cover all of them. The study will concentrate primarily on *public gardens* and *parks*. By gardens, we are referring to spaces that feature a variety of plants and include paths and benches for visitors to walk through the gardens and to sit in them. They may also include a café or an eating establishment. They are spaces that are primarily aimed at relaxation and the enjoyment of greenery in open air settings. They can be of various sizes.

A park may include a wider variety of recreational uses than a garden. A park may include a garden, and can also include a playfield with play equipment for children, sports fields (for basketball, volleyball, soccer, tennis ...), swimming pools, and eating facilities. Accordingly, a park can include a garden, but a garden cannot include a park. A park also may not include active recreational areas and merely include forested or green areas. Many parks across the world include tracts or remnants of natural forests that were integrated into a parkland setting. These too can be of various sizes. In most of the MENA region, a park and garden are often used interchangeably.

Other open green areas that this guide will address include green urban pockets - which are essentially small gardens, wide tree-lined sidewalks, and traffic roundabouts.



Plan of Central Park in New York City.

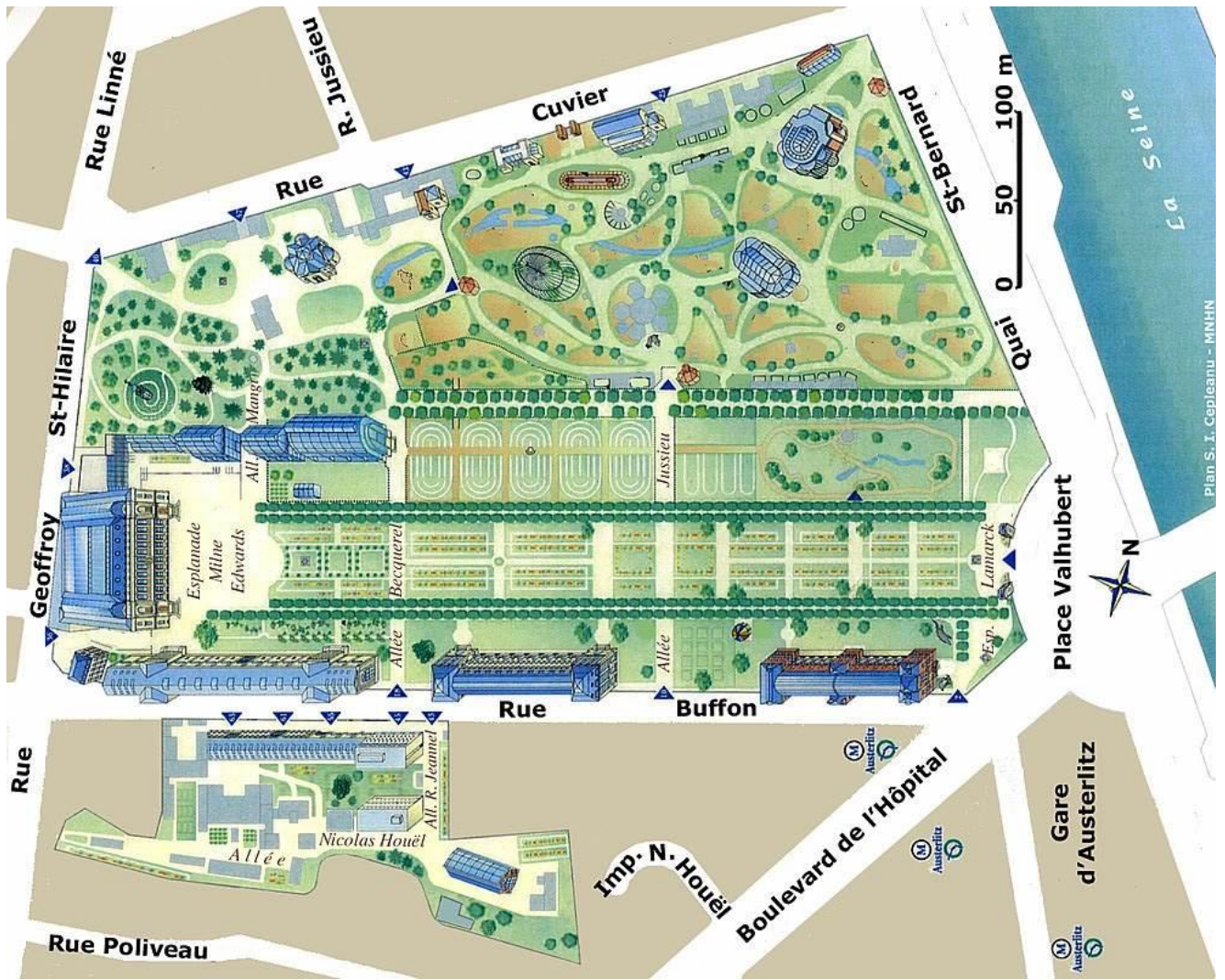
Source: https://commons.wikimedia.org/wiki/File:1870_Vaux_and_Olmstead_Map_of_Central_Park,_New_York_City_-_Geographicus_-_CentralPark-knapp-1870.jpg.



Panoramic view of Central Park in New York City.

Photo credit: Martin St-Amant - Wikipedia - CC-BY-SA-3.0.

Source: https://en.wikipedia.org/wiki/Central_Park#/media/File:26_-_New_York_-_Octobre_2008.jpg.



Plan of the Jardin de Plantes in Paris.

Source: https://en.wikipedia.org/wiki/Jardin_des_plantes#/media/File:Plan-MNHN.jpg.



A view of the Jardin de Plantes in Paris.

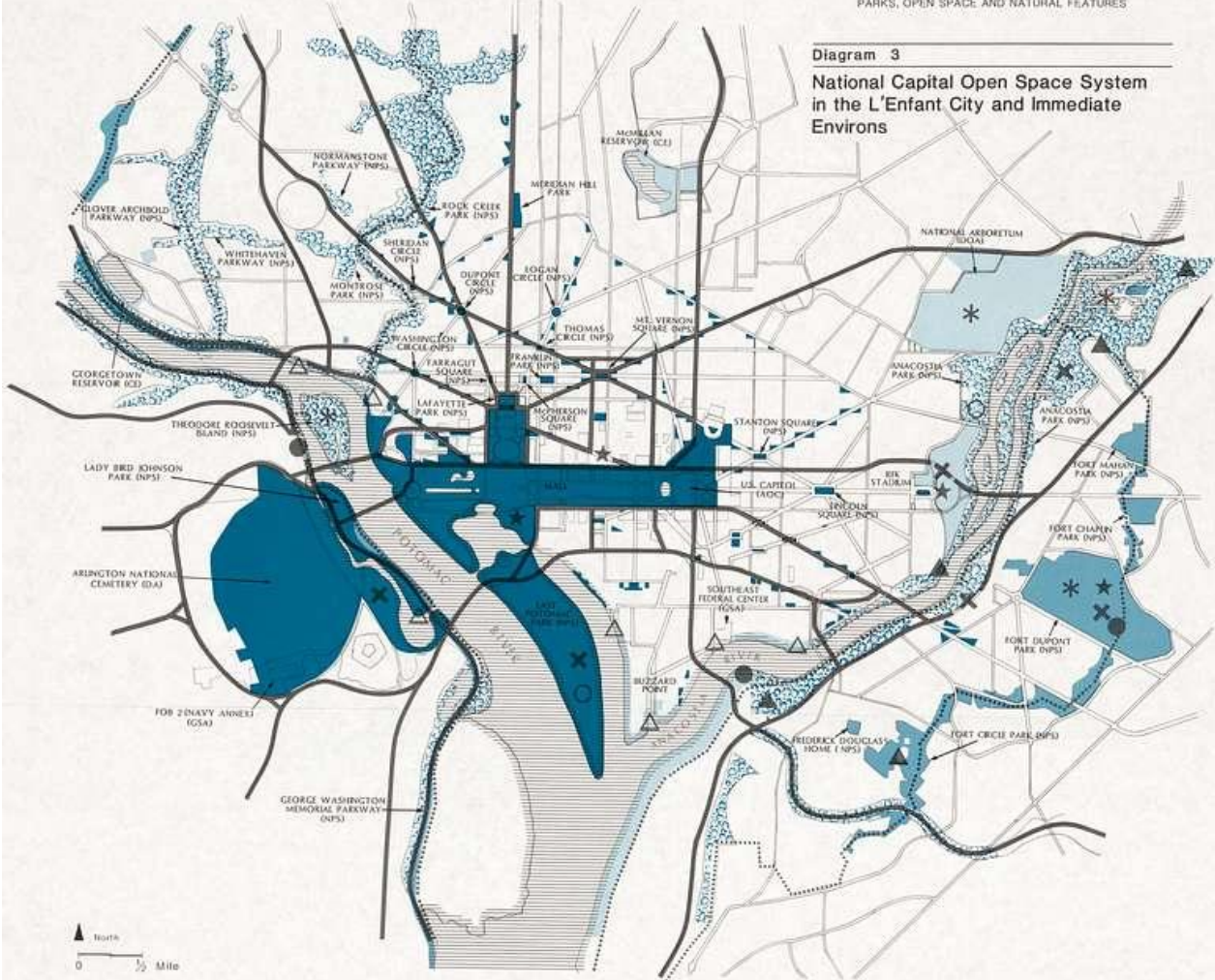
Source: <https://www.flickr.com/photos/ugardener/3452232693>.

Categorization according to function

Although public open green spaces may be categorized according to features such size and shape (as with a central space such as a roundabout, or a linear space such as a tree-lined wide sidewalk or a green street median), they also may be categorized according to function. In addition, it should be kept in mind that these various approaches to categorization are not mutually exclusive and involve considerable overlap. Regarding the category of function, the Nonpoint Education for Municipal Officials (NEMO) of the University of Connecticut's Center for Land Use Education and Research (CLEAR) mentioned above, for example, more or less divides such spaces according to the following functional categories:

1. Areas that address natural resource protection. Examples of these include animal and vegetative habitats.
2. Areas that address outdoor recreation. These include:
 - a. Active recreation areas such as parks, playgrounds, beaches, trails ...
 - b. Passive recreation areas such as plazas, sitting areas, arboretums ...
3. Areas that address resource management. These include forests, fisheries, farmland ...
4. Areas that address the protection of public health and safety. These include floodplains, wetlands, unbuildable areas or areas with limitations for development including steep slopes, high water-table areas ...
5. Areas that contribute to shaping community character or design. These include buffer strips, front, back and side yards, greenways...
6. Historic or archeological sites. These include battleground sites, historic structures and grounds, historic districts, town greens ...

Diagram 3
National Capital Open Space System
in the L'Enfant City and Immediate
Environs



LEGEND

National Capital Open Space System

- Monumental and Decorative Areas and Parks
- Natural Parks
- Historic Parks
- Other Open Space
- Rivers, Shorelines and Other Water Areas
- Gateways

Recreation Activities

- Golfing
- Boating
- Multiple Sports
- Outdoor Performing Arts
- Nature Study
- Swimming
- Camping
- Local Recreation Center
- Trails

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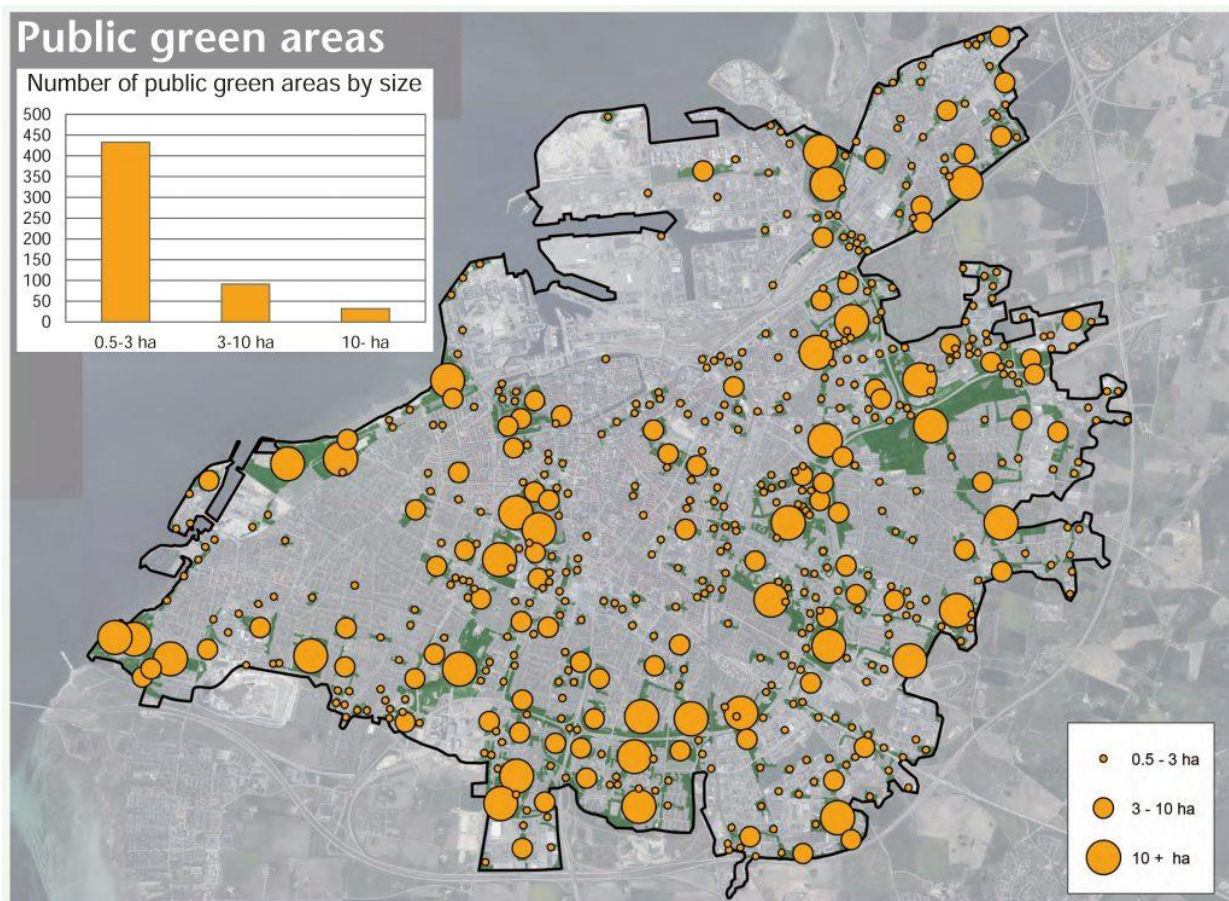
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An example of an open space plan with categorizations for the District of Columbia in the United States of America.
Source: <https://picryl.com/media/comprehensive-plan-for-the-national-capital-federal-elements-washington-dc-9>.

Presenting all of this visually

The city's inventory of existing available spaces may be presented through city maps consisting of a series of color-coded and annotated layers. These layers would feature the following visual and textual information:

- The area of each space.
- The ownership of each space (public or private, and specifying the owner).
- The current function of each space (categories may include the following: unused, developed as visual markers, used as a park or garden, used for functions other than those connected to public open green spaces ...).
- The current condition of each space (categories may include the following: needs total reconfiguration in terms of function and design; needs complete refurbishment; needs considerable refurbishment; needs some refurbishment; needs very little intervention; needs no intervention).
- Potential functions for each space



© Statistics Sweden and Lantmäteriet

Footnote: A public green area is defined as an area of contiguous green space of at least 0.5 hectares which is available for the public.

A plan showing public green areas in the Swedish city of Malmö. Note that a public green area is defined here as occupying an area of no less than 0.5 hectares.

Source: https://www.efgs.info/wp-content/uploads/2016/05/Malmoe_Public_green_areas-e1462203712428.jpg.

The expropriation of land to satisfy the need for public open green spaces

As authorities determine how to expand the available body of public open green spaces to accommodate the city's growth in area and population, there is a need to identify land that is already owned by the authorities and land that the authorities should acquire, usually through expropriation, although sometimes also through donation. Throughout this, one of course needs to be aware of the financial and human resources available - and needed - for acquiring such public open green spaces, and also for developing and managing them. In addition, it is important to develop the necessary legal tools (e.g., zoning and land-use) that are necessary to acquire, develop, and manage such spaces.

Communicating with relevant stakeholders

Throughout this, it is important to communicate with other relevant public authorities (such as those involved in issues relating to the environment, public works, the provision of utilities ...), and also with the general public to inform them of ongoing plans and to obtain their feedback. As will be shown below, this may take place through publications, public lectures, public hearings ... Further information on this topic is provided in section 8 of this guide.

What is a suitable amount of public open green space in the city?

A few remarks also should be made regarding the required amount of public open green space (in square meters) that needs to be available for each inhabitant of the city. There is no one magic number, and that number is affected by various factors such as the availability of private space in the city. For example, an area consisting primarily of single-family homes will need far less public open green spaces in comparison to an area where most of the population lives in apartment buildings. In the United States, for example, cities usually provide about 20 – 40 square meters of public open green space per resident. Achieving the higher end of this range is not an easy task, but we believe that municipal authorities should aim for providing a minimum of 20 square meters of such spaces per resident.

Quantity – Green space per capita

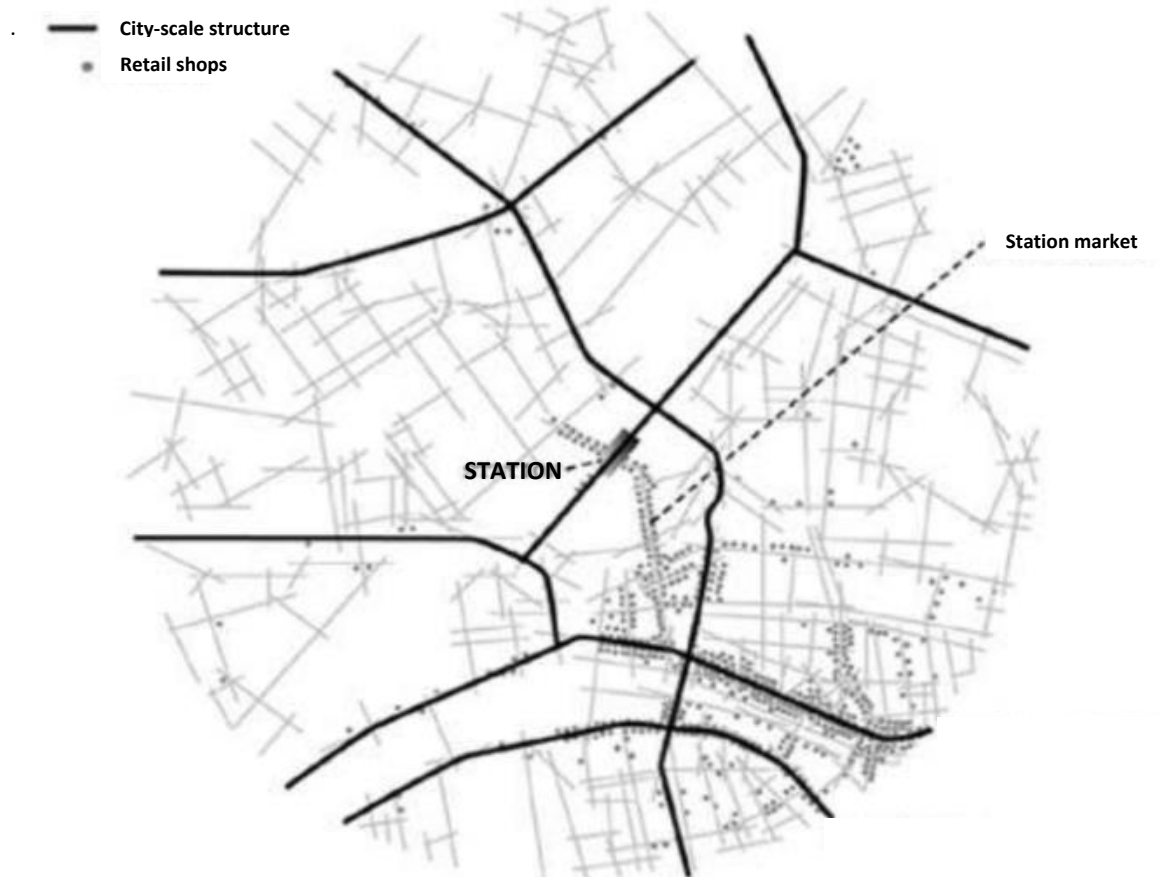


Area of green space per person in selected cities around the world.

Source: Bernard van Leer Foundation.

The proximity of public open green spaces to the city's inhabitants

Another important issue is the proximity of these public open green spaces to the city's various residents. Ideally, a public open green space of adequate size should be within walking distance to all city residents. This means that a person should not live more than one kilometer away from such spaces, which approximately translates into a ten-minute walk. This is usually the distance that people can comfortably cover on foot. And, of course, the route linking these public spaces to one's place of residence should be adequately pedestrian friendly (e.g., it should have usable sidewalks and not be interrupted by thoroughfares with high-volume and fast vehicular traffic). Although cities will have large public open green spaces that serve the city as a whole, and therefore located at the center or at the outskirts of the city (The Belvedere Park in Tunis and Central Park in New York are examples of the former; and The King Hussein Park in Amman and Forest Park in St. Louis in the United States are examples of the latter), these spaces do not compensate for local public open green public spaces that function at the level of a neighborhood or a district in the city. By neighborhoods, we are referring to urban areas with populations of 5,000 to 9,000 inhabitants. Their areas would occupy an area of nearly 0.65 square kilometers. About 10% of a neighborhood should be devoted to public open green spaces.



A section of an urban area defined by a one-kilometer radius.

Source: https://www.researchgate.net/figure/City-scale-structure-plotted-with-the-distribution-of-retail-shops-within-one-kilometer_fig6_237753052.

Upkeep and maintenance

Another issue to keep in mind is that public open green spaces need considerable upkeep and maintenance. Plants can die without care over a period that may be as short as a few days. This upkeep and maintenance requires considerable human and financial resources. If such resources are not available, it is better not to embark on such projects until the resources are available, or to develop spaces on a more modest scale that are commensurable with available resources. The motto to be followed is: *If you cannot maintain it, do not build it*. More will be said about upkeep and maintenance in the upcoming sections of this guide.

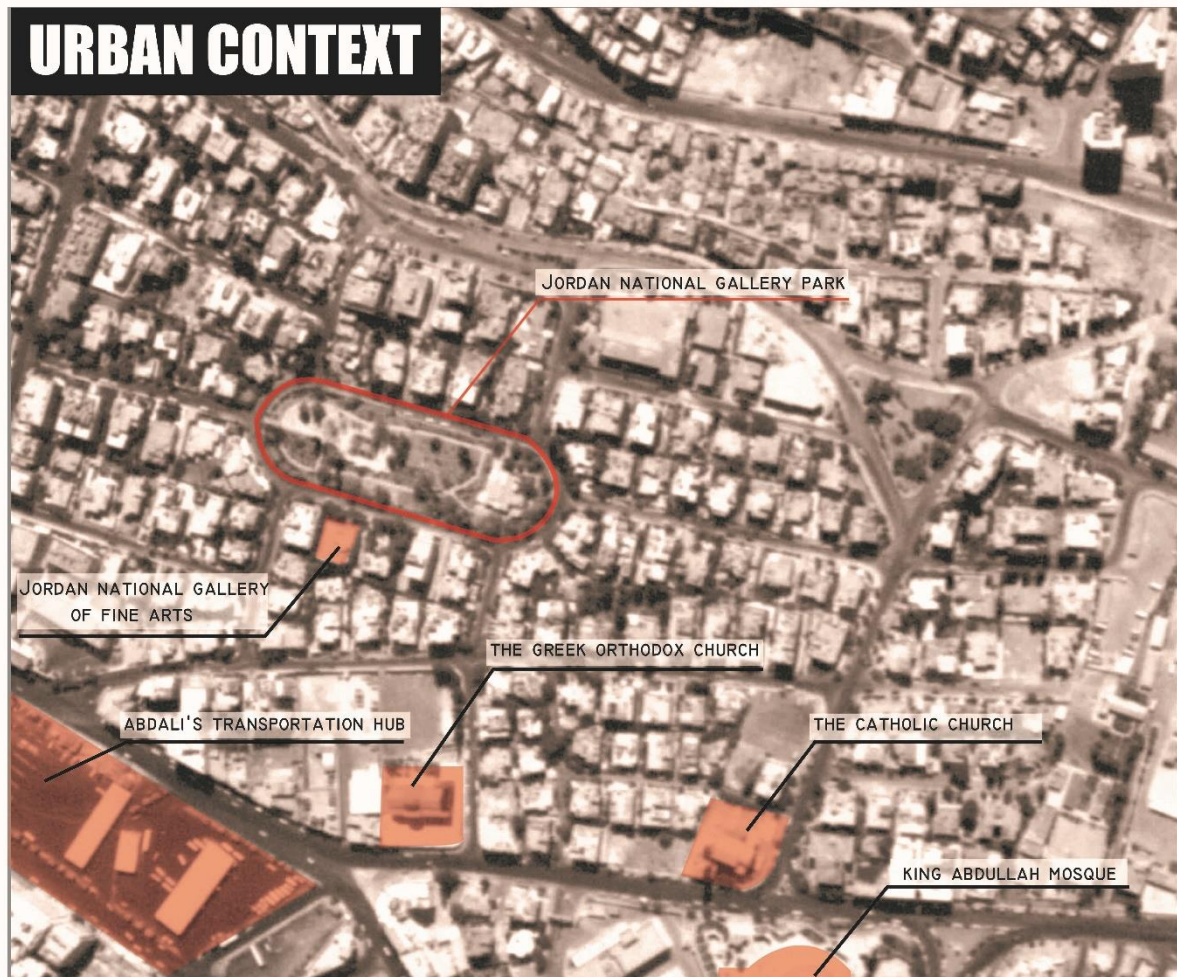
3. Surveying, analyzing, and assessing the area surrounding the site

Introduction

This section will help achieve a better understanding of the physical context of the site, who are its users, and what are their needs.

The section includes providing the information requested below. As you do so, provide whatever information you can, and feel free to add information as you see fit. Use the boxes marked by a red arrow for writing the requested information.

Using an aerial photograph or a plan, or both, draw a circle with a radius of one kilometer based at the center of the site. This circle covers an area for which the site is accessible for pedestrians. The area amounts to 3.14 square kilometers, and consists of an equivalent of a city district that covers an average of five neighborhoods.



Example of an aerial map showing the surrounding urban context of an urban park, the Jordan National Gallery of Fine Arts Park in Amman, which is used as a demonstration site for this guide.

Source: <http://www.csbe.org/the-national-gallery-of-fine-arts-park>.

Provide the information specified below for this area. Do keep in mind that the numbers you come up with need to be dealt with cautiously. You will notice from the questions provided below that although they address quantifiable information, there is no necessarily single correct answer. One accordingly needs to develop as comprehensive a picture of a given situation as possible, and to look into multiple answers before reaching any final conclusions. The thoroughness of the investigation will of course depend on the availability of data, so one will need to make the best out of the accessible data.

Population of the area

This figure provides a preliminary idea about the number of people that the open green space will serve. The space of course may end up serving a smaller number of users if a significant number of residences in the area have private gardens, for example. It also may need to serve a larger number of people if it attracts visitors from outside the area it is intended to serve.



Provide answer(s) and explanatory notes for answer(s) here:

The issue of the population of the area is not as simple as it may initially seem, and can be a tricky one. It often combines both residents and jobs in the area. It may also include other day users of the area such as students coming from other areas who study at the area's educational institution(s), or customers of existing businesses. In most cases, however, it is sufficient to only use the number of residents in the area since those are the ones most likely to use its open green spaces.

Number of households in the area and the average number of people per household

Knowing the average household size is important since the larger the family, the more it will have a need for open green spaces. If information is also available regarding the age groups inhabiting the area, that would be of use. The needs of different age groups regarding open green areas differ greatly. For example, young children will usually need play equipment, and will usually be accompanied by their parents when using them; teenagers and young adults tend to want to engage in group sports such as soccer and basketball; and older users tend to prefer spaces that offer calmness and serenity.



Provide answer(s) and explanatory notes for answer(s) here:

Number of households per building in the area

Single family homes at the one end of the spectrum will usually have their own gardens, and apartment buildings at the other end of the spectrum will have no gardens at all, or one or more of the ground-floor units may have its own small garden or terrace. This information accordingly will help achieve a better understanding of the availability of private green spaces, and thus the level of need for public ones.



Provide answer(s) and explanatory notes for answer(s) here:

Number and types of buildings in the area and their zoning regulations

Begin by noting the uses of the different buildings in the area. Users of non-residential buildings in a given neighborhood or district will generally have less of a need for open green areas, or will use the spaces differently or at different times of the day. Still, there are exceptions, as is the case with educational facilities. Students there often use such spaces heavily during their free periods or after teaching hours in the afternoon.



Provide answer(s) and explanatory notes for answer(s) here:



An example of the documentation of the land-use surrounding the Jordan National Gallery of Fine Arts Park in Amman.
 Source: <http://www.csbe.org/the-national-gallery-of-fine-arts-park>.

Natural characteristics of the area

Issues such as the topography of the surrounding area; the amount and types of vegetation it includes; the presence of water bodies in it; and the micro-climate(s) defining it, including rainfall, temperature ranges, sun paths throughout the year, as well as the strength and direction of prevailing winds, will all have an impact on the design of the public open green space.



Provide answer(s) and explanatory notes for answer(s) here:

Availability of other open green spaces in the area

There is a need to put together an inventory of open green spaces in the area to understand the extent to which the public open green space under consideration will be used. At one end of the spectrum, if it is the only available public open green space in the area, then there will be high demand for it. At the other end of the spectrum, if the people in the area have other options available to them in terms of open green spaces, there will be less demand for it. The inventory accordingly would need to address the following:

- Other public open green spaces (gardens, parks, urban pocket spaces, wide tree-lined sidewalks, roundabouts ...; provide brief descriptions and square areas for them).
- Semi-public open green spaces such as school yards (provide brief descriptions and square areas for them).
- Private open green spaces that are accessible to the public such as open-air cafés (provide brief descriptions and square areas for them).
- Other open green spaces.



Provide answer(s) and explanatory notes for answer(s) here:

Building density in the area

Provide the square area of the district that is occupied by open spaces, by roads, and by buildings. Provide the ratios of built square areas to the area of the district, of open spaces to the area of the district, of roads to the area of the districts, and of open spaces + roads to the area of the district. This information supplements the information provided above regarding population and building density in the area.



Provide answer(s) and explanatory notes for answer(s) here:

Roads

In addition to the information provided above about the square area of roads in the district, it is important to collect information on the various types of roads in the district to understand not only their carrying capacity in terms of traffic, but also the amount of through traffic that they accommodate. Such through traffic has the potential of bringing additional visitors to the public garden / park. In addition, high-volume, high-speed roads are very often extremely difficult, if not impossible, for pedestrians to cross. As a result, even those who are situated close to the park may not be able to reach it because of such roads. It is therefore important to identify the following (providing their locations, width, and length):

- Local roads.
- Through roads.
- Highways.
- Other.



Provide answer(s) and explanatory notes for answer(s) here:

Social and environmental conditions

The following indicators help give a better understanding of a number of physical and social conditions that define the character of the area.

- Primary activities in the area (residential, commercial, business, administrative, recreational, governmental ...).
- Income levels of the inhabitants of the area.
- Social, ethnic, and religious make-up of the area.
- Levels of safety in the area (crime, harassment ...).
- Levels of noise pollution in the area.
- Levels of air pollution in the area.
- Levels of traffic congestion in the area.
- Negative / positive environmental conditions.
- Other.



Provide answer(s) and explanatory notes for answer(s) here:

4. Surveying, analyzing, and assessing the site

As we embark on this section and the one that follows it, it should be kept in mind that an assessment or analysis differs from a general site inventory or survey in that it includes a synthesis of the physical aspects of the site. For example, the topography is surveyed and noted, but an assessment also is made on whether the slopes are steep or shallow. Both of course need to be carried out.

This section will help in determining the level of physical interventions needed in the site for the development of a public open green space.

As you provide the information requested below, provide whatever information you can, and feel free to add information as you see fit. A surveyed site plan and an aerial view of the site are needed for this section. A good part of the information requested for this section may be marked directly on the plan and / or aerial view.



Insert a site plan or an aerial view of the site here:

Assessing the site's regulatory context

Ownership of the site

Note the land ownership of the site. If the municipality does not own the site, but it is owned by another public-sector institution, one needs to look into the arrangements that have to be put in place for the municipality to develop and run the site.

Codes and regulations

There is a need to be informed of any existing or planned zoning regulations that affect the site and its surroundings. These include a wide variety of issues such as parking regulations, allowable built-up areas and heights of structures, allowable land uses in the area (residential, commercial, industrial, recreational ...). Also note utility and access easements, as well as other legal restrictions such as conservation or historical / archeological zones.

Assessing the site's infrastructure context

Availability of infrastructure / municipal services

The availability of water, electricity, and garbage collection are all crucial for the functioning of a garden / park. Water is needed for irrigating the plants; electricity is needed for lighting and for powering the water pumps; and garbage collection is needed to ensure the overall cleanliness of the facility. If any of these are not available, an assessment needs to be made regarding the required efforts and costs involved in providing them through conventional or alternative sources (solar power, on-site water collection, wastewater treatment ...). A connection to a sewage network is also needed if the facility is to hold any built areas.



Water:

Electricity:

Sewage:

Garbage collection:

Alternative sources:

Streets, bicycle routes, and pedestrian networks bordering the site

There is a need to understand the pedestrian network of sidewalks, street crossings, informal pedestrian paths ... that provide access to the site. There is also a need to understand the nature of the streets that provide vehicular access to the site. Both service and passenger vehicles will need access to the site. Having too many streets or sizable thoroughfares, however, may be a liability rather than an asset, since it may bring too much traffic, noise, and air pollution to the site. Information also will be needed regarding any new planned developments, whether in terms of roads or buildings, that will affect pedestrian and vehicular access to the site.



Streets:

Bicycle routes:

Pedestrian networks:

Availability of parking for the site

A neighborhood or district park should generally be accessible on foot, and the availability of parking should not be a priority. Still, the availability of a few parking spots, which may simply consist of street-side parking areas for both service and passenger vehicles, is preferable. This of course is different for parks and gardens that serve the whole city rather than ones that only serve a specific neighborhood. When assessing the availability of parking, take into consideration street parking, parking lots, and surrounding empty plots that may be used for parking.

Availability of public transportation to the site

If the site, or its immediate vicinity, is accessible via public transportation, then the site would be accessible to those living beyond the area defined by the one-kilometer radius mentioned above. This can be positive or a negative factor, depending on whether or not the site is intended to serve those living outside this area. In many cities in the MENA region, public space is often very scarce and not readily available on the neighborhood level. The scarcity of open space often leads to having public spaces serve larger numbers of people (and who often come from different parts of the city) than they were designed to accommodate.

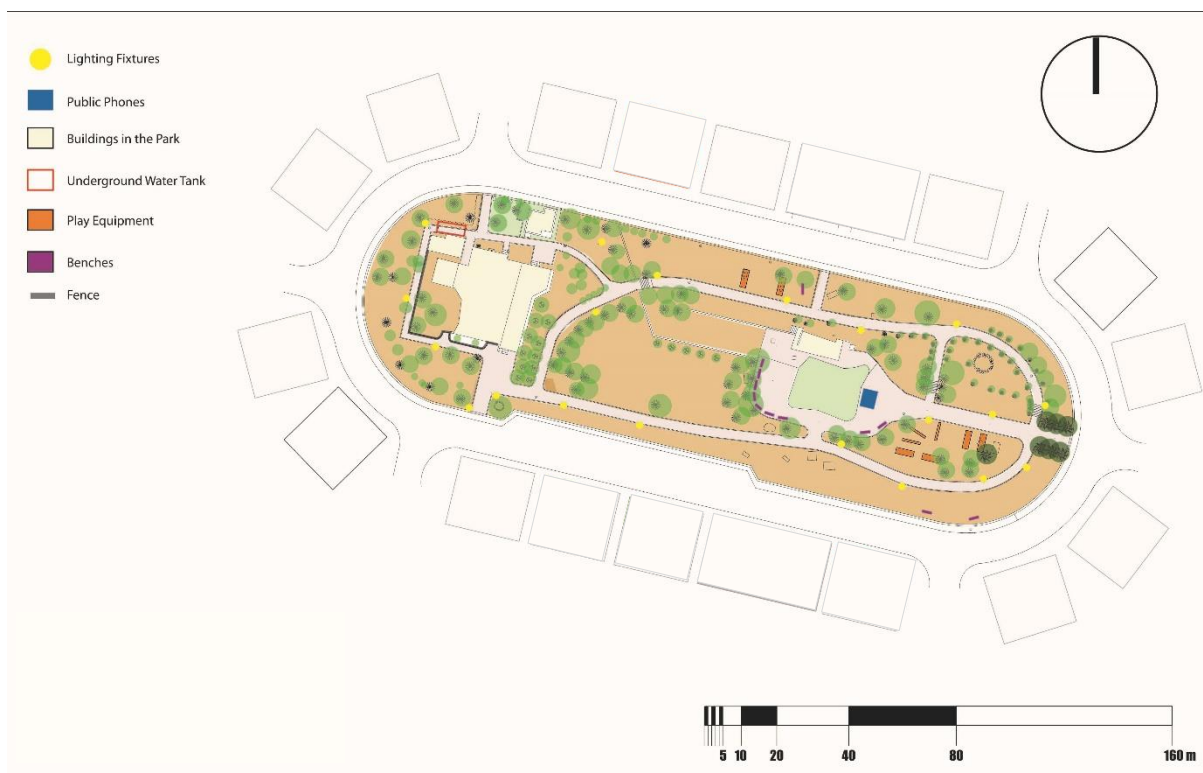
Assessing the site's physical context

Base map

Preparing an accurate base map is the first step in understanding the site's physical context. The preparation of the base map should be done by a professional surveyor. Having an accurate base map facilitates the design process and ensures that the design drawings adequately respond to the existing site conditions. This saves time and money during construction.

The base map typically should include the following elements (a number of these elements already will be included in a surveyed site plan of the site):

- Property lines and setback lines.
- Topography (including levels of surrounding roads or access points).
- Hydrology (bodies of water (including perennial streams or surface water courses), floodways).
- Structures (buildings (including their windows and doors), walls, fences, gates).
- Utilities / manholes (electrical: external lighting, electrical outlets; water: network, downspouts from roofs, water taps or outlets; sanitary / sewer; storm water drainage).
- Roads / culverts, driveways (both inside the site and surrounding it).
- Vegetation (both inside the site and surrounding it).
- Immediate off-site conditions such as neighboring buildings, roads, natural features ...



Example of a base map for the Jordan National Gallery of Fine Arts Park.

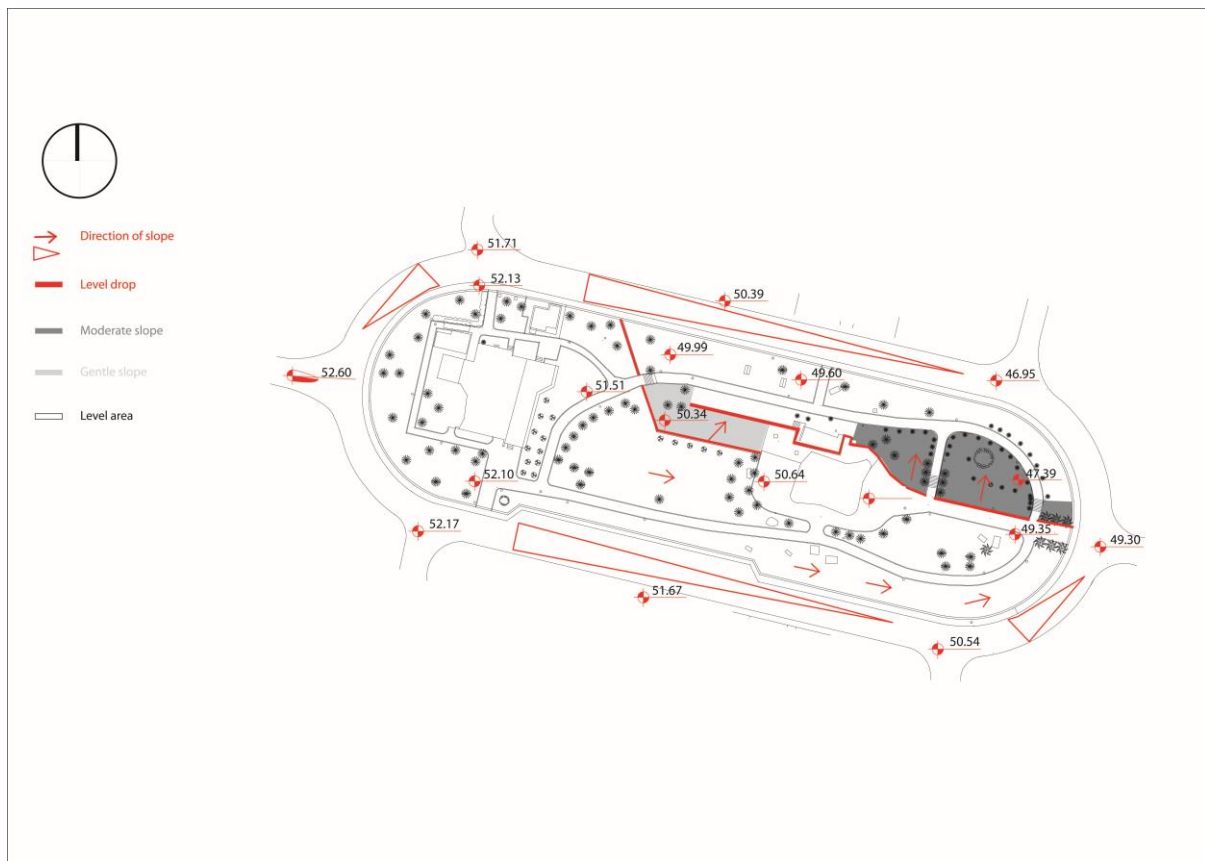
Source: <http://www.csbe.org/the-national-gallery-of-fine-arts-park>.

Area and shape of the site

This of course is a major factor determining what services may be included in the site (seating areas, playfields, pathways, food concessions).

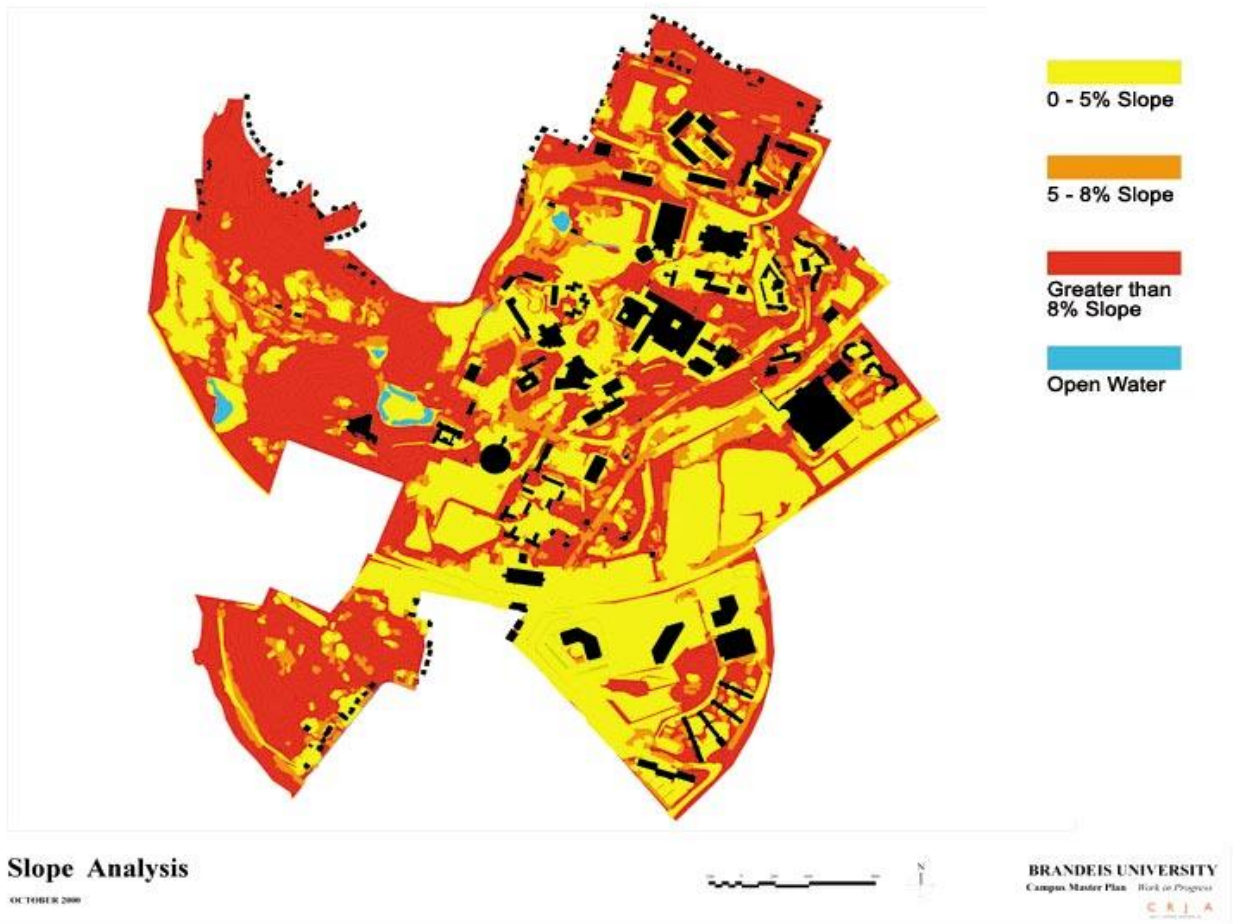
Topography / slopes

Begin by studying the existing topography (this is best done using a surveyed plan). Note flat areas and steep areas. Sloped gradients can be studied using software such as GIS and CAD programs, or manually by calculating the slope percentage (elevation divided by distance between contour lines). A site characterized by considerable slopes will require additional interventions in terms of providing items such terracing, retaining walls, stairs, and ramps. It also can limit the amount of leveled open space that may be used for congregation or sports. Still, it also can provide opportunities for visual and experiential variety for the visitors of the garden / park. In addition, the topography of the site slopes will affect water drainage in and around it, and may cause erosion problems. In contrast, flat sites with slopes less than 1% will require solutions for drainage.



Example of an analysis of the existing topography of the Jordan National Gallery of Fine Arts Park.

Source: <http://www.csbe.org/the-national-gallery-of-fine-arts-park>.



Topographic slope analysis for the Brandeis University (in Boston, Massachusetts, the United States of America) master planning project conducted by Carol R. Johnson Associates.

Source: https://www.brandeis.edu/masterplan/imgs-topographic_slope_analysis.html.

Hydrology

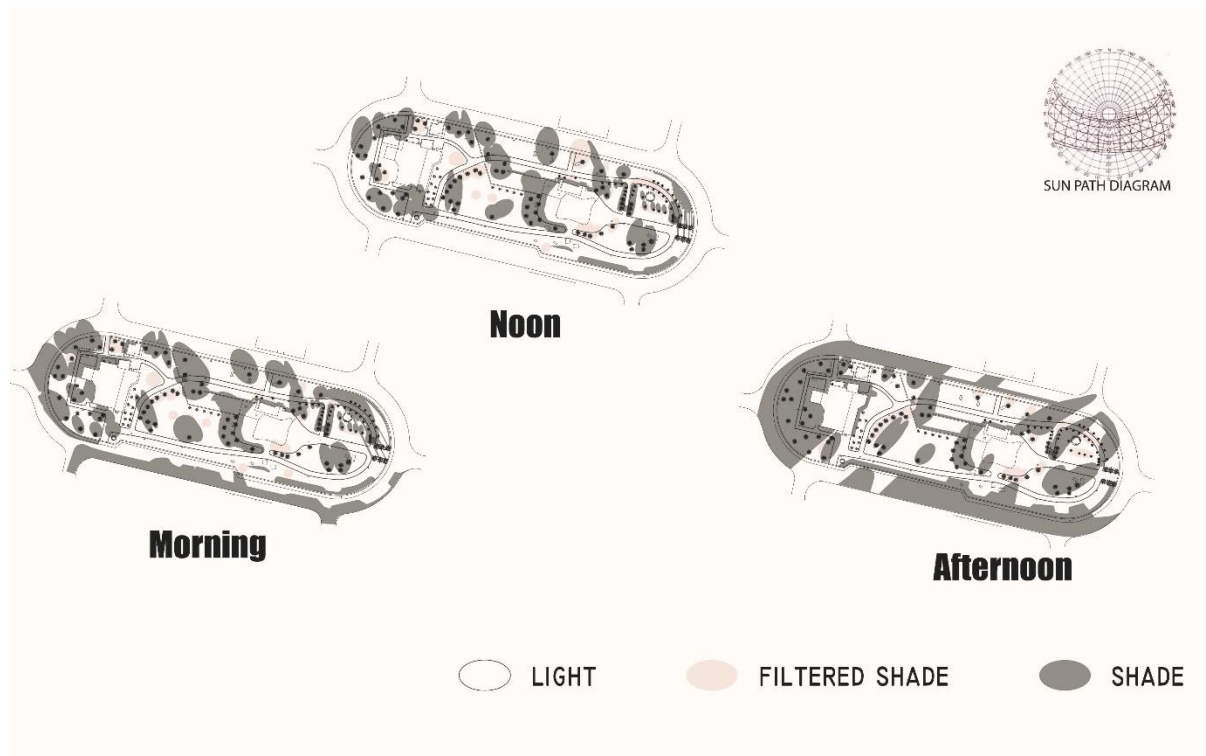
The presence and movement of water greatly impacts the development of a site. Note the availability and quality of ground water (potable, brackish, saline), the location and pattern of surface water run-off, and the presence of water bodies. Also keep in mind tidal and flood zones, which are usually subject to restrictions on building and development. Ground water infiltration affects planning and sustaining vegetation (particularly in arid climates) in terms of soil moisture retention and groundwater recharge, and surface water run-off impacts the location of built structures.

Existing soil

In a number of cases, the existing soil on the site may not be suitable to support plant life. For example, the quality of the soil may have been degraded over time as a result of factors such as the lack of care or the accumulation of debris. The soil also may be clay, sandy, or saline soil and therefore not suitable for many plant forms. As a result, the existing soil may need to be treated, and new soil may need to be brought into the site, which of course involves effort and is a cost to be factored into the making of the new public open green space. In some cases, it is a good idea to perform a soil test on the existing site soil.

Climate and micro-climate

An analysis should be made of the climatic conditions of the area and those that are unique to the site. These include issues such as temperature ranges, prevailing winds / breezes, rainfall / snowfall, as well as solar radiation, sun movement, and resulting sun / shade patterns. Such patterns will greatly impact the type of vegetation that is suitable for the site, and the nature and timing of functions and activities taking place in it. Note warm areas, cool areas, the direction of prevailing winds, sunny / shady areas, as well as damp or wet areas. Understanding the climatic and micro-climatic conditions of a given site is key in the long-term sustainability of the vegetation.



An example of a sun/shade analysis for the Jordan National Gallery of Fine Arts Park.
Source: <http://www.csbe.org/the-national-gallery-of-fine-arts-park>.

Vegetation

Note the existing plants on site (trees, shrubs, ground covers, native scrubland ...). A plan indicating the type and size of the vegetation should be produced. Efforts should be made to protect the existing vegetation of the site and to incorporate it into the design of the public open green space. For one thing, such vegetation is usually rather durable to have been able to survive possible harsh conditions and lack of care. Also, such vegetation, particularly trees, takes a considerable amount of time to fully grow and reach maturity. Accordingly, preserving existing ones rather than planting new ones would save years of waiting for the new ones to grow. Also keep in mind that plants provide habitat for wildlife, improve micro-climates, and help clean the air.



An example of a vegetation survey / documentation for the Jordan National Gallery of Fine Arts Park.

Source: <http://www.csbe.org/the-national-gallery-of-fine-arts-park>.

Current use and existing buildings and structures (if applicable)

Fences / gates

There are parks located in settings where levels of social consciousness are high enough so as not to require physical barriers such as fences and gates that would be used at night, for example, when acts of vandalism may take place. The issue of vandalism in public spaces is a major problem throughout the world, particularly in developing-world countries, where the sense of public ownership may be weak. Fences and gates accordingly are needed in most instances to control access, particularly at night, when the vast majority of visitors do not come to the site, and those who engage in vandalism or other illegal / socially dubious behavior are therefore more likely to be present in the site. Gates and fences are costly items, and the necessary budget would need to be earmarked for them. If the site has existing gates and fences, then there is a need to assess their condition and whether they require upgrading or maintenance, and accordingly specify the necessary budget for that.

Paths

Existing paths, whether dirt or paved ones, usually mark common patterns of movement within an expansive space. It is often advisable to take them into consideration when designing or upgrading an existing open green space, and to incorporate them in the new or upgraded design.

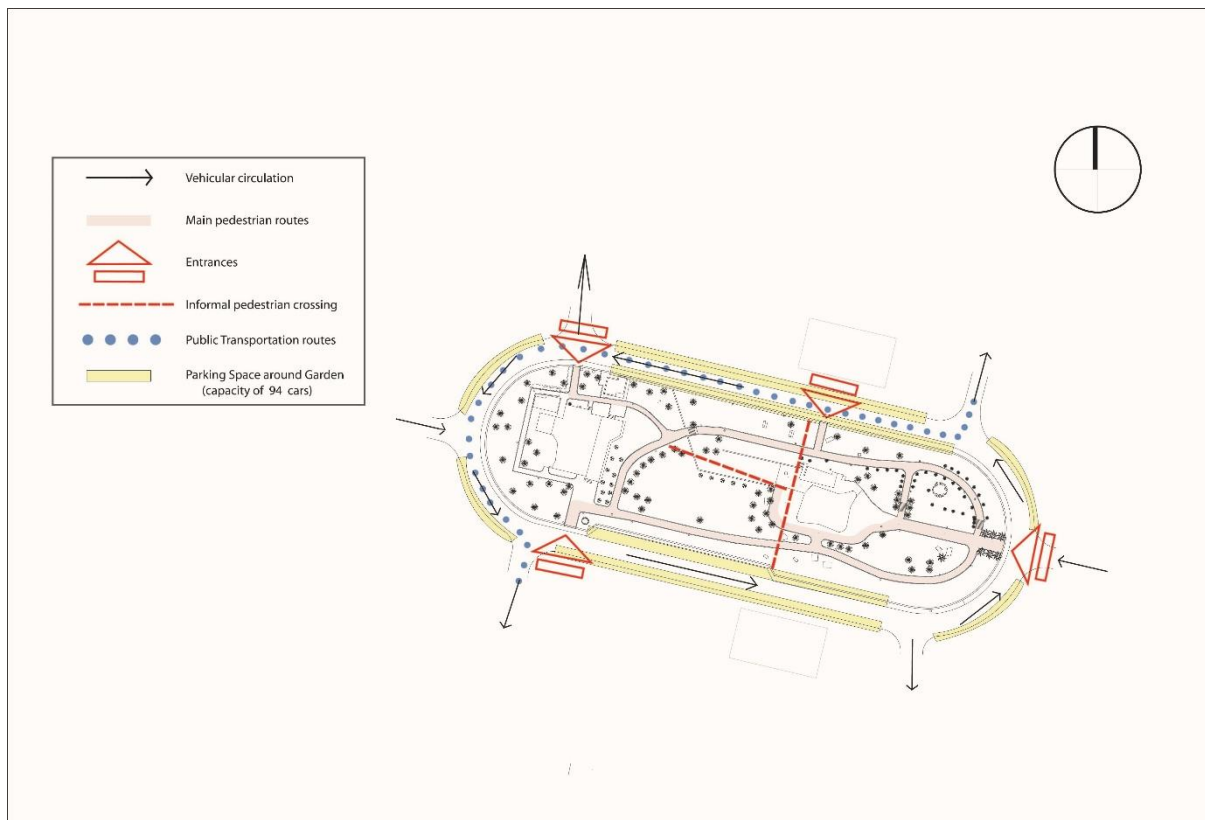
Paved areas

Paved areas serve a number of functions. They provide spaces where people may easily congregate without having to worry about the presence of mud or dust, as is the case in dirt covered spaces;

and they save on the consumption of water (in comparison to planted areas). Paving materials (stone, granite, concrete tiles ...) do need to be skid and glare resistant; easy to walk or run on, or to push a stroller on; and also durable. Paving surfaces of course are expensive. Accordingly, efforts should be made to reuse and adapt existing paved surfaces that meet these standards whenever possible.

Existing buildings

If existing buildings on the site meet minimal standards in terms of issues such as structural integrity, efforts should be made to keep them and incorporate them into the design of the open green space. They may be used for a variety of functions ranging from providing storage space to housing administrative or communal functions.



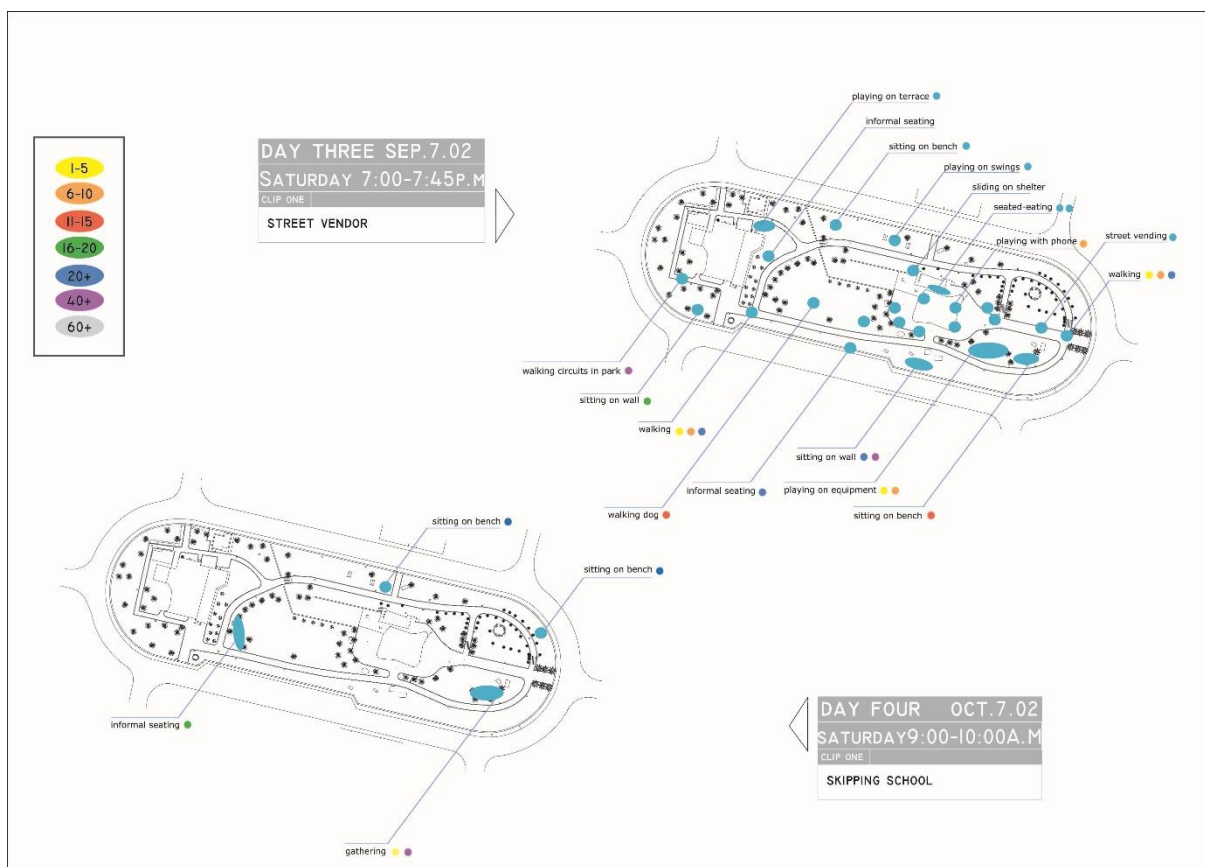
An example of an analysis of the National Gallery of Fine Arts' pre-existing existing paths, entrances, buildings, and paved areas.

Source: <http://www.csbe.org/the-national-gallery-of-fine-arts-park>.

Current use(s)

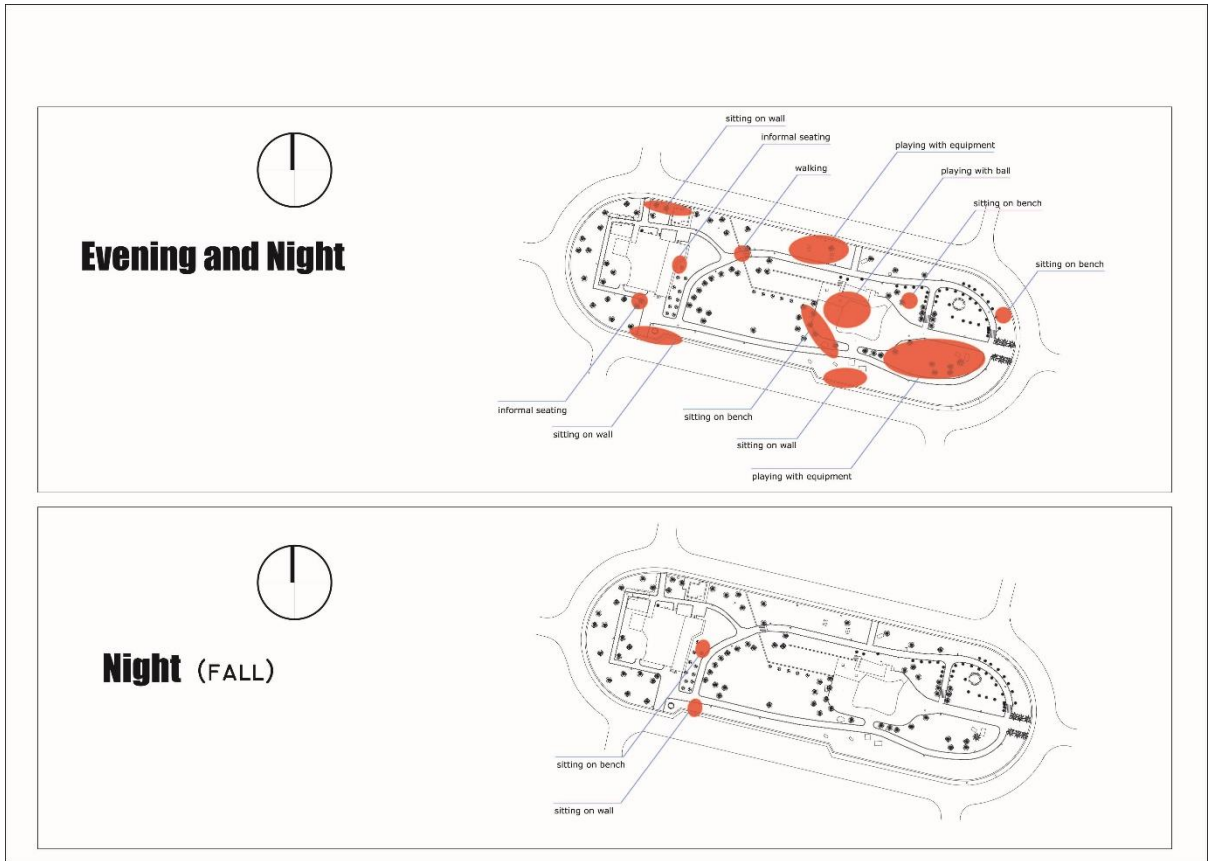
The current use(s) of the site will inform the design of the public open green space. This will provide information on what may and may not - as well as what should and should not - be done in the new open green space. It is also worth investigating the reason why the site is currently used to house a certain function(s). If the function is a positive one and fits into the role of a public open green space, or at least does not oppose it, then it may be maintained and even enhanced. Of not, then such a current use should be excluded from the site.

Tools such as behavioral observational mapping may be used to document and analyze the current use of the site. This involves visiting the site at different seasons of the year, different days of the week, and different times of the day. 'Observers' would note the number of people in each zone of the space, their age group / gender, and the type of activity they are engaged in. Formal or informal interviews may also be conducted to add to the available information on the current use of a site.



An observational plan showing the density of users, age group, and the dominant activities taking place in the National Gallery of Fine Arts Park on a summer evening.

Source: <http://www.csbe.org/the-national-gallery-of-fine-arts-park>.



An observational plan showing the density of users and the dominant activities taking place over the summer and autumn evenings in 2002 in the Jordan National Gallery of Fine Arts Park.

Source: <http://www.csbe.org/the-national-gallery-of-fine-arts-park>.



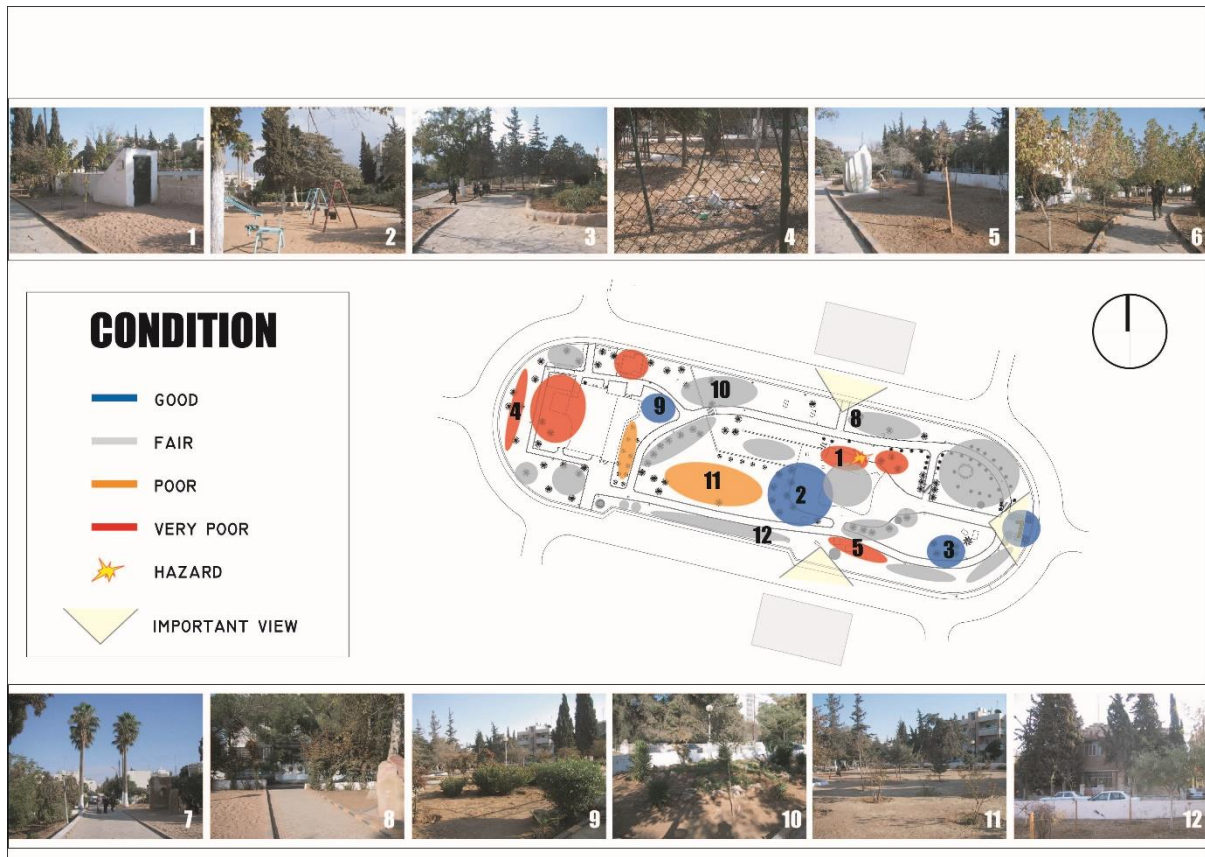
Observational mapping plan summarizing density and location of users according to age group in the Jordan National Gallery of Fine Arts Park.

Source: <http://www.csbe.org/the-national-gallery-of-fine-arts-park>.

Assessing the site from a visual and sensory perspective

Visual assessment

Some views are ones that one would want to emphasize (such as a view of a river or sea), and others are ones that one may want to block through constructed or natural green screens (such as a view of dilapidated buildings). Also, one should note any adjacent or nearby landmarks (such as a historical building), nodes (such as a roundabout), or other special features (such as unusual natural geographic formations as with a rocky outcrop) that need to be considered in the design of the open green space. In addition, note the condition of natural features and existing site elements and structures.



A visual assessment of the Jordan National Gallery of Fine Arts Park.

Source: <http://www.csbe.org/the-national-gallery-of-fine-arts-park>.

General sensory observations

Note any negative or positive issues relating to noise, pollution, as well as scents and smells. Identify if these are permanent or temporary conditions, or if they are limited to specific time frames within the day, week, or year.

Conducting a SWOT analysis

Once the above surveying and assessment is completed, a further assessment of the site may be conducted through using a SWOT analysis or SWOT matrix. SWOT is an acronym for a strategic planning technique that aids in identifying a site's strengths, weaknesses, opportunities, and threats. Strengths and weakness are based on internal factors while opportunities and threats are based on external factors. Typical questions to answer when conducting a SWOT analysis include the following:

- What are the positive features of the site that can be exploited (e.g., scenic views, mature trees, easy accessibility ...)?
- What are the negative features of the site that need to be mitigated (e.g., steep slopes, saline soil, windy conditions, pollution, traffic ...)?
- What types of opportunities are there that can contribute to the success of the project (e.g., tourism in the area, a company based in the area that has a Corporate Social Responsibility (CSR) program, the availability of inexpensive labor ...)?
- What are the factors that threaten the success of the project (e.g., vandalism, future over-development of the area, population decline in the area ...)?




Example of a SWOT analysis:

Strength: *The site has beautiful views to the sea and a good number of mature trees.*

Weakness: *The topography is steep in some areas, which makes the inclusion of playfields, for example, a challenge. Adding retaining walls to maintain even shallow slopes is costly.*

Opportunity: *The site is adjacent to a community center. This presents possible collaborations in the upkeep of the site.*

Threat: *Nearby open spaces suffer from vandalism, and this site is also susceptible to it.*

	<u>Strengths:</u>
	<u>Weaknesses:</u>
	<u>Opportunities:</u>
	<u>Threats:</u>

Studying precedents and references

Researching precedents and similar case studies is a useful activity to be undertaken before beginning the design of the green open space. Studying different approaches to solving similar design problems can lead to both appropriate and innovative solutions. Note overall design strategies, response to context, environmentally friendly practices, and the use of materials for example. Also consider studying local, regional, and international examples.

5. Designing the green open space

Once the site and the area surrounding it and their characteristics are surveyed and assessed, there should be adequate information available to begin the design of the specific site.

Depending on the size of the job and the number and capacities of the municipal staff, a design may be conducted in-house or outsourced to a specialized consultant or company. This section outlines the process to be taken in developing the design of public open green spaces. Even if the design process is outsourced, input and engagement from the municipality or another relevant public sector organization commissioning the space will be needed at various stages, particularly in the development of the design brief.

Below are the primary steps required for developing a design for public open green spaces:

- Preparing a design brief that defines the functions and various requirements to be accommodated in the designed site.
- Preparing cost estimates and considering available budgets.
- Producing the design documents.

Preparing a design brief

A design brief is typically a written statement outlining the project goals, the target audience, the various functions / activities to be included, the overall theme or style of the design, and other technical or aesthetic requirements. It may also include budgets (more about budgeting is provided below), a timeline, and a specific scope of work and deliverables (especially if the design is outsourced).

The design brief should answer the following questions:

- What were the results of the community engagement activities (surveys / questionnaires / focus groups, if conducted (more about community engagement is provided below))?
- Are there any specific or pressing community needs that can / need to be addressed in the design of the space?
- Who is the target audience? Who will the open green space serve? Note numbers, gender, age groups, and type of user (i.e., resident, tourist, pre-university or university student, office worker ...)?
- What types of activities are to be included and what areas are needed to accommodate these functions and activities?
- What support services are needed (guard room, WCs, storage facility, water reservoir...)?
- Which environmental and sustainable practices should be considered in the design (e.g., use of local materials, emphasis of water conservation, use of solar lighting...)?
- What aesthetic or conceptual considerations are to be considered? Are there any specific themes or sources of inspiration identified by the municipality or by the community (e.g., Islamic gardens, historical or specific cultural aspects of the surrounding area, mimicking nature, attracting wildlife...)?

To create a welcoming public plaza that meets the community needs of the surrounding neighborhood and also attracts tourists visiting the adjacent historical mosque and central market.

- Objectives of the design: Maintain visual site lines to the mosque; maintain a clearly identifiable entrance to the market; provide shade.

- Elements to be included: Open plaza, seating for tourists and residents, trees and shaded areas, tourist information booth, waste bins, interpretive and way-finding signage, water feature.

- Special requirements: Sturdy materials to be used for paving and site furniture; underground cistern to be provided for the collection of rainwater; local materials should be sourced where possible.

- Design concept, theme, or inspiration: the design should draw inspiration from 9th-century Islamic architecture in the area.

Example of a design brief statement.

Conducting cost estimates and considering available budgets

The cost of construction and long-term maintenance are key considerations in the design planning process. One accordingly needs to consider issues such as the budget available for construction; the budget available for yearly maintenance; available opportunities for raising additional funds through the private and public sectors or foreign donors; and the possibility of phasing the project if there are budgetary constraints ... An initial budget usually is set at the time of the conception of the project, but budgets need to be revisited and revised throughout the life of the project. The issue of budgeting is discussed in further detail below.

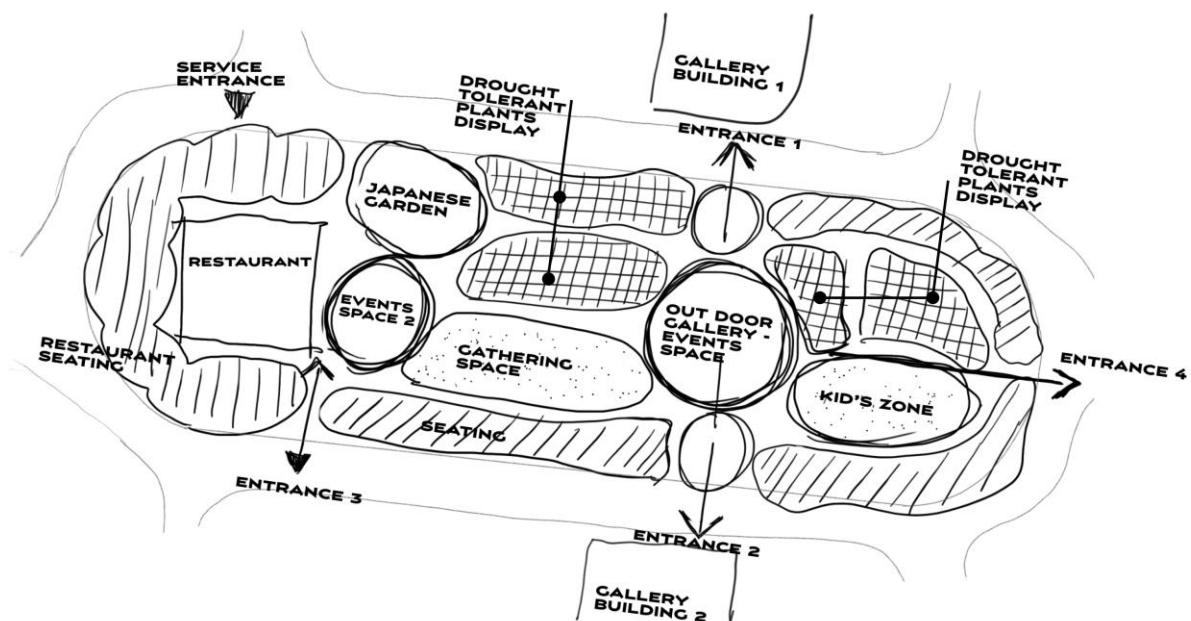
Producing the design documents

A number of design documents will need to be produced to provide a complete design. These include the following:

Concept plan

The concept plan, also known as a 'functional diagram,' is considered the first step in the design process. When developing the conceptual plan, keep in mind the site's program, the community engagement results, and the results of the site analysis. Writing down key concepts and goals helps keep the plan on track. The conceptual design should generate solutions to the problems and constraints identified, and also take advantage of the opportunities identified.

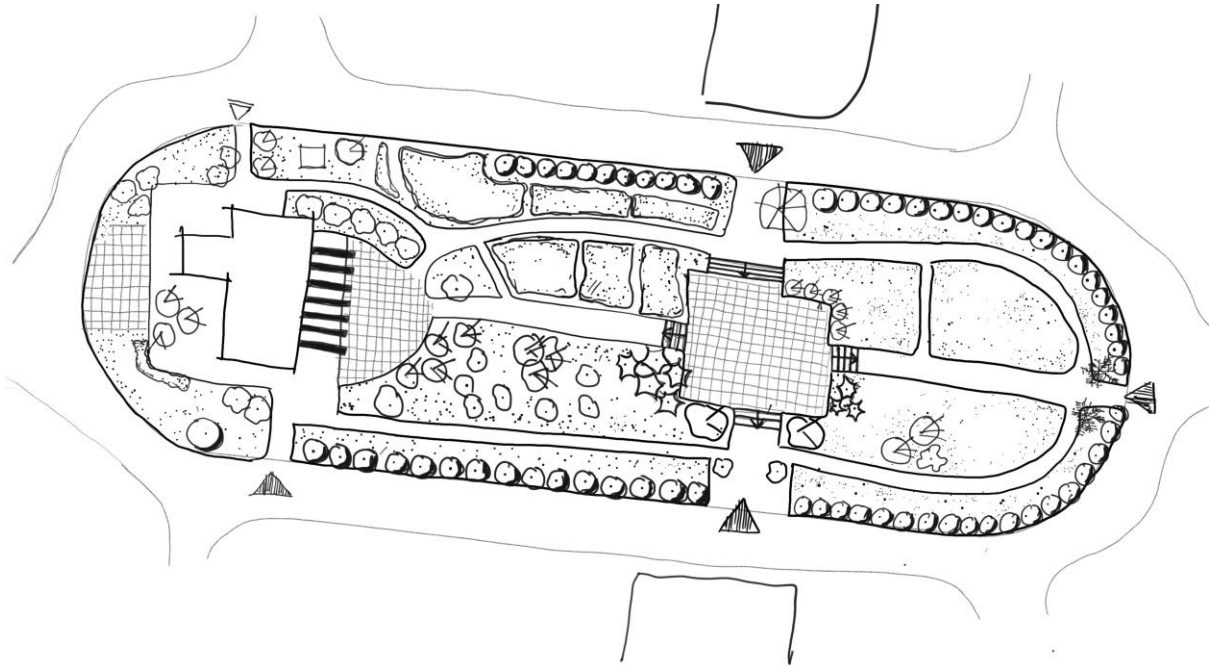
The concept plan is developed through outlining the various functions and activities, showing the rough areas needed for each of them. These are typically represented using a "bubble diagram." This results in spatial patterns and an elaboration of the associations connecting the various components of the project to scale. The concept plan is usually rather loose and in sketch form. This allows the designer to jot down ideas in a quick manner. A few concept plans may be produced to test different design solutions before choosing a preferred option.



Example of a concept plan.

Design development (this includes schematic design and design development stages)

The concept plan is further developed into a schematic design plan to illustrate specific geometries and arrangements of spaces and components, as well as to specify types of plants and finishing materials. The schematic plan is then developed into a design development stage plan, which defines the geometries and material selection to a finalized form, and constitutes a refinement and articulation of the conceptual phase outlines.



Example of a schematic design plan sketch.



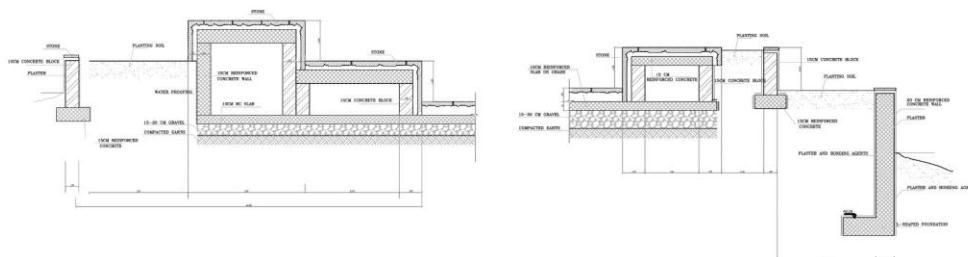
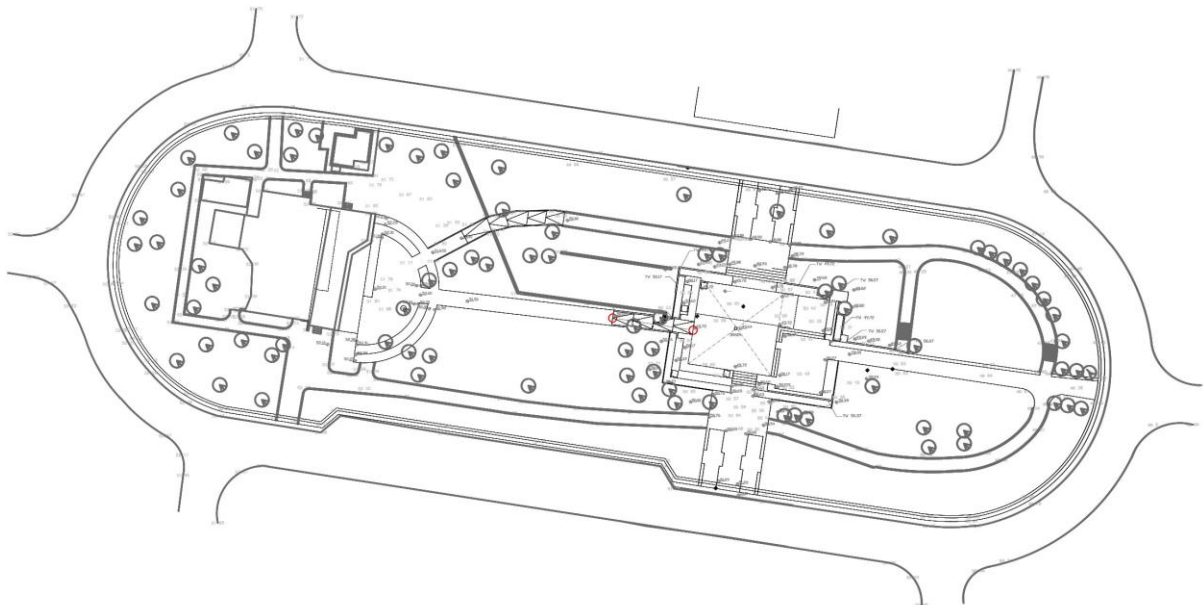
Example of a rendered schematic design plan.

Construction documents

These are final plans that will be used for the construction of the project. They illustrate sizes, materials, spacing, levels, and exact quantities of plant and construction materials.

A typical construction drawing set includes the following documents:

- Setting-out plan (this plan provides the dimensions and locations of the various design elements such as paved areas, walls, stairs, playfields ...).
- Grading / levels plan (this plan indicates the levels and changes in the topography).
- Materials and finishes plan (this plan indicates the materials specified for surfaces, pathways ...).
- Planting plan (this plan shows the location, types, and arrangement of trees, shrubs, and groundcovers).
- External lighting plan (this plan indicates the location and types of lighting fixtures; it may also indicate the various electrical circuits).
- Irrigation plan (this plan shows the irrigation system design including the route of the main lines, sub-mains, sprinklers, valve location ...).
- Construction details (these include details for retaining wall, slabs on grade, fences, fountains ...).
- Signage (this plan indicates the location and type (wayfinding, interpretative, cautionary ...) of the signage used in the public open green space).



Example of construction documents for the National Gallery Park

Site specific design guidelines

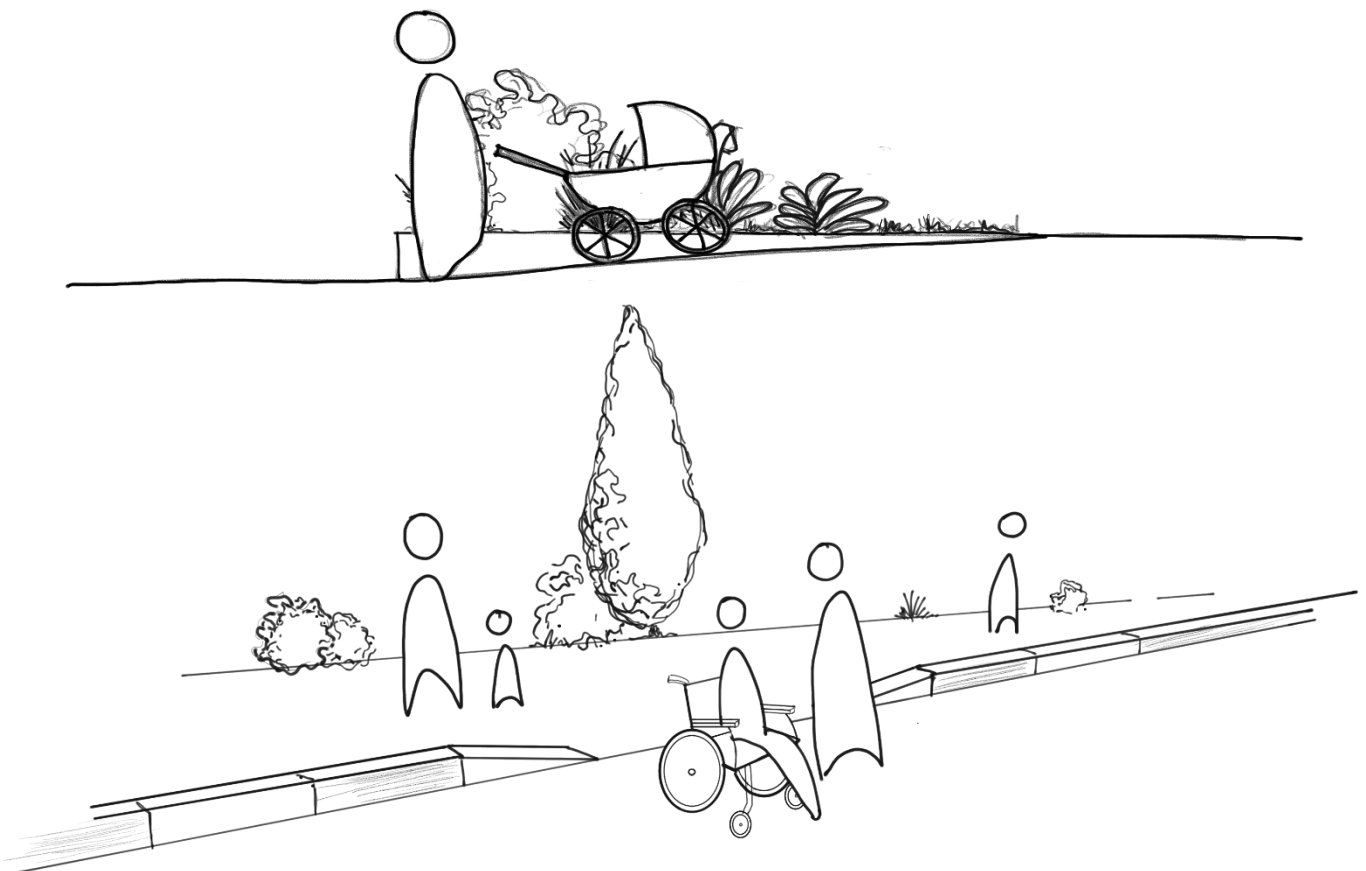
Access and circulation

Designing a site's circulation system requires an understanding of the surrounding context and transportation networks discussed in the previous sections. Consider the location of parking areas and crosswalks in relation to the proposed entrances in terms of safety and accessibility. Also consider clearly defining entrances to the site, and linking its different parts via paths and nodes. Successful circulation systems combine both ease of access and pleasurable special experiences. A good rule of thumb in designing functional circulation is to provide access according to visual cues (access points should be visible and clearly defined).

It is recommended that pathways be at least 1.2 meters wide and to be as level as possible. To accommodate baby strollers, pathways should be at least 2.4 meters wide.

Accessibility for people of all age groups and for people with disabilities is key in fulfilling the needs of all users. Moreover, all spaces should be accessible to wheelchair users or to people pushing children's strollers. Providing minimal accessibility requirements includes building ramps and curb cuts in sidewalks.

A good reference regarding accessibility is the United Nations "Accessibility for the Disabled - A Design Manual for a Barrier Free Environment" (<https://www.un.org/esa/socdev/enable/designm/intro.htm>).



It is important to provide ramps and curb cuts to ease accessibility and allow for the movement of strollers and wheelchairs.

Grading and leveling

Dealing with topography is a major aspect of a successful design. Keeping the existing topography of a site is usually the most economical and efficient approach to design. This, however, is not always possible when attempting to accommodate various functions and to provide accessibility. It is nonetheless advisable to retain the existing topography as much as possible.

When dealing with sloped topographies, common strategies for creating functional usable spaces include leveling areas, retaining sloped areas, and including retaining walls. When dealing with flat sites, one may consider elevating or sinking areas as well as creating landforms such as berms and swales to separate functions or add interest to the special experience of a site.

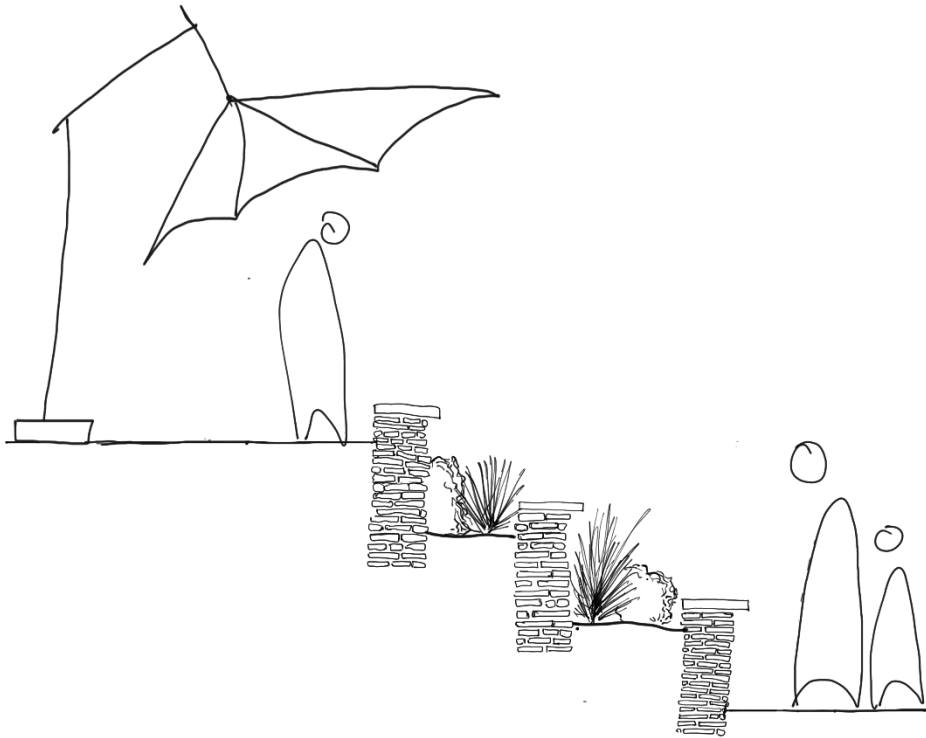
Below are some guidelines for grading and leveling:

“When cutting into the slope, one may compromise its integrity. In some cases, this is unavoidable, and retaining walls then are essential. By cutting smaller terraces into a slope, however, one can avoid the need for large retaining walls at the base and erosion control at the top, which is required with a larger cut and fill design”. Consider using differences in levels to integrate seating or viewing platforms. (see, <https://www.firstinarchitecture.co.uk/landscaping-a-sloped-or-steep-site/>.)

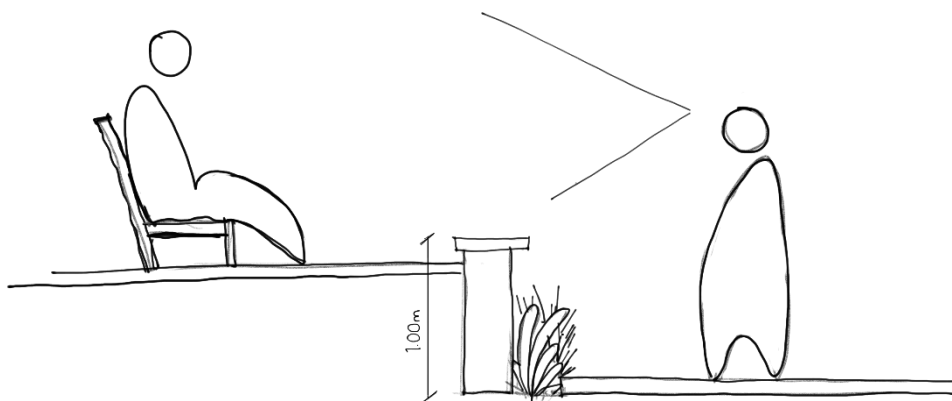


Changes in level can provide an opportunity to create a seating platform.

- Keep retaining walls as low as possible. When connecting two spaces located at different levels, the level difference should not exceed 1 – 1.2 meters, which also allows for a strong visual connection between the spaces. Keep in mind that a 45 – 50-centimeter-high retaining wall is visually unobtrusive and can also be used for seating.



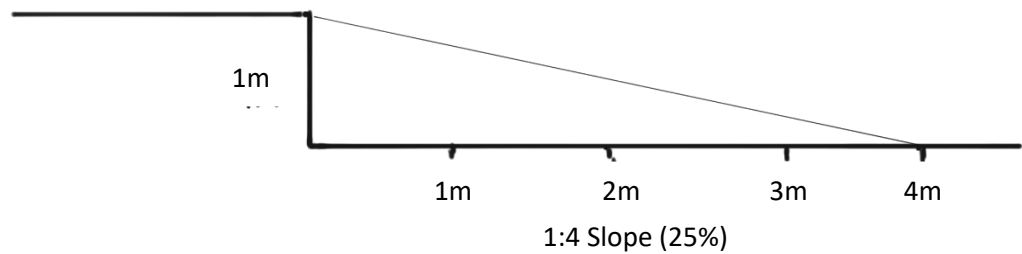
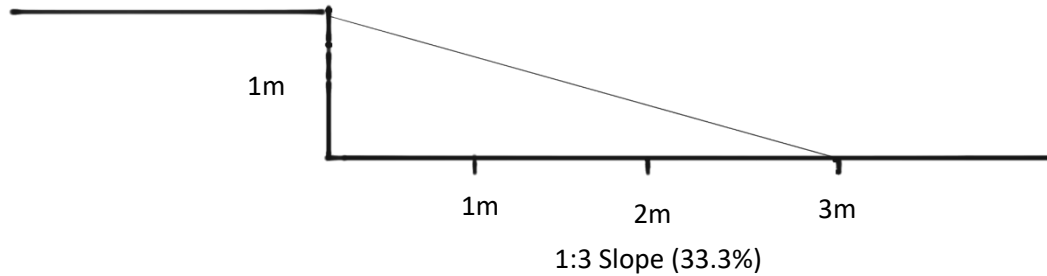
A number of low retaining walls are used here to connect spaces located at different levels.



A low retaining wall does not obstruct visual sight lines.

- Paved flat surfaces will need to be drained to a nearby open ground area or via storm water drains. It is advisable to seek the input of mechanical engineers in determining the best drainage solutions and the sizing of drains and storm water pipes. A 1% minimum slope is recommended for draining paved areas and pathways, and a 2% slope is recommended for draining turf areas.
- Ramps should have a 1 to 12 or 7 - 8% slope (i.e., a 1-meter rise to a 12-meter run).
- A self-retaining soil slope usually has a maximum ratio of 1 to 3 (or 33.3%, i.e., a 1-meter rise to a 3-meter run). This ranges depending on the type of soil. If the slope is higher, the soil will be subject to erosion, and a stabilizing element such as geo-grid or steel mesh would be needed to keep the soil in place.

- Planted slopes should preferably not exceed 25%. A 1 to 3 slope is the maximum to be used, but a shallower slope is preferable.



Preferable maximum slopes for soil and planted areas.

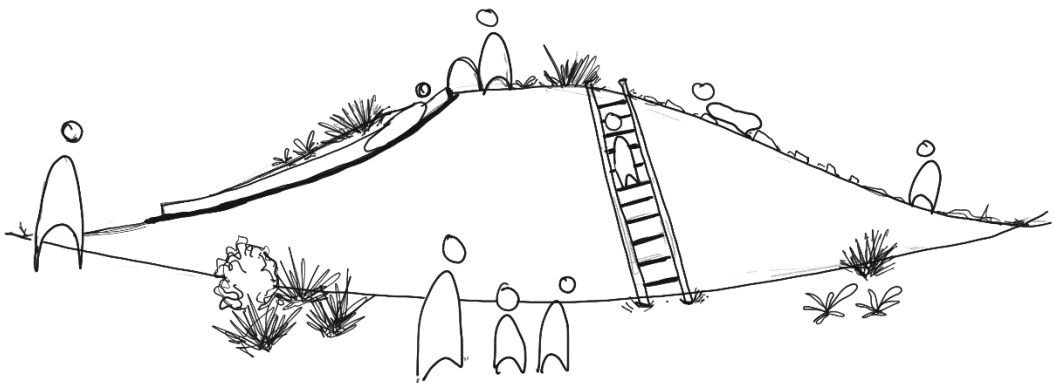
- Consider the use of landforms for various functions. Berms may be used to elevate areas to provide privacy or screening. Swales may be used to collect run-off water from a site and to direct it to low-lying areas for passive water retention (see the section below on water harvesting for more information on this topic). Landforms also may be used to create playscapes for children.



Berms may be used to elevate areas so as to provide privacy or screening.



Swales may be used to collect run-off water from a site and to direct it to low-lying areas for passive water retention.



Landforms may be used to create play-scapes for children.

Paving and surfacing

Introduction

Paving and surfacing are a major component of any landscape. Hard surfaces are typically used for gathering, circulation, parking, and sporting activities such as basketball, tennis, or volleyball. Including hard surfaces reduces the water consumption and maintenance of a landscape, but can be harsh and inhospitable to visitors if not combined with softer landscape elements such as trees and shrubs. The key is to include a balance of hard and soft areas. Surrounding paved areas with shrubs and trees (particularly shade-providing trees), or incorporating soft elements within the paving creates a sense of lush greenery and also ameliorates the microclimate. This also helps cool the surrounding area because of the evapo-transpiration of plants.



Integration of planted and hard surfaces at the Jordan National Gallery for Fine Arts Park.
Photo by Osman Hakuz; courtesy of the Center for the Study of the Built Environment (CSBE).

Hard surfaces can also be used to harvest water and channel it into collection tanks for use in the dry season. Further details on water harvesting are provided below.

When selecting a surfacing material, it is important to select materials that are suitable for outdoor use. Select non-slip materials and ones that do not cause glare. Also consider the heat absorption factor of materials. Mediterranean and desert climates in Tunisia are characterized by ample sunshine. Using light-colored materials can lead to glare, but it also should be taken into consideration that dark materials absorb heat and cause areas to become excessively hot.

Consider materials that do not show the accumulation of dirt and stains. It is advisable for example to use darker shades for parking and vehicular traffic areas.

Another consideration when selecting materials is durability, especially in public spaces that are subjected to heavy wear and tear, and to possible vandalism. Using local materials is generally more

cost-effective and environmentally friendly. Maintaining surfaces made from local materials is also easier in the long run in that they are readily sourced and available when replacement is needed.

A wide variety of paving and surfacing materials are available in the market. Below are some commonly used materials for paving and hard surfacing:

Stone

(The parts below on stone, concrete, and ceramic and porcelain tiles are adapted from the Paving Solutions guidelines in the Resources on Landscape Design section in the CSBE website. See, <http://www.csbe.org/resources-on-landscape-design>).

A variety of different stone types, sizes, and finishes are available. Hard stone should be used for paving surfaces; soft stone is subject to erosion from foot traffic, and is not recommended for use on ground surfaces. A variety of effects can be achieved through the use of stone (or marble or granite) for paving. Stone paving pieces can consist of geometrically cut pieces, usually squares or rectangles, and also of irregular pieces. Small irregular stone paving tiles usually are leftover pieces resulting from the stone cutting process, and can be obtained at relatively low prices.

Concrete (pre-cast concrete tiles, cast-in-place concrete)

Concrete provides a diversity of possibilities as a paving surface. Concrete tiles can be found in various thicknesses that offer different strengths. They come in a variety of shapes and colors, and can be made to resemble other materials such as stone or brick. Concrete tile types include those with relatively smooth surfaces, as well as ones with slightly protruding patterns. Another common type of concrete paving tiles is exposed aggregate tiles, which consist of concrete mixed with pebbles, thus providing a somewhat rough texture.

Other possibilities include interlocking concrete paving systems, which provide a number of advantages in relation to rectangular or square concrete tiles. The interlocking nature of such systems strongly binds individual paving units and prevents any lateral movement in them. They consequently do not require mortar to bond the individual paving units to each other. Because mortar is not used, these systems more effectively deal with water ponding problems since excess water simply seeps through the joints to settle in the soil below. Also, the strong bonding created between the individual paving units means that these systems do not require a concrete bedding and can be placed directly on a compacted layer of sand. Another advantage of interlocking paving tiles is that they can be removed easily and placed again in the same location (if maintenance work is to be carried out), or used in a different area.

Cast-in-place concrete can be used to provide various patterns and textures. This method relieves one of having to transport finished concrete tiles to the site. When using such a system, however, make sure to place contraction joints at adequate intervals to avoid cracking. Cast-in-place concrete includes stamped concrete, which allows for creating a wide variety of paving patterns and textures through the use of rubber molds that are applied to the concrete paving before it dries.

Ceramic and porcelain tiles

Ceramic tiles that are specially manufactured for outdoor use include various colors and textures. They provide beautiful compositions that also are sturdy and that resist glare and slippage. Ceramic tiles, however, can be relatively expensive in relation to other paving choices such as concrete since their manufacturing is more complex. In addition, one might face difficulties after installing ceramic tiles if there is a need to carry out expansion or maintenance work since the original type of tiles might no longer be available in the market. Consequently, when using ceramic tiles, buy extra quantities and store them in case there is a need to replace any of the original tiles.

Poured Rubber

Rubber surfacing is typically used under play equipment or for running tracks. It is a very safe material to use under children's play equipment as it is shock-absorbent. The thickness of the rubber surfacing varies according to the height of the anticipated fall from play structures. It is important to check the information provided by the manufacturer on the thickness required.



Poured rubber surfacing in a playground in a resort in Aqaba.
Photo by Lara Zureikat.

Acrylic surfacing

Acrylic surfacing is typically used as a finishing material for sports fields such as tennis, basketball, and volleyball. It is an all-weather slip and glare-resistant layer that is applied over an asphalt or concrete sub-surface. It comes in a variety of colors and textures. Its all-weather quality is ideal for outlining a sports field's marking lines. Certain types of acrylic surfacing also provide some cushioning.



Acrylic surfacing on a soccer field in a public school in Jordan.
Photo courtesy of CSBE.

Asphalt

Asphalt is a relatively quick and cost-effective surfacing material, especially when surfacing large (or long) areas such as roads and parking lots. The standard black asphalt paving is not attractive and is heat absorbent. There are, however, colored and textured types that are ideal for walking paths or natural driveways.



Textured asphalt.
Photo by Lara Zureikat

Colored and textured asphalt.
Source: <https://www.creapave.com/terrazzo.html>

A close-up of textured asphalt.

Loose and compacted gravel

Other options for surfacing are soft inorganic materials. These include loose gravel and compacted gravel (also known as bound gravel). These materials require less effort in terms of construction work and are relatively less costly than hard surfacing materials. Loose gravel and bound gravel are ideal for gathering spaces, pathways, or seating zones. One advantage is that they are quick to lay, and are easily removed if design changes are to occur in a park or garden.

Loose gravel is an aggregate composed of either crushed stone, river stone, or other naturally occurring stone aggregates. It comes in various sizes, shades, and mixtures, and is usually laid as a layer that is 6 – 10 centimeters thick on top of soil, sub-soil, or compacted fill. Including an edging made of wood, steel, or stone around the area where the gravel is laid helps keep it in place. Do keep in mind that loose gravel requires regular replenishment to fill areas where the gravel erodes with time.



Loose gravel in a variety of sizes and colors.
Photos by Lara Zureikat.



The Japanese Garden that was installed at the Jordan National Gallery of Fine Arts Park in 2005 presents a variety of loose gravel and stones.
Photo by Osman Hakuz; courtesy of CSBE.



Loose gravel in a private herb garden in Amman.
Photo by Lara Zureikat.

Bound gravel (or bound or self-binding gravel) is a fine gravel laid on compacted sub-layers. The gravel is bound together through a rolling and compaction process, and remains firmer underfoot when compared with conventional loose gravel. It can also be used on driveways and parking areas.



Bound gravel path at the Palestinian Museum in Bir Zeit, Palestine.
Photo by Iwan Baan.

Sand

Sand is an easy to install and relatively inexpensive shock absorbent surfacing material. It is often used under children's play equipment. It is also a material enjoyed by children for play purposes such as digging and shape forming. The depth of sand needed varies according to the height of the anticipated fall, but the minimum depth should be 30 centimeters. Other alternatives are rubber mulch, woodchip mulch, and engineered wood fiber. Sand and these other alternative loose materials need regular cleaning and replenishing.



Rubber mulch used under a play structure.

Source: https://commons.wikimedia.org/wiki/File:Rubbercycle_Mulch.jpg.

Plant selection and planting design considerations

(Parts of this section are adapted from material for a course developed by Professor Margaret Livingston from the University of Arizona, and organized by CSBE in February of 2012.)

Plant selection

Plant selection should be based on the adaptation of a given species to the site environment, its functional uses, its aesthetic qualities, the amount of care it needs, and other characteristics such as growth rate, flowers, roots, and leaves.

Using plant species adapted to the site environment ensures the sustainability of plants in a landscape, reduces water consumption, and also reduces the need for soil modifications and maintenance. Using native species also contributes to biodiversity and supports native wildlife such as birds, and pollinating insects such as bees and butterflies. The use of native plants also contributes to reinforcing a sense of place and preserving the natural character of a given region.

In addition to ensuring a plant's adaptability to the macro-climate and bioregion, it should also be adapted to site-specific environmental conditions such as wind, sun / light patterns, dampness or dryness, and soil conditions. Always check a plant's sun and water requirements as well as its tolerance for wind, salinity / acidity / alkalinity.

A plant's functional use includes providing screening for privacy, shelter (using vines on a trellis, or the canopy of a tree for example), and shade; blocking wind; or defining functional zones associated with various activities. They can be conceived in an architectural and spatial sense as with providing walls and roofs, framing or blocking views, and providing respite from harsh environmental conditions such as the strong sun and wind.

Although the aesthetic qualities of plants are the most noticed by people (and are the most exciting), they should not be the only factor in plant selection. Aesthetics and the art of combining plants transform a space, bring joy, and contribute to wellbeing, but will not stand on their own if they do not function well and are not adapted to environmental conditions. Plant selection should not be merely based on one's favorite plants.

Other characteristics to consider are a plant's growth rate. Fast growing plants may be used to create quick windbreaks or screens for privacy. They can also quickly form large canopies that provide shade. Some trees have invasive or shallow roots and may heave pavements or damage underground water pipes (some examples are *Salix* sp. (invasive roots), *Ailanthus altissima* (invasive roots), and Olive (shallow feeder roots)). Consider using root barriers when selecting trees with such root systems.

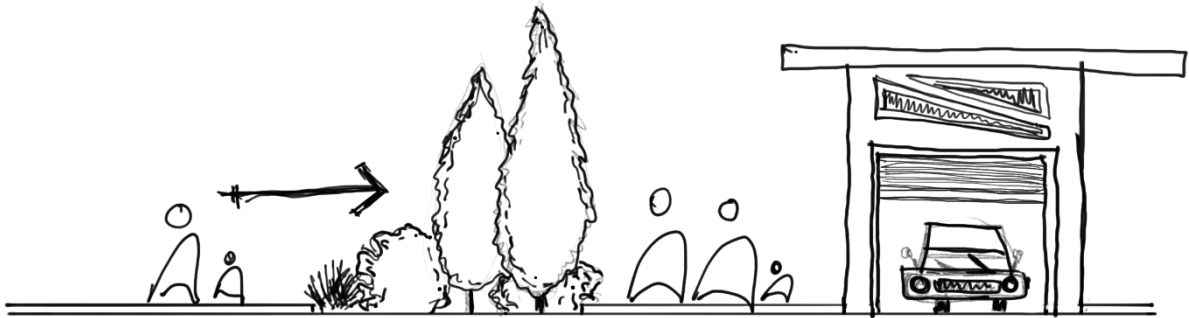
Leaves and fruits are other characteristics to keep in mind. The litter of small leaves may cause maintenance issues around pools or water features as it is harder to clean than the litter of large leaves. Also, soft fruit may stain pavements or attract birds and their droppings.

Planting design considerations

Plants and their combinations in a design scheme have three general functions: structural, environmental, and aesthetic.

Structural planting

This is a term used to describe the defining elements of the form of a planting design or the “bones’ of the landscape. It is used to create space or outdoor rooms, block unsightly views, emphasize an element or function, and direct movement through the landscape. When selecting structural planting for screening, for example, consider whether the plant is deciduous or evergreen, its desired height and spread, its growth rate, as well as site conditions.



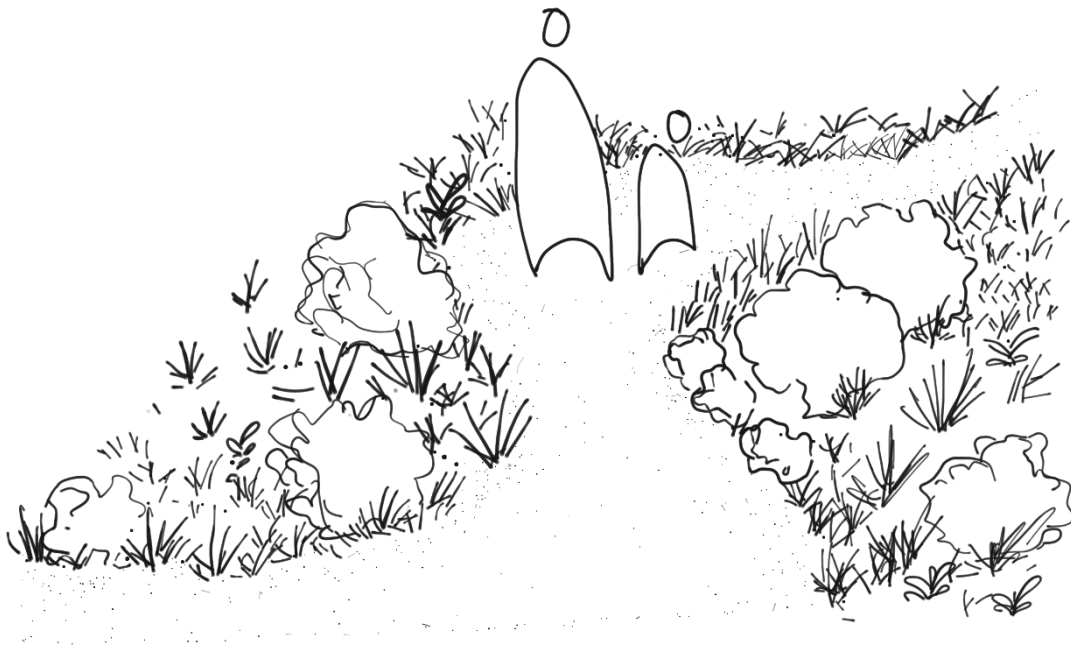
Planting used to block views and create privacy.



Planting used to create what may be described as an outdoor room.



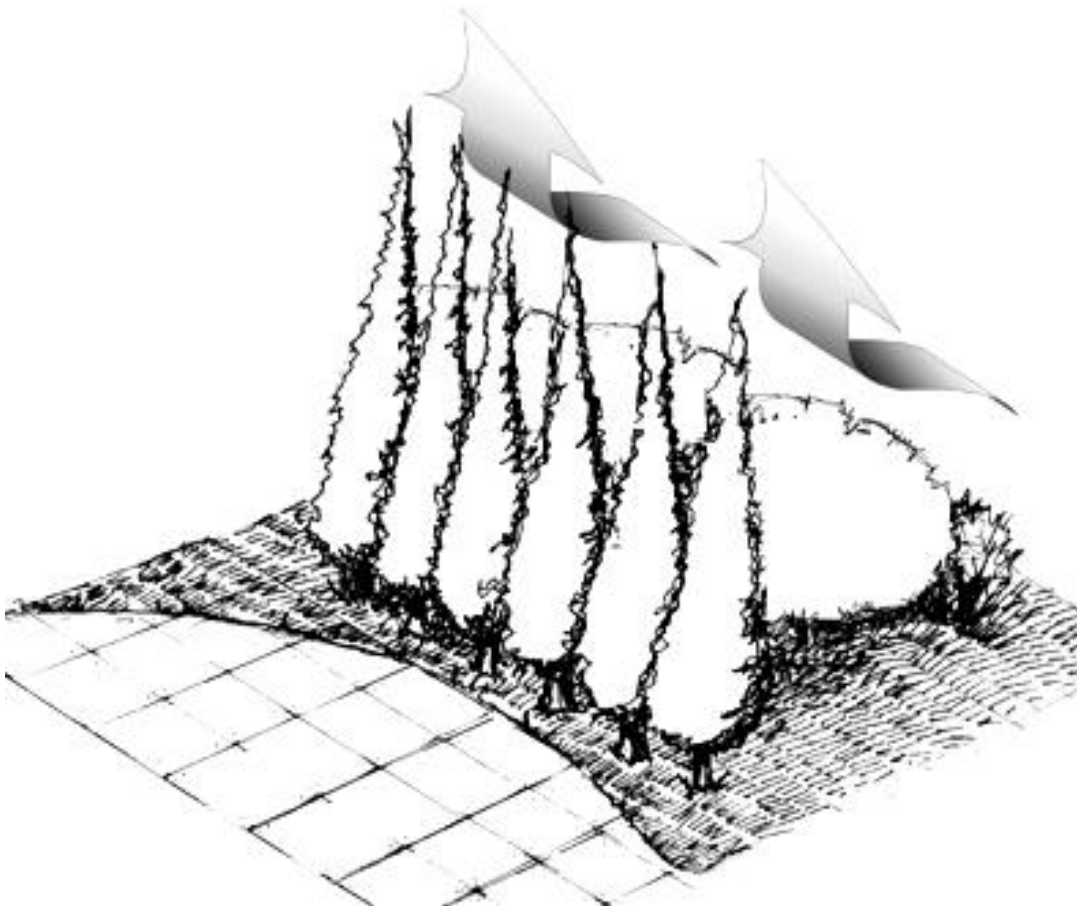
Planting used to emphasize and frame a view.



Planting used to delineate a path through an implied rather than an actual enclosure.

Environmental uses of plants

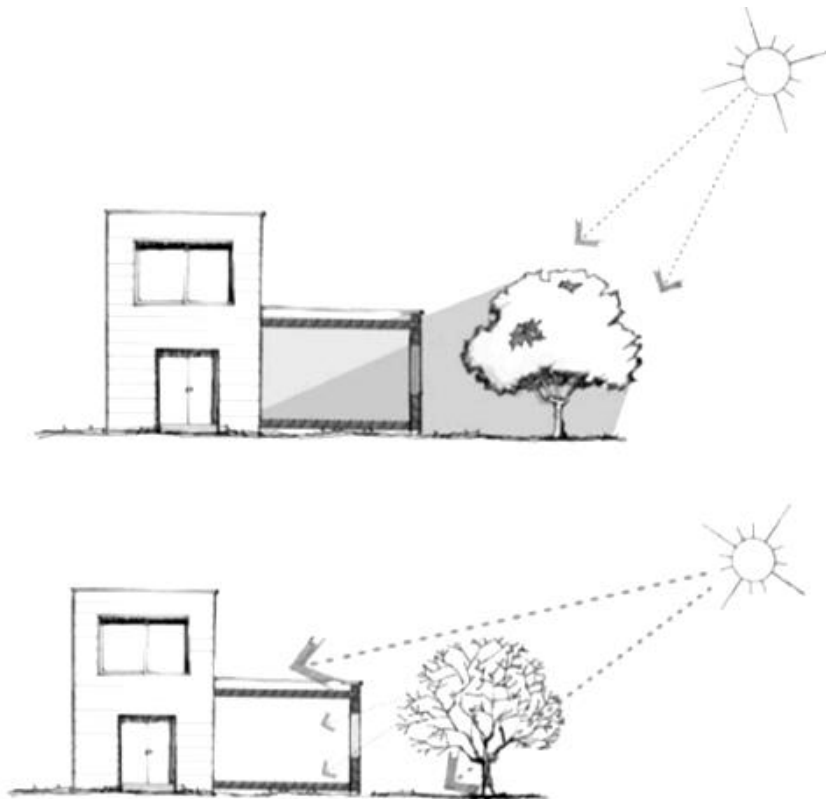
These include modifying the microclimate, providing shelter and shade from the sun, controlling erosion (specially to stabilize steep slopes), controlling wind and dust, reducing air pollution, and providing habitat.



Plants used to moderate the climate by blocking wind.

When using plants as windbreaks take these general guidelines into consideration:

- Allow some flow through the screen to prevent too much force from building up on its downwind side.
- The protection generally provided by plant windcreens is a distance that is three to five times the height of the windbreak plant.



Large trees provide shade on the southern end of a building and thus help regulate the microclimate. Deciduous trees provide shade during the summer but allow for the winter sun to enter.

- When using plants for the purposes of solar control, take these general guidelines into consideration:
- What to shade:
 - South, east, and west walls.
 - Air conditioning units.
 - Exterior heat sinks such as asphalt and brick surfaces.
- General guidelines for solar benefits and control:
 - Evergreens work best for the west side as they provide welcomed shade from the harsh afternoon sun, and help provide protection from the cold western winter winds.
 - Deciduous trees work best for the south side as they allow the winter sun to warm up the structure.
- Effective location of trees:
 - Near the structure, thereby shading the roof.
 - High tree canopies cool the roof and allow the low winter sun to warm the structure.
- Plant selection for shade:
 - Select trees with a high canopy density; broad, round canopies; and a fast growth rate.

Aesthetic and visual qualities of plants

Several considerations need to be taken into account when looking at the aesthetic and visual qualities of plants. These include scale, form, foliage type, color, and texture.

Scale

The scale or size of plants is an important aspect of any design. Large trees can frame views, create a sense of enclosure (either vertical or overhead), or screen undesirable areas. The size of plants can also mitigate the scale of neighboring buildings and provide a human dimension in the visual site-line.



Plants mitigating the scale of a building and provide it with a human dimension.



Plants create a sense of vertical enclosure.

Leaf type

Successful landscapes are ones that provide interest to the user throughout the seasons. Plants lose their leaves, they flower, and they bear fruit at different times of the year. It is accordingly important to combine plants in such a way that ensures that the visual / aesthetic and functional aims of the design are viable year-round. Combine evergreen and deciduous plants to provide a green cover in the winter months. Note that deciduous plants emphasize variations between seasons, are less prone to breaking from snow loads, and create interesting shade patterns on walls and sidewalks. Evergreen plants have a more stable effect in a landscape and are effective for use as background plants and anchors in a composition.



Combine deciduous and evergreen foliage to provide a green cover in the winter months.

Color

Flowers and fruits bring color to a landscape. Note the flowering and fruiting times of plants and combine them in a way to provide color throughout the seasons. A harmonious color scheme is achieved by combining analogous colors such as purple / blue / pink / white together, and yellow / orange / red as another combination. Complementary color schemes (using colors such as blue and orange, or yellow and purple together) are typically used for contrast. In a landscape, complementary colors are often most successful when one color is more dominant than the other, rather than in equal proportions. Visual interest using color may be achieved by combining different shades of green together, and also using plants with silver and maroon foliage.



A planting combination at the Sidi Amor Organization in Tunis. A n analogous flowering scheme incorporating analogous colors is used (white / pink / blue). Also note the use of bright and dark green foliage as well as silver and maroon foliage to provide contrast. Photo by Lara Zureikat.



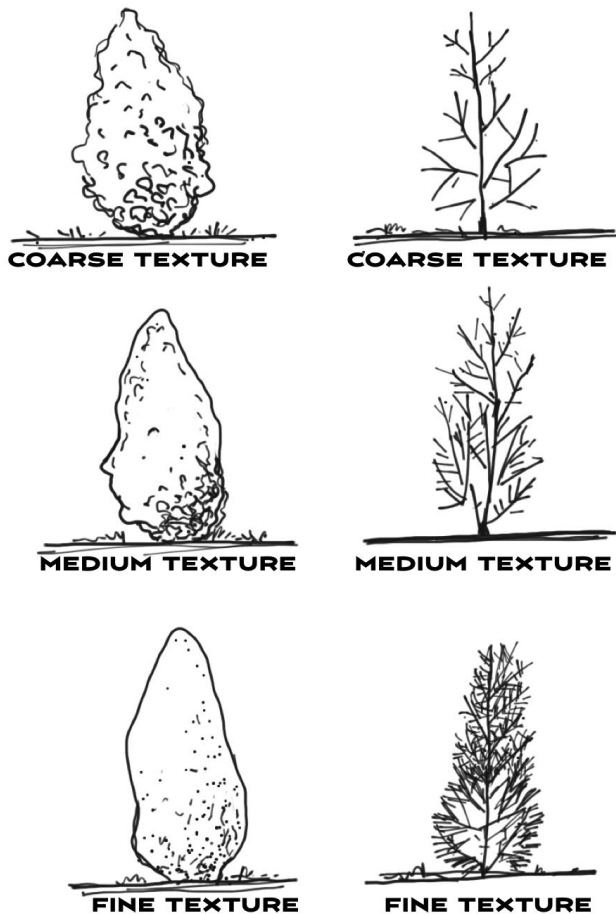
A complementary color scheme of purple and orange flowers at the Sidi Amor Organization in Tunis. Photo by Lara Zureikat.

Texture

An equally important aesthetic quality of plants is texture. Various planting effects such as boldness, buoyancy, and stability may be achieved by selecting and combining plants for their texture. Plant texture is classified into three types: course, medium, and fine. Course-textured plants usually have large leaves, thick branches, and an open, loose composition. They have a bold and visible presence in the landscape. Medium-textured plants have a moderately dense growth habit and medium sized leaves. Most plants are of a medium texture. They unify a composition and provide a link between course and fine-textured plants. Fine-textured plants have small leaves and branches, and a soft or delicate appearance.



Course, medium, and fine-textured foliage.
Photos courtesy of CSBE.



Coarse, medium, and fine-textured plants.



Course, medium, and fine textured plants at the Sidi Amor Organization in Tunis.
Photo by Lara Zureikat.

Plant Spacing and Grouping

Note the long-term changes in the size of plants and space plants according to their long and medium-term eventual size. Also, group plants in odd numbers such as three, five, and seven. This grouping results in a natural effect of plant massing. Grouping plants in twos is most commonly used to emphasize an element or defining an entrance or pathway.



Dodonea visocosa 'Purpurea' plants (maroon foliage) grouped in two to emphasize an architectural element at the Sidi Amor Organization in Tunis.
Photo by Lara Zureikat.

Irrigation

(The sections on Irrigation, Soil, and Mulch are adapted from: Lara Zureikat and Dalia Hussein, [Landscape Water Use Efficiency Guide](#) (Amman: Instituting Water Demand Management Project (USAID-IDARA) and the Center for the Study of the Built Environment (CSBE)), 2012. The guide is available online at <http://www.csbe.org/resources-on-landscape-design>).

An efficient irrigation system is essential in the long-term success of any landscape. An initial investment in an effective irrigation system saves water and minimizes maintenance efforts. Low-volume-emitting systems such as drip irrigation bring water to the plant where it needs it, and at a rate through which it can absorb it (as opposed to watering using a hose, which emits water at large volumes and results in run-off water being wasted). The use of drip irrigation also minimizes evaporation. Spray irrigation, which emits larger volumes of water and is subject to evaporation, is only recommended for turf areas.

Planting design with water efficiency in mind also contributes to the water efficiency of an irrigation system. It is recommended to place plants with similar water needs in the same zone (and controlled by the same valve). By organizing the planting and irrigation according to water needs (known as a hydro-zone; the method is referred to as 'hydro-zoning'), water consumption can be controlled to reach plants at the recommended consumption rates. For example, a high-water-use plant such as a citrus tree, should not be combined with low-water-use groundcovers such as succulents.

To further improve the efficiency of irrigation, develop a schedule that trains plants to consume less water and thus increase their overall drought tolerance. This can be achieved by watering at widely spaced intervals, but with deep applications. This encourages root systems to extend deeper into the soil in search of water.

Although trees require generous amounts of water at widely spaced time intervals, plants with shallow root systems, such as groundcovers, should be irrigated with smaller amounts of water at more tightly spaced time intervals. When irrigating, water should reach a soil depth of 50 – 60 centimeters for trees, 35 – 40 centimeters for shrubs, and 15 centimeters for groundcovers.

Irrigate in the early morning, when temperatures are lowest, and evaporation is minimized.

Moreover, modify the irrigation schedule as the seasons change and the plants grow. During the rainy season, for instance, irrigation can be decreased considerably, if not stopped altogether. In Mediterranean zones with ample winter rain, irrigation is not needed during the winter months. Also, keep in mind that drought-tolerant plants need less water as they mature.

In addition, apply water slowly on slopes to allow for better penetration. Do not apply water faster than the soil's ability to absorb it. Also, consider the use of moisture-retaining materials such as mulches to minimize the need for irrigation. These may be placed either on top of the soil or mixed in it. For more information on mulches, refer to the section below.

Water harvesting and alternative water resources

Water harvesting

In water-scarce environments such as the Mediterranean zones with no summer rainfall, harvesting water for use during the dry season provides a supplementary and sustainable source of irrigation water.

There are two types of water harvesting systems: passive and active. Passive water harvesting systems require no storage containers, and rainwater can be diverted from roof areas or paved surfaces in the planted areas directly to the soil (called “landscape holding” areas) in the site for direct use by the plants. Below are tips for optimizing passive water harvesting systems:

- Make sure that the soil in the landscape holding areas is not compacted, because this inhibits water from moving through the soil. After planting, apply a layer of mulch to reduce evaporation and to control erosion. If the soil is compacted, loosen it by tilling. If the soil is too sandy, add organic matter to increase the soil’s moisture-holding potential.
- Be careful in the selection of plants for the low-lying landscape-holding areas. These areas can get saturated with water for extended periods of time, and some plants may not be able to survive such conditions. Select plants that are adapted to damp conditions such as Papyrus or Reed.
- For new plantings, locate the plants at the upper edge of concave holding areas to encourage extensive rooting and to prevent soil erosion.
- To take advantage of water falling freely from roofs, plant large sturdy plants where the water falls. Also, use rocks or other hard material, or hang a large “rain chain” from the downspout to the ground to disperse and slow down the water, and also to prevent erosion.

Active water harvesting systems require storage containers, either above or underground. Although underground reservoirs are more aesthetically pleasing, they are more expensive than above-ground containers. A cost analysis should be conducted during the design phase to determine the feasibility of building an underground reservoir. To calculate the amount of water that can be potentially harvested, apply the following formula below:

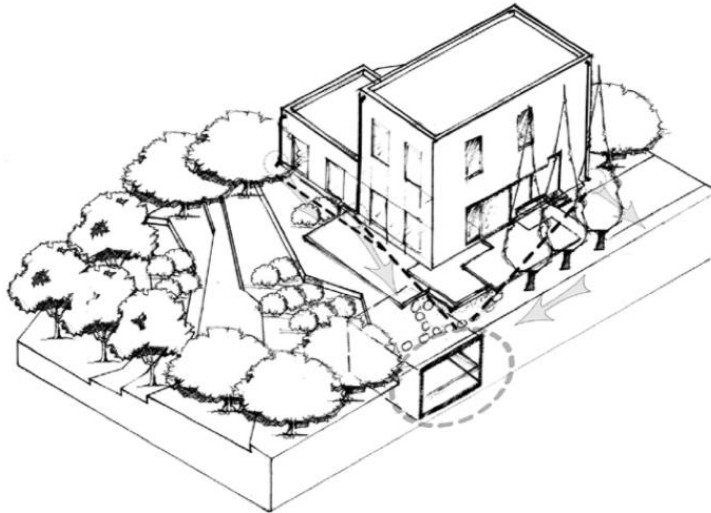
QUANTITY OF HARVESTED RAINWATER (CUBIC METERS) = RAINFALL (METERS) X CATCHMENT AREA (SQUARE METERS) X RUNOFF COEFFICIENT *

* The runoff coefficient is the percentage of the rainfall that can be harvested from a specific material. It varies from 0.95 - 0.90 for asphalt and smooth concrete to 0.10 - 0.05 for flat, sandy soil.

Below are tips for optimizing active water-harvesting systems:

- Place water storage containers as close as possible to collection points and usage areas, and far away from contamination sources such as septic tanks and sewage networks.
- When collecting water from a high-level catchment area such as a roof, place containers at an elevated level to take advantage of gravity flow. This will put less stress on pumps and will conserve electricity.

- Connect the water storage containers to the municipal water supply network and make them accessible to water trucks to be able to replenish them if the amounts of harvested rainwater become scarce during the dry season.
- Seal the water container to keep out organic materials and sunlight. This will prevent evaporation and bacterial growth.



Active and passive water harvesting.

Alternative water resources

The use of reclaimed, reused, or recycled water for landscape irrigation offers excellent opportunities for water conservation. When available, reclaimed water should be used to irrigate street medians, traffic circles, and other landscapes that are not in direct contact with users. Where high environmental quality standards can be applied, reclaimed water may be used to irrigate parks. Drip irrigation systems should be used when irrigating with reclaimed water. Graywater and reclaimed water should not be airborne and thus should not be run through sprinklers or sprayers. If they must be used for irrigating turf areas, consider the use of sub-surface irrigation.

You may often find sources of water from the interior of buildings on the site that can be reused outdoors. For example, water from a hospital's reject water from the reverse osmosis process may be available for landscape irrigation. Graywater (from ablution facilities in mosques, or water fountains in schools for example) is another good source of water for sub-surface irrigation of trees and shrubs.

Soil

Proper soil analysis should be conducted and appropriate amendments added prior to planting any landscape. Alkaline soils that are poor in organic materials need to be amended. Also, high acidity in the soil means there are fewer nutrients available for the plants. Adding organic matter to soils before planting increases their water and nutrient-holding capacity, and improves plant growth and water use. Soil can be amended by adding 2.5 – 5 centimeters of compost, peat moss, or sterilized manure and mixing it well into the top 15 centimeters of soil.

Soils differ greatly in their ability to store water. Soils that include a mixture of topsoil and organic fertilizers retain moisture well and also provide plants with their nutritional needs. Adding organic materials to your soil mix will further increase its water-holding capacity.

Compacted soil reduces air and water circulation in the soil. In order for plants to increase their drought tolerance, their roots need to be able to move freely in the soil in search of water. Compacted soil prevents them from doing this.

A soil test can shed light on necessary soil improvements. A typical soil analysis would address texture, infiltration levels, pH levels, total soluble salts, sodium levels, and the percentage of organic matter.

Mulch

Mulches are organic or inorganic materials applied to a planting bed as a top-dressing to serve a number of purposes. In addition to serving as an aesthetic element in the landscape, mulches play several important roles in conserving water in built landscapes. These include the following:

- Maintaining moisture levels in the soil.
- Moderating soil temperatures.
- Inhibiting weed growth, thus reducing competition for water among plants.
- Reducing soil erosion, compaction, and water runoff.
- Providing a barrier between the plant and the soil, thus controlling soil-borne diseases that might cause plant stress.

Also keep in mind that aside from occasional weed control and top-dressing with additional mulch, unplanted mulched areas require no water and little routine maintenance.

Mulches should be applied at the base of all plants, but should not touch the plants' stems or trunks directly to avoid wood decay and fungal diseases. Inorganic mulches, i.e., those made of stone, rock, and synthetic products, are recommended for public parks and street medians because they require less maintenance than organic mulches. Pumice stone, when available, is very effective and economical to use. Mulches should be regularly augmented or replaced for best results. The recommended thickness for applying mulch is 6 – 10 centimeters. Examples of inorganic mulches include gravel, marble chips, crushed stone, decomposed granite, river-run rock, and pumice stone. Pumice stone retains moisture well because of its highly porous structure.



River-run stone, crushed stone, and pumice stone.

Photos by Lara Zureikat.



Mulch laid on the surface of the soil helps retain moisture in the soil, reduce weeds, cover irrigation pipes, and give a polished look to a landscape in a garden in Amman.

Photo by Lara Zureikat.

External Lighting

Lighting is necessary in public parks, particularly those located in warm regions, where many of the public spaces are more likely to be used in the evening and nighttime, especially in the hot summer months. Lighting can be used to boost safety at night and to also emphasize entrances, walkways, and gathering spaces. Consider using a hierarchical approach and determine which areas are to be lit at night and which areas are not. Concentrate lighting in high priority areas such as gathering spaces and primary walkways. In some cases, such as nature reserves or bird sanctuaries, lighting may disturb wildlife and should be either eliminated, screened, or kept to a bare minimum.

Lighting placed at a height not reachable by hand is less likely to be damaged or vandalized, but lighting placed closer to the ground level creates softer and more intimate effects.

Choose lighting fixtures with high efficiency and that are readily available in the market. Consider the use of solar lighting to save energy.

Site furniture

Site furniture includes seating (benches, tables, picnic tables ...), trash and recycling receptacles, bollards, bike racks, planters, and other accessories such as tree grates and tree protectors. These items can either be produced locally, or ordered via local or international manufacturers.

Site furniture should be weather-proof, durable, and easy to replace. Also, consider the integration of both fixed and flexible seating.

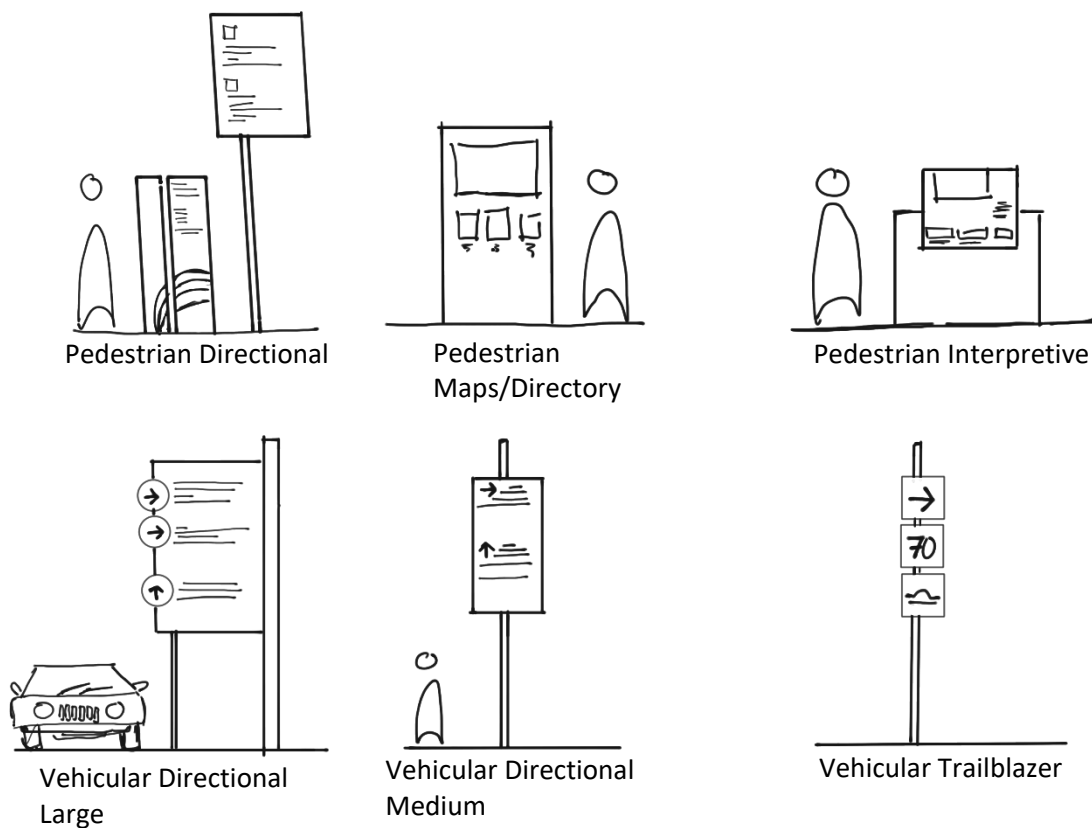
Locate and source local good quality and low-cost manufacturers. Stone and metal are durable and easy to produce locally.

Signage

Providing signage is oftentimes necessary, and it also elevates the user experience. Wayfinding signage is essential in large open spaces, and cautionary signs are needed for safety purposes. Interpretive signage adds another layer of interaction for the public, especially in sites with historical, cultural, or educational significances. A variety of materials is available for signage: wood, aluminum, stainless steel, galvanized steel, and plexi-glass.

It is recommended to draft specific signage guidelines for various public spaces (including roads). This ensures that signs are legible and unified, and also contributes to the enhancement of the image of the town or city. These guidelines should address scale, shape, material, color, front, and placement.

Below are illustrated examples of different types of signage.



Types and shapes of signage that serve various purposes.

Play equipment and play zones

This is a very involved subject for which one needs to take into consideration issues relating to safety, varying age groups users, visual variety, as well as providing spaces for traditional and adventure play.

In general, ideal play areas should stimulate physical, perceptual, social, and intellectual faculties in children. Play areas should include opportunities for sensory and motor activities such as touching, hearing, running, crawling, and climbing. They should also allow for emotional experiences such as playing with sand, role-playing, and make-believe playing, as well as allow for social interaction with people and children of different age groups. Additionally, including elements such as puzzles, mazes, and interactive objects allows children to develop their intellectual capacity by investigating how things function and how they relate to one another. (For additional information, see, A. Eriksen, Playground Design: Outdoor Environments for Learning and Development (New York: Van Nostrand Reinhold, 1985.))

Good play environments must be usable and inviting to all children, including children with disabilities. Efforts should be made to make sure that play areas are accessible from walkways. Low barriers such as berms or fences should define playground areas but not strongly separate them from the rest of the park. Also, hard surfaced paths, bike paths, and paths leading to restrooms or paths with heavy bike or pedestrian circulation should be separated from play areas. (See, R. C. Moore, S. M. Goltsman, and Daniel S. Iacofano, eds., Play for All Guidelines: Planning, Design and Management of Outdoor Play Settings for All Children (Berkeley, California: MIG Communications, 1992.)

Play areas should also be protected from harsh weather conditions, including harsh sun or cold winds.



A shaded playground using a sail shade structure in a resort in Aqaba.
Photo by Lara Zureikat.

Since children of different age groups have different developmental needs, note age-appropriate play equipment and include equipment or play structures that cater to all age groups when possible. A common categorization of age-appropriate play equipment is as follows:

- 2 - 5 years.
- 5 - 8 years.
- 8 - 12 years.

Play equipment should be grouped and separated according to age groups. Physical separation, however, should nonetheless allow mixed age groups and siblings to play together and in the same vicinity to accommodate parental observation.

Safety is a primary consideration in designing play areas. Shock-absorbing surfacing materials should be used under play equipment. These include sand, poured and loose rubber surfacing, as well as loose organic mulches. The depth or thickness of these materials depends on the equipment heights. The recommended minimum depth for sand used for sand play is 45 – 90 centimeters.

Sports fields

Below are some tips for designing sports fields.

- Sports fields require large, flat, evenly graded areas. When space is tight, consider applying half-fields or reduced size standards.
- Orient sports fields according to a north-south direction to avoid direct visual sun exposure.
- Consider if a hard or soft surface is to be used according to the type of sport (refer to the paving and surfacing section for more details).
- Remember to include drainage and water catchments for hard surfaces.
- Many types of fields such as tennis or basketball courts require fencing to keep balls inside the playing area.
- Provide shaded seating for spectators.

Water features

Water features are very desired by the public and have historical precedence in the Islamic world. They can provide a soothing and cooling effect in hot climates. Nonetheless, it is not recommended to include them in public spaces as they tend to be high-maintenance items, and very often fall into disrepair to become eyesores and places where garbage gathers. If they are to be included, consider ones that have a small surface area to reduce evaporation. Also consider water features with the nozzles located under the ground surface. This way, the space around these water features can be multifunctional when the nozzles are tuned off, and they also are less susceptible to vandalism.

6. Assessing available financial resources for construction and upkeep / maintenance

It is important to carry out the necessary financial planning for the development of the public open green space as early on in the process as possible, even though budgets and financial estimates will need to be continuously revisited and revised throughout the life of the project. A construction and planting budget will need to be developed. The construction budget should address items such as:

- Infrastructure services:
 - Water (which may also include underground cisterns).
 - Electricity (including lighting).
 - Sewage.
- Surrounding sidewalks and parking areas.
- Fences and gates.
- Hardscaping elements (paths, plazas, playgrounds ...).
- Park furniture.
- Play and sports equipment.
- Buildings (whether rehabilitated preexisting ones or newly constructed ones).
- Planting, which includes:
 - Preparing the soil:
 - Bringing in new soil.
 - Adding fertilizer.
 - Providing groundcover mulching, both organic and inorganic.
 - Installing an irrigation system.
 - Placing the plants in their locations.
- Signage with information about using the open green space and about the plants featured in it.

The needed funds for constructing and planting the open green space are of course considerable, and will range widely according to the design features and materials used. An even bigger challenge is that of upkeep and maintenance. As those responsible for the making of the open green space are occupied securing the funds for constructing it and also managing and coordinating the construction process, in many cases, very little, if any, consideration is given to the post-construction phase of the life of the space. This is very unfortunate because if the space is not properly cared for, it would be better if it had not been created at all.

As a result, the budgetary planning phase should also include the post-construction life of the space. In addition to budgeting for general upkeep and follow up (which will be discussed in more detail below), there is a need to set aside funds for maintenance costs. After all, broken paving tiles will need to be replaced; the irrigation system will have a limited lifespan; new plants will need to be added to replace dying ones; and any buildings included in the site will require maintenance. As a general guideline, it is advisable to set aside every year an average of about 1% of the overall costs of creating the open green space for maintenance purposes.

It is important to keep in mind that not only is there a need to ensure that such upkeep and maintenance funds are secured, but that they are not diverted away from the relevant open green space to cover unrelated expenses, which is a very common occurrence. Public – private partnerships (PPPs) are often suggested as a means through which such funding may be made available. Accordingly, a private enterprise may for example rent a part of the space to run a facility such as a café or a restaurant, and that rent income would be spent on the open green space's upkeep and maintenance. Another option would be for a private enterprise to oversee upkeep and maintenance tasks, and in turn be provided with public acknowledgement of their role (as with a banner or sign in the space) and / or tax breaks. Again, the challenge lies in ensuring that the income generated from such partnerships efficiently goes to upkeep and maintenance activities rather than being diverted to other running costs such as the salaries of staff who may not be directly connected to the space. This is particularly a problem in contexts where the supply of public open green spaces is not considered a priority, whether at the level of local, provincial, or national governments.

7. Carrying out upkeep and maintenance tasks

The importance of upkeep and maintenance in the case of public open green spaces has been repeatedly emphasized in this guide. Only a few days of neglect - particularly in hot, dry weather - are enough to cause extensive, if not permanent, damage to plants and, by extension, the site in which they are located.

A maintenance team accordingly needs to be put in place for any open green space. Although there is no precise universal formula, as a rule of thumb, eight man-hours a day – carried out at a high rate of productivity - (i.e., the equivalent of one full-time caretaker) are needed to carry out basic upkeep needs, including cleaning and gardening, for every half a hectare of land. The upkeep person or team would need to cover the following tasks:

- Cleaning of waste: This includes cleaning up waste resulting from littering, emptying waste containers, and disposing the collected waste through an integrated municipal waste management system.
- Pruning.
- Collecting dead plant materials such as leaves, branches, and flowers: These materials may be used for composting or developing organic ground cover mulch, as explained below.
- Planting.
- Irrigating the plants.
- Fertilizing and following up on the health of the planting soil.

Weekly schedules may be developed for the person or team following up on each task. Each weekly schedule, for example, would specify the task and mark the day and time during which the task is to be carried out. The relevant staff member would initialize the appropriate box once a task is completed.

Staff member name: Samir Omar															
Week: October 13 - 20, 2019															
	Sun. AM	Sun. PM	Mon. AM	Mon. PM	Tue. AM	Tue. PM	Wed. AM	Wed. PM	Thu. AM	Thu. PM	Fri. AM	Fri. PM	Sat. AM	Sat. PM	
Task:															
Sweeping hardscaped areas		x SA				x SA				x SA		x SA		x SA	
Picking up litter		x SA				x SA				x SA		x SA		x SA	
Emptying wastebaskets in large container		x SA				x SA				x SA		x SA		x SA	

A sample task schedule for cleaning waste

Dead plant material should not be discarded, but used for composting or making organic ground-cover mulch. A mechanical chipper / shredder is needed for making the mulch. The composting and making of mulch may be carried out onsite if enough space is available and if the plants in the site produce enough dead plant material. Otherwise, it is advised that that the relevant municipal authority creates a station (or a number of stations) for this purpose.

In addition to these upkeep tasks, maintenance tasks need to be carried out. As mentioned above, and as a rule of thumb, it is advisable to set aside each year an average of about 1% of the cost of constructing the open green space for such tasks. Some open green spaces of course may need a

higher budget, and some may need a lower one. A more specific number will emerge with time for each space.

Visual inspection sheets will need to be developed for each of the components below, among others. These components would need to be inspected on a weekly basis. Any issues that need attention would be marked so that appropriate action would be taken. Each sheet should include a map / plan that shows the relevant component being examined. Remarks may be made directly on the map / plan.

- Sidewalk bordering open green space.
- Fences and gates.
- Pavement of hardscaped paths and spaces.
- Retaining walls.
- The site's electrical system components (lighting bulbs, fixtures, wiring, switches ...).
- The site's irrigation system components (pumps, valves, tubes, emitters, end caps ...).
- Plants that need replacement.
- Signage.
- Buildings (facades, floors, ceilings, roofs, windows, doors, bathrooms, kitchens ...).

<p>[Name of Park] Inspection sheet Park fences and gates Week 1: January 1 – 7, 2019 Comments: - Lock for northern gate is not working properly because of rust. - Paint is peeling off the fence located in the southwestern segment of the park. Actions: - Lubricant applied to lock, and is now working properly. - Paint ordered for the part of the fence with peeling paint. Expected to be delivered in two weeks.</p> <p>Week 2: January 8 – 14, 2019 Comments: Actions:</p>
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Sample inspection sheet for fences and gates in a park showing the first two weeks of the year.

The list will also function as a record of the maintenance tasks carried out and their costs over time.

It is also worth noting that a good deal of damage in public open green spaces takes place not only as a result of neglect and lack of regular maintenance, but also as a result of vandalism. Precautions therefore need to be made to limit the possibilities of its occurrence. These precautions include securing the space through surrounding it with fences and locking its gates during night hours, and installing closed circuit cameras. Also effective is the presence of human protection. A guard may be present at certain times, and regular patrols by security personnel are helpful. Regarding the latter, the establishment of a specialized "environmental police" unit would be of value. These not only would ensure safety and security, but also would be specially trained to appreciate the importance of both environmental issues and the value of soft social skills in law enforcement.

8. Engagement of users in the design process

It goes without saying that it is very important to incorporate the input of users during the different phases of the realization and maintenance of a public open green space. Considering the large number of users that such a space will serve, it would be impossible to engage in a participatory design process with all of them. Still, valuable and considerable input from users may be ensured through organizing a series of interviews with groups of seven or less, or putting together focus groups consisting of larger numbers of people that involve various users of the space in as inclusive a manner as possible. The engagement of users should include both males and females from different age groups, whether children, teenagers, young adults, adults, and the elderly. In addition, those engaged should represent both residents of the area and those who work in it.

The benefits of engaging users include the following:

- Gaining insight and information from people who know the area well.
- Developing a more responsive design and reducing the risk of failure.
- Developing a more sustainable design, as well as encouraging user buy-in and a high degree of ownership and responsibility towards one's environment.
- Enabling realistic expectations and lowering resistance to change.
- Fostering stronger bonds among the members of a given community.

One manner of reaching the various users is through local community organizations and schools since both will have links to many members of a given community. There are numerous tools that one can use to engage users including questionnaires (statistical or non-statistical), interviews, focus groups, and public hearings.

One or a combination of these tools may be used to gather information. For example, if time and resources allow, interviews may be conducted to structure a questionnaire, and then focus groups or further interviews may be conducted to expand on the questionnaire results. Focus groups may also be used to develop design ideas with community members, and public hearings may be held at interim or final stages to present the design progress and the final design proposal.

The interviews and focus groups are not intended as the equivalent of quantitative surveys, but as qualitative processes through which those involved in the making of these spaces can better understand the needs of their various users. In the case of schools, one may carry out focus groups that involve whole classrooms of students from various ages. Otherwise, it would be very productive to hold interviews with seven people or less at a time. Ideally, each interview or focus group meeting should be administered by a member of the municipal team and a member of the design team for the space.

It is more fruitful to view these interviews and focus groups as informal group conversations rather than mechanically administered question-and-answer sessions. They of course should be well-documented as this documentation will greatly inform the design process of the space. It is recommended to hold ten to twenty focus group sessions (additional ones would be an added bonus) to obtain an acceptable overview of the expectations of the local community regarding open green spaces.

It is recommended to hold public hearings during various phases of the planning and implementation of the project as needed (and even beyond those phases). These sessions provide an opportunity for those responsible for the project to present it to as large an audience of stakeholders as needed, to engage them, and to obtain real-time input from them as the project evolves and moves on from one phase of its life to the other.

Issues that may be discussed and questions that may be posed during the interviews and focus group meetings include the following:

- Do you frequent any open green spaces?
- If so, why and how often?
- If not, also why?
- Do you have your own garden space at home? If so, how does that impact your interest in frequenting open green spaces?
- What do you like, and what do you not like about the open green spaces in your city (bring up issues such as quality of design, quality of upkeep and maintenance, cleanliness, safety and security, overall behavior of visitors ...)?
- Why would you visit an open green space (relaxation, connecting to nature, engaging sports activities, spending time with family, seeing people, taking one's children to play ...)?
- What facilities, in order of importance, would you like to see in these open green spaces (seating areas, children's play equipment, sports fields, eating establishments, places for public congregation ...)?
- How much value would you place on having a public open green space within walking distance of your residence in comparison to one that is further away?
- If you work or study in the area, rather than live in it, how important are those public open green space for you? When and how would you use them?
- What added interventions, in order of importance, do you feel should be made in the public open green spaces of your city (improved upkeep and management, new facilities, increased security, added greenery ...)?

9. Additional resources

In addition to the resources mentioned above in the text of the guide, the following resources provide additional information and guidance that is of use to the conception and implementation of public open green spaces:

- Center for the Study of the Built Environment (CSBE). Water-Conserving Gardens: A User's Manual. Amman: Center for the Study of the Built Environment, 2004.

Available online at <http://www.csbe.org/water-conserving-gardens>.

- "Neighborhood Unit." Wikipedia.

Available online at https://en.wikipedia.org/wiki/Neighbourhood_unit.

- Little, Val. "A Graywater Reuse Study in Southern Arizona and the Water Conservation Demonstration Garden in San Diego, California." In Mohammad al-Asad and Majd Musa (eds.). Exploring the Built Environment: Essays on the Presentations of Diwan al-Mimar and Affiliated Public Lectures. Amman: Center for the Study of the Built Environment (CSBE) and Darat al-Funun – The Khalid Shoman Foundation, 2007, pp. 189 – 202.

Available online at <http://www.csbe.org/template-1-1>.

- Livingston, Margaret. "Creating Landscapes in Water-Scarce Environments: A Case Study of Tucson, Arizona." In Mohammad al-Asad and Majd Musa (eds.). Exploring the Built Environment: Essays on the Presentations of Diwan al-Mimar and Affiliated Public Lectures. Amman: Center for the Study of the Built Environment (CSBE) and Darat al-Funun – The Khalid Shoman Foundation, 2007, pp. 209 – 219.

Available online at <http://www.csbe.org/creating-landscapes-in-water-scarce-environments>.

Moreover, detailed information on landscaping is available on the website of the Center for the Study of the Built Environment (CSBE) at <http://www.csbe.org/resources-on-landscape-design>.

Appendix 1: Plant lists

Introduction

This appendix provides a list of plants suitable for use in Mediterranean contexts. The plants are categorized according to the following types:

- Trees and palms
- Shrubs and sub-shrubs
- Climbers
- Herbaceous plants (annuals, perennials, grasses)
- Cacti and succulents

Plant Lists

Trees and palms

1. *Ficus microcarpa* var. *nitida*
2. *Ficus macrophylla*
3. *Ficus elastica*
4. *Ficus lyrata*
5. *Schinus molle*
6. *Schinus terebinthifolius*
7. *Phoenix dactylifera*
8. *Phoenix canariensis*
9. *Washingtonia filifera*
10. *Washingtonia robusta*
11. *Citrus aurantium*
12. *Punica granatum*
13. *Grevillea robusta*
14. *Acacia cyanophylla*
15. *Acacia dealbata*
16. *Acacia tortilis* (N)
17. *Ceratonia siliqua* (N)
18. *Pinus halepensis* (N)
19. *Quercus ilex* (N)
20. *Quercus suber* (N)
21. *Quercus coccifera* (N)
22. *Cupressus sempervirens*
23. *Cupressus sempervirens* 'Stricta'
24. *Olea europea*
25. *Jacaranda acutifolia*
26. *Albizia julibrissin*
27. *Albizia lebbek*
28. *Cercis siliquastrum*
29. *Auracaria excelsa*
30. *Chamaerops humilis*
31. *Cycas revoluta*
32. *Sophora japonica*
33. *Sophora secundiflora* (Alnejma Alzahra)
34. *Robinia pseudoacacia*
35. *Ligustrum lucidum*
36. *Melia azedarach*

37. Lagerstroemia indica
38. Tamarixaphylla
39. Laurus nobilis
40. Cedrusatlantica
41. Casuarina equistifolia
42. Delonixregia?
43. Erythrina?
44. Thujaorientalis
45. Eriobotrya japonica

Shrubs and sub-shrubs

1. Arbutus unedo
2. Argyranthemumfrutescens
3. Artemisia arborescens
4. Atriplex sp.
5. Berberisthunbergii
6. Buddleia davidii
7. Buxusmicrophylla japonica
8. Callistemon laevis
9. Carissa macrocarpa
10. Carissa macrocarpa 'Prostrata'
11. Cistus creticus (N)
12. Cistus salvifolius
13. Cuphea hyssopifolia
14. Dodonaeaviscosa
15. Hebe
16. Hibiscus rosa-sinesis
17. Hibiscus syriacus
18. Juniperushorizontalis
19. Lantana camara
20. Lantana motevidensis
21. Lavandula angustifolia
22. Lavandula dentata
23. Lavandulapinnatabuchii
24. Leonotisleonurus
25. Leucophyllumfrutescens
26. Ligustrum ovalifolium
27. Myoporum laetum
28. Myrtuscommunis
29. Nandinadomestica
30. Nerium oleander
31. Nerium oleander 'Nana'
32. Pistacialentiscus (N)
33. Pittosporum tobira
34. Pittosporum tobira 'Nana'
35. Polygala myrtifolia
36. Rosmarinus officinalis
37. Rosmarinus officinalis 'Prostratus'
38. Ruscus aculeatus
39. Santolinachamaecyparissus

40. *Solanum rantonnetii*
41. *Spartiumjunceum*
42. *Viburnum lucidum*
43. *Viburnum tinus*
44. *Vitex agnus-castus*
45. *Yucca elephantipes* (check clasificaiton)

Climbers

1. *Bougainvillea glabra*
2. *Bougainvillea spectabilis*
3. *Ficuspumila*
4. *Hedra helix*
5. *Jasminum grandiflorum*
6. *Jasminum officinale*
7. *Jasminum sambac-flora*
8. *Lonicera japonica*
9. *Parthenocissus quinquefolia*
10. *Passiflora edulis*
11. *Plumbago capensis*
12. *Podraneanicasoliana*
13. *Pyrostegiavenusta*
14. *Rosa sp.*
15. *Solanum jasminoides*
16. *Tecomastans*
17. *Tecomariacapensis*
18. *Trachelospermumjasminoides*
19. *Vitis vinifera*
20. *Wisteria sinensis*

Herbaceous (annuals, perennials, and grasses)

1. *Achillea millefolium*
2. *Agapanthus oreintalis*
3. *Asparagus densiflorus*
4. *Canna indica*
5. *Convulvuloussabatius*
6. *Cymbopogoncitratus*
7. *Felicia amelloides*
8. *Gauralindheimeri*
9. *Gazania rigens*
10. *Iris germanica*
11. *Limoniumsiniatum*
12. *Oreganum vulgare*
13. *Osteospermumfruticosum*
14. *Pelargonium domesticum*
15. *Pelargonium graveolense*
16. *Pelargonium peltatum*
17. *Pelargonium x hortum*
18. *Pennisertumsetaceum*
19. *Perovskiaatriplicifolia*
20. *Phormiumtenax*

21. *Salvia officinalis*
22. *Strelitzia reginae*
23. *Thymus prostratus*
24. *Tulbaghia violacea*
25. *Verbina peruviana*

Cacti and succulents

1. *Aeonium* sp.
2. *Agave Americana*
3. *Agave attenuate*
4. *Agave palmeri*
5. *Aloe* sp.
6. *Aptiniacordifolia*
7. *Carpobrotus edulis*
8. *Crassula ovata*
9. *Drosanthemum floribundum*
10. *Echeveria* sp.
11. *Maleophora lutea*
12. *Opuntia ficus-indica*
13. *Sanseveria*

Appendix 2: Water conservation in public green open spaces

(This section is adapted from a brochure developed by the Center for the Study of the Built Environment (CSBE). The brochure is available online at: <http://www.csbe.org/the-seven-principles-of-xeriscape>).

Mediterranean climates are characterized by dry summer periods in which supplementary irrigation is required to sustain plant growth. Hence, water conservation is a key strategy in planning, designing, and maintaining green open spaces. Although water-wise principles and techniques are addressed throughout this guide, this appendix provides a quick summary of the main guiding principles of water conservation. They are often referred to as the ‘Seven Principles of Xeriscape,’ and are summarized below. Note that xeriscape means low-water-using, it does not mean dry and barren looking. Applying the seven principles of xeriscape enables the designer to use natives and climate-adapted plants for lovely, colorful, and shady landscapes.

1- Incorporating water-wise planning and design

Begin by making a plan for the site. Determine how the various areas are intended to be used. Next, divide the site into oasis-type, moderate, and low-water-use areas. The oasis area should be a focal area, where use is the most intense, and that provides shade and coolness as well as aesthetic appeal.

The lowest-water-use area will probably be at the outer edge of the site, where minimal visual and functional use is expected, and may include native plants already growing there. Once the plants in this zone are established, they will need little or no water.

The moderate area is a transition zone between the other two areas and uses a moderate amount of water. Providing this transition zone helps visually and functionally unify the landscape. Identify shady and sunny areas, sloped and flat areas, and how air moves on the site. Understanding the various topographies and microclimates may also influence the location of the various water-use zones. For example, the oasis zone may be located in an area with pre-existing shade, or in a low-lying area with natural water retention that is sheltered from drying winds.

Plants that have a similar need for water, sun, and maintenance should be grouped together to increase irrigation efficiency and reduce maintenance time

2- Using low water-consuming plants

Significant amounts of water (and maintenance) can be saved when using low-water-use plants. There are plenty of plants that use little water. A wide selection of such plants is provided in the plant lists included in this guide. Native plants are the most suitable and require little to no irrigation once established. There is also a wide selection of adapted drought-tolerant plants with attractive flowers, foliage, and fruits.

3- Limiting grass areas

Grass uses more water than anything else in a landscape and also requires more maintenance, so use it only where it provides functional benefits. Avoid using grass to provide a green appearance, and use groundcovers, low shrubs, or native grasses and wildflowers instead. In cases where the use of grass is necessary, limit its area as much as possible and consider the use of drought-tolerant

grasses such as Bermuda or Paspalum. Also consider using artificial turf for large athletic fields, traffic circles, and street medians. Several high-quality types are available in the market.

4- Incorporating water harvesting techniques

Incorporate water-harvesting techniques into your landscape design. This means simply channeling runoff from rain to planted areas or to a container (or underground reservoir) for later use. A few simple methods that direct runoff to where it is needed include sloping sidewalks and terraces, collecting roof water, contouring lawns or other sloped areas, and the use of rock "river" channels. By constructing earth mounds or berms at the edge of your property you can also hold water on your site. Locate plants where they can take advantage of this extra water.

5- Incorporating an efficient irrigation system and design

Match your irrigation method to the type of plant being irrigated. This includes drip irrigation for individual plants, and spray irrigation for grass. Drip irrigation is the most efficient way to irrigate because it puts water where it is needed and reduces evaporation. Use a timer or controller to schedule irrigation and change schedules often, particularly when the weather changes, especially when it rains. Put plants with similar water needs and similar rooting depth on separate valves so that you are not wasting irrigation water on shallow-rooted plants such as groundcovers to accommodate deep-rooted plants such as trees. Most soils cannot absorb water as fast as a spray irrigation system puts it out, so use low volume spray heads to avoid runoff.

And, most importantly, water wisely. Too much water is as bad as not enough, and in many cases is worse. Use deep widely-spaced irrigations. This will encourage deeper rooting and more drought tolerance in plants. Water in the early morning to reduce water loss from evaporation.

6- Applying mulch

Apply mulches at the base of plants to retain moisture, keep weeds down, and control erosion. Mulches can also reduce soil compaction and salt buildup. Typical mulches include compost, bark chips, and inert materials such as decomposed granite and river run rock.

7- Providing proper maintenance

A water-wise landscape will not only reduce water use, but will also minimize maintenance efforts. Still, some pruning, weeding, and fertilizing will be needed. Without good maintenance, water saving and the intended appearance will not be achieved. Go easy on the fertilizer and use a slow-release type. Remember that many xeriscape plants need no or very little fertilizer. Aerate and de-thatch lawn areas once a year to improve infiltration and reduce runoff. Pull up weeds because they use up water and fertilizer. Establish a regular maintenance program for the irrigation system to check for leaks and damaged equipment. Be sure and fix any problems immediately or turn your system off until you can.

General notes

- This document, A Design Guide for Parks in the Mediterranean Context, contributed to the compiling by USAID's *Making Cities Work (MCW) / Tunisia Accountability, Decentralization, and Effective Municipalities (TADAEEM)* project of a design guide for the development of municipal parks in Tunisia.

- Any diagrams shown in this document for which attribution is not provided are courtesy of CSBE.