Gardens depicted in Sanskrit literature, Nandavanams and residential gardens of South India

FLORA AND GARDENS: MAURYA AND POST MAURYA PHASES

One of the earliest instances is from epigraphic records of the mid third century BCE in the form of declarations of the Maurya monarch Aśoka. The second edict of Aśoka claims to have initiated presumably a wide operation for planting medicinal fruit – bearing trees, herbs and roots for the benefit of humans and animals and digging wells and ordinary shady trees for the travelers on the long - distance roads. The urge of the monarch indeed stemmed from his concern for the subjects and his orientation towards the society reflecting his personal engagement with morality or Dhamma– the phenomenon embodying 'civil religion'. A clear reference to selective herb gardening at the ruler's initiative in relation to medicinal plants could also imply general prevalence of such methods of gardening/cultivation.

Another early reference to landscaping and gardening for adornment of settlements, especially urban spaces, is found in an inscription of the Kalinga king Khāravela of the Meghavāhana Dynasty. The narration begins with description of the great tasks undertaken by Khāravela upon his accession to the throne. This included first of all, the matter of repairing all the gardens in the royal city of Kalinga along with the gates, walls, houses and tanks which were devastated after a severe storm.

The Arthaśāstra categorized six different types of vana or middling forests, of which three were not related to revenue or material yield. Besides vana, we have references that imply there was the prevalence of ārāma i.e., gardens or parks for promenade. Flower gardens and fruit orchards adjacent to ordinary urban quarters (Arthaśāstra 2.4.25) were termed as puspaphalavātān.

A chapter that was devoted to the discussions on how to construct temples began with the general observation that one wishing to gain both reputation as well as religious merit ought to build temples and next, that deities take pleasure in places endowed with water bodies and gardens. In fact some of the plant species have especially been declared as auspicious for planting around the temples. Hence, the indication is that while building temples one must take into account the landscape and enhance it with artificial devices that were said to please the Divine. The text provides poetic descriptions of such ideal spots. Gods are imagined as sporting in the forests, near rivers and cataracts, in the vicinity of towns with pleasure gardens. The imagination flows in poetic notes describing the Gods gracing such places where birds frequent, aquatic animals take rest in the shades of trees on the banks of tanks and swans float the water gleefully. Such places are filled with the flowering trees and the melodious notes of happy birds and the land rolls in rounded banks of water and lofty swells of sand dunes.

Sacred Gardens:

Sacred gardens are an ancient tradition in many major cultures, including our own. They are the cultivated counterparts of the sacred groves and are a place for meditation, spiritual awakening and celebration.Although, there is less archaeological evidence of early gardens in India, the Hindu scriptures and books (Ramayana, Abijnana Shakuntalam, Mrichchakatika etc.) give remarkably detailed description of elaborate gardens with flowerbeds, lotus ponds, fruiting trees, creepers and shady spaces. In fact, gardens are a symbol of paradise in Hindu philosophy and art.

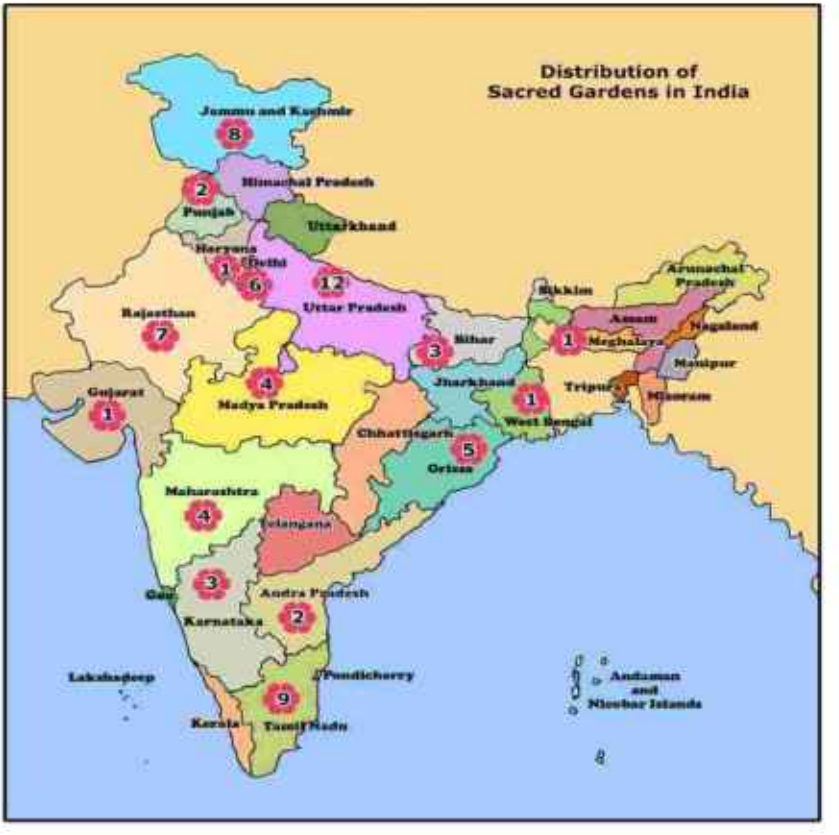
TYPES OF SACRED GARDENS:

Nandavanam – Divine plays (leelas) of Hindu Gods are often depicted in gardens. Most Hindu temples are therefore associated with gardens, also known as Nandavanam. These gardens are usually managed and maintained to serve the temple. Example: the Thirunandavanam or Madurakavi nandavanam attached to the Ranganathar temple at Srirangam.

Buddhists gardens – In Buddhism, gardens are described as a place for meditation and healing. There were beautiful gardens in Nalanda and Taxila. It is even believed that Lord Buddha was born under a tree at the Lumbini garden (now in Nepal), which is now listed as a World Heritage Site. The monasteries played a central part of the life in the monasteries during early periods. Even today, monasteries in India have attractive gardens attached to them.

Bagh (Bagicha) – They are ethno-silvi-horticultural gardens, traditionally planted near tanks, settlements or amidst forests, especially in the northern parts of our country. The biodiversity mainly consists of utility trees such as Mangifera indica, Madhuca latifolia, Syzygium cuminii etc. Green felling is totally banned in these gardens. Also, there is temple or separate space dedicated to the Gods (or village deity). For example, an excellent Bagh exists near a village inside the Darrah Wildlife Sanctuary in Kota.

Gardens of Paradise - Mughal Gardens are square or rectangular in shape, along the lines of Persian gardens. They are generally enclosed by a high wall with imposing gates on four sides. The garden is an orderly view of paradise. They are generally associated with tombs, since the soul of the dead person is believed to have reached paradise, which is replicated on earth in the garden. The tomb garden is called Char Bagh and is based on *hasht-vihisht* or eight paradises plan making a cross-axial garden. The well-known tomb gardens of India are Humayun's Tomb (1571), Delhi; Akbar's Tomb (1613), Sikandra, Agra; Taj Mahal (1630), Agra; and Bibi Ka Maqbara (1661) Aurangabad.



Sacred Gardens of India:

State	Garden
Andhra Pradesh	
	Tiruchanur
	Tirumala –Tirupati Gardens
Bihar	

	Bodhgaya
	Jetavana Buddha Garden
	Nalanda Buddhist Monastery Garden
Delhi	
	Akshardham Temple
	Humayun's Tomb Garden
	Lodhi Gardens
	Lotus Temple
	Roshanara Garden
	Safdarjung's Tomb Garden
Gujarat	
	Akshardham Temple
Haryana	
	Pinjore Gardens
Jammu & Kashmir	
	Achabal Bagh
	Chashme Shahi Garden
	Dara Shikoh Garden
	Nasim Bagh
	Nishat Bagh
	Pari Mahal
	Shalimar Gardens
	Verinag Garden
Karnataka	
	Bidar Fort Gardens
	Bijapur
	Melkote
Madhya Pradesh	
	Islamnagar Gardens
	Kaliadeh Palace Garden
	Mai ki Bagiya
	Sanchi Great stupa Garden
Maharashtra	
	Bani Begum Garden

	Bibi ka Maqbara Garden
	Daulatabad Fort Garden
Meghalaya	
	Lalong Park
Odisha	
	Ekamravan garden
	Gundicha Temple Garden
	Hanuman Vatika
	Rajarani temple garden
	Rani Sati Temple garden
Punjab	
	Aam Khas Bagh
	Ram Bagh
Rajasthan	
	Amer Fort Gardens
	Deeg Palace Gardens
	Dholpur Lotus Garden
	Kanak Vrindavan Garden
	Mandore Gardens
	Ranakpur Jain Temple Garden
	Sisodia Rani Ka Bagh
Tamil Nadu	
	Koodal Azhagar Koil
	Madanagopalaswamy Temple Garden
	Madurai Meenakshi Amman temple
	Mannargudi Rajagopalswamy Temple Garden
	Sri Oppiliappan Temple Garden
	Sri Varadaraja Perumal Temple Garden
	Srirangam Madurakavi Nandavanam
	Srivilliputhur Andal Nandavanam
	Thiruvanaikkaval Vaaleeswarar Temple Garden
Uttar Pradesh	
	Akbar's Tomb
	Bara Imambara Garden

	Etimad-ud-Daula's Tomb
	Khusrau Bagh
	Kushinagar Buddhist garden
	Mehtab Bagh
	Ram Bagh
	Sarnath
	Sikandar Bagh
	Taj Mahal Garden
	Vrindavan Gardens
	Zenana Garden
West Bengal	
	Pareshnath Jain Temple

Thirunandavanam or Nandavanam is the name given to a garden in Tamil. Gardening is a hobby that gives us pleasure and peace of mind. Apart from enhancing the aesthetics, the garden helps in keeping the air clean by reducing pollution.

In this mechanized world it becomes all the more important for every human being to find a way to relax - gardening happens to be one. The traditional methods of gardening have changed over a period of time and modernization has crept into it. This is referred to as bio-aesthetic planning and is nothing but planting of trees and plants with the prime objective of beautifying the city roads, parks, public places, and the precincts. It is further defined as a "planned ecology of living beings" from the artistic and aesthetic point of view in both rural and urban areas. Thus, it runs hand in hand with town planning.

In early days, this practice was taken up and done by the then kings of different dynasties. Besides the king, his subjects prepared and maintained many gardens in the name of their rulers (Gangaikonda Cholan thirunandavanam – S.I.I.II.p.115) and the presiding deity of that particular temple for which the land was donated. In this traditional method of gardening, nearly 100 different kinds of plant species were grown and a good number of floras protected. Medicinal herbs and plants were also grown and protected in these nandavanams and proper care was taken to nurture these plants.

Gardening was encouraged as flowers were essential for the decoration of the deities and for the temple rituals throughout the year. One may recall the nandavanam of Periyazhwar from where he prepared a garland everyday for Lord Ranganatha. Tirupallithamam referred to garland offerings to the temple deities. The inscriptions of the Pallava, Pandya and Chola kings of the Tamil country issued between 600 - 1300 A.D. throws light on their methods of maintenance of temple gardens. These inscriptions speak about thriu nandavana puram, the land donated by the king and his subordinates for the purpose of creating temple gardens. The kings encouraged the practice of making and maintaining nandavanams by providing the following privileges:

- Lands were donated to the temples for establishing nandavanam.
- Gardeners were appointed to maintain the gardens - thiunandavana kudigal (S.I.I.XIV.132)
- The subjects were given cultivable lands for their livelihood.
- For better irrigation for the plants in the garden, separate channels were dug and protected from other users by strict laws. Violation by any means, such as construction of sub-channels, water lifting through small levers or baskets were punishable offences and heavily penalized.
- The cultivable lands given as donation for gardeners were tax-free.
- Nandavanams were protected by thirunandavana kappu - watchman.
- Thevaradiyar pendugal, the female servants appointed by the king, made garlands for the gods, goddess, and deities. They were also given cultivable lands and houses. (S.I.I.XIV.132)
- Nandavana parru - a tax was collected to maintain gardens. (S.I.I. II. Pp.115)

Flora in Inscriptions

Tamil Name	Common Name	Botanical Name	Historical evidence
Chenbakam	Golden champaca	Michelia champaca	(K.P.Pp.118) 11th c. A.D.
Chiru-chenbakam	Ananga flower	Cananga odoratum	(K.P.Pp.118) 11th c. A.D.
Iruvatchi	Tuscan jasmine	Jasminum sampac	(SII.VII. 523) 12th c. A.D.
Karumugai	Malabar jasmine	Jasminum auriculatum	(SII.XIV.238) 12th c. A.D.
Malligai	Jasmine	Jasminum multiflorum	(SII.XIII.270) 11th c. A.D.
Mahilam	Pointed leaf ape flower	Mimosops elengi	(K.P.Pp.223) 11th c. A.D.
Sengalunir	Red water lily	Nymphaea odorata	(SII.II.22) 10th c. A.D.
Tumbai	White flower	Leucas aspera	(SII.VII.523) 11th c. A.D.
Thondai	A creeper flower	Capparis horrida	(E.I. VII.26d).
Vanji	Gulancha tinospora	Tinospora cordifolia	(SII.III.28) 11th c. A.D.
Vagai	Fragrant Indian siris	Albizzia lebbeck	(SII.III.88) 12th c. A.D.
Vanni	Flower from suma tree	Prosopis spicigera	(SII.III.205) 11th c. A.D.
Vembu	Margosa	Azadirachta indica	(SII.III.205) 11th c. A.D.

These are few examples of our garden wealth in early times. Ancient Tamil literature of the Sangam period mentions hundreds of flowers used for various purposes in the day-to-day life of the Tamil people. Tulsi and vilvam in temple gardens have more medicinal value, and grow well with care. But later Tamil inscriptions mention only a few flowers that were used in the temples. Over the years, the invasion of foreign species affected the indigenous plant species that once constituted the gardens and resulted in eliminating many native species. Presently, we do not cultivate any medicinal plants in the nandavanam (excluding botanical gardens and gardens particularly made for medicinal plants).

Though on one hand we have our traditional methods of protecting and conserving plants, on the

other, we are not able to revive and maintain them due to the phenomenal changes in our lifestyles. There is no encouragement to establish and maintain nandavanams. in many places, the lands are no longer available, nor is there water for the plants. Nandavanams were another means of preserving the natural wealth and biodiversity.

JAPANESE GARDENS

- INTRODUCTION
- HISTORY OF JAPANESE GARDENS

- ELEMENTS OF JAPANESE GARDENS
- TYPES OF JAPANESE GARDENS

- FAMOUS JAPANESE GARDENS
- DIFFERENCES BETWEEN CHINESE AND JAPANESE GARDENS

- CASE STUDY

KATSURA IMPERIAL GARDEN, KYOTO

JAPANESE GARDENS

HISTORY

Around 552 A.D. Buddhism was officially installed from China, via Korea, into Japan. Japanese gardens were influenced by the Chinese philosophy of Daoism, and Amida Buddhism, imported from China in or around 552 A.D. Daoist legends spoke of five mountainous islands inhabited by the Eight Immortals, who lived in perfect harmony with nature. Each Immortal flew from his mountain home on the back of a crane. The islands themselves were located on the back of an enormous sea turtle. In Japan, the five islands of the Chinese legend became one island, called Horai- zen, or Mount Horai. Replicas of this legendary mountain, the symbol of a perfect world, are a common feature of Japanese gardens, as are rocks representing turtles and cranes of the Chinese gardens, but gradually Japanese garden designers began to develop their own aesthetics, based on Japanese materials and Japanese culture. By the Edo period, the Japanese garden had its own distinct appearance Since the end of the 19th century, Japanese gardens have also been adapted to Western settings Japanese gardens also were strongly influenced

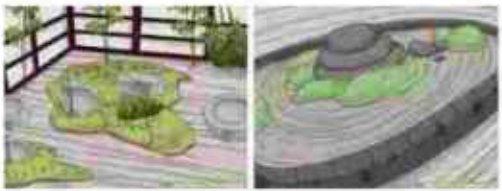
JAPANESE GARDENS

Much of the landscape of Japan, an island nation, consists of mountains and oceans. These ever-presentmountains and oceans are reduced to two of the primary and enduring components of the Japanese Garden — rocks and water. In traditional Japanese gardens these elements has been created in miniature forms, often in a highly abstract and stylized way. Spirit of Japanese Garden -Nature is the ideal in Japanese gardens. They idealize it, even symbolize it, but never create something that nature itself cannot. From ancient times to the present, living in harmony with nature has reflected the in Japanese gardens as per seasons. A traditional garden will usually have an irregular-shaped pond, or, in larger gardens, two or more ponds connected by a channel or stream, and a cascade, a miniature version of Japan's famous mountain waterfalls.

JAPANESE GARDENS

ELEMENTS OF JAPANESE GARDENS

WATER



ROCKS AND SAND

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JAPANESE GARDENS

FISH

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STONE LANTERNS AND WATER BASINS

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GARDEN BRIDGES

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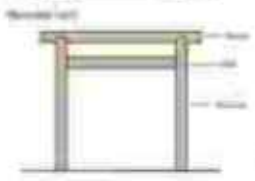
GARDEN FENCES, GATES, AND DEVICES



JAPANESE GARDENS

TREES AND FLOWERS

•Plants are chosen according to aesthetic principles,

•Plants are used either to hide undesirable sights or to serve as a backdrop to certain garden features, or to create a picturesque scene, like a landscape painting or postcard.

•Trees are carefully chosen and arranged for their autumn colors.

•Mosses often used to suggest that the garden is ancient.

•Flowers are also carefully chosen by their season of flowering.

•. Some plants are chosen for their religious symbolism, such as the lotus, sacred in Buddhist teachings, or the pine, which represents longevity.

•The trees are carefully trimmed to provide attractive scenes, and to prevent them from blocking other views of the garden sculpted trees and bushes at a Residence.

AESTHETIC PRINCIPLES

Japanese gardens largely followed the Chinese model, but gradually developed their own principles and aesthetics. Some basic principles are: Miniaturization - The Japanese garden is a miniature and idealized view of nature. Rocks can represent mountains, and ponds can represent seas. Concealment - ('hiding and revealing.') The Zen Buddhist garden is meant to be seen at all once, but the promenade garden is meant to be seen one landscape at a time, like a scroll of painted landscapes unrolling. Features are hidden behind hills, trees groves or bamboo, walls or structures, to be discovered when the visitor follows the winding path. "

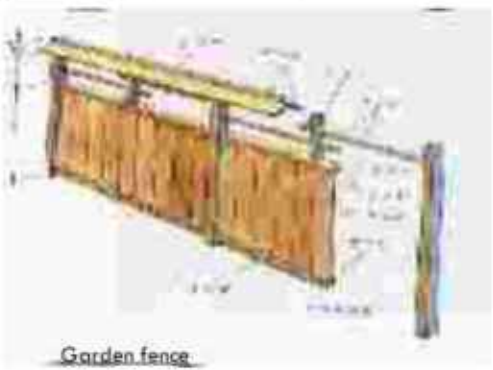
BORROWED" SCENERY (SHAKKEI)

Smaller gardens are often designed to incorporate the view of features outside the garden, such as hills, trees or temples, as part of the view. This makes the garden seem larger than it really is.

ASYMMETRY

Japanese gardens are not laid on straight axes, or with a single feature dominating the view. Buildings and garden features are usually placed to be seen from a diagonal, and are carefully composed into scenes that contrast right angles, such as buildings with natural features, and vertical features, such as rocks, bamboo or trees, with horizontal features, such as water. According to garden historians David and Michigo Young, at the heart of the Japanese garden is the principle that a garden is a work of art. "Though inspired by nature, it is an interpretation rather than a copy; it should appear to be natural, but it is not wild.".

Stone lantern



Garden fence

JAPANESE GARDENS

TYPICAL JAPANESE GARDEN LANSCAPE

JAPANESE GARDENS

PURPOSE & STYLES OF JAPANESE GARDENS

Earlier the gardens were designed for recreation and aesthetic pleasure of emperors and nobles, while the gardens of Buddhist temples were designed for contemplation and mediation.

Today there are several styles in Japanese gardens as per function. They are:

1.POND GARDEN
2.PARADISE GARDEN
3.HERMITAGE GARDEN
4.DRY ROCK GARDEN OR ZEN GARDENS
5. TEA GARDENS - simple, rustic gardens with teahouses where the Japanese tea ceremony is conducted.
6. PROMENADE OR STROLL GARDENS - where the visitor follows a path around the garden to see carefully-composed landscapes
7. COURTYARD GARDENS

POND GARDEN

known as "lake-spring-boat excursion garden". It was imported from China during the Heian Period Elements of pond garden – •Lake •Islands Features – It featured a large, ornate residence with two long wings reaching south to a large lake and garden. These gardens had large lakes with small islands, where musicians played during festivals and ceremonies. Eg - Heian- jingū and Daikaku-ji Temple in Kyoto. Heian-
jingū is a recreation of the old imperial pond garden of Kyoto GARDEN STYLES

POND GARDEN

PARADISE GARDEN

HERMITAGE GARDEN

ZEN GARDEN

JAPANESE GARDENS

THE PARADISE GARDEN

The Paradise Garden appeared in the late Heian Period. They were meant to symbolize Paradise or the Pure Land (Jōdo), where the Buddha sat on a platform contemplating a lotus pond. Elements of paradise garden – •A lake island known as Nakajima •a Buddha hall •Arching bridge Features – These gardens featured a lake island called Nakajima, where the Buddha hall was located, connected to the shore by an arching bridge. Eg - The most famous surviving example is the garden of the Phoenix Hall of Byōdō-in Temple, built in 1053, in Uji, near Kyoto. Temple in Uji, near Kyoto. a paradise garden in Kyoto.

HERMITAGE GARDEN

A hermitage garden is a small garden usually built by a samurai or government official who wanted to retire from public life and devote himself to study or meditation. Elements of these gardens – •Garden – traditional garden features •Rustic house •Winding path Features – The garden is attached to a rustic house, and approached by a winding path, which suggests it is deep in a forest. It may have a small pond, a Japanese rock garden, and the other features of traditional gardens, in miniature, designed to create tranquility and inspiration. Eg. - An example is the Shisen-dō garden in Kyoto, built by a bureaucrat and scholar exiled by the shogun in the 17th century. It is now a Buddhist temple. Shisen-dō, built in Kyoto, in the 17th century, one of the best examples of a hermitage garden

DRY ROCK GARDENS/ ZEN GARDENS

These are meant for meditation and in these gardens. Elements of rock/ zen gardens – •White sand •Raked gravel Features – These gardens have white sand or raked gravel in place of water, carefully-arranged rocks, and sometimes rocks and sand covered with moss. Eg - The most famous example is Ryōan-ji Temple in Kyoto. Rosan-ji garden, Kyoto Zuihō-in garden, Kyoto

JAPANESE GARDENS

TEA GARDENS

The style of garden takes its name from the path to the teahouse, which is supposed to inspire the visitor to meditation to prepare him for the ceremony.

ELEMENTS OF TEA GARDEN

•Outer garden •Gate •Covered arbor •Inner garden •Moist and green pathway Features

There is an outer garden, with a gate and covered arbor where guests wait for the invitation to enter. ☐ They then pass through a gate to the inner garden, where they wash their hands and rinse their mouth, as they would before entering a Shinto shrine, before going into the teahouse itself. ☐ The path is always kept moist and green, so it will look like a remote mountain path, and their are no bright flowers that might distract the visitor from his meditation. A teahouse and roji, or tea garden, at Ise Jingu.

PROMENADE GARDENS

These gardens were meant to be seen by following a path clockwise around the lake from one carefully-composed scene to another. Elements of promenade gardens – •Scenery – mountains ,temples •Pathway , fences, bamboo ,buildings Features – These gardens used two techniques to provide interest; "borrowed scenery", which took advantage of views of scenery outside the garden, such as mountains or temples, incorporating them into the view so the garden looked larger than it really was; and "hide-and-reveal," which used winding paths, fences, bamboo and buildings to hide the scenery so the visitor would not see it until he was at the best view point. Eg - Edo Period gardens also often feature recreations of famous scenery or scenes inspired by literature; Suizen-ji Jōju-en Garden in Kumamoto has a miniature version of Mount Fuji, and Katsura Villa in Kyoto has a miniature version of the Ama-no- hashidate sandbar in Miyazu Bay, near Kyoto. Katsura Imperial Villa, the prototype for the promenade garden Two hills covered with trimmed bamboo grass which represent Mount Lu in China. This feature is in Kōraku-en Garden in Tokyo

JAPANESE GARDENS

COURTYARD GARDEN

These small gardens were originally found in the interior courtyards of Heian Period and palaces. Elements of courtyard garden – •Stone Lantern •A Water Basin •Stepping Stones •Plants Features – These tiny gardens were meant to be seen, not entered. These were designed to give a glimpse of nature and some privacy to the residents of the rear side of the building. Eg. - A good example from the Meiji Period is found in the villa of Murin-an in Kyoto.

TEA GARDEN

PROMENADE GARDEN

COURTYARD GARDEN

FAMOUS JAPANESE GARDENS

Tenryū-ji Garden in Kyoto.
(Kaiyū-shiki Garden, completed in 14th century)
Kōraku-en in Okayama.
(Kaiyū-shiki Garden, completed in 17th century)
Adachi Museum of Art Garden, Yasugi.
(Kanshō-shiki Garden, completed in 20th century)
A spacious Japanese garden, Suizen-ji Jōju- en, near Kumamoto Castle

JAPANESE GARDENS

Differences between Japanese and Chinese gardens

JAPANESE GARDENS	CHINESE GARDENS
Architecture – •The architecture in a Japanese garden is largely or partly concealed. •The buildings are well apart from the body of water. • the buildings are simple, with very little ornament	**Architecture –** •Emphasis is being given to buildings •These are in the center of the garden, occupying a large part of the garden space. •They are very elaborate, with much architectural decoration.
Viewpoint – Later Japanese gardens are designed to be seen from the outside	**Viewpoint –** These are designed to be seen from the inside, from the buildings in the center of the garden.
Symmetry – The structures in a Japanese garden from the Edo period onward are organized asymmetrically.	**Symmetry –** These are usually symmetrically designed along straight axes.
Use of Rocks – Rocks were smaller and placed in more natural arrangements, integrated into the garden	**Use of Rocks –** Rocks were selected for their extraordinary shapes or resemblance to animals or mountains, and used for dramatic effect. They were often the stars and centerpieces of the garden.

JAPANESE GARDENS

CASE STUDY

Katsura Imperial Palace Garden

Katsura Imperial Villa was built in the early Edo Period for Prince Toshhihito (1579-1629) and work began when he was 40. The prince himself was the main designer, working with Kobori Enshu, a tea master, government official and garden designer.

A lake (1.25 ha) was dug, hills and islands formed, beaches made, pavillions built and planting undertaken. The result was a pleasure landscape of the kind described by Lady Murasaki in the Tale of Genji, 620 years earlier. There are 16 bridges. The lake could be used for boating parties and the surrounding land as a stroll garden, in effect a tea garden on an enormous scale.

The 'Katsura Tree' (Cercidiphyllum japonicum) was associated with the God of the Moon and the garden has a platform to view its rising. After Prince Toshhihito died the work was continued by a former emperor, Gomizunoo.

There are 23 stone lanterns to light the stroll path after dark. They were recent introduction to Japanese gardens but have come to be thought of as typical, along with the stepping stones which reinforce the path and protect the plants.

Stone basins were used for hand-washing before a tea ceremony. Katsura was designed not only for meditation (Zen) but also for ceremonious courtly pleasures. Its elegance, balance and harmonious restraint have charmed all .

ITALIAN RENAISSANCE GARDENS

- The **Italian Renaissance garden** was a new style of garden which emerged in the late 15th century at villas in Rome and Florence, inspired by classical ideals of order and beauty, and intended for the pleasure of the view of the garden and the landscape beyond, for contemplation, and for the enjoyment of the sights, sounds and smells of the garden itself.
- In the late Renaissance, the gardens became larger, grander and more symmetrical, and were filled with fountains, statues, grottoes, water organs and other features designed to delight their owners and amuse and impress visitors. The style was imitated throughout Europe, influencing the gardens of the French Renaissance and the English garden.

The *Fontana dell'Ovato* ("Oval Fountain") at the Villa d'Este at Tivoli (1572)

Gardens of Villa Garzoni

- Prior to the Italian Renaissance, Italian Medieval gardens were enclosed by walls, and were devoted to growing vegetables, fruits and medicinal herbs, or, in the case of monastery gardens, for silent meditation and prayer. The Italian Renaissance garden broke down the wall between the garden, the house, and the landscape outside.
- The Italian Renaissance garden, like Renaissance art and architecture, emerged from the rediscovery by Renaissance scholars of classical Roman models.
- Pliny described shaded paths bordered with hedges, ornamental parterres, fountains, and trees and bushes trimmed to geometric or fantastic shapes; all features which would become part of the future Renaissance garden.

Alberti and the principles of the Renaissance Garden

- The first Renaissance text to include garden design was *De Re Aedificatoria* ('The Ten Books of Architecture'), by Leon Battista Alberti (1404–1472). He drew upon the architectural principles of Vitruvius,[3] and used quotations from Pliny the Elder and Pliny the Younger to describe what a garden should look like and how it should be used. He argued that a villa should both be looked at and a place to look from; that the house should be placed above the garden, where it could be seen and the owner could look down into the garden.
- Within the garden, Alberti wrote: "...You should place porticos for giving shade, planters where vines can climb, placed on marble columns; vases and amusing statues, provided they are not obscene. You should also have rare plants.... Trees should be aligned and arranged evenly, each tree aligned with its neighbours.

Power and magnificence - the political symbolism of the Renaissance garden

- While the early Italian Renaissance gardens were designed for contemplation and pleasure with tunnels of greenery, trees for shade, an enclosed *giardino segreto* (secret garden) and fields for games and amusements, the Medici, the ruling dynasty of Florence, used gardens to demonstrate their own power andmagnificence. "During the first half of the sixteenth century, magnificence came to be perceived as a princely virtue, and all over the Italian peninsula architects, sculptors, painters, poets, historians and humanist scholars were commissioned to concoct a magnificent image for their powerful patrons."
- The central fountain at Villa di Castello featured a statue of Hercules defeating Antaeus, alluding to the triumph of the garden's builder, Cosimo de' Medici. over a faction of Florentine nobles who had tried to overthrow him. The garden was a form of political theater, presenting the power, wisdom, order, beauty and glory that the Medici had brought to Florence.

Glossary of the Italian Renaissance Garden

- **fontaniere**. The fountain-maker, a hydraulic engineer who designed the water system and fountains.
- **giochi d'acqua**. water tricks. Concealed fountains which drenched unsuspecting visitors.
- **Sacro Bosco**. Sacred wood. A grove of trees inspired by the groves where pagans would worship. In Renaissance and especially mannerist gardens, this section was filled with allegorical statues of animals, giants and fantastic creatures.
- **Giardino Segreto**. The Secret Garden. An enclosed private garden within the garden, inspired by the cloisters of Medieval monasteries. A place for reading, writing or quiet conversations.
- **Semplici**. "Simples," or medicinal plants and herbs.

Gardens of the Early Italian Renaissance

- **The Medici Villa at Fiesole (1455-1461)**
- Villa Medici in Fiesole.
- The oldest existing Italian Renaissance garden is at the Villa Medici in Fiesole, north of Florence. Unlike other Medici family villas that were located on flat farmland, this villa was located on a rocky hillside with a view over Florence.
- The Villa Medici followed Alberti's precepts that a villa should have a view 'that overlooks the city, the owner's land, the sea or a great plain, and familiar hills and mountains,' and that the foreground have 'the delicacy of gardens.'[18] The garden has two large terraces, one at the ground floor level and the other at the level of the first floor. From the reception rooms on the first floor, guests could go out to the loggia and from there to the garden so the loggia was a transition space connecting the interior with the exterior. Unlike later gardens, the Villa Medici did not have a grand staircase or other feature to link the two levels.

The Medici Villa at Fiesole (1455-1461)

Villa Medici in Fiesole.

Garden of Villa d'Este. Fish ponds.

Gardens of the High Renaissance-Villa d'Este at Tivoli (1550-1572)

- The Villa d'Este at Tivoli is one of the grandest and best-preserved of the Italian Renaissance gardens. It was created by Cardinal Ippolito II d'Este,
- Ligorio created the garden as a series of terraces descending the steep hillside at the edge of the mountains overlooking the plain of Latium. The terraces were connected by gates and grand stairways starting from a terrace below the villa and traversing down to the Fountain of Dragons at the foot of the garden. The stairway was crossed by five traversal alleys on the different levels, which were divided into rooms by hedges and trellises covered with vines. At the crossing points of the stairway and the alleys there were pavilions, fruit trees, and aromatic plants. At the top, the promenade used by the Cardinal passed below the villa and led in one direction to the grotto of Diana, and in the other to the grotto of Asclepius.
- The glory of the Villa d'Este was the system of fountains, fed by two aqueducts that Ligorio constructed from the River Aniene. In the centre of the garden, the alley of one hundred fountains (which actually had two hundred fountains), crossed the hillside, connecting the Oval Fountain with the Fountain of Rome, which was decorated with models of the famous landmarks of Rome. On a lower level, another alley passed by the Fountain of Dragons and joined the Fountain of Proserpine with the Fountain of the Owl. Still lower, an alley of fishponds connected the Fountain of the Organ to the site of a proposed Fountain of Neptune.[xxii]
- The Fountain of the Owl used a series of bronze pipes like flutes to make the sound of birds but the most famous feature of the garden was the great Organ Fountain. It was described by the French philosopher Michel de Montaigne, who visited the garden in 1580: "The music of the Organ Fountain is true music, naturally created...made by water which falls with great violence into a cave, rounded and vaulted, and agitates the air, which is forced to exit through the pipes of an organ. Other water, passing through a wheel, strikes in a certain order the keyboard of the organ. The organ also imitates the sound of trumpets, the sound of cannon, and the sound of muskets, made by the sudden fall of water ...[xxiii]
- The garden was substantially changed after the death of the Cardinal and in the 17th century, and many statues were sold, but the basic features remain, and the Organ Fountain has recently been restored and plays music once again.

The first botanical gardens

- The Italian Renaissance also saw a revolution in the study of botany through the systematic classification of plants and the creation of the first botanical gardens. During the Middle Ages, plants were studied for the medicinal uses. Until the 16th century, the standard work on botany was De Materia Medica written in the 1st century AD by a Greek physician, Pedanius Dioscorides, that described six hundred plants but lacked many of the native plants of Italy and had vague descriptions with stylized and inexact illustrations.[20] In 1533, the University of Padua created the first chair of botany and appointed Francesco Bonafede as the first *Professor Simplicium*- professor of 'simples,' or medicinal plants. In 1545, a scholar from the medical school of the University of Padua, Pietro Andrea Mattioli, wrote a new book on medicinal herbs, *Commentarii in libros sex Pedanii Dioscoridis*, which, in successive editions, systematically described and gave the medicinal uses of twelve hundred different plants. Such scientific work was aided by sailors and explorers returning from the New World, Asia and Africa, who brought back samples of plants unknown in Europe.
- In June 1543, the University of Padua created the world's first botanical garden, the Orto botanico di Padova, and the University of Pisa followed with its own garden, the Orto botanico di Pisa, in 1545.[21] By 1591, the garden at Padua had over 1,168 different plants and trees, including a fan palm tree brought from Egypt. In 1545, in Florence, Cosimo de' Medici founded the *Giardino dei Semplici*, the garden of medicinal herbs. Soon the medical schools of the universities of Bologna, Ferrara and Sassari all had their own botanical gardens filled with exotic plants from around the world.

French Renaissance

- The **Gardens of the French Renaissance** is a garden style, initially inspired by the Italian Renaissance garden, which evolved later into the grander and more formal Garden à la française during the reign of Louis XIV, by the middle of the 17th century.
- In 1495, King Charles VIII and his nobles brought the Renaissance style back to France after their war campaign in Italy.[1] They reached their peak in the gardens of the royal Château de Fontainebleau, the Château de Blois, the Château d'Amboise, and the Château de Chenonceau.
- French Renaissance gardens were characterized by symmetrical and geometric planting beds or parterres; plants in pots; paths of gravel and sand; terraces; stairways and ramps; moving water in the form of canals, cascades and monumental fountains, and extensive use of artificial grottoes, labyrinths and statues of mythological figures. They became an extension of the châteaux that they surrounded, and were designed to illustrate the Renaissance ideals of measure and proportion, and to remind viewers of the virtues of Ancient Rome.

History
Italian influence

- Château de Vallery, about 1570.
- In the 13th century, the Italian landscape architect Pietro de' Crescenzi wrote a treatise called *Opus Ruralium Commodium*, which laid out a formal plan for gardens, ornamented with topiary sculptures, trees and bushes trimmed into architectural shapes, following a tradition begun by the Romans. King Charles V of France ordered a French translation in 1373, and the new Italian style began to appear in France.
- Another influential writer was Leon Battista Alberti (1404–1472), who in 1450 wrote a tract, *De re aedificatoria* for Lorenzo de' Medici, he used the geometric principles of Vitruvius to design building façades and gardens. He suggested that the house should look over the garden, and that the garden should have "porticos for giving shade, cradles where vines grow on columns of marble, and there should be vases and even amusing statues, provided that they are not obscene."
- In his design of the gardens of the Belvedere in Rome, the architect Bramante (1444–1544) introduced the idea of perspective, using a long axis perpendicular to the palace, along which he placed parterres and fountains. This became a central feature of Renaissance gardens.

- The **French formal garden**, also called the ***jardin à la française*** (literally, "garden in the French manner" in French), is a style of garden based on symmetry and the principle of imposing order on nature. Itsepitome is generally considered to be the Gardens of Versailles designed during the 17th century by the landscape architect André Le Nôtre for Louis XIV and widely copied by other European courts.
- Gardens of the Palace of Versailles.
- Gardens of the Château de Chantilly.
- The "Basin of Apollo" in the Gardens of Versailles.
- *Parterres* of the Orangerie at the Palace of Versailles.
- Gardens of the Grand Trianon at the Palace of Versailles.
- *Parterres* of Vaux-le-Vicomte.
- 17th-century engraving of Vaux-le-Vicomte.
- *Parterre* of *broderies*(embroidery-like patterning) at Vaux-le-Vicomte.

History
Renaissance influence

- The *Garden à la française* evolved from the French Renaissance garden, a style which was inspired by the Italian Renaissance garden at the beginning of the 16th century. The Italian Renaissance garden, typified by the Boboli Gardens in Florence and the Villa Medici in Fiesole, was characterized by planting beds, or parterres, created in geometric shapes, and laid out symmetrical patterns; the use of fountainsand cascades to animate the garden; stairways and ramps to unite different levels of the garden; grottos, labyrinths, and statuary on mythological themes. The gardens were designed to represent harmony and order, the ideals of the Renaissance, and to recall the virtues of Ancient Rome.
- While the gardens of the French Renaissance were much different in their spirit and appearance than those of the Middle Ages, they were still not integrated with the architecture of the châteaux, and were usually enclosed by walls. The different parts of the gardens were not harmoniously joined together, and they were often placed on difficult sites chosen for terrain easy to defend, rather than for beauty. All this was to change in the middle of the 17th century with the development of the first real *Garden à la française*.

Vaux-le-Vicomte

- The first important garden à la française was the Chateau of Vaux-le-Vicomte, created by Nicolas Fouquet, the superintendent of Finances to Louis XIV, beginning in 1656. Fouquet commissioned Louis Le Vau to design the chateau, Charles Le Brun to design statues for the garden, and André Le Nôtre to create the gardens. For the first time, that garden and the chateau were perfectly integrated.
- A grand perspective of 1500 meters extended from the foot of the chateau to the statue of the Hercules of Farnese; and the space was filled with parterres of evergreen shrubs in ornamental patterns, bordered by colored sand, and the alleys were decorated at regular intervals by statues, basins, fountains, and carefully sculpted topiaries. "The symmetry attained at Vaux achieved a degee of perfection and unity rarely equalled in the art of classic gardens. The chateau is at the center of this strict spatial organization which symbolizes power and success."

Parterres of the Orangerie at the Palace of Versailles.

Gardens of the Grand Trianon at the Palace of Versailles.

Parterres of Vaux-le-Vicomte

17th-century engraving of Vaux-le-Vicomte.

Parterre of *broderies*(embroidery-like patterning

- **Gardens of Versailles**
- The Gardens of Versailles, created by André Le Nôtre between 1662 and 1700, were the greatest achievement of the Garden à la francaise. They were the largest gardens in Europe – with an area of 15,000 hectares, and were laid out on an east–west axis followed the course of the sun: the sun rose over the Court of Honor, lit the Marble Court, crossed the Chateau and lit the bedroom of the King, and set at the end of the Grand Canal, reflected in the mirrors of the Hall of Mirrors. In contrast with the grand perspectives, reaching to the horizon, the garden was full of surprises – fountains, small gardens fill with statuary, which provided a more human scale and intimate spaces.
- The Fountain de Latone, Versailles (1678)
- The central symbol of the Garden was the sun; the emblem of Louis XIV, illustrated by the statue of Apollo in the central fountain of the garden. "The views and perspectives, to and from the palace, continued to infinity. The king ruled over nature, recreating in the garden not only his domination of his territories, but over the court and his subjects.

The Fountain de Latone, Versailles (1678)

Decline

- Andre Le Nôtre died in 1700, but his pupils and his ideas continued to dominate the design of gardens in France through the reign of Louis XV.
- Nonetheless, a few variations in the strict geometry of the garden à la française began to appear. Elaborate parterres of broderies, with their curves and counter-curves, were replaced by parterres of grass bordered with flowerbeds, which were easier to maintain. Circles became ovals, called rotules, with alleys radiating outward in the shape of an 'x', and irregular octagon shapes appeared. Gardens began to follow the natural landscape, rather than moving earth to shape the ground into artificial terraces.
- In the middle of the 18th century, the influence of the new English garden created by British aristocrats and landowners, and the popularity of the Chinese style, brought to France by Jesuit priests from the Court of the Emperor of China, a style which rejected symmetry in favor of nature and rustic scenes, brought an end to the reign of the symmetrical garden à la française. In many French parks and estates, the garden closest to the house was kept in the traditional à la française style, but the rest of the park was transformed into the new style, called variously *jardin a l'anglaise* (the English garden), "anglo-chinois",*exotiques*, or "pittoresques". This marked the end of the age of the garden à la française and the arrival in France of the *Jardin Paysager*, or landscape garden, which was inspired not by architecture but by painting, literature and philosophy.

Term-English translation-Definition

- Parterre-On the ground-A planting bed, usually square or rectangular, containing an ornamental design made with low closely clipped hedges, colored gravel, and sometimes flowers. Parterres were usually laid out in geometric patterns, divided by gravel paths. They were intended seen from above from a house or terrace. A *parterre de gazon* was made of turf with a pattern cut out and filled with gravel.
- Broderie-Embroidery-A very curling decorative pattern within a parterre, created with trimmed yew or box or made by cutting the pattern out of a lawn and filling it with colored gravel
- Bosquet-Grove-A small group of trees, usually some distance from the house, designed as an ornamental backdrop
- Allée-Alleyway-A straight path, often lined with trees
- Topiary-Ornamental gardening-Trees or bushes trimmed into ornamental shapes. In French gardens, they were usually trimmed into geometric shapes.
- Patte d'Oie-Goose foot-Three or five paths or allées which spread outward from a single point

Principles

The form of the French garden was largely fixed by the middle of the 17th century. It had the following elements, which became typical of the formal French garden:

- A geometric plan using the most recent discoveries of perspective and optics.
- A terrace overlooking the garden, allowing the visitor to see all at once the entire garden. As the French landscape architect Olivier de Serres wrote in 1600, "It is desirable that the gardens should be seen from above, either from the walls, or from terraces raised above the parterres.
- All vegetation is constrained and directed, to demonstrate the mastery of man over nature. Trees are planted in straight lines, and carefully trimmed, and their tops are trimmed at a set height.
- The residence serves as the central point of the garden, and its central ornament. No trees are planted close t the house; rather, the house is set apart by low parterres and trimmed bushes.
- A central axis, or perspective, perpendicular to the facade of the house, on the side opposite the front entrance. The axis extends either all the way to the horizon (Versailles) or to piece of statuary or architecture (Vaux-le-Vicomte). The axis faces either South (Vaux-le-Vicomte, Meudon) or east–west (Tuileries, Clagny, Trianon, Sceaux). The principal axis is composed of a lawn, or a basin of water, bordered by trees. The principal axis is crossed by one or more perpendicular perspectives and alleys.
- The most elaborate parterres, or planting beds, in the shape of squares, ovals, circles or scrolls, are placed in regular and geometric order close to the house, to complement the architecture and to be seen from above from the reception rooms of the house.
- The parterres near the residence are filled with broderies, designs created with low boxwood to resemble the patterns of a carpet, and given a polychrome effect by plantings of flowers, or by colored brick, gravel or sand.
- Farther from the house, the broderies are replaced with simpler parterres, filled with grass, and often containing fountains or basins of water. Beyond these, small carefully created groves of trees (), serve as an intermediary between the formal garden and the masses of trees of the park. "The perfect place for a stroll, these spaces present alleys, stars, circles, theaters of greenery, galleries, spaces for balls and for festivities."
- Bodies of water (canals, basins) serve as mirrors, doubling the size of the house or the trees.

A French estate, 18th century

Colors, flowers and trees

- Ornamental flowers were relatively rare in French gardens in the 17th century, and there was a limited range of colors; blue, pink, white and mauve. Brighter colors (yellow, red, orange) would not arrive until about 1730, because of botanical discoveries from around the world brought to Europe. Bulbs of tulips and other exotic flowers came from Turkey and the Netherlands.;[1] An important ornamental feature in Versailles and other gardens was the topiary, a tree or bush carved into geometric or fantastic shapes, which were placed in rows along the main axes of the garden, alternating with statues and vases.
- At Versailles flower beds were found only at the Grand Trianon and in parterres on the north side of the palace. Flowers were usually brought from Provence, kept in pots, and changed three or four times a year. Palace records from 1686 show that the Palace used 20,050 jonquil bulbs, 23000 cyclamen, and 1700 lily plants.
- Most of the trees at Versailles were taken from the forest; they included hornbeam, elm, linden, and beech trees. There were also chestnut trees from Turkey and acacia trees. Large trees were dug up from the forests of Compiègne and Artois and transplanted to Versailles. Many died in transplanting and had to be regularly replaced.
- The trees in the park were trimmed both horizontally and flattened at the top, giving them the desired geometric form. Only in the 18th century were they allowed to grow freely.

The trees in the park were trimmed both horizontally and flattened at the top, giving them the desired geometric form. Only in the 18th century were they allowed to grow freely.[19]

Belvedere Palace's Gardens in Vienna, designed by Dominique Girard, pupil of André Le Nôtre

Broderies in the gardens of the château de Villandry (Indre-et-Loire)

decorative element of the much larger garden.

Technologies

- The appearance of the French garden in the 17th and 18th centuries was a result of the development of several new technologies. The first was **géoplastie**, the science of moving large amounts of earth. This science had several technological developments. This science had come from the military, following the introduction of cannon and modern siege warfare, when they were required to dig trenches and build walls and earth fortifications quickly. This led to the development of baskets for carrying earth on the back, wheelbarrows, carts and wagons. Andre LeNotre adapted these methods to build the level terraces, and to dig canals and basins on a grand scale.
- A second development was in **hydrology**, bringing water to the gardens for the irrigation of the plants and for use in the many fountains. This development was not fully successful at Versailles, which was on a plateau; even with 221 pumps and a system of canals bringing water from the Seine, and the construction in 1681 of a huge pumping machine at Marly, there was still not enough water pressure for all the fountains of Versailles to be turned on at once. *Fontainiers* were placed along the routes of the King's promenades, and turned on the fountains at each site just before he arrived.
- A related development took place in **hydroplasie**, the art and science of shaping water into different shapes as it came out the fountain. The shape of the water depended upon the force of the water and the shape of the nozzle. New forms created through this art were named *tulipe* (the tulip), *double gerbe* (the double sheaf), *Girandole*(centerpiece) *candélabre* (candelabra), and *corbeille* (bouquet), *La Boule en l'air* (Ball in the air), and *L'Evantail* (the fan). This art was closely associated with the fireworks of the time, which tried to achieve similar effects with fire instead of water. Both the fountains and fireworks were often accompanied by music, and were designed to show how nature (water and fire) could be shaped by the will of man.
- Another important development was in horticulture, in the ability to raise plants from warmer climates in the northern European climate by protecting them inside buildings and bringing them outdoors in pots. The first orangerie were built in France in the 16th century following the introduction of the orange tree after the Italian Wars. The orangerie at Versailles has walls five meters thick, with a double wall that maintains temperatures in winter between 5 and 8 degrees Celsius (41 and 46 °F). Today it can shelter 1055 trees.

Various ways in which water was used as a design element in mughal gardens.

- **Water**
- Water is a central element of Islamic garden design where it has both a physical and metaphysical importance. Islam was established and grew in a part of the world which has a hot, harsh climate and where water brings life to the desert and those who live in it. These concepts, both conceptually and physically, are central to the use of water in the garden.
- **Vegetation and shade**
- In hot, arid climates the promise of water is a design imperative, but so too is the constant requirement for shade. Coolness, lush greenery, fruit and beauty are also features of the garden. These help to create a setting for rest and enjoyment, providing fruits and shade, colour and movement.

ELEMENTS - CHABUTRA

- Chabutra or Pavilions were located at the junction of the channels, the main one at the centre.
- Generally there was one, however in the Pleasure gardens, there were more than one, each located at the center of every terrace.
- Airy and resembling tents these pavilions were mostly open with just columns and roofs.
- They frequently had water flowing through them as well.

ELEMENTS - CHINNIKANNAS

- Niches carved in the area behind a waterfall/ cascade. They would be filled with rosesand other flowers in the day time and candles in the night.
- Generally carved out of white marble.
- Excessively used in Pleasure gardens of Kashmir and the forts

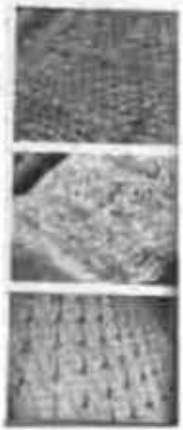
FOUNTAINS

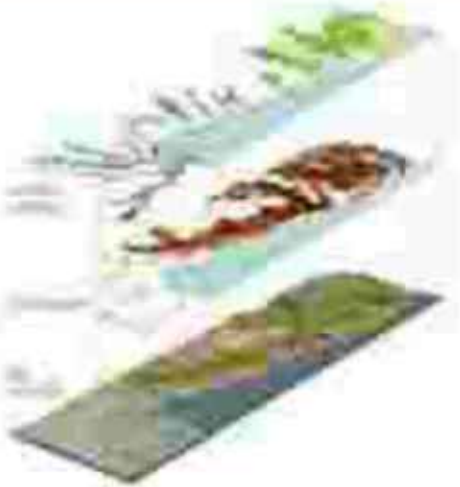
- Fine sprays, jounets or as mist fountains added moisture to the dry air, cooling the garden. It's sound masking background noise and reflections form it adding light and sparkle.

TANKS

- Since paradise overflowed with water, water in these tanks always reached the brim.
- Symbolically, the shape was a cube or rectangle that reflected stability or earthly paradise

CHANNELS - CHADDAR





Site Evaluation Checklist

Pupil Dimension, NASA, et al.)

This is a checklist of the factors that may be assessed in evaluating a site. Although lengthy, this list is not all-inclusive, and factors are added from time to time. Information is usually collected using the inside figure/ground for the project.

PHYSICAL FACTORS
Climate

A. Prevailing winds
   1. Direction
   2. Maximum, minimum, and average velocities
   3. Special forces (e.g., tornadoes, hurricanes)

B. Solar orientation
   1. Sun angles
   2. Degree of daylight
   3. Obstructions
   4. Shading of the more adjacent structures, natural features, and vegetation

C. Temperature
   1. Ranges of variation
   2. Maximum and minimum

D. Humidity
   1. Ranges of variation
   2. Absorption and transmission

E. Precipitation
   1. Mud (actual cloud)
   2. Annual and seasonal totals

Topography

A. Legal property descriptions, including limits of property, easements, rights of way, and water boundaries

B. Topographic maps and aerial photos
   1. Contours and spot elevations
   2. Water, watercourses, coastal conditions
   3. Impervious
   4. Erosion channels
   5. Extent, location, and general configuration of roads, bridges, buildings, ridges, drainage lines, and other natural features

   a. Aerial photographs
   b. Historical profiles showing any construction (flattened, leveled, etc.)

C. Analysis of physical features, indicating major flood and drainage areas and their interrelationships within, over, and out from the site

D. Existing access and circulation
   1. Vehicular
   2. Pedestrian

E. Vegetation

F. Existing water bodies
   1. Location, size, depth, direction of flow
   2. Water quality
      (Note: polluted, seasonal conditions, etc.)
   3. Use, seasonal, permanent
   4. Significant ecological features
   5. Shoreline (seasonal water levels, tides, wave action
   6. Coastal features

G. Drainage (water runoff, erosion, sediment, saline, swamp, etc.)
   1. Natural and built
   2. Alignments and gradients
   3. Patterns and direction

H. Existing environmental assessments
   1. Surface
   2. Subsurface

I. Surface drainage
   1. Relationship on and off the site
      (Location of streams and aquifers)
   2. Seasonal or floodplains
      a. Maximum flood levels
      b. Permanently flooded areas
   3. Loss of vegetation areas, amount of runoff collected, and location of outfalls
   4. Drainage and concave areas of acid-sensitive pollute drainage and other obstacles that may interrupt or obstruct natural surface drainage
   5. Existing/proposed improvements
      (Erosion/sedimentation ponds)

J. Ground and features

Geotechnical Data

A. Basic surface soil type and its load-bearing capacity (clay, silt, rock, shale, gravel, loam, limestone, etc.)

B. Rock and soil type characteristics/description and origin
   1. Geologic formations present and parent material
   2. Orientation
   3. Bearing capacity

C. Subsoil
   1. Depth to bedrock
   2. Bedrock classification

D. Seismic considerations

E. Environmental hazards

Utilities

A. Potable water
B. Electricity
C. Gas
D. Telephone
E. Cable television
F. Special wireless services
G. Storm drainage (surface, subsurface)
H. Fire protection

Jurisdictional Surroundings

A. Neighborhood characteristics: buildings, vehicular access, etc.
B. Building and sector scale
C. Visual, historic scenery, passing vessels, persons, etc.
D. Noise
E. Views and vistas

Practice in Transition

General Service

A. Fire and police protection
B. Transportation (airport) services
C. Storm removal, including on-site storage

CULTURAL FACTORS
Site History

A. Former site uses
   1. Historical changing
   2. Landfill
   3. Old foundations
   4. Archaeological (burial)

B. History of existing structures
   1. Historic worth
   2. Affiliations
   3. Owners
   4. Location
   5. Form (elevation)
   6. Type
   7. Condition
   8. Use or vacant

Land Use, Ownership, and Control

A. Present zoning of site and adjacent property

B. Adjacent (environmental) land uses
   1. Present
   2. Proposed
   3. Probable effects on the development of the site

C. Type of land ownership

D. Persons and agencies of local (or state) interest, form (size, grading, shape/use)
   1. Present
   2. Former

E. Locations, type, and size of all known community services
   1. Schools and churches
   2. Shopping centers
   3. Parks
   4. Municipal services
   5. Recreational facilities
   6. Banks
   7. Food centers
   8. Health services
   9. Access to highways and transportation

Economic Value

A. Political jurisdictions and land taxes
B. Industrial "service-in"
C. Police protection
D. Special surrounding site and environmental zone usages

REGULATORY FACTORS
Zoning Codes

A. Permitted uses
   1. By variance
   2. By special use permits
   3. Guidelines involved

B. Minimum site area requirements

C. Building height limits

D. Yard setback requirements

E. Lot coverage
   1. Floor area ratio (FAR)
   2. Percentage of coverage
   3. Open space requirements

F. Off-street parking requirements

G. Landscaping requirements

H. Sign requirements

Subdivision, Site Plan Review, and Other Local Regulations

A. Lot requirements
   1. Area
   2. Configuration
   3. Setbacks and coverage

B. Street requirements
   1. Widths
   2. Boundary, profile, curves
   3. Curbs and curb cuts
   4. Road construction standards
   5. Placement of utilities
   6. Dedication of streets
   7. Intersection convexity
   8. Sidewalks
   9. Alleys

C. Drainage requirements
   1. Retention of existing and surface water
   2. Storm control
   3. Flood subject to flooding
   4. Erosion/sedimentation control

D. Parks
   1. Open space requirements
   2. Park and playground requirements
   3. Screening from adjacent uses

Environmental Regulations

A. Water issues, including wild water disposal
B. Clean air requirements
C. Soil contamination
D. Protected areas, wetlands, floodplains, coastal zones, and water areas
E. Fish and wildlife protection
F. Protection of archaeological resources

Other Codes and Requirements

A. Historic preservation and landmarks
B. Archaeological (design) controls
C. Special districts
D. Miscellaneous, e.g., historic homes, billboards, etc.
E. Environmental issues in building codes
   1. Building separation
   2. Parking and access for persons with disabilities
   3. Service and emergency vehicle access and

What are the different levels of open spaces to be provided as per regulations and discuss their components in detail.

- **Local or Small Local Open space** serving a local catchment such that users are within safe walking distance. This could be in the range of 150m or 300m, depending on the population density and presence of barriers, etc. Size is usually less than .5 hectare and could be quite small sites. A minimum width of 30m could be required to achieve a reasonable proportioned open space. Examples include parklands, gardens and civic spaces.
- **Neighbourhood Open space** serving an area generally with a walking distance of around 400 metres from dwellings. Size generally a minimum of .75 or 1 hectare and can be up to 2ha. A minimum width of 50m could be required to achieve a reasonable proportioned open space. Generally provided for residents in a single neighbourhood. Examples include parklands and gardens.
- **Sub District Open space** serving three neighbourhoods. Size generally 5-6 hectares Generally provide several recreation nodes offering a range of opportunities. Provision of sporting facilities will depend on the settlement type and the specific catchments that relate to individual sports and types of facilities. Passive recreation provision is important as either the primary open space provision or to complement a sporting use.
- **District Open space** serving around six neighbourhoods or a population catchment area of 15,000 to 25,000 people. Size generally up to 10 hectares Generally provide for a wide range of recreational activities including facilities for organised sports. Informal recreation and passive use of open space at this level is also very important. Accessible to residents by safe walking and cycling routes. Where provided beyond 1km from residences, will also cater for visitors arriving by car. Examples include district sports fields and conservation reserves

What are the different levels of open spaces to be provided as per regulations and discuss their components in detail.

- **Township** Typically used in rural areas to describe open space that services a local township area and its surrounding localities / villages. Size can up to 10 hectares and this open space is likely to be home for the towns outdoor sporting and recreation facilities such as playing fields, outdoor courts, pavilion / hall and parkland. The passive recreation use and connectivity features of this open space will be important to ensure accessibility for the whole community. Will usually be central in a township and accessible by car for the surrounding community. Municipal Open space providing for the needs of the whole municipality. Might be located a minimum of 2km from residences, not necessarily needing to be in safe walking distance, therefore would provide car parking capability. Minimum of 3 ha would be reasonable for municipal open space.
- **Open space at a municipal level** may be specialised for specific sporting infrastructure. It will be important to ensure that informal recreation and passive activities are well provided for.
- **Regional Open space** serving catchment including and beyond the municipality, including neighbouring municipalities. Size generally 10-30 hectares. Also includes significant sites of local or state historic, cultural and/or environmental significance. State Open space serving an intra or interstate catchment. Usually associated with site specific environmental, landscape or cultural values. State significant open spaces usually managed by state agencies, often in partnership with Council. Examples include National Parks and State Forests / Forest Parks.

Role of landform in landscape design

- Land form refers to the lay of the land or the shape taken by the ground
- surface of the designed landscape. It is a play of visual design, landscape engineering, (including drainage, cut and fill etc.,) and various other disciplines. A classic example is the design of tees in a golf course, which calls for the expertise of a landscape architect, to provide smooth curvilinear land forms, with smooth lawns.
- The working principle is cut and fill. Land reclamation projects, projects with major elevational sculptural forms etc., are examples of land form design. Shakti sthal, the famous Samadhi of late Prime minister, Smt.Indira Gandhi has a landscape design of trees on mounds enclosing a stupa. The mounds are huge landforms, on the bank of the Yamuna, and these were filled with earth and flyash from the nearby industries.
- Design of swales (vegetated drains), grassy mounds, are manifestations of landform design. One works out a proposed contour plan with proposed contour levels and proposed spot levels. The most important aspect to be looked into is drainage. Water should not leave the site. Water should be harvested to the single last drop within the site boundaries.

Squares and Plazas

- Squares and plazas are specific typologies of open spaces in urban areas. A square is generally perceived as a busy open space in the midst of the dense city, often commercial in character. Many streets open out into a square. It may be found in core-areas of modern cities.
- A plaza is a term used to refer to an open space, European in origin, belonging to the renaissance period, where a group of monuments opened out into a large urban open area, used for the public to gather in. The St.Peter's cathedral group of monuments is famous for its plaza. These spaces were also referred to as 'piazzas'. It is a more specific kind of square while the square is a more generic term for spaces which developed into outdoor areas, commercial in nature.
- Squares should be differentiated from streets for their width-to-height ratio. A square may have a width to height ratio of 1:1 with its adjacent buildings. A plaza has a similar proportion, maybe with greater width.
- Squares, as the name suggests, are geometric in nature, whereas plazas may be more informal and irregular. Both may comprise of other elements such as street furniture, sculptural elements etc., A temple tank in Indian core towns is may also be contained in a square belonging to the temple precinct.
- In the modern context, urban open spaces associated with commercial buildings are very successful in their ability to attract people, especially shoppers, office goers, youngsters who want to 'hang out' etc., these urban open spaces, have a life of their own in space and time, and treatment of these spaces is one of the important tasks a space designer has to do. Choice of materials, design details, scale of space, circulation within and to and from the spaces, its interaction with its neighbouring activities, the way it is maintained and run – all depend on the decisions made by the designer.

- Lovejoy fountain – Landscape architect Lawrence Halprin (modern example)

Campus planning

FIVE PRINCIPLES OF THE CAMPUS LANDSCAPE VISION

- Principle One: Building Siting
- its topography, the river, the distant hills, and its historic structures – with thoughtfully sited buildings. New construction and renovation projects on campus must be sited to reinforce the campus character and engage the campus topography and setting to create connections and spaces outside the building that are as positive as those within. • Site buildings to use topography and other resources to enhance the campus landscape • Site buildings to shape successful campus spaces • Site buildings to strengthen campus connections
- Principle Two: Campus Spaces
- Enrich the University with a comprehensive network of campus spaces that refl ect the University's mission to embody excellence in learning. Approach the design of campus spaces in a comprehensive manner – prime consideration must be the space's contribution to the entire campus open space system and the embodiment of excellence, not the enhancement of a particular building
- Principle Three: Campus Connections
- Optimize campus pedestrian connections above all others. Campus landscapes are, above all, places for people; in order for the campus to be perceived as a cohesive, welcoming, and attractive space, its pedestrian connections must be positive ones, vehicular connections must be downplayed, and alternative transportation promoted. • Reinforce campus pedestrian connections • Minimize the impact of vehicles on campus - design streetscapes and vehicular zones for pedestrian comfort • Enhance alternative transportation on campus '
- Principle Four: Campus Plantings
- Enhance all campus spaces and connections with healthy, well-sited, and wellmaintained plantings and turf. Campus plantings play a critical supporting role in shaping successful campus spaces and connections; the health, performance, and maintenance level of those plantings and lawns are essential to providing the campus with a high-quality image • Shape campus spaces with plantings • Create high quality and high performance landscapes
- Principle Five: Sustainability
- Augment the integrity and performance of the campus landscape by employing sustainable practices. • Implement sustainable

Campus planning

- About IIT Kanpur, architect: Achyut Kanvinde
- The site for IIT was located on the outskirts of the industrial city of Kanpur. Envisioned as a self-contained residential campus capable of growth, it had to be planned as an integrated urban environment which would fulfil the needs of living and studying. In his master plan,Kanvinde superimposed a layer of major and minor roads along cardinal directions which subdivided the site into interlocking quadrangular segments. A separation of vehicular and pedestrian traffic which was commonly accepted as a fundamental principle of urban design internationally underpinned the scheme with each quadrangle planned as a pedestrian precinct surrounded by a vehicular road. A 50 acre precinct for academic buildings was planned centrally surrounded by residential and recreational zones. Critical to the size and relation between precincts was the 20 minute walking radius that ensured a pedestrian scale – an idea based on the concept of a "neighbourhood unit".6 Such a designated land use assured long-range reservation for need-based growth while retaining relationships to other parts of the campus – a principle which has continued to determine the character of campus today even after 50 years. The range of academic buildings required by the program included laboratories, workshops, lecture halls, library administrative offices and an auditorium.

Fig. 2 Banaras Hindu University Campus, site plan Kanvinde and Mitter, Campus Design in India, 91

Campus planning

Similar to ongoing educational experiments in the international context that emphasised an interdisciplinary approach, particularly initiated in the new British universities, the IITK management too envisaged an integrated and flexible academic setting. In response, Kanvinde grouped the activities as per functions rather than department. Clustered around informal open spaces, the buildings were modular (based on laboratory and non-laboratory requirements) which ensured flexibility and expansion and were constructed using reinforced concrete frame and exposed brick-skin walls. A dominant feature of the scheme was a series of double level-walkways that threaded through all the buildings. These linear pedestrian and bicyclefriendly linkages that functioned in climatic extremes of Kanpur (lower level shaded for summer and top level open for winter) were envisioned as vital street like settings where social interactions would occur in lush landscaped gardens. Additionally, service tunnels were planned underneath walkways. Kanvinde called the walkways "arteries and veins" thus reflecting their critical role in the effective functioning and vitality of campus life. However their particular manifestation in the Indian context can be understood further by looking at Kanvinde's book on campus design.

The search for a viable integration of the past and the future in campus design for India was reflected in the authors' reading of Louis Kahn's closely observed design of the Indian Institute of Management (IIM), Ahmedabad (1962-74). Noting Kahn's integration of academic and living areas, expression of indigenous brick and proposal of a water pond for evaporative cooling, they also drew attention to his creative fusion of Indian history with progressive campus design, "The special qualities and singular strength of character [of IIM] are reminiscent of the monastery unit of the old Nalanda University, yet incorporating the very latest ideas in university campus development. It is an exceptionally fine concept and could serve to renew an appreciation of the values of the historical institutions."

Campus planning

- 'Presenting Kahn's design as a compelling model for designing a 'modern-Indian' campus, the book thus addressed the issue of national identity. More specifically, Kanvinde and Miller's analysis of medieval and ancient Indian campuses in order to distil lessons for the present reflected both an effort to localise the international concepts through nature, materiality and climate but also an attempt to negotiate history. In their analysis of Haus Khas Madarsa (1352-88AD), a medieval Islamic centre of learning outside Delhi, Kanvinde and Miller highlighted the campus organisation in which nature played a functional as well as an aesthetic role. Comprised of learning cells, a palace and a tomb interwoven with landscaped terraces and gardens, the L-shaped building was built around an existing lake-reservoir that was originally constructed to combat the hot and dry climate of the Delhi region. In their appraisal of the ancient Ajanta Cave Monastery, Maharashtra (200BC-700AD) – a series of rock-hewn cave units carved into a crescent shaped cliff sporadically over a period of centuries, the integration with topography was argued as being critical to the cohesive character of the campus despite the absence of a master plan. These examples also enabled Kanvinde and Miller to make an argument for achieving contextual specificity through usage of natural materials, mainly local stone or brick which they praised for climatic benefits and permanence as much as for their assimilation of cultural expression of art, craft and sculpture. This preference for natural and local materials was not limited to the economic standpoint of a developing country

- An exemplar that brought together most of their discussion of post-war themes and located them within the appropriate national and typological context of India was that of the ancient Nalanda University (300BC-1200AD) in Bihar. Based on archaeological findings and surviving writings, it is deduced that the Buddhist University of Nalanda was a systematically planned campus. The campus constructed in local red brick and adorned with sculptures in its heyday, comprised of an integrated framework of linearly arranged monastery units comprising of cellular rooms (modules) interspersed with translucent water ponds and parks, communal and symbolic spaces such as the stupa (temples), had a large library and multi-storeyed lecture halls with towers that acted as visual landmarks.

Role of water in landscape design

- Waterfronts and urban waterfronts definitions The word meaning of waterfront get through as "the part of a town or city adjoining a river, lake, harbour, etc." in the Oxford American Dictionary of Current English in English Dictionaries and Thesauruses (Dong, 2004).
- The word "waterfront" means "the urban area in direct contact with water". According to the author, waterfront areas usually is occupied by port infrastructures and port activities. Yasin et al. (2010) indicated that waterfront is defined generally as the area of interaction between urban development and the water. Hou (2009), described the waterfront area as the conflux area of water and land.
- One reason for the importance of natural water source in urban area is aesthetic effects whose creates on human. This effects are visual, auidal, tactual and psychological effects.
- Water in urban areas is aesthetic effects as well as functional effects. These are climatic comfort, noise control, circulation effects and recreational aims. Water surfaces cool air by means of increasing the amount of moisture in an environment. Especially with continental climate, that is a great importance.
- Also, water is used to freshen up the outdoor's air. Wide water surfaces in regional-scale regulate air's temperature surrounding areas (Önen, 2007). Water element is an important in urban areas where is in this regions, because of its visual and climatic effects (Gençtürk 2006).
- In addition, water areas in urban spaces are composed of a barrier to artificial sounds with its creating the natural sounds (Önen, 2007). Eckbo (1950), water is in the organization of space as a limiting and concealer element. Because person has to walk around in suitable direction (Gençtürk 2006). It is possible to see mostly this effect at the riverfronts.
- Rivers taked on a spine task which is established cities and in the formation of streets, parks and other urban spaces have become a major factors. For example, (Figure 3) in Manhattan, Pittsburg, Philadelphia and Pekin (Hattapoğlu, 2004). Recreational use of water element is too varied. Natural and artificial water surfaces and its surrounding can be serve many recreational uses such as swimming, fishing, boat tour, entertaiment, walking etc.

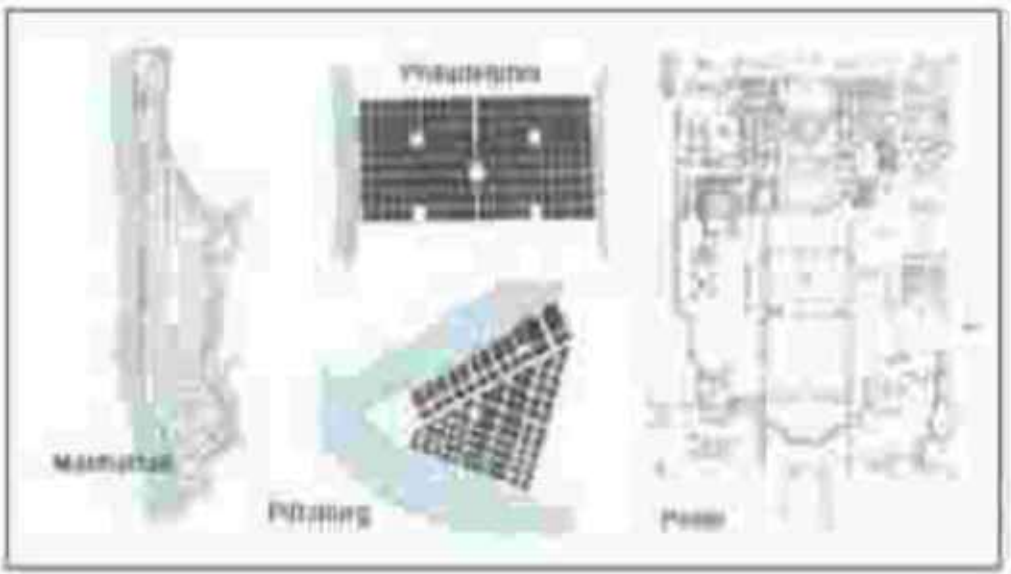


Figure 3. Morrow, Linda (1994), urban schemata of Manhattan, Philadelphia, Pittsburg and Paris (Hammoughi, 2004)

Waterfront development-Case studies

11. Case studies 11.1. Porsuk Stream, Eskişehir, Turkey According to Anonim (2005), Ulu (2005), Eskişehir which was only a small settlement with under 30.000 residents until the period of the Republic increased the number of its population to 706.009 by 2000 with a rise of 4,5 times. Until 2001, Porsuk Stream and its banks within the city of Eskisehir has been exposed to intensive pressures because of the increasing number of the city population, and the following inaccurate use of the related lands. As a result, the stream has become almost an open sewage running through the city (Pekin, 2008). Eskisehir Greater Municipality took into consideration the fact that a city with a river running through is always under threat of possible floods and also the recent earthquake disaster (August 17, 1999) the city experienced and so initiated the Project of Porsuk Stream in 2001 (Figure 24) with the support of European Investment Bank with the aim of protecting the city from the damages of natural disasters and also minimizing the effects. This project is performed as the Project to Lessen the Damages of the Natural Disasters (Component 2) which is part of the Urban Development Projects with three main components (Büyükerşen & Efeler̈i, 2005). This project includes the 12 km long part of Porsuk Stream running through the city center. This project is basically project of flood defence, river rehabilitation was done to get over flood in a manner safe. The issue of floods in Eskişehir was examined by State Water Affairs in the frame of Porsuk Basin Water Administration Plan. In addition to this study, Porsuk Stream Urban Transition Rehabilitation Project was prepared. The according precautions may be summed up as follows (1) Building Sarısu Flood Detention Dam since Sarısu Stream which flows into Porsuk Stream within the city has an increasing effect on flood risk, (2)

Construction of Sarısu and Porsuk sand traps in order to detent swept down dregs and dirt and also cleaning of these traps before and after the flood season (3) Restoration of 9.6 km part of Porsuk Stream bed (4) Building nine bridges for vehicles, examination of four bridges for pedestrians against earthquake risk and building four new bridges for pedestrians (5) Construction of eight buildings for controlling water level in order to render the regulation of the river flow uniform in the restored parts and maintain full flow (6) Equipping water level buildings with automatic sensors which make them mobile in order to prevent those buildings to become any handicap during floods, (7) Rehabilitation of main irrigation canals that consists 3408 m. left bank and 5100 m. right bank (Büyükerşen & Efeler̈i 2005). Anonim (2006c). Beside, the stream flow is regulated by Porsuk Dam (Pekin, 2008). Also, it has been necessary to equip the water level buildings with boat transfer shutters in order not to prevent the waterborne transport within the stream (Büyükerşen & Efeler̈i 2005).

Figure 25. Porsuk Stream in Eskişehir in Turkey Porsuk Çayı (a) before; (b) in application; (c) now (Eskişehir Greater Municipality, 2006)

Smooth parts revived after the restoration process made waterborne transport on the stream possible. In addition, a comprehensive landscape project was prepared to accommodate the restoration to the very surrounding of the stream (Figure 26). According to this, a footpaths, recreational areas and parks was done on the banks and its environs (Büyükerşen & Efeler̈i 2005).

Figure 26. (a) The water transport (Eskişehir Greater Municipality, 2006), and (b) Canoe competitions on the Porsuk Stream (Anonymous, 2013)), (c) Footpaths Eskişehir Greater Municipality, 2006).

Waterfront development-Case studies

Figure 25. Pınarak Stream in Eskişehir in Turkey: Pınarak Çayı (a) before, (b) an application, (c) now (Eskişehir Greater Municipality, 2006)

(a) The water transport (Eskişehir Greater Municipality, 2006), and (b) Canoe competitions on Stream (Anonymous, 2015), (c) Footpaths Eskişehir Greater Municipality, 2006)

Figure 22. An application River Elbe, Hafencity in Hamburg (Stone, 2012)

Waterfront development-Case studies

11.2. Hafen City, Hamburg, Germany The city of Hamburg is located on the river Elbe which flows into the North Sea as Germany's second largest city and host to Europe's second-largest port (Waterfront Communities Project, 2007). While the important parts of the port are now located on the south bank of the river Elbe, most of the northwestern bank has become disused for port functions until 1997 and has thus been regenerated for urban use (Hans, 2008; Erkök, 2009). This regeneration area described as Hafen City. The Hafencity or harbour city Project (Figure 27) offers an amazing opportunity on the banks of the river Elbe. Because of its proximity to the central area, the project has the potential to become a comfortable extension to the city centre (Appleton, 2005). This project area (http://www.hafencity.com) takes place between the historic Speicherstadt warehouse district and the River Elbe, there will be a new city with a mixed uses. According to Hafencity Hamburg GmbH (2006), the area occasionally getting flooded required a smart solution for this problem, not cutting off land from water by high defenses. With the exception of the waterfront promenades, the entire area will be raised by 7.50 to 8.00 meters above mean sea level, creating a new and distinctive topography while preserving access to the water (Erkök, 2009). Beside, residental areas and promenades will be fixed on concrete piles (Mimdaporg, 2008). In the Project area, elevated footpaths, waterproof parking basements and the accessible waterfronts, as part of the new emergency infrastructure, have provided a successful combination of safety and spatial quality of urban spaces. As a solution for the accessibility of water at all tides in the very high quays, Enric Miralles designed a descending 'landscape' of surfaces (Figure 28, 29) (Erkök, 2009).

Figure 27. In application River Elbe, Hafencity in Hamburg (Bruns, 2012)

The project which includes an area of 155 hectares, is currently under construction and application of it includes an ambitious 25 years period. When it is fully realised, Hafencity will have 5,500 apartments, 20,000 work places, 20 hectares of public open space and major cultural facilities to this waterfront. Also it involves approximately 10 km of quayside promenades (Appleton, 2005; Erkök, 2009). It is the largest inner city development project in Europe. With Hafencity project will be enlarged city center by 40 % and also it will be home 10000-12000 inhabitants (Erkök, 2009; Hans, 2008).

Figure 28. A waterfront terraces and the descending 'landscape' of surfaces (Schneider, 2010)

Figure 29. A views of public uses in Hafencity (Bruns, 2012)

Beside, in Hafencity Project points out with a highly attractive public transport system. According to this, pedestrian ways (Figure 29) are more dominant than vehicle ways. Also 70 % of pedestrian ways are away from the streets and bicycle paths take place in the area (Hans, 2008; Mimdaporg, 2008). In this project was considered sustainability principles. There was noticed economic use of energy. In this context, eco-friendly building materials were used (Mimdaporg, 2008). Numereous Projects which are developed by different architects, are together in Hafencity (Mimdap, 2008). Cultural highlights of the project range from the striking landmark Elbphilarmonie Concert Hall (Figure 30a), to International Maritime Museum of Hamburg (Figure 30b) and the new urban plazas being used for smaller events (Erkök, 2009). Beside, with reuse of warehouse, bridge and ramps were provided

Waterfront development-Case studies

Figure 28. A waterfront terrains and the descending 'landscape' of surfaces (Schwaller, 2010)

Figure 30. (a) Elbphilharmonie Concert Hall, (b) International Maritime Museum of Hamburg (Schwaller, 2010)

Figure 29. A views of public uses in Helsinki (Evans, 2012)

Street furniture

Street furniture refers to various design elements and details which certainly do impart character to an area as a result of the choices made by the designer. The various aspects of street furniture include,

- Lighting
- Outdoor seating
- Services such as trash-bins, water fountains,
- Steps and ramps (outdoor)
- Bollards
- Tree-guards
- Signage
- Fences, railings, gates etc.,
- All of these come under architectural detail and each element comes in a
- wide choice of designs and character.For instance, lighting is a specialised area of design, light fixtures are mounted at various heights, for various types of lighting such as uplighting, downlighting, spotlighting, floodlighting etc., the fixtures are available in a range of characters, in a variety of materials, such as wrought iron, sleek steel fittings, colored or transparent luminaires, posts of various heights with vandal-proofed designs or otherwise. They lend a distinct urban character to an area apart from satisfying their functional requirement.
- **Outdoor seating:** these may be readymade furniture in various styles such
- as furniture for interiors, or they may be built-in seating, which is more resistant to outdoor weather. Materials such as brick, concrete, stone may be used for built-in seating, which can be designed as appropriate to the space and the requirement in the program. Readymade furniture may be of wrought iron or wood or even stainless steel. OATs are also a type of built-in seating. In campuses, or public parks one will find a variety of outdoor seating.

Street furniture

- **Services:** Trash bins, water fountains and ornamental fountains are available
- readymade for the outdoor areas. They act as fillers, in an otherwise empty urban / habitable public space.
- **Steps / ramps:** there are standards for design of outdoor steps / ramps, and
- these can be delightful spaces, as they can be designed with interesting flooring materials and located in strategic spots.
- **Bollards:** these are low-lights and also act as barricades bordering a space.
- Hence it is an interesting outdoor architectural element. Available in a variety of designs.
- **Tree guards:** maintaining of trees in urban areas is very important. One
- should try to have adequate tree cover and maintain all available trees in the urban roads. Hence tree-guards play an important role. Draining water to the roots, protecting the roots are important functions of tree guards.
- **Signage:** design of signage is a specialized area, as they are character-
- giving elements, by virtue of its inherent properties, scale, color, boldness or uniqueness, its readability and style play an important role.
- **Fences, railings, gates etc.,** : these elements are designed in various styles,
- materials, colors and vary in scale and character. They can be coordinated with the predominant landmarks and the design character of the entire space by means of the choice of materials, color. The level of detail can also determine the importance of that element.

UNIT-III (B)

MUGHAL GARDENS

MUGHAL GARDENS

TAJ MAHAL, In Agra, Uttar Pradesh, India (N 27°10' E 78°03')

- **MUGHAL GARDENS** are a group of gardens built by the Mughals in the Islamic style of architecture.
- This style was influenced by Persian gardens.
- Significant use of rectilinear layouts are made within the walled enclosures.
- Some of the typical features include pools, fountains and canals inside the gardens.

HISTORY

- The founder of the Mughal empire, Babur, described his favourite type of garden as a charbagh.
- India, Bangladesh and Pakistan have a number of Mughal gardens which differ from their Central Asian predecessors with respect to "the highly disciplined geometry".

- An early textual references about Mughal gardens are found in the memoirs and biographies of the Mughal emperors, including those of Babur, Humayun and Akbar.
- The first serious historical study of Mughal gardens was written by Constance Villiers-Stuart, with the title *Gardens of the Great Mughals* (1913).
- Her book makes reference to the forthcoming design of a garden in the Government House at New Delhi (now known as Rashtrapati Bhavan).
- She was consulted by Edwin Lutyens, and this may have influenced his choice of Mughal style for this project.
- From the beginnings of the Mughal Empire, the construction of gardens was a beloved imperial pastime.
- Babur, the first Mughal -king, had gardens built in Lahore and Dholpur.

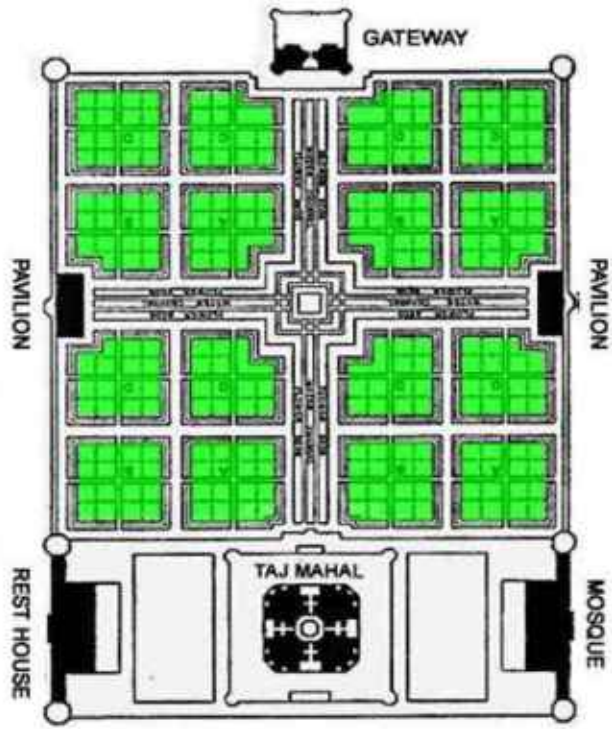
- Akbar built several gardens first in Delhi, then in Agra, Akbar's new capital.
- These tended to be riverfront gardens rather than the fortress gardens that his predecessors built.
- Building riverfront rather than fortress gardens influenced later Mughal garden architecture considerably.
- Akbar's son, Jahangir, did not build as much, but he helped to lay out the famous Shalimar garden and was known for his great love for flowers.
- Jahangir's son, Shah Jahan, marks the apex of Mughal garden architecture and floral design.
- He is famous for the construction of the Taj Mahal.
- He is also responsible for the Red Fort at Delhi which contains the Mahtab Bagh, a night garden that was filled with night-blooming jasmine and other pale flowers.

- Mughal garden design derives primarily from the medieval Islamic garden.
- Islamic garden as walled off and protected from the outside world; within, its design was rigidly formal, and its inner space was filled with those elements that man finds most pleasing in nature.
- Its essential features included running water (perhaps the most important element) and a pool to reflect the beauties of sky and garden; trees of various sorts, some to provide shade merely, and others to produce fruits; flowers, colorful and sweet-smelling; grass, usually growing wild under the trees; birds to fill the garden with song; the whole cooled by a pleasant breeze.

SITES OF MUGHAL GARDENS

TAJ MAHAL

- The complex is set around a large 300-metre square charbagh or Mughal garden.
- The garden uses raised pathways that divide each of the four quarters of the garden into 16 sunken parterres or flowerbeds.
- A raised marble water tank at the center of the garden, halfway between the tomb and gateway with a reflecting pool on a north-south axis, reflects the image of the mausoleum.
- Elsewhere, the garden is laid out with avenues of trees and fountains



- The Taj Mahal garden is unusual in that the main element, the tomb, is located at the end of the garden.
- The use of symmetry and pattern can be seen in the relationship between sunlight and shade, plants and water, and light and dark tones. The effect is that of a Persian rug leading to the entrance of the mausoleum.
- Early accounts of the garden describe its profusion of vegetation, including abundant roses, daffodils, and fruit trees.

HUMAYUN'S TOMB, DELHI

- While the main tomb took over eight years to build, it was placed in centre of a 30-acre Char Bagh Garden, with quadrilateral layout and was the first of its kind in the South Asia region in such a scale.
- The highly geometrical and enclosed Paradise garden is divided into four squares by paved walkways and two bisecting central water channels.
- Each of the four square is further divided into smaller squares with pathways, creating into 36 squares in all, a design typical of later Mughal gardens.

- The central water channels appear to be disappearing beneath the tomb structure and reappearing on the other side in a straight line, suggesting the Quranic verse, which talks of rivers flowing beneath the 'Garden of Paradise'.
- The entire tomb and the garden is enclosed within high rubble walls on three sides, the fourth side was meant to be the river Yamuna, which has since shifted course away from the structure.

- The central walkways, terminate at two gates: a main one in the southern wall, and a smaller one in the western wall.
- It has two double-storey entrances, the West gate which used now, while the South gate, which was used during Mughal era, now remains closed.
- The palm trees have recently been added to the garden for making the pathways junction more appealing.

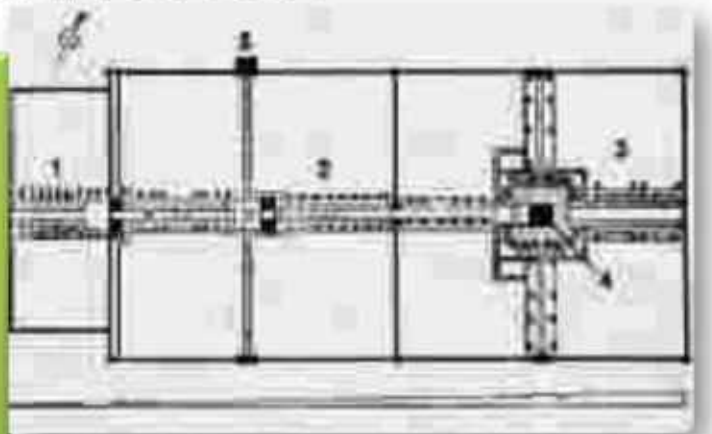
RAM BAGH

- The Ram Bagh is the oldest Mughal Garden in India, originally built by the Mughal Emperor Babur in 1528, located about five kilometers northeast of the Taj Mahal.
- The garden is a Charbagh, where pathways and canals divide the garden to represent the Islamic ideal of paradise, an abundant garden through which rivers flow.

- The Ram Bagh provides an example of a variant of the charbagh in which water cascades down three terraces in a sequence of cascades.
- Two viewing pavilions face the Jumna river and incorporates a subterranean 'tahkhana' which was used during the hot summers to provide relief for visitors.
- The garden has numerous water courses and fountains.

SHALIMAR BAGH

- Shalimar Bagh is a Mughal garden linked through a channel to the northeast of Dal Lake, on its right bank located near Srinagar city.
- The Bagh was built by Mughal Emperor Jahangir for his wife Nur Jahan, in 1619.
- It is also based on charbagh concept.
- The garden built with a size of 587 metres ,length on the main axis channel and with a total width of 251 metres . The garden has three terraces fitted with fountains and with chinar tree-lined vistas.



- Broad green paths bordered the lake with rows of chinar trees.
- The garden was laid in trellised walkways lined by avenues of aspen trees planted at 2 feet interval.
- The first terrace is a public garden ending in the Diwan-e-Aam (public audience hall). In this hall, a small black marble throne was installed over the waterfall.
- The second terrace garden along the axial canal, slightly broader, has two shallow terraces. The Diwan-i-Khas (the Hall of Private Audience), which was accessible only to the noblemen or guests of the court.

- In the third terrace, the axial water channel flows through the Zenana garden, which is flanked by the Diwan-i-Khas and chinar trees.
- At the entrance to this terrace, there are two small pavilions (built in Kashmir style on stone plinth) that is the restricted and controlled entry zone of the royal harem.
- Shahajahan built a baradari of black marble, called the Black Pavilion in the zenana garden.
- It is encircled by a fountain pool that receives its supply from a higher terrace.
- A double cascade falls against a low wall carved with small niches, behind the pavilion.

- The Shalimar Bagh is well known for chini khanas, or arched niches, behind garden waterfalls.
- They are a unique feature in the Bagh. These niches were lighted at night with oil lamps, which gave a fairy tale appearance to the water falls.
- However, now the niches hold pots of flower pots that reflect their colours behind the cascading water.

NISHAT BAGH

- Nishat Bagh is a Mughal garden built on the eastern side of the Dal Lake, close to the Srinagar city.
- 'Nishat Bagh'is a Hindustani word, which means "Garden of Joy," "Garden of Gladness" and "Garden of Delight".
- Even though the layout of Nishat Bagh was based on the basic conceptual model of the Chahar Bagh, it had to be remodelled to fit the topographic and water source conditions at the site chosen in the Kashmir valley.
- A rectangular layout with east-west length of 548 metres and width of 338 metres was adopted.

- Nishat Bagh as laid out now is a broad cascade of terraces lined with avenues of chinar and cypress trees, which starts from the lakeshore and reaches up to an artificial façade at the hill end.
- Rising from the edge of the Dal Lake, it has 12 terraces representing twelve Zodiacal signs.
- There are, however, some similarities with the Shalimar Bagh, such as the polished stone channel and terraces.
- The source of water supply to the two gardens is the same.


©Mainak Dutt

- Built in an east-west direction, the top terrace has the Zenana garden while the lowest terrace is connected to the Dal Lake.
- The central canal, which runs through the garden from the top end, is 4 metres wide and has a water depth of 20 centimetres.
- Water flows down in a cascade from the top to the first terrace at the lake level.
- The water flow from one terrace to the next is over stepped stone ramps that provide the sparkle to the flow.
- At all the terraces fountains with pools are provided, along the water channel.
- At channel crossings, benches are provided for people to sit and enjoy the beauty of the garden and the cascading flows and fountain jets.

PINJORE GARDEN

SAFDARJUNG'S TOMB,DELHI

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LANDSCAPE DESIGN

UNIT-I

Ar.MYTHILI MADHUSUDHAN
Professor, SOA,MCE

SYLLABUS

- **UNIT I INTRODUCTION 7**
- Introduction to landscape architecture. Basic concepts of ecology and the impact of human activities
- on them. Bio, Geo, chemical cycles including water cycle, carrying capacity of an ecosystem.
- Environmental impact assessment. Reclamation and restoration of derelict lands.
- **UNIT II ELEMENTS IN LANDSCAPE DESIGN 10**
- Introduction to hard and soft landscape elements. Different types of hard landscape elements. Plant
- materials, water and landform - classification, characteristics, use and application in landscape
- design.
- **UNIT III GARDEN DESIGN IN HISTORY 10**
- Japanese, Italian Renaissance, Mughal and English gardens. Outline of landscape and garden design
- in Indian history. Gardens depicted in Sanskrit literature, Nandavanams and residential gardens of
- South India. Moghul gardens. Public parks and residential gardens of the colonial period.
- Contemporary public landscape projects. Study of notable examples. Spatial development in
- landscape design.
- **UNIT IV SITE PLANNING 10**
- Organisation of spaces in the outdoor environment. Role of circulation and built form in shaping the
- environment. Role of landscape design in design of neighbourhood parks, children's play area and
- campus development.
- **UNIT V LANDSCAPING OF FUNCTIONAL AREAS 8**
- Urban open spaces and principle of urban landscape. Street landscaping, landscape design for
- waterfront areas and functional areas in urban centres. Green infrastructure including green roofs and
- walls.

INTRODUCTION

- Landscape architecture is a discipline that focuses on intervention through the activities of planning, design, and management. However, it is generally understood to mean the outdoor environments and relationships between people and places. Landscape architecture is concerned with landscapes of all types both urban and rural, and at all scales from the smallest open space to the whole region.
- As a result, people enjoy attractively designed gardens, public parks, playgrounds, residential areas, college campuses, shopping centers, golf courses and parkways. Landscape architects design these areas so that they are not only functional but also beautiful and harmonious with the natural environment. They plan the location of buildings, roads, and walkways, as well as the arrangement of flowers, shrubs and trees.
- Some landscape architects work on a variety of types of projects. Others specialize in a particular area, such as street and highway beautification, waterfront improvement projects, parks and so on. Others work in regional and resource management, feasibility, environmental impact and cost studies or site construction. Increasingly, landscape architects work in environmental remediation such as preservation and restoration of wetlands or abatement of stormwater runoff in new developments. Historic landscape preservation and restoration is another area where landscape architects increasingly play a role.

Landscape in playgrounds Courtesy of http://www.rudi.net

- ecology and environment.
- The energy from the sun is called solar capital. We use the term 'environment to describe, in the language of G.T Miller, The Plant's fife - support system for us and for all other forms of life'
- Ecology as a discipline is focused on studying the interactions between an organism of some kind and its environment. In ecology, 'niche' refers to the role an organism or species play in its ecosystem.
- word ecology derived from the Greek word 'Oikos meaning habitation, and logos meaning discourse or study, implies a study of the habitations of organisms.
- variously defined by other investigators as "Scientific natural history", "the study of biotic communities, or "the science of community population", probably the most comprehensive definition is the simple one most offers given' a study of animal and plants in their relations to eachother and to their environment.

- ENVIRONMENT Its meaning and significance History reveals that human race was once afraid of nature and the natural forces.
- The term environment describes the sum total of physical and biotic conditions influencing the responses organisms. More specifically, the sum of those portions of the hydrosphere, lithosphere, and atmosphere into which life penetrates is the biosphere.
- A-habitat is a specific set of physical and chemical conditions (for example, space, substratum, climate) that surrounds a single species, a group of species or a large community.
- The term biotope defines a spatial or topographic unit with a characterstic set both of physical and chemical conditions and of plant and animal life.

- Environment can be classified into 3 broad types
- a) Biotic (living) - The word biotic refers to having to do with living organisms. Biotic elements refer to the biological component of the ecosystem, consisting of population of plants, animals and micro organisms in complex communities.
- The biotic component of the ecosystem consists of 3 distinct groups of organism, the producers, consumers and decomposers.

- Abiotic - Abiotic factors include the flow of energy necessary to maintain any organism, the physical factor that affect it and the supply of molecules required for its life functions. Other physical factors include climate, temperature, preciptation, including its types (rain, snow, hill) around and seasonable distribution, types of soil present (sandy or clay, dry or wet, fertile or infertile).
- c) Cultural - The stage of development that human being have attained in the path towards progress will determine their culture as way of life. Human interaction with environment also influence the ecosystem. People of different cultures view their place in society from different angles. Among the factors that can shape their views are religious understandings, economic pressures and fundamental knowledge of nature. Due to this diversity of background different cultures put different values on the natural world. But the general attitude has been one of development rather than preservation.

- So self conscious and intelligent management of the earth is one of the greatest challenges facing humanity today. Human also cause extinction lin indirect ways. The building of dams changes the character of rivers, making them less suitable for some species.

- The environment therefore can be said to constitute as "Life support system". Since the environment is crucial to human wellbeing and human survival, we have a duty towards the environment i.e. a duty which is derived from human interest. This involves a duty to assure that the earth remains environmentally hospitable for supporting human life. For this there is a need to strike a balance between resource use and resource availability.
- DYNAMICS OF DEVELOPMENT AND CHANGING HUMAN - NATURE RELATIONSHIP – Hinduism states that the natural environment is a manifestation of divine nature itself. The order of creation was Akash (space), Vayu (air), Teja (energy), Aap (water) and prithvi (earth).

- There are from basic components of natural environment :-
- 1) Atmosphere or the air.
- 2) Hydrosphere or the water.
- 3) Lithosphere or the rocks and soil.
- 4) Biosphere or the living component of the environment. Atmosphere - this consist of a complex mixture of a number of gases, watervapour and a variety of fine particulate material.

- FACTORS RESPONSIBLE FOR CHANGING HUMAN-NATURE RELATIONSHIPS ARE AS FOLLOWS
- It is common knowledge that attempts to solve seemingly environmental problems like desertification and the loss of productive soil or deforestation, emphasis should be placed not only on such physical factors like climate, soil type modes of cultivation on land use patterns, but also on many other driving forces like demographic trends, types of technology levels used and distribution of income among the population consumption patterns, cultural habits, and educational levels of the inhabitants. Without such an integral approach, action taken to solve the specific problem could give rise to several other side effects, the sum total of which would even be worse than the problems to be resolved.
- The world population steadily increased from 2.5 billion in 1950 to 4.8 billion in 1984 and 6 billion in 2000, in just 50 years. The population spread, density, socio-economic political and cultural characterstics vary from place to place and country to country. However population is subject to births and deaths. While births increase the population, the death decreases population, depending upon the rate at which addition and is taking deletion place.

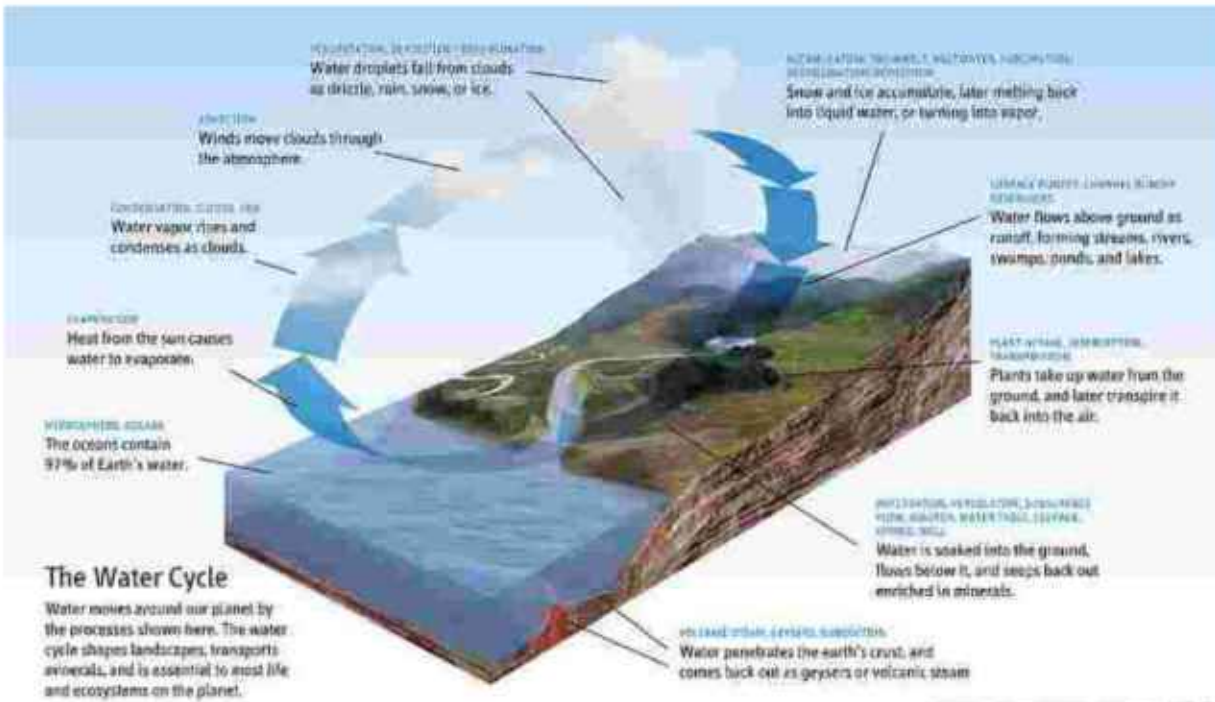
- Development - Development is multifaceted. The increasing population develops stress on agriculture for increased food production, establishment of employment centers to develop opportunities for gainful employment, efficient transport for mobility, shelter for better living health and educational facilities – affordability – utilise natural resources – energy crisis – fertiliser shortage – transfer of impacts and responsibilities from present to future
- Consumption of natural resources: Different parts of the globe are endowed with natural resources of varying types, quality and quantity. The degree of consumption of these natural resources are neither uniform at all places nor priced at the same level. the very land which supplies the raw material receives the pollutant

- Health hazards: The chemical industries which supply the chemicals and the pharmaceutical industry which manufactures medicine, release large quantity of chemical effluents which have severe side effects or causes diseases warranting further efforts to find new drugs.

- ECO-SYSTEM an assemblage of species of plants and animals inhabiting a common area and having effects on one another is known as a biotic community. A combination of a biotic community with the natural or physical environment is known as an ecosystem. The term eco-system implies to a local community of organisms inter-acting with their local non-living environment. In other words the interdependence of living and non-living aspects i.e. plants, animals, man, forest, soil etc. make an eco-system. It is defined as an unit which include all the organisms (biological component) in a given area inter-acting with the environment (physical component) so that the flow of energy leads to a clearly defined tropic (nutrient supply) structure biotic diversity and material cycles. It means every eco-system has a flow of energy and cycling of nutrients which bind the biological and physical components together.
- 1) Aquatic or water eco-system such as seas, rivers, ponds etc.
- 2) Terrestrial or land eco-system such as deserts, forests etc.
- 3) Decomposers and reducers

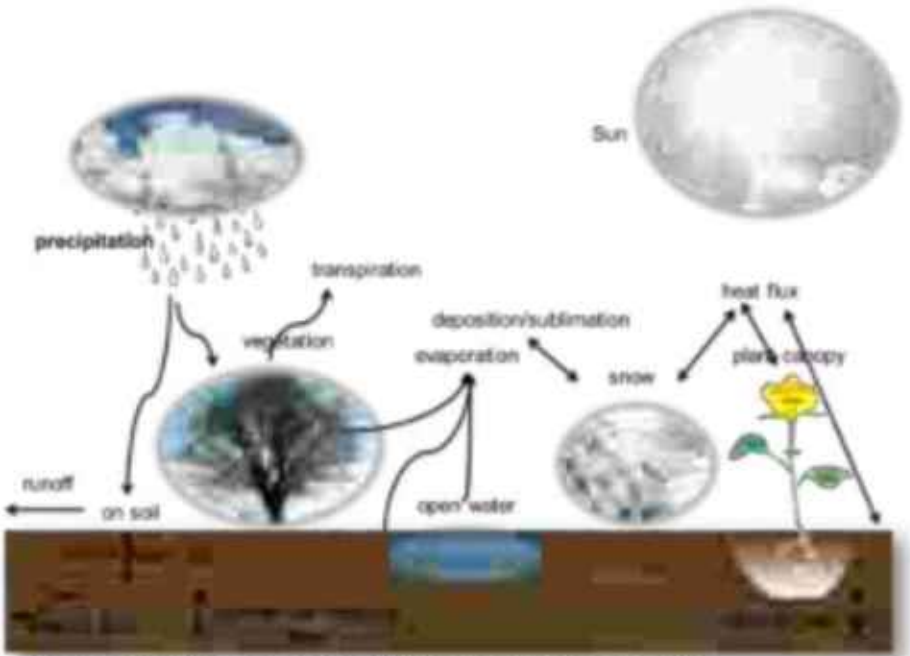
- FUNCTIONS OF AN ECO-SYSTEM
- 1) Eco system performs the most important function of satisfying the requirements of the different aspects of the biotic component.
- 2) It is through an eco-system that the interaction as well as interdependence between the biological component and the physical component in the environment takes place, this interdependence is between biotic and biotic components. For ex:- plants depend on solar energy and soil. The interdependence is also between different aspects within the biotic components. For ex. the carnivores depend on herbivores.
- 3) Eco-system leads to transfer of food energy and nutrients from one source to another source.
- 4) The different forms of eco-system are beneficial because they lead to positive effects on the environment which in turn helps the living organisms.
- 5) Eco-systems have helped human beings by providing materials as well as services necessary for survival as well as development.

- In ecology and Earth science, a **biogeochemical cycle** or **substance turnover** or **cycling of substances** is a pathway by which a chemical substance moves through biotic (biosphere) and abiotic (lithosphere, atmosphere, and hydrosphere) compartments of Earth. There are biogeochemical cycles for the chemical elements calcium, carbon, hydrogen, mercury, nitrogen, oxygen, phosphorus, selenium, and sulfur; molecular cycles for water and silica; macroscopic cycles such as the rock cycle; as well as human-induced cycles for synthetic compounds such as polychlorinated biphenyl (PCB). In some cycles there are *reservoirs* where a substance remains for a long period of time.
- The water cycle involves the exchange of energy, which leads to temperature changes. When water evaporates, it takes up energy from its surroundings and cools the environment. When it condenses, it releases energy and warms the environment. These heat exchanges influence climate. The water moves from one reservoir to another, such as from river to ocean, or from the ocean to the atmosphere, by the physical processes of evaporation, condensation, precipitation, infiltration, surface runoff, and subsurface flow. In doing so, the water goes through different forms: liquid, solid (ice) and vapor.



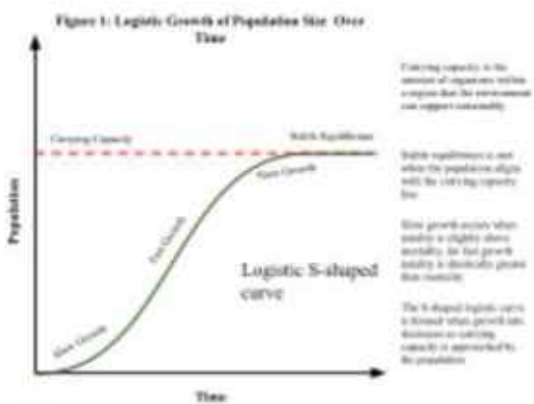
The Water Cycle

Water moves around our planet by the processes shown here. The water cycle shapes landscapes, transports minerals, and is essential to most life and ecosystems on the planet.



(Chen et. al., 1996, 1997; Chen and Dudhia, 2001; Ek et. al., 2003; Koren et. al., 1999)

- The **carrying capacity** of an environment is the maximum population size of a biological species that can be sustained in that specific environment, given the food, habitat, water, and other resources available. In population ecology, carrying capacity is defined as the environment's maximal load, which is different from the concept of population equilibrium, which may be far below an environment's carrying capacity.[1] The effect of carrying capacity on population dynamics may be modelled with a logistic function.
- The specific reason why a population stops growing is known as a limiting or regulating factor.



Carrying capacity was originally used to determine the number of animals that could graze on a segment of land. The idea has recently been applied to humans in the context of environmentalism.

ENVIRONMENTAL IMPACT ASSESSMENT

- Environmental impact assessment is a management tool which can be used for better project planning and design.
- In India, any new project or the expansion or modernization of any existing industry or project should submit a Rapid Environmental Impact Assessment report along with application to the Secretary, MoEF (Ministry of Environment and Forests), New Delhi.

TYPES OF EIA

- Rapid Environmental Impact Assessment
- Comprehensive Environmental Impact Assessment (for large projects / projects with high pollution loads)
- Strategic Environmental Impact Assessment (used in analysis or project-level decision making stage)
- Used in design of sector investment programmes for reviewing smaller projects etc.,
- Regional Environmental Impact Assessment

BENEFITS OF EIA

- Reduced cost & time for project implementation
- Cost-saving modifications in project design
- Prevention of impacts and violations of laws and regulations
- Project performance
- Avoiding waste treatment / cleanup expenses.
- Maintenance of biodiversity

BENEFITS OF EIA

- Reduced resource use
- Reduced conflicts over natural resource usage
- Better and improved human health
- A healthier environment encompassing forests, water sources, agricultural potential, recreational potential & aesthetic values.

CHARACTERISTICS OF EIA PROCESSES

- Status, scoping & data assembly: involves meetings with the decision-making body, affected and interested individuals, groups, agencies & depts. at all levels of the govt. to help identify the scope of the issues to be addressed.
- Consideration of alternatives: Includes alternative sites & the consequences of 'no action'. Uncertainties are identified and possible cumulative adverse effects should be noted.

CHARACTERISTICS OF EIA PROCESSES

- Review of proposed mitigation measures: encompasses pollution control, nature conservation & environmental management.
- Screening: Draft EIA document identifies the preferred document and the reason for it.
- Communication: Full involvement of the public is sought & meetings are conducted.
- The Decision: Decision is publicly released.
- Post project Analysis (PPA)

ENVIRONMENTAL IMPACT

Environmental impact encompasses the following

- Pollution & ecological effects on air, water, noise & vibration levels, radiation levels, flora & fauna, ecology , biological diversity, contamintion levels, health, areas of outstanding natural beauty, natural & artificial landscapes, historic & cultural heritage, soil erosion & land degradation, drainage & sewerage, open space, waste generation & mangement of climate.

ENVIRONMENTAL IMPACT

- Natural resource such as effects on agricultural land, forest resources, water supplies, minerals & marine resources, energy resources, building materials, wetlands, mangroves, coral, rainforest, wilderness & bush.

ENVIRONMENTAL IMPACT

- Social, such as effects on settlement patterns, employment, land-use, housing, social life, welfare, recreational facilities, community facilities & services, accssiblity, safety & residential amenity.
- Economic effects on employment opportunities, accessibility to facilities, services & employment opportunities, urban infrastructure, choice & affordability of goods & services.

considerations, (k) risks and hazards, (l) emergency

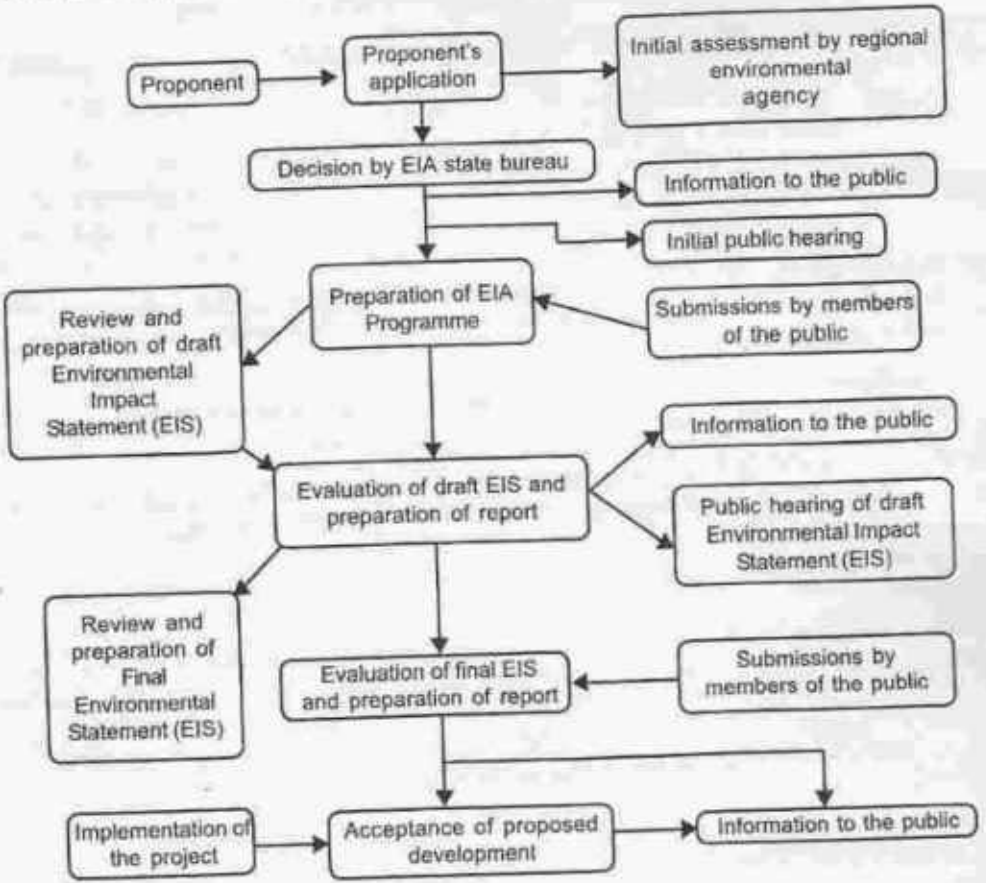


Fig. 14.1 Environmental Impact Assessment procedure

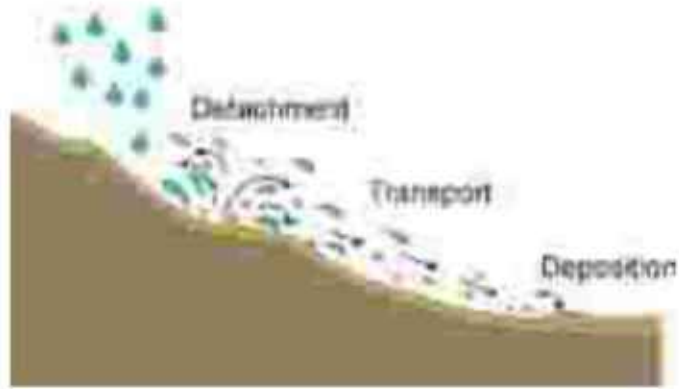
Wasteland Reclamation

- Land classified in Land revenue records as uncultivated or uncultivable public land, most of which is in highly degraded status
- These lands form part of village commons
- Legally under the jurisdiction of revenue department
- Govt project for waste land reclamation- IWDP – started in 1989-90

Soil erosion

Soil Erosion

- the detachment, transport & deposition of soil particle on land surface
- soil and rock are removed from the Earth's surface by exogenetic processes such as wind or water flow, and then transported and depo sited in other locations.
- Natural process→ anthropogenic activities increase the rate of erosion
- three distinct actions – soil detachment, movement and deposition

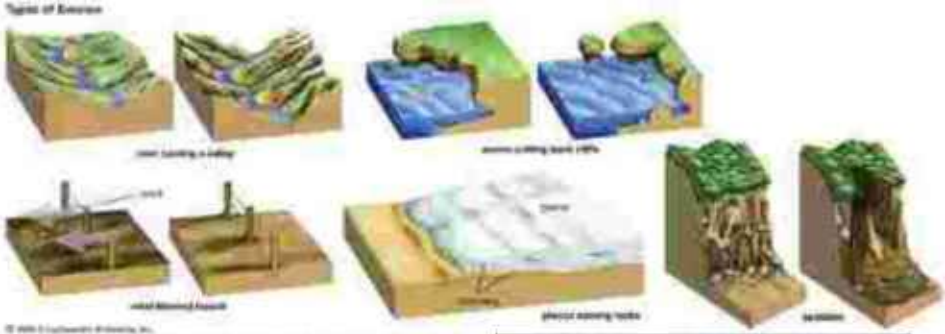


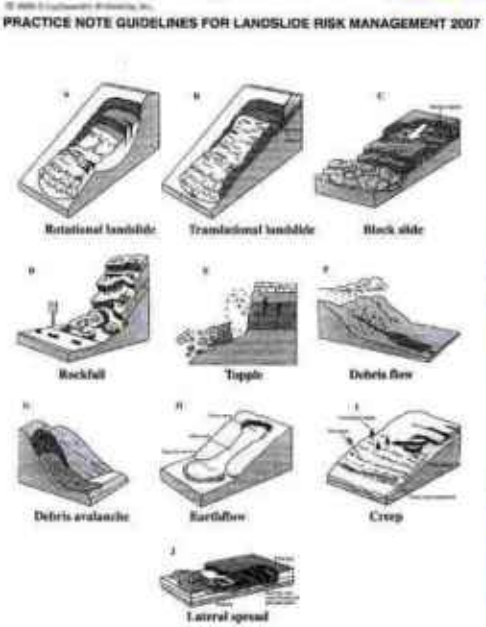
- Effects
  - On site effect- loss of top soil→ reduction in crop productivity/ forest productivity/ ecosystem productivity- loss of soil productivity→ land degradation , desertification
  - Off site effect
    - siltation in ditches, streams , reservoirs→ reduction in storage capacity/ carrying capacity→ Flooding
    - Transportation of agricultural pollutants (fertilizers, pesticides)→ soil and water pollution

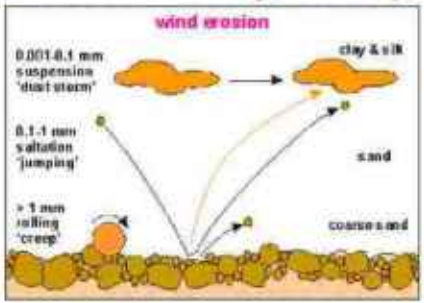
- Causes of soil erosion
  - Natural and Human induced
    - Land use - Over grazing by cattle, Deforestation, arable land use, faulty farming, construction, mining etc.
    - Climatic conditions: precipitation & wind velocity
    - Soil: soil characteristics - texture, structure, water retention and transmission properties.
    - Hydrology: Infiltration, surface detention, overland flow velocity, and subsurface water flow.
    - Land forms: Slope gradient, slope length and shape of slope

Agents of soil erosion

- Wind
  - Depends on wind speed, soil, topographic features and vegetative cover
  - More problems in arid or semi-arid region
  - Change in texture of soil
  - In India: Mainly occur in Rajasthan, Gujarat and parts of Punjab
- Gravity→ landslide
- Water
  - Glaciers
  - Rainfall and runoff
  - Water bodies and reservoirs







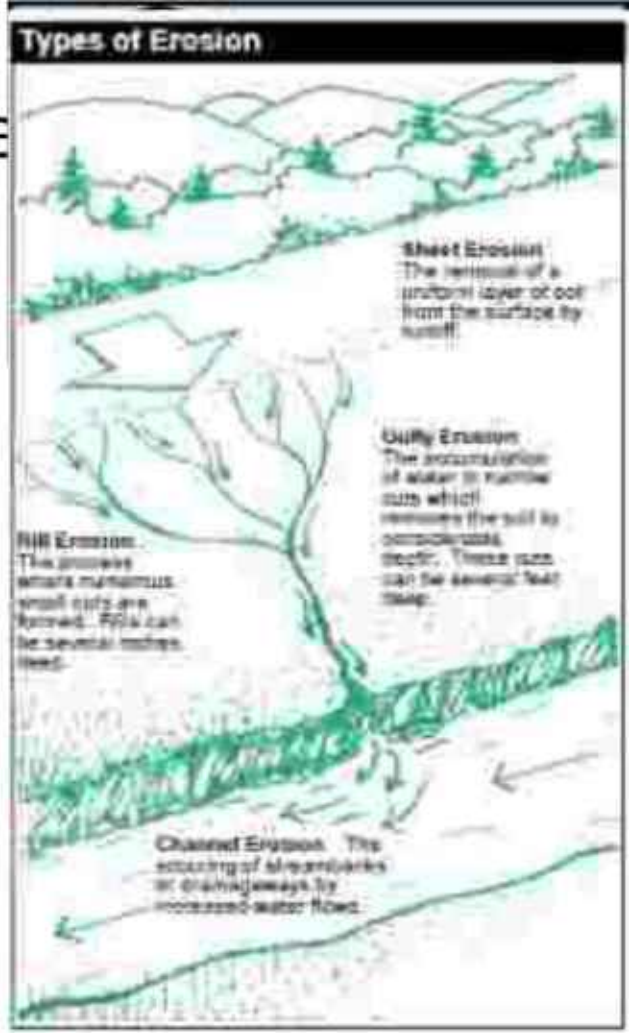
Factors affecting erosion by water

- Climate → Precipitation, temperature, wind, humidity and solar radiation
- Soil→ size, type of soil, soil texture, structure, organic matter
- Vegetation → interception of rainfall-reduce surface sealing & runoff, decrease surface velocity, improvement of aggregation, increased biological activity and aeration, transpiration, physical holding
- Topography→ degree of slope, shape and length of slope and size and shape of watershed

- Factors influencing water erosion
  - Soil erodibility
    - an estimate of the ability of soils to resist erosion, based on the physical characteristics of each soil
    - Texture, structure, organic matter and permeability
      - soils with faster infiltration rates, higher levels of organic matter and improved soil structure have a greater resistance to erosion.
      - Sand, sandy loam and loam-textured soils tend to be less erodible than silt, very fine sand and certain clay-textured soils.
      - Tillage and cropping practices that reduce soil organic matter levels, cause poor soil structure, or result in soil compaction, contribute to increases in soil erodibility.
      - Past erosion- exposed subsurface soils on eroded sites tend to be more erodible than the original soils
  - Slope Gradient and Length- steeper and longer the slope of a field, the higher the risk for erosion
  - Cropping and Vegetation
  - Tillage Practices- Minimum till or no-till practices are effective in reducing soil erosion by water.

Types of wate

- Inter-rill
  - Raindrop erosion- Soil detachment & transport - from impact of raindrops directly on soil particles or on thin water surfaces
  - Sheet erosion- Uniform removal of soil in thin layers from sloping land resulting from overland flow
- Rill erosion- Detachment and transport of soil particles by concentrated flow of water
- Gully erosion- Advanced form of rill erosion –forms larger channels than rills
- stream channel erosion- Removal of soil for stream banks or soil movement in channel




Sheet erosion


Gully erosion


Rill erosion

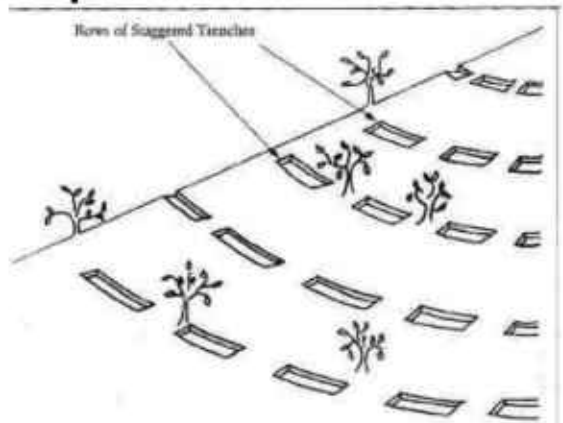

Channel erosion

Soil conservation practices

- Vegetative practices
  - Contouring
  - Strip cropping
  - Tillage operations
  - Mulching
- Mechanical practices
  - Terraces
  - Bunds (graded & contour)
  - Check dams
  - Vegetated outlets & watercourses

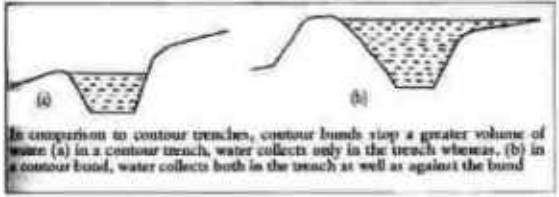
Soil conservation practices

- Ridge area treatment
  - forest regeneration and plantation- On slopes higher than 25% in the ridge area, it is advisable to undertake vegetative interventions only- protection and regeneration of existing forests or replantation
  - Contour trenching
    - method of checking the velocity of runoff in the ridge area of any watershed
    - a trench dug along a contour line
    - serve to collect the rainwater that falls in the ridge area.
    - Not suitable if slope is more than 25 % or less than 10 %

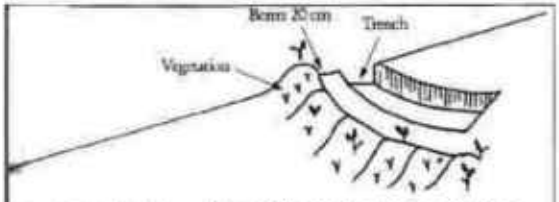


Contour trenches should always be staggered. In this way mistakes made in contouring are avoided. To ensure that water does not escape from the undug gaps, another line of contour trenches is dug on the next contour below covering these gaps

- earthen contour bunding- a bund constructed along a contour line- slope of the ridge area is below 10%.

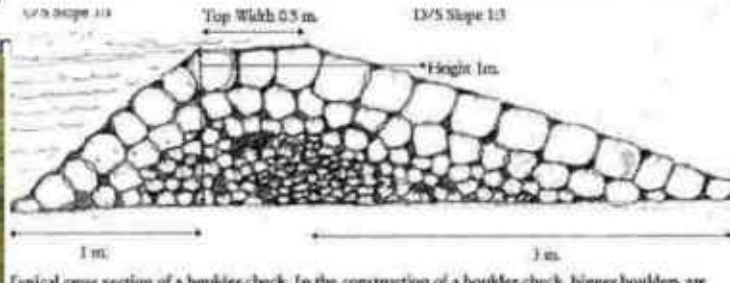


In comparison to contour trenches, contour bunds stop a greater volume of water (a) in a contour trench, water collects only in the trench whereas, (b) in a contour bund, water collects both in the trench as well as against the bund



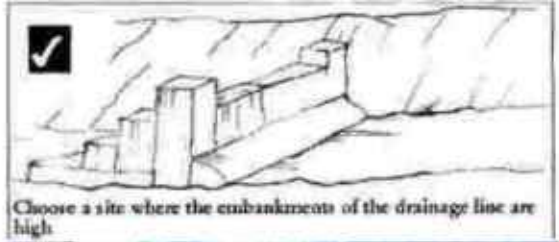
If grass is to be planted near the trench this should be done on a bed 10 cm. high, prepared with the excavated earth. If trees are to be planted this should be done on the berm or on either side of the trench

- Drainage line treatment
  - boulder checks or gully plugs- loose rock dams made on small c catchm ha



Typical cross section of a boulder check. In the construction of a boulder check, bigger boulders are placed outside and smaller ones inside. On the outside, the biggest boulders are placed on the downstream side.

- Gabian checks - to reduce the velocity of water flowing through the drainage line- across the stream or along embankments
- Earthen water harvesting structure



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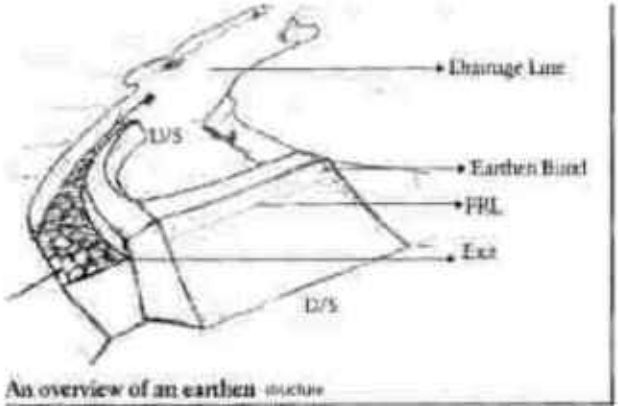


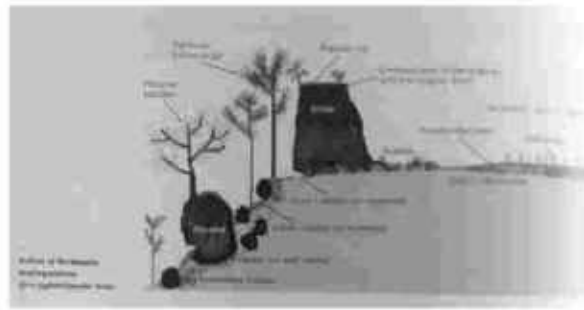
- Dug out or embankment type Farm ponds - a

- Naala Diversion/ Naala training
- Countour cultivation - done across the slope by keeping them on contour or nearly so
- Farm bunding - Ideally, bunds on farm be made on th contour line

LANDSCAPE CONSERVATION AND REGIONAL LANDSCAPE PLANNING

RESTORATION OF BAUXITE MINES, MAHARASHTRA

- Durgmanwadi and Kasarsada in Kolhapur district Maharashtra are operational bauxite mines of Hindalco, a major Indian producer of aluminium products. Located in the western ghats, one of the 34 biodiversity hotspots across the globe. In 2007, the company commissioned Envirosearch to carry out habitat restoration of the mined out area of the two mines.
- The regions are located in elevated plateaus at 1000 meters above sea level, surrounded by scarp formations. Due to heavy monsoons and moisture in the substrates, specialised flora are found here which include *Drosera* sp., *Utricularia* and ground orchids like *Habenaria*.



WHY HABITAT RESTORATION?

Rehabitlitation and reclamation is a statutory requirement under the Mineral Conservation and Development Rules, 1988 framed under the Mines and Minerals (Regulation and Development) Act, 1957. The companies submit mine closure plans including a mine restoration component.

The rehabilitation model is selected from various models like agriculture, horticulture, forests, wetland and grassland. It depends on land ownership, agency involved and the setting. Cost factors are also extremely important.

- RESTORATION OBJECTIVES
- The landscape is a forest landscape, home to a large number of endangered species which play an important role in the ecosystem. Mine restoration helps in mitigating the impacts of habitat fragmentation and other disturbances. Creates conditions which are conducive for recolonization and complements conservation of biodiversity found in the area. The objective is to create high quality restoration of the mined out area including flora and fauna.
- RESTORATION MODEL
- Since both mines are adjacent to a forest, it was logical to restore them to a natural habitat rather than a managed habitat such as agriculture or horticulture. The two natural models available are teh natural forest found on the slopes surrounding the plateaus while the second model is the ephemeral monsoon flora habitat found on lateritic plateaus. The forest (tree plantation) model is well-recognised by regulating authorities and an easier model to restore to, with well-established technology. Hence, a decision was taken in consultation with the company, to recreate a forest habitat. The monsoon flora model of plateau is more complex so it was decided to take it up at a later stage.
- After creating conditions suitable for growth of plants, evidences of natural re-colonization were found in the restored area. In the first year, only shrub and herb species grew there. In subsequent years, seedlings of shrub and tree species have started colonizing the area. This is very desirable because natural recolonization will enrich the ecosystem.

- CHALLENGES
- Bauxite mines are more challenging than other open-cast mines because of the unique conditions on these plateaus. High rainfall and wind velocity is not tolerated by many species used for restoration. The clay substrate which remains after mining bauxite is inert and devoid of nutrients. It has low permeability and poor drainage. The topsoil stored and saved before removal of laterite is insufficient for restoration.
- STRATEGIES
- A two-pronged approach was followed –rejuvenation of substrate and introduction of native species. Both in-situ clay substrate and overburden was used. Backfilling with overburden creates porosity and improves the substrate quality for restoration, and is preferred for it is conducive to plant growth. But since there was a shortage of overburden insitu clay was used in many places as a substrate.
- A combination of bagasse and pressmud, by-products of the sugar industry was used, as they provide organic material which is lacking in the substrate. Farmyard manure and vermicompost were also added, introducing bacteria and earthworms that help accelerate the soil formation process. Topsoil was used and silt was transported from nearby. All this was at considerable cost to the company. Experiments were carried out with various proportions and combinations to determine the best mix.

- SELECTION OF SUITABLE SPECIES FOR REHABILITATION
- In the first year, a biodiversity survey of the mines and surrounding lease area was undertaken. This helped set the goals and gave insights to species selection. Around 35 species, a mix of pioneering, fruit-bearing and locally important keystone species as well as some species of conservation importance that grow in surrounding forests were short-listed.
- The species selected were slow-growing but hardy and adaptive to local climate.
- KEY OUTCOMES
- A total area of 25.2 ha has been restored at Durgmanwad and Kasarsada (11.5 ha) mines. This amounts to planting nearly 50000 plants. The growth rate is almost 80% in all plantations. There are more than 60 tree species including species that have recolonised. Native shrubs and trees such as gholi (Trema orientalis), ran tambaku (Lobelia nicotinifolia have colonized the area naturally. Evidence of wildlife such as gaur, sambar, hare and civet has been found in several locations in the restored area.

Landscape Design for Children and Their Environments in Urban Context

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Additional information is available at the end of the chapter

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1. Introduction

One of the most important topics of landscape architecture profession is to design high-quality open spaces for people to meet their needs and expectation. These open spaces range from smaller-scale residential gardens, used by certain number of people, to large city parks, used by people with different age groups and the crowded masses. These different open spaces and differences in uses lead to changes in the needs and expectations. Therefore, it is necessary to know well about the needs and expectations of people when designing spaces for them.

Children constitute a significant part of users in urban open spaces. Because children's time, spent in open spaces with play during the development, is extremely important and necessary in terms of physical social, emotional, and cognitive aspects. Therefore, nature of the play space is very important. Because, the elements, facilities and quality of a space also affect the quality of the play. As it will be discussed in the following sections of this text, when importance of play for children is considered, the design of open spaces for children becomes an extremely important issue.

Today cities are getting crowded due to the variety of business and social opportunities offered to the people. Due to the increasing population density and intensive construction, open spaces that children can use are decreasing. In this context, introducing new and alternative play spaces and play options are a solution. It is extremely important that designed play areas should be qualified to meet children's needs and desires and to make positive contributions to their development.

This chapter focuses on landscape designs for children, particularly in urban spaces. At this point, the subject will be discussed in terms of landscape design, children, and urban context. First, it will be focused on the general definition of landscape design, interests, and

the place of children's play areas among them. Second, the concept of play, the relationship of the child with their environment, open spaces, natural areas and their importance, the differences between environmental perceptions of children and adults will be mentioned. Children's needs and expectations in urban open spaces will also be discussed. Third, all of above mentioned issues will be evaluated in terms of urban context with playgrounds examples selected from around the world. Finally, in the light of all this information and assessments, children's expectations from open spaces, design process of children's play areas and considerations to design an ideal playground will be presented.

2. Landscape design

"Landscape, originates from French word "paysage" which means scenery. Nowadays, the word encompasses a wider and deeper meaning. While in the medieval period, "landscape" was used as a synonym for "region" and "territory" in most of the Germanic languages, beginning from the 15th century landscape became a pictorial genre. The use of landscape as a term in science is relatively new. Today, landscape refers to not only a phenomenon described and analyzed by scientific methods, but also a subjective experience which has perspective, aesthetical, artistic and existential meaning" (Memlük, 2012).

Design is the creative process of responding to conditions and concentrating meaning; and landscape design is the creation of responsive, evocative, meaningful, sustainable, and regenerative landscapes (Motloch, 2000). In other words "landscape design is the art and science of organizing and enriching outdoor space through the placement of plants and structures in agreeable and useful relationship with the natural environment" (Van Der Zanden and Rodie, 2008, Adapted from the Nebraska Master Gardener Handbook, 1994).

A designer must handle both aesthetics and function at the same time in the designs. Because one cannot exist without the other in quality design (VanDerZanden and Rodie, 2008). Especially, when the area is considered for children, function is more important. Because children evaluate the environment with its functional rather than its esthetical features. The aim of the landscape design is to build up qualified spaces in open areas for people. Open areas that are the interest of landscape design may be urban or rural and private or public. In this article urban landscape will be emphasized. "From a wider perspective, urban landscape is a part of urban matrix. Therefore design of urban landscapes should be considered as an integral part of urban design. Urban landscape design is clearly not urban design, but a crucial part of it. Hence, factors influencing urban design also influence the form and functioning of urban landscapes (Memlük, 2012).

There are lots of spaces, having different functions, that can be subject of landscape design in urban. Some of them may be ranged as urban squares, public gardens, playgrounds, open areas of public institutes such as education, health...etc, and yards. Each of these spaces requires different activity fields according to their users and locations. Among these spaces, children's play areas have an important place because playing in open areas in the childhood period is extremely important for children's healthy development.

3. Children

When designing places for people, the first necessary thing is to know the users of these places. In this way, it would be possible to determine the user's needs and expectations. Places to meet these needs are preferred and used by users. Therefore, design for children requires to know the child, to understand the importance and necessity of play for child, and to know activities children do and want to do especially in public areas.

Play and importance of play for children

When you think of a child, the first thing that comes to mind is play. The play is a concept of universal that extremely important for the development of child's personality. There are many definitions of play in the literature.

According to the Winnicott "to play is to use imagination, the most important thing a person can do…Play is always an experience of creating, also of uniting time and space- so is fundamental to how we live'(Day and Midbjer, 2007).

Moore (1990) states that "play lies at the heart of childhood, limited in its boundaries only by the opportunities afforded by physical settings and by the attitudes and commitment of those whose business it is to manage them" (Jones, 1997).

According to Piaget, play is not a condition of mental, but is a behavior or action and it causes the child makes effort about what to do. According to him, the play is necessary for the development of intelligence (Piaget and Inhelder, 1971).

Play is a form of behavior which has many definition, description and developmental theories (Piaget and Inhelder, 1971; Jones, 1997). As a result, if we need to briefly mention, the play refers to a unscheduled, spontaneous situation. It is possible to mention the four assumptions about the play (Jones, 1997). These are listed as follows;

1. children learn during the play and play is necessary for the child's development and growth,
2. the play is not limited to younger children, it is an important concept in adults' life-cycle,
3. to play outside is an important need because it offers opportunities not found anywhere else,
4. play environments are educational areas.

Children obtain feelings of achievement and self-security, of being together with others, respect for themselves and others as a result of playing the play (Day and Midbjer, 2007).

Play is an extremely important concept in terms of children's rights. The International Play Association (IPA) Declaration of the Child's Right to Play was introduced in November 1977 at the IPA Malta Consultation held in preparation for the International Year of Child (1979) (Clements and Fiorentino, 2004). Play was emphasized that nutrition, health, housing and education, as well as of vital importance for the development potential of each child in this declaration (Yılmaz and Bulut, 2003).

Experts working on childhood states that the best learning is provided through play and exploration for children (Vicki and Stoecklin, 2004). A child learns and discovers himself and his environment during the play. During the play, children use objects to learn how to use them, perform activities with them and recognize them. Children should change the places of them, create compositions, bring together, separate, take a piece of them, and re-install the missing part (Piaget and Inhelder, 1971). In this way, children find the opportunity to learn by trying different things. Therefore play is the child's experiment tool.

Benefits of play on the development of children can be classified under two headings. These are; the benefits of playing during the play, the benefits of playing over time. In 1978, Jones and Prescott stated that "through play, children (and bigger people, too) learn a great deal about the variety and complexity of the world, and about themselves as self-directed learners" (Jones and Prescott, in Jones, 1997).

There are also benefits that bring to the play over time, summarized as follows:

- Children gain a sense of freedom and self-confidence
- When a child's respect for other individuals increases, sharing also increases
- Children become an healthy individual both physically and mentally, the learning ability of children develop
- Children's creativity increases

Recognizing the importance of play and playing game will provide to better understand the importance of play spaces as well. Because the nature of space and its components affects children's play. As we live in an environment that surrounds us, outdoor areas where children play are not possible to think independently from the environment. In this context, the relationship between the child and their environment is important.

Child and Environment

The physical environment influences everybody's behavior (Proshansky et al., 1976; Day and Midbjer, 2007) and supports the formation of self-identity during childhood years. Children obtain information about environment and interact socially as a result of their experiences in the physical environment. In order to learn about the environment children need actively use and explore the environment. They invest certain meanings and names in special environments for themselves. The importance of these special environments continues through adulthood period. This sense of attachment and meaning of color, smell and texture of special places has been studied by educators and designers (Francis, C. 1997). Studies on this subject and the remaining images in the minds of children about their environment can be evaluated in future play space design.

Individuals' motivation, behavior and mental health are affected between individual characteristics from the environment and the characteristics of the environment (Özdemir and Yılmaz, 2008). When we look at it in terms of children, if an environment meets the psychological needs of children, it provides satisfaction, if it does not meet, it provides dissatisfaction. In addition, motion is required in order the children get to know a place and to explore it. "Before they can locomote or move from place to place (crawl, walk, run, etc.)

independently, infants are interested in many of things that fall within their reach" (Bell, 2008). Environments that offer opportunity for movement and that offer diversity for children are more preferred. At the same time, as this kind of environment will provide an opportunity to explore, it will make positive contributions to the development of children.

Studies on children's needs and the experiences in the environment can be found in the environmental psychology literature (Spencer and Woolley, 2000). Environmental psychology is a branch of discipline developed by Proshansky, Rivlin and Ittelson. This interdisciplinary work area includes specific research topics such as perception, cognition and social learning in the relationship between the environment and human (Loebach, 2004). In the field of environmental psychology, the best concept to assessment the child's relationship with the environment, the opportunities presented by the environment and its elements is "affordance" theory. Affordance generally refers to functional facilities offered by the environment. Firstly, it has been developed by James J. Gibson in the late 1970's. Later, the concept of affordance used to identify children's environment's opportunities by many researchers particularly in Harry Heft (1988) and Marketta Kyttä (2002, 2003, 2004) (Loebach, 2004; Clark and Uzzell, 2008; Acar, 2009). Functional possibilities offered by the environment create opportunities for different activities for children (figure 1, 2, 3).

Figure 1. Sloping surfaces in any area are used to slide by children (Photo Acar, H., Rotterdam, Netherland).

Figure 2. Any object that children can enter might be a play space for them (Photo Acar, H., Den Haag, Netherland).

Figure 3. Open green spaces provide opportunities for different activities (Photo Acar, H., Paris, France).

Children use these opportunities according to their own imagination, creativity, or purposes (figure 4).

Figure 4. Children use materials in the environments according to their own purposes (Photo Acar, H., Paris, France).

These activity opportunities may be in open or closed spaces. But open areas are more important for children than closed areas.

Opportunities offered by open spaces for children

Children need environment-related experiences during the character decisive years of their life. Environmental experiences helps children prepare for their life and provide positive contributions to their development. Open spaces are important places for obtaining these experiences because play outside offers a direct relation with environment and makes children discover their environment. Therefore open areas must be provided for children to play. Outside play areas contribute to the development of children's gross motor, allow them to play freely and noisier plays, and also help them to learn about the natural environment (Wilson, 2004).

Open spaces provide more opportunity than the closed spaces with the materials they have (Heerwagen and Orians, 2002; Day and Midbjer, 2007; Acar, 2009). First of all, these spaces experimentally allow children to contact with their environment, to make observation and to learn natural events (change of the seasons and so on). Also, it helps children to become social because it presents the opportunity of being together with other children (figure 5, 6).

Figure 5. Open spaces provide the opportunity to be together with other children (Photo Acar, H., Paris, France).

It is possible to increase these opportunities offered by open spaces for children. The importance of children's use of open spaces is more valuable, especially in urban areas. Children's opportunity to benefit from and access to open areas is less than in the rural areas than urban areas due to security, traffic and intensive construction. Therefore, it has become more important to make the existing places more qualified.

Figure 6. Even a fountain allows children come together, to communicate, to socialize. At the same time helps them to learn issues such as to respect the rights of others and their right to self-defense (Photo Acar, H., Paris, France).

Natural materials and play potential

Natural areas, one of the open spaces, and the materials they have can provide lots of opportunity for different activities when they are used in accordance with the creativity and imagination of children. Some researchers state that experiences in natural areas play an important role on children's cognitive and affective development (Pyle, 2002; Derr, 2008). Actually these studies show that this situation is a reflection of adults' childhood experience (Derr, 2008). That is, adult's childhood experiences affect attitudes of their adulthood. Therefore, being in interaction with nature and natural materials in childhood contribute to getting information about this subject in future, being sensitive and conscious towards the environment and handing down this experience to the next generations.

Childhood is a period for exploring and it is wonderful, powerful and life-changing discoveries for many children. In this process, period of 6-12 years is considered as middle childhood (Tai et al., 2006). Especially during middle childhood, children get significant experiences and skills that they can use throughout their lives. Therefore, interaction with nature is extremely important for people during this period (Bixler et al., 2002; Tai et al., 2006; Acar, 2009).

Studies show that children have a tendency to more natural materials and these materials provides a positive contribution to their healthy development (Fjørtoft and Sageie, 2000; Fjørtoft , 2004; Taylor and Kuo, 2008; Louv, 2008). For this reason, these materials should be used in the play areas by considering their utility situations in plays and activity facilities. Especially these materials must be used in play spaces in urban areas where it is difficult to find natural areas and materials. But, it cannot be provided just by taking these materials into the playground. The important thing is that these materials should support children's activities. For example, if the climbing activity will be done by a tree instead of a climbing wall, the tree should be appropriate for children's dimensions and in an appropriate form to climb.

"As childhood has become more restricted, opportunities for interaction with nature and natural experience are even more critical" (Mark Francis, in Lyle, 1997). Interaction with nature and natural materials contribute children's physical, mental, moral and emotional development. There are strong evidences that constant change and growth in nature have a strong effect on the development of intelligence. Also, when human beings and animals are in dynamic environment containing natural areas, neural connections in the brain increase and start to be more complex. Being deprived of such rich environments can cause lack of energy and violent behavior (Tai et al., 2006).

Diversity and complexity offered by the environment support children's play. This complexity and diversity creates opportunities for social interaction and problem solving. If a play environment contains complexity and diversity, this environment will continue to attract the attention of children over time (Jones, 1997). These complexity, diversity and richness in the environment can be created more with the natural materials. Because natural materials can be evaluated in different ways in the extent of children's creativity due to their variability. Therefore, areas that have such elements will attract the attention of children for a long time.

In addition, nature's contributions to the development of children are frequently mentioned in the literature. These can be grouped under the following headings (Acar, 2009):

- Nature contributes in terms of psychological, cognitive, and emotional health, treatment of attention deficit and hyperactivity disorder, motor development, play quality, increased sensitivity to the environment, socialization
- Nature develops the imagination, creativity and social play
- Nature evokes positive emotions, sense of place
- Nature has a stimulating effect
- Nature allows thinking, observation and research
- Natural environments are rich, tutorial, educational and informative environments

Stephen R. Kellert who is social ecology expert express that children can relate to nature in three ways. These are (Kellert, 2002):

- *Direct*; there is physical contact with nature and children recognize the nature more closely.
- *Indirect*; physical contact with nature is limited and is programmed, such as zoos, botanical gardens.
- *Symbolically*; there is no physical contact with nature, children recognize the nature with materials such as book and computer.

The most ideal of these for children is direct contact with nature (figure 7). But today establishing a direct relationship with nature and access to nature's facilities are limited for children in their daily experiences. The most important factor of this is the vast majority of the population has begun to live in urban and suburban areas. In this case children see the natural areas in their environment less than children live in rural or even they cannot see, they usually go to school by service or other vehicles, they cannot have the experience or the

opportunity to explore their environment, children use more open areas under adult supervision due to security matters or they are recommended to use closed areas to play and due to the increasing constructions children can use limited areas for play. Studies about subject show that all of them effect the healthy development of children negatively. Considering we don't have a chance to change our living conditions and after that these conditions would change more against the children, especially designers who design open spaces for children have important role from now on.

"Study nature, love nature, stay close to nature. It will never fail you" Frank Lloyd Wright (Tai et al., 2006). This expression of Wright explicitly refers to the result of being in relationship with nature.

Figure 7. An activity allowing direct contact with nature- pony ride on the area- (Photo Acar, H., Paris, France)

Differences in the perceptions and expectations of children and adults about the environment

Children and adults see and perceive the world differently (Day and Midbjer, 2007) and use open spaces differently (Moore, 1991). Therefore, while making a decision about the design of open spaces we should not forget that there are differences between children's and adults' perspectives. Functional features of the environment are more important than the aesthetic features for children (figure 8). Therefore, when designing areas for children we should determine according to children's needs and desires.

Adults just focus on how to use space and they know what it is. On the other hand, for children what the space means and how they meet and experience it is more important (figure 9). "Paula Lillard distinguishes these approaches: 'children use the environment to improve themselves; adults use themselves to improve the environment. Children work for the sake of process; adults work to achieve and result. This means places-for adults-are for pre-defined purposes; but to children, they offer opportunities for things to do. Adults live (mostly) in a world of material facts-'known' and unchanging. For children, the 'real' world is often servant to an imaginary world" (Day and Midbjer, 2007).

Figure 8. Figure 8. A rock garden and rocks in the garden designed aesthetically for adults are elements waiting, climbing, over and around the watch for children (Photo Acar, H., Trabzon, Turkey)

Figure 9. Figure 9. A curved equipment designed by adults for aesthetically or sitting in the shopping center can be play element to slide for a child (Photo Acar, H., Trabzon, Turkey)

For example, while adults enjoy looking at a lake, trees, the grass, these must be a tactile auditory, oral and olfactory experience for children. "It is through body contact, direct and often disorderly, that need to experience their world". Puddles of water that adults avoid are funny places splashing when pressed for children. Lush green hills adults likes looking at is a place to roll down, feel the wet soft grass, smell its green smell for a child, an experience the free fall of tumbling round and round. Adults prefer visually clean and well maintained places instead of irregular and wet grass in open spaces. However, children as one of the players that use the environment are "place-messers" (Francis, M. 1997).

The streets have always been one of the important and attractive play spaces for children (figure 10). Children meet their friends around there, get to know each other and explore the environment. The most important feature that makes streets attractive is its accessibility for

both sexes and all age groups. However, streets are thought as a transportation routes used to go from a point to b point or parking areas for vehicles by adults (Moore, 1991).

Figure 10. Figure 10. Streets are play spaces for children near their home (Photos Acar, H., Trabzon, Turkey)

One way to understand how children use the environment and what kind of environment they want is observing them. If the user of area that is designed for the child is apparent - for example a school or daycare garden- in order to learn the expectations of children we should observe children's behavior in the area instead of learning by interviews. In this way, it can be determined that which points in the area, when, how often, with how many people and finally and most importantly, for which activity children use. Also, children can build special places such as wooden houses, clubhouses built with waste materials, cottages, and so on, for their own needs in their environments. These places built by the children are an important indicator of their expectations from the environment. These special places are not very aesthetically pleasing but it is important for the development of children's creativity. Therefore, designers should learn to look at the environment through children's eyes or listen them while designing the spaces for children.

4. Urban context

Human has needed spaces that have different functions for various needs and wishes since the transition of urban life. These can be either open or closed spaces. Space, with the simplest definition, is place of a person or group. Space is a place which has human, human relations, and equipment required for these relations and the boundaries of a space is defined according to the structure and characteristics of activity (Gür, 1996). Urban is a settlement consists of these spaces and people using them.

While Norberg Schulz defines the urban as a "meeting place" in which people come together and a "microcosm" surrounding the people (Erdönmez and Aki, 2005). Lynch (1960) defines the urban as a place of a communication in which there are open and closed symbols, religious symbols, signs and plates, towers, columns, entries and rural areas. Urban have a different user segments together with the diversity of this place. So, all of the city's open

spaces especially in public spaces are used by different age groups. Children are one of the most important of these user groups.

Churchman (2003) began his research with a question "Is there a place for children in the city?". In fact, we should ask this question for all cities and even all the settlements where children are in. Because unfortunately open green spaces decreases in parallel with an increase in the population and the number of structural elements such as residential and business centers increases in urban areas with the process of urbanization. Decrease in open areas also causes a decrease in outside play areas for children. Whereas as mentioned in the previous sections playing in open spaces is really important and necessary for the healthy development of the children.

Being Child in the City

Nowadays childhood has shown a change through over-controlled by families rather than child-centered (Francis and Lorenzo, 2008). Especially changing environmental conditions in urban areas-traffic density, lack of security- have significant impact on this change. As a result of this, while children spend less time in open areas, they spend more time with individual plays in their homes, in virtual environments such as computers and television and with technological devices such as mobile phone, portable play station, play station (Heerwagen and Orians, 2002; Onur, 2007; Acar, 2009). Eventually, problematic children who cannot intetact with nature and with their peers, cannot develop talents and creativity and have limited knowledge about their environment are brought up. This also means problematic adults (Francis and Lorenzo, 2008). Whereas former children were playing in the gardens of their houses or in vacant fields near their homes, on the streets or special places they created. They could find opportunity to be with the same or different age groups and friends in there. Today this condition disappeared in urban areas although it continues in rural areas. This case is not special only for Turkey but for the world-wide (Francis and Lorenzo, 2008; Acar, 2009).

Especially in the last four decades of childhood both negative and positive changes have been occurred. The most alarming cause of these changes is developed cities. Children are increasingly disappearing in density and the chaos of the cities. They are often under the control of the adults while using open spaces. Researchers refer that this situation prevents the needs and the rights of living and enjoying the city of children (Francis and Lorenzo, 2008). Therefore, it is very important to find solutions that will allow children to use open spaces freely and happily for their needs in advanced and crowded cities. Because kids are the same everywhere and need opportunities for healthy development. According to Ellen Ruppel Shell (2001) the title of her article "Kids don't need equipment, they need opportunity".

There are open spaces that have different qualities in the urban centers. These areas provide opportunities for children and are grouped under the following headings;

- Private residential gardens
- Schools' and daycare centers' open spaces

- Shopping centers'-plazas' open spaces and courtyards
- Play areas in urban parks
- Playgrounds
- Streets
- Urban forests
- Vacant fields and natural areas
- Cities

Some of these open areas used by children designed especially for children, some of them are not designed (such as natural areas, streets). Needs of each designed areas can show diversity according to the state of the user and usage. While designing these places, designers should pay attention to these needs and children's desires. There are studies on the design of these open spaces in the literature (Moore et al., 1997; Francis, 1998; Spencer and Woolley, 2000). Generally issue of "how urban open spaces should be designed for children" will be discussed under the next heading.

How cities should be for the children?

Issues such as how cities should be for children, design criteria for urban open spaces designed for children, and specific points need to be considered in design are classified under specific headings by experts who design open space for children and work on these issues.

Elizabeth Jones (1997), classified specific design elements of spaces under the 9 titles including children play activities depending on the design requirements. These are:

1. Accessible-Inaccessible
2. Active-Passive
3. Challenge/Risk-Repetition/Security
4. Hard-Soft
5. Natural-People/Built
6. Open-Closed
7. Permanence-Change
8. Private-Public
9. Simple-Complex

"They all are essential in the creation of outdoor settings offering guidance in meeting the needs of children intellectually, socially, cognitively and physically" (Jones, 1997).

Owen (1988) determined the qualities required for children in urban design in accordance with the relevant experts and children's statements to define best cities. Francis and Lorenzo (2008) also determined characteristics of better urban places for children based on their design experiences and Owen's (1988) suggestions. These characteristics are;

1. *Accessibility*: Play areas (if far away from children's home), especially for small children, should be separated from traffic flow, and be connected to their home or school with a good link or be within reach by bike.

2. *Mixed use and mixed users:* Children do not like mono-functional zoning. These ideas are consistent with the mixed use and zoning idea of urban designers and planners today. Children want to be together with individuals with different age groups and cultures rather than special places for themselves. They want to try events and functions, and make observations without limitation of adults in a space.
3. *Sociability:* Children want to be together with different age groups of children and young people autonomously. Besides, children and youth want to be involved in management of some places.
4. *Small, feasible, flexible:* Children often prefer small-scale constructions formed by recycled, low-cost materials, and natural and green components.
5. *Natural, environmentally healthy, growing and in movement:* Natural elements, especially plants are preferred by children and are responded to their expectations as they are living materials and reflect seasonal changes. Natural elements, therefore, used for different activities by children and should be included in the design of children places. In addition, other living materials and water should be considered.
6. *Urban and place identity:* Disorder in scale, function and form in children's place, especially in urban areas, cause perception of space, as a market place. Whereas children know that places need to be identifiable. Signals and signs can be designed into the physical plan. Their design solutions are colors, materials, plantings, etc.
7. *Places and opportunities for participation:* Children want to contribute to the ongoing, flexible, and permanent design in the process. Children feel good about themselves and have protective attitudes when they have a voice and contribute to the design of the environment they live in.

Tai et al. (2006) classified the design process in a play area under the titles such as research (the inventory and analysis, program development and user needs, design) and construction documentation (cost estimating, implementation). Considerations for determining user needs in this process are listed as follows:

- *Five senses:* Designs to outdoor areas used by children should contribute to the use and are aware of their feelings. Scientifically, unchanging and unchangeable environments is not ideal for the senses. When diversity is not exist in the environment, the brain searches for other ways to stimulate such as self-introspection or goes to sleep, concentration deteriorates, attention fluctuates and lapses. In contrast, varying stimuli provides attention and awareness keeps you awake (Day and Midbjer, 2007).
- *Scale:* While adults see the world on a larger scale, children are more cautious about the details. Studies in this area also support this idea. Gary Nabhn, one of the authors of The Geography of Childhood, saw his photographs are different, looking at the photos taken by his son in western National parks travels. While his photographs present interesting vistas, his son took more photos with rocks, twigs, lizards and other more tactile, small-scale objects. Therefore, when an adult designs a space for children, he should care for the child's point of view.
- *Safety:* Creating a play space, safety is one of the most important design principles to be considered. At this point, there are two important elements that children like to see

around, the water and the high elements. Therefore they should be used in children places by taking the necessary safety precautions.

- *Retreat:* Although children are different from adults, it should be noted that they are also individuals and there are similarities between adult and kids. Adults need special places that they will be alone for relaxing and escaping. Children need spaces away from the control of adult, feeling secure and playing privately. These spaces should be in a safe environment and close to adults so the security of children should be guaranteed. Such areas can be form in bounded tree house or a building, such as plastic game tubes.
- *Play:* Play is an activity that is important to explore the world through the eyes of a child. There are many theories and classifications for play. One of them is contributing to the child's physical development and active movement. Another one is contributing to the development of the child's mind and the discovery of creative environment.
- *Active play:* Active play, in essence, includes a lot of action. These are extremely important for the development of physical health and motor skills. However, it should be noted that children having different needs have different expectations. This situation is related to different skill levels and preferences of the children. In this case, play spaces should be funny and comfortable for physical and active play. These places should also be versatile for the different needs and abilities of children.
- *Creative play:* Creative play is one of the most important experiences in the childhood period. Children's creativity develops when stimulated in a healthy play environment. The natural environments are the best areas to stimulate creativity and to encourage children. In such areas, twigs, leaves, rocks, provide opportunities for different play. When a child is given any material to create a new world, possibilities are endless.
- *Plants:* The selection of plant materials in the play area requires care. Dangerous, poisonous, thorny, and allergic species should not be used.
- *Wildlife:* Plants, necessary for play areas, is also important for wildlife. Monitoring these habitats is necessary for childhood learning.
- *Food:* While plants provide habitat for wildlife, they also provide information about ecology for children with the features such as acorns, nuts, berries, or other seeds.
- *Water:* All animals need water to drink or bathe. A water feature in the garden guarantees that birds will come into this area in the future. In this way, children can be ensured to see birds.
- *Shelter:* To attract wildlife and keep them in the area, shelters, especially on plants, can be made for animals. Brush piles, fallen logs, rock piles and other natural elements can provide animals safety and shelter.
- *Place to rise the young:* Wildlife has benefits both for adults and children. Children can learn about wildlife by observing the natural environments.

There are different elements around that we can use to draw children's attention. These elements should be utilized in the designed areas for children. Water is one of these elements. Water, either artificially created or with natural surroundings (a river, lake or sea), in the city are always offers unlimited opportunities for children to explore (figure 11). Similarly, blankets, pillows and boxes can be used to create places to hide. Trikes and bikes

encourage children to be active. All of these and other similar elements can contribute to the development of children's physical ability, motion, coordination, balance and testing skill, and encourages them to play. The setting that include "attractive materials" can be a clue when designing play spaces for kids (Jones, 1997).

As a part of biological diversity, plants, animals, water elements (lake, river, ...) that provide habitat for a particular species, and natural areas that include a portion or all of them in urban areas, can be a source of inspiration for play (Acar, 2010) (figure 12). Even if not completely natural, these should be used in the design of children spaces. As discussed in detail in the previous sections, contact with natural areas and natural elements in childhood is extremely important for children. As Robin Moore pointed out, "green" alone is not enough as well as. Spaces created for children should be child-centered, recollective and inviting, and should continuously be effective on the development of children (Tai et al., 2006).

Figure 11. Playing with water have always been attractive and exciting for children (Photos: Acar, H.)

Gender differences should be taken into account in play space design. Girls and boys are different from each other physically, and activity elements should be suitable for both sexes. Although the reason is not always clear, girls and boys are attracted to different places. Boys' plays can often last over days even weeks to complete. While boys usually construct unused buildings (especially tower), the girls usually construct rooms with people in them.

Girls are often pay attention to the aesthetics of the environment and like colorful and beautiful flowers. Girls particularly 13-15 aged ones, have a variety of definition about the space when compared to boys (Day and Midbjer, 2007). It is observed, that girls prefer, for example, flowers and butterflies and trees, whereas boys prefer more active play such as sliding and playing hide and seek. However, they all need quite places to rest, talk, and socialize (Simonic et al., 2005).

Figure 12. Figure 12. The opportunity of interaction with animals allows children to have information about the animals (Photo Acar, H., Nara, Japan)

Color is an important factor in the children's preferences. Color preferences are personal. Young children love bright colors. In the 1960s, some educationalists were considering that children can only perceive main colors. Today, it is believed that they are over-stimulating. Strong colors can be used in small spaces. But, in large spaces in which we spend more time, it would be better to use muted colors or mood stabilizers. Distinct and warm colors (red, yellow, and orange) are preferred by children over 6 years old. This is not surprising. At this age, they are activity-led, not feeling- or thought-led. Boys preferred red color more than girls that is compatible with their behavior. Older children prefer blue color. Beyond the personal preferences, there are also powerful therapeutic effects of the color (Day and Midbjer, 2007). The color choice seems to change according to age. H. Friedling, in his study performed in 1974, showed the color preferences of children according to age. According to this study, popular and unpopular colors vary as follows (Gür and Zorlu, 2002):

- Popular colors:
  - 5-8 ages – pinkish purple, red, pink, lilac, lemon yellow
  - 9-10 ages – purples, pink, red, turquoise, reddish orange, coffee,
  - 11-12 ages – green, light blue, red, purple
  - 13-14 ages – light blue (masculine), red (feminine), blue, green, orange, dark orange

- Unpopular colors:
  5-8 ages – black, white, gray, dark brown
  9-10 ages – gray, dark brown, black, rust green, rust blue
  11-12 ages – olive green, rust green, purple, lilac
  13-14 ages – rust green, brown, dark brown

Children would like to see plants that can be used for play. For this purpose, plants can also be used to serve a variety of outdoor activities in open spaces designed for children. Trees, shrubs, flowers, vegetables and parts of these plants, such as branches, leaves, pinecones are important elements of children's environments and plays (figure 13, 14, 15). Plants in child environments are used with the objectives of enclosure, identity, movement, climbing, play props, programmed activities/education, accessibility/integration, landmarks, seasonal change, wildlife enhancement, climate modification, and environmental quality (Moore, 2002). Plants offer different color options in different seasons with their colorful leaves, flowers and fruits. Results of the author's master thesis that focused on the plant preferences for children play spaces revealed that children like red, yellow, mottled, blue and orange colored leafs while they do not like yellow and green colored leafs. Study also revealed that purple, pink and white flowers were favorite, while red and white colors were unfavourable. In terms of fruit color, study also found that red and blue were favorite, while yellow and orange colors were unfavourable (Acar, 2003).

Figure 13. Plants are interesting materials for children (Photo: Acar, H., Paris, France)

The functional properties of the plants can be assessed by children in addition to the esthetic properties such as color, form, etc. As mentioned in previous sections, to evaluate existing elements, such as the functional point of view is more important for children. In this respect, children use plants in the playground depending on the features that they have for activities such as climbing, hiding, symbolic games (branch and leaf-like parts of the imaginary cone), and swinging (Acar, 2009). For these purposes, appropriate species selection is needed depending on, function and usage of the space, and the activities that will take place (e.g. size, form, texture, evergreen-deciduous, coniferous-broadleaved, fruit-fruitless, etc.)

(Moore, 2002). In addition, care must be taken for children's health and safety according to selected species (allergens, toxic, barbed should not be used).

Figure 14. Figure 14. Plants are ideal materials to hide behind (Photo Acar, H., Trabzon, Turkey)

Figure 15. Figure 15. Plant parts are important play materials (Photo Acar, H., Trabzon, Turkey)

Finally, White and Stoecklin (1998), cited the following features that children likes to see in public areas;

- water
- vegetation including trees, bushes, flowers and the long grass
- animals, creatures living in ponds
- sand and water
- natural colors, diversity and change
- places to sit under, in, and on, and sheltered places
- hidden, and private, places and places providing good view
- especially replaceable structures, materials, and equipment that they imagine

These features and everything mentioned so far are important clues for the design of open space for the children Needs and preferences can vary depending on the individual; however, the knowledge of the general trend provides a significant contribution for space design.

Children's participation in the design process

Overall, by definition, "participation" refers to that the active participation in decisions affecting one's self and has a say. This is also the right of individual citizens in a democracy. A meaningful participation in the design of open space can be achieved by the participation of individuals from all ages on the subject that includes designed field evaluation, identification of problems, evaluation of the available data, solution proposals, needs and the development of alternatives and by combining all of these on a common plan for a conclusion. Participation is local, transparent, inclusive, interactive, responsive, relevant, educational, reflective, transformative, sustainable, personal and voluntary (Driskell, 2002).

Children should be included in the design of kid play areas through the design process, if possible. Children participation in the decision-making process has advantages for both designers and practitioners. In this way, their needs will be met and their contribution to the construction process leads to a protective attitudes towards these areas among them. "Local Agenda 21" action plan that was introduced in the United Nations Conference on Environment and Development held in Rio de Janeiro in 1992 and accepted by the UN members, strongly supports the involvement of children in the planning of local environments.

A meeting was held in Bologna (Italy) in May 1994 to contribute the identification of child-friendly cities. Approximately more than 300 children from 100 primary and secondary schools in different cities of Italy, educators, planners, and administrations all have described the problems of the cities. All of the children supported by WWF Italy took part in participatory design projects. As a result of these activities, *The Children's Manifesto: How to Win Back Our Cities* gives clues for future urban design. According to this, the children's ideas are grouped under following headings: "needs in general, expectations from the city, needs regarding urban green spaces, needs in school, needs related to whelming traffic, and needs for the future" (Francis and Lorenzo, 2002). Some of their expectations are;

- to interact with nature in cities which means: playing, climbing, building huts, listening, looking and understanding,
- to have different experiences, sleeping out of doors, strolling together, 'kites between the houses', bridges between the windows, etc.
- more sport activities and children's theaters,
- areas for cycling
- to be heard by others
- to establish children's council to participate decision-making
- quiet environments

- colourful and beautiful schools
- secure traffic
- a lot of trees, shrubs and grasses,
- collect fruit trees

These are very important as it reflects the expectations of children's requests.

Francis and Lorenzo (2002) stated that children should be included into the process of urban design. In this context, they identified seven realms for children's participation in urban design and planning.

1. Romantic
2. Advocacy
3. Needs
4. Learning
5. Rights
6. Institutionalization
7. Proactive

A new approach is on the agenda in line with the participatory design to re-planning of cities which are not suitable for children to meet their needs. This approach is a proactive process that is including idea of children, adults and professional designers. This approach is fundamentally different approach to the participation of children, which indicates multi-faceted perspective and multi-faceted participation. It is based on listening and learning the ideas of children, adults, designers, planners and decision-makers. Differences of opinion between children and adults are negotiated. In the design process, the concepts of equality, justice, and sustainability are important. This process is also based on social science methods that adults re-remember their childhood experiences and share them as their own children. In addition, this involves the use of Internet and Digital Media interactively. This approach claims that the work of children in other age groups, will contribute to the formation of livable, ecologically sustainable and child-and adult friendly cities (Francis and Lorenzo, 2008). In this process, children can participate to the design of children's play areas.

5. Examples from the world

In order to make an overall assessment of selected samples around the world, it is important to see the different perspectives and approaches for the design of children's play. It is possible to increase the number of samples.

Rotterdam, Netherland

This example is a play space in which space's boundaries are defined with color differences on the ground in the city. This area is composed of artificial equipment completely and is quite small. Despite this, it allows more than one activities (figure 16).

Figure 16. Play space from Rotterdam, Netherland (Photos Acar, H.)

Brussels, Belgium

This area was designed in woodland in the city. It is particularly suitable for disabled people with ramp play equipment. It provides an opportunity to contact with nature for children as it is in a woodland area (figure 17).

Figure 17. Figure 17. Play space from Brussels, Belgium (Photos Acar, H.)

Luxemburg, Luxemburg

Ship is a play element that is frequently used in playgrounds and is also attractive in any time for children. It evokes discovery and adventure. The figure of the ship, located in the city offers many activities (sliding, hiding, stable standing, monitoring around, climbing, etc.) for children. Timber materials are used in the area and their colour are in a harmony with wooded area. Animal figures are used as sitting equipment. Although they are artificial, they give an opportunity to children to see and touch the turtle. Water-related spaces that children would like to see were designed in a wide range. In addition, there are towers offering different height options in this play spaces (figure 18).

Figure 18. Figure 18. Play space from Luxemburg, Luxemburg (Photos Acar, H.)

Den Haag, Netherland

There is also a ship figure in this play space. In addition, there are different equipment for different activities such as swinging, sliding, balancing, jumping, and playing with sand. Seating areas were also designed around the playground for parents together with the children (figure 19, 20).

Figure 19. Figure 19. Play space from Den Haag, Netherland (Photos Acar, H.)

Figure 20. Play space from Den Haag, Netherland (Photos Acar, H.)

Istanbul, Turkey

This example is in woodland of the city. There are only artificial equipment offering different activities in this play space. Because these play spaces located in a natural area, they provide the opportunity to become intimate with nature for children (figure 21).

Figure 21. Play space from Istanbul, Turkey (Photos Acar, H.)

Paris, France

This play area located in Paris is an extremely good example in terms of different topography options. The existing slope in this area was evaluated without too much intervention. As described in affordance theory, curved surfaces afford to climb or slid. So, there is more climbing activity provided with different equipment such as rope in this play area. In addition, this play space is suitable for sliding. Also, although this is a fairly curved area, the safety of children is provided by safety barriers. Boundary elements are also suitable to sit (figure 22, 23).

Figure 22. Play space from Paris, France (Photos Acar, H.)

Figure 23. Play space from Paris, France (Photos Acar, H.)

6. Conclusion

As a result, looking at the subject in the light of information covered so far in general, the design process in outdoor play space for children in urban areas can be classified under the following headings.

- Site analysis and data collection
- To form main design decisions in accordance with the field opportunities and the needs and preferences of children
- Producing scenario
- Selection of ideal scenarios and detailing
- Application

In this process, the design considerations of play spaces in urban areas can be grouped under the following headings.

The nature of the site and facilities:

Designed area: The location of designed area in the city, the relationship of space with its surroundings and the possible means of transportation and routes of people expected to use this area should be determined.

The usage status: The place that will be designed as play space or its surroundings and the purpose of use should be evaluated. For example, the school, city park, playground, and so on. Accordingly, the users (age group), as well as the needs and demands of these users should be determined. For example, if the designed area is a primary school, intensive use depending on the number of students at certain intervals such as break hours; areas of application that can be made for courses such as science or nature experiences; areas for active movement such as physical education courses should be considered.

Site facilities: The whole data during the site analysis and information gathering about field (topography, climate, existing vegetation types, soil, space and constructions around the pedestrian-vehicle transport) should be reviewed and evaluated. The positive ones (plant species evaluated in case of the protection, different topography options) should be evaluated in the designs by maintaining or strengthening. In this way, the area will be completely unmodified and untreated, so the existing facilities will be evaluated. The negative features (bad images, features that constitute a threat to children) should be removed from the area or improved.

The needs of children:

User profile: The user group of the area is extremely important. Because when the development, changes in physical measurements, sense and mental capacities and motion abilities of children according to their age is considered, the change of needs and desires is inevitable. Therefore, the varieties of activity and capacities of spaces should be determined appropriately for the age groups of children that will use these areas.

Expectations: The preferences of people vary according their personal expectations, environments and cultures. This situation is also same for children. However, the needs and desires of children about open spaces have been shown by some investigations. It is possible to determine on the basis of their general tendency. It will give useful results if some interviews are made with the users of the area to determine their direct expectations and even by including the children to the designing process. In this way, children's expectations will be fulfilled by mutual consultations. In this way, designed play spaces can be used by children for a long time. Apart from this, if there will be a revision to the design area, giving design decisions would be more healthy after observing the behaviors of children using the area for a while before design it from the beginning.

Activities: Before you design an environment, you need to determine the activities which are expected to be implemented in that area. Because, spaces are designed depending on the particular activities. When designing the space for the child, users' requests, the age groups of children are kept in mind to decide which activities would be done. These activities may be active or passive. The form, capacity and equipment of space are designed according to the type of determined activity and number of people performing this activity. Suggested activities for children in outdoor areas should contribute to their physical, mental, emotional and social developments. In addition, it is essential to suggest some areas for the parents to sit and rest since they need to be near their children.

Safety: Safety is one of the most important issues in children's play spaces. If a field is not safe, no matter how many different activities it suggests, the children will not favour them. Or their families will not allow their children to use that space. Security in play areas should be ensured in terms of accessories used in the play space as well as its relationships with its environment.

Nature: As it is mentioned the contribution of natural areas and materials for to the development of children are extremely high. For this reason, the natural elements designed children's play spaces must be provided transportation. Therefore in designs, natural materials such as plant, rock, and water should be used so that they allow for children to use the appropriate size in playing.

Plant: Plants and parts such as branches, leaves, and pinecones are very good play materials for children. They are preferred especially when children can use them with different aims due to their creativity during their plays if they are open to be changed. For this reason, they contribute to children's intellectual development and the development of their power of creativity. In addition, the use of nature enables the children to learn the natural cycle since they are alive seasonal changes, leafing, flowering and fructification time. However to manage this it is necessary to ensure the appropriate planting for play area. For example, for climbing activity, species that has branching structure which are not so high and are appropriate for climbing should be selected. To show seasonal variations, species showing coloration in autumn and having leaved broad can be selected. Species with edible fruits may be included where appropriate. For the development of children's visual senses, leaves, wind, sound-producing species should be suggested. These examples can be multiplied. If the existing plant species in the area will be used for these purposes, they should be protected. In addition, those which have psychologically negative affect or which are harmful for children with, such as barbed or very tall species should be avoided.

Water: Water which always attracts the attention of children is a very important material. It should be used necessarily in play areas. It can be used such as a fountain, water gushing from the ground, pied feet of small puddles of water, with sand in different forms.

Animal: Animals always attract the attention of children because of they are living organisms and acting. Children tend to touch or examine a small ant whenever they see them. Seeing animals around themselves will be affective to understand and have information on their roles in the life cycle, their nutrition their habitats. Zoos are open areas offering children a chance to see animals in nearly natural environments. However, arrangements can be made in smaller areas to provide the opportunity to see animals which do not need special care such as ant, bird, butterfly. For example, to manage this, plant species which attract birds and butterflies can be used.

Topography: Topography of the area can be used for different activities. For example, curved surfaces enable children to climb and slide, high places do the same for going on around the watch, the hills are good for rolling over and hiding behind. If these and similar topography options are present in field, they should be established or improved in the different options. Because children prefer very irregular forms than a uniform backgrounds.

Socialization: Open spaces allow children to be associated with ones at the same or different ages. It is important for the socialization of children. Therefore, you need to design areas to ensure children to have time together with other children. These places may include activities that meet large groups of people, and activities in large areas. Moreover, there should be relatively small-scale spaces allowing two children to sit and chat in more quiet corners of the field, either.

The use of the senses: The play spaces should contribute to the development of the senses of children. Therefore, designs and accessories that we can collect data from environment by five senses in the play should be used. For example, plant species with fragrant flowers to smell, different sound-producing musical instruments to hear, different display mirrors offering a choice of perceive to see by looking at the outside environment, edible plant species to taste, different textured surfaces or plants created by offering a choice of vertical and horizontal planes or different textures to touch should be used.

Creativity: Outdoor play areas contribute to the development of children's creativity. However, for this, environment elements can be modified and used for different purposes. These can be different materials such as water with sand, or non-constant materials to build a structure in the field, flowers and leaves to make a symbolic meal in children's plays, the boat leaves to refloat, the plant parts to ride a horse and so on. Children use them in playing in accordance with their creativity and imagination.

The materials that is to be used:

Safety: Security is the most important criteria in playgrounds design. For this reason, safety should come first both for the designed play areas, its surroundings and the material; we should avoid the life-threatening risks for children.

Soundness: All the materials to be used in play space should be sound, convenient and ergonomic in terms of anthropometric measurements of children. For more use, the deformed space and accessories should be renewed or replaced as soon as possible. Wooden materials that will be used should not be cracked or rough.

Health: Plant material that will be used in the play space should not be constituted a threat to the health of children. To do this, toxic, allergenic pollen, with thorny species should be avoided. In addition, horizontal, vertical, or other artificial materials used in contact with reinforcement made of materials should be non-toxic.

Natural-Artificial: Based on the studies on the subject, most of them appear to prefer natural areas or natural materials. And this material provides a positive contribution to their development. However, this does not indicate the need for children's play spaces using only natural materials. Because, artificial materials with color, texture and potential in different sizes attract children. For this reason, natural materials, as well as artificial materials should be included in the designs.

Free materials: In play areas, there should be portable free standing, unstable materials that allow children to change their places and take them together to build new things. These

enable children to build up the objects in their dreams and to learn while doing and trying so and to be in cooperation with other children also.

Design for Everyone: The right of every citizen is to take advantages of urban open spaces equally. Therefore, in the play places designed for children in cities all children (disabled, non-disabled) should take advantage of them. Therefore, non-impaired persons with disabilities at the beginning of the design process needs to be considered. Both efficacy and regulations (space and reinforcement measures) should be considered.

As a result this article deals with children's play areas' design in urban open space. It should not be forgotten that children's preferences and expectations may vary according to the individual, the society and the culture. However, scientific studies on children, children's environment and children's preferences, observations and experiences show us that the general trend is in this direction. In addition, all the types referred to in a play space, variety of activity areas or equipment may not be able to use together. In particular concept (such as water gardens, water gardens or sense) of one or a few of them in the play area may be considered. In addition, the above mentioned information is considered to be an important resource for those working with children and general open space designer for children.

Finally, "a child's play space should ideally never be finished, it should be in a constant state of change" (Goltsman, in Loughlin and Suina, 1997).

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Basic Principles of Landscape Design[1]

Gail Hansen[2]

LANDSCAPE DESIGNERS WORK on a canvas that is distinctly different from other art forms. The "art" is always changing as the plants grow, environmental conditions change, and people use the space. For this reason, landscape designers use a design process that systematically considers all aspects of the land, the environment, the growing plants, and the needs of the user to ensure a visually pleasing, functional, and ecologically healthy design.

ELEMENTS AND PRINCIPLES

The design process begins by determining the needs and desires of the user and the conditions of the site. With this information, the designer then organizes the plants and hardscape materials, which are collectively referred to as the features. The features can be physically described by the visual qualities of line, form, color, texture, and visual weight—the elements of design. The principles are the fundamental concepts of composition—proportion, order, repetition, and unity—that serve as guidelines to arrange or organize the features to create an aesthetically pleasing or beautiful landscape.

Knowledge of the elements and principles of design is essential to designing a landscape and working through the design process. This publication describes each of the elements and explains the principles and their application.

Elements of Design

The elements of composition are the visual qualities that people see and respond to when viewing a space. Visual qualities can illicit many different emotions and feelings, and the more positive those feelings, the more likely people are to enjoy and use a space. Perhaps the most common element in a composition is line. Line creates all forms and patterns and can be used in a variety of ways in the landscape.

Line

Line in the landscape is created by the edge between two materials, the outline or silhouette of a form, or a long linear feature. Lines are a powerful tool for the designer because they can be used to create an infinite variety of shapes and forms, and they control movement of the eye and the body. Landscape designers use lines to create patterns, develop spaces, create forms, control movement, establish dominance, and create a cohesive theme in a landscape. Landscape lines are created several ways: when two different materials meet on the ground plane, such as the edge of a brick patio meeting an expanse of green turf; or when the edge of an object is visible or contrasts with a background, such as the outline of a tree against the sky; or by the placement of a material in a line, such as a fence. Figure 1 shows common landscape lines, including bedlines, hardscape lines, path lines, sod lines, and fence lines. Lines can have one or more characteristics, such as those described below, but they typically serve different purposes.

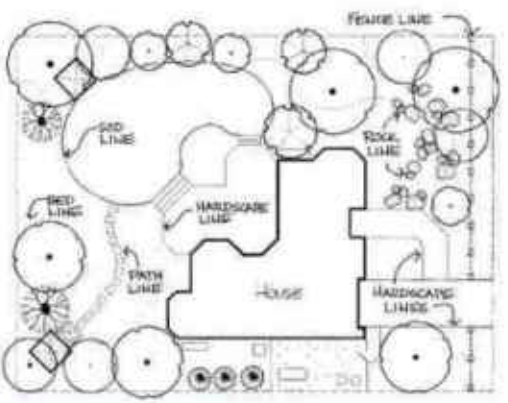

FIGURE 1. Lines in the landscape

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PROPERTIES OF LINES

The properties of lines determine how people respond to the landscape, both emotionally and physically.

Straight lines

Straight lines are structural and forceful; they create a formal character, are usually associated with a symmetrical design, and lead the eye directly to a focal point. Diagonal lines are straight lines with an intentional direction. Straight lines are most often found in hardscape edges and material.

Curved lines

Curved lines create an informal, natural, relaxed character that is associated more with nature and asymmetrical balance. Curved lines move the eye at a slower pace and add mystery to the space by creating hidden views.

Vertical lines

Vertical lines move the eye up, making a space feel larger. An upward line can emphasize a feature and has a feeling of activity or movement. Vertical lines in the landscape include tall, narrow plant material, such as trees, or tall structures, such as an arbor or a bird house on a pole.

Horizontal lines

Horizontal lines move the eye along the ground plane and can make a space feel larger. Low lines are more subdued and create a feeling of rest or repose. Horizontal lines can spatially divide a space or tie a space together. Low lines are created by low garden walls, walkways, and short hedges.

Lines are used to draw forms on a plan. In plan view, they define plant beds and hardscape areas. Lines are also created by the vertical forms of built features and plant material. There are three primary line types that create form in the landscape: bedlines, hardscape lines, and plant lines. Bedlines are created where the edge of the plant bed meets another surface material, such as turf, groundcover, gravel, or patio pavers. Bedlines connect plant material to the house and hardscape because the eye follows the line, moving the gaze through the landscape. Hardscape lines are created by the edge of the hardscape, which delineates the built structure. Line can also be created by long and narrow materials, such as a fence or wall.

Form

Shape is created by an outline that encloses a space, and form is the three-dimensional mass of that shape. Form is found in both hardscape and plants, and it is typically the dominant visual element that spatially organizes the landscape and often determines the style of the garden. The form of structures, plant beds, and garden ornaments also determines the overall form theme of the garden. Formal, geometric forms include circles, squares, and polygons. Informal, naturalistic forms include meandering lines, organic edges, and fragmented edges. Plants create form in the garden through their outlines or silhouettes, but form can also be defined by a void or negative space between plants.

GEOMETRIC FORMS

Circular form

Circles can be full circles, or they can be divided into half circles or circle segments and combined with lines to create arcs and tangents. Figure 2 shows the use of circle segments for hardscape and lawn panels. Circles can also be stretched into ovals and ellipses for more variety and interest. Circles are a strong design form because the eye is always drawn to the center, which can be used to emphasize a focal point or connect other forms.

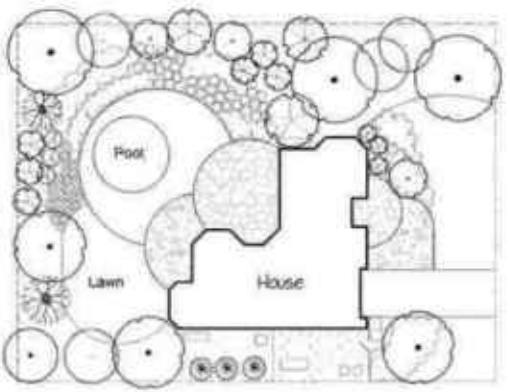

FIGURE 2. Circular forms in hardscape and lawn panels.

Square form

Squares are used for a variety of features, including stepping stones, bricks, tiles, and timber structures, because they are an easy form to work with for construction. The square form can also be segmented and used repeatedly to create a grid pattern. Unlike circles, squares are stronger on the edges, which can be lined up or overlapped to create unique patterns and more complex forms.

Irregular polygons

Polygons are many-sided forms with straight edges. Triangles, for example, are three-sided polygons. The angled edges of polygons can make interesting shapes, but they should be used cautiously because the forms can become complex; simplicity is best.

NATURALISTIC FORMS

Meandering lines

Meandering lines often mimic the natural course of rivers or streams and can be described as smooth lines with

deeply curved undulations. Meandering lines (Figure 3) work well for pathways, plant bedlines, and dry stream beds. Meandering lines can add interest and mystery to a garden by leading viewers around corners to discover new views and spaces.

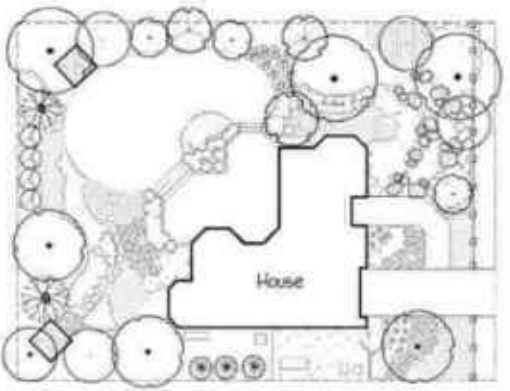

FIGURE 3. Meandering lines in the landscape

Organic edges

Organic edges mimic the edges of natural material, such as foliage, plant forms, and rocks, and can be described as rough and irregular. Organic lines can be found in rock gardens and along dry creek beds or purposely created on hardscape edges.

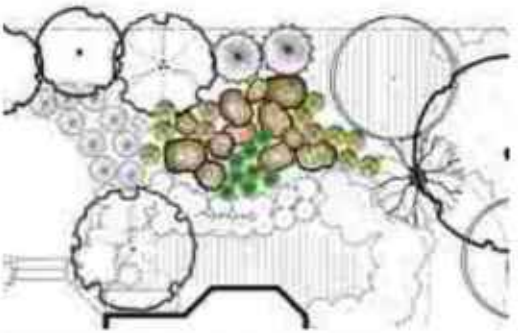

FIGURE 4. Organic edges: irregular edge of rock garden

Fragmented edges

Fragmented edges resemble broken pieces scattered from the edge, such as stones or pavers, and are often used to create a gradually disappearing edge on patios or walkways.

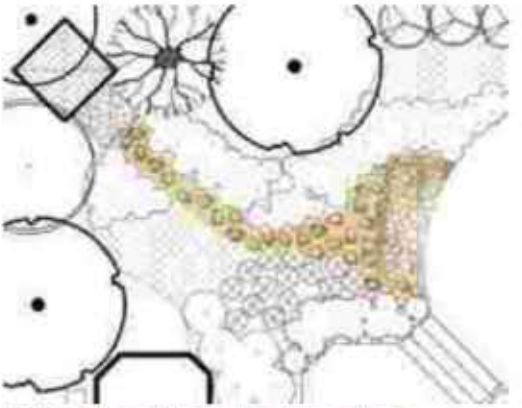

FIGURE 5. Fragmented edges: stepping stones in pathway

PLANT FORMS

Form is the most enduring quality of a plant. Common plant forms are well established and standardized, as form is the most consistent and recognizable characteristic of plants. Form can also be created through the massing of plants, where the overall mass creates a different form than an individual plant. A strong form that contrasts with the rest of the composition will have greater emphasis within the composition. A highly contrasting form must be used with care—one or two work well as a focal point, but too many create chaos. Natural plant forms, rather than over-trimmed forms, should establish the bulk of the composition. The relevance of overall form is more or less dependent on the viewing perspective—the form of a tree can appear quite different to a person standing under the canopy versus viewing the tree from a distance in an open field. Vertical forms add height; horizontal forms add width. Plant forms also create and define the void or open spaces between the plants, creating either convex or concave forms in the voids. High-arching tree branches typically create a concave open space under the branches, and a round canopy with low branches fills the space to create a convex form in the open space under the tree.

Tree forms

Common tree forms (Figure 6) include round, columnar, oval, pyramidal, vase shaped, and weeping. Different tree forms are used for visual appeal, but the form is also important for function. Creating a shady area in the garden requires a round or oval tree, while a screen usually requires a more columnar or pyramidal form, and a weeping tree form makes a good focal point.

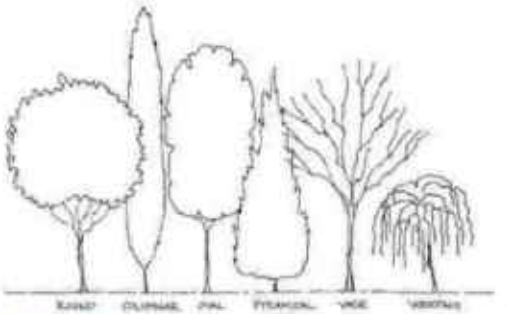

FIGURE 6. Tree forms

Shrub forms

Shrub forms (Figure 7) include upright, vase shaped, arching, mounding, rounded, spiky, cascading, and irregular. Choosing shrub forms often depends on whether the shrub will be used in a mass or as a single specimen. Mounding and spreading shrubs look best in a mass, and cascading and vase-shaped shrubs do well as specimen plants.

Groundcover forms

Groundcover forms (Figure 7) include matting, spreading, clumping, sprawling, and short spikes. Almost all groundcovers look better in masses because they are typically small, ground-hugging plants that have very little impact as individual plants.

PROPERTIES OF FORM

Form is very powerful because people can often recognize and identify a feature based on an outline or silhouette. People can often perceive a form when only a portion of it is visible. Familiarity and the suggestion of a form is enough for the eye to fill in the rest. Repetition of form is essential to the creation of pattern, which is the basic organizational structure of the landscape.

Form is also the primary determinant of a formal or informal garden. Geometric forms with straight edges are typical of formal gardens that are based on an established style, such as contemporary or Italian gardens. An informal garden has more naturalistic, organic forms that are normally found in gardens that mimic nature. Form compatibility is also a major component of unity in design—one or two strikingly different forms are good for contrast and emphasis, but generally all other forms should have some similarities for a unified look.

Texture

Texture refers to how coarse or fine the surface of the plant or hardscape material feels and/or looks. Texture is used to provide variety, interest, and contrast. The plant's foliage, flowers, bark, and overall branching pattern all have texture. The size and shape of the leaves often determines the perceived texture of the plant. A plant can generally be described as having a coarse, medium, or fine texture. Coarse texture is more dominant than fine and also tends to dominate color and form, while fine texture is more subordinate to other qualities and tends to unify compositions. Coarse-textured plants attract the eye and tend to hold it because the light and dark contrasts of the shadows provide more interest. Fine texture exaggerates distance and gives the feeling of a larger, more open space. Rough texture minimizes distance—plants appear closer

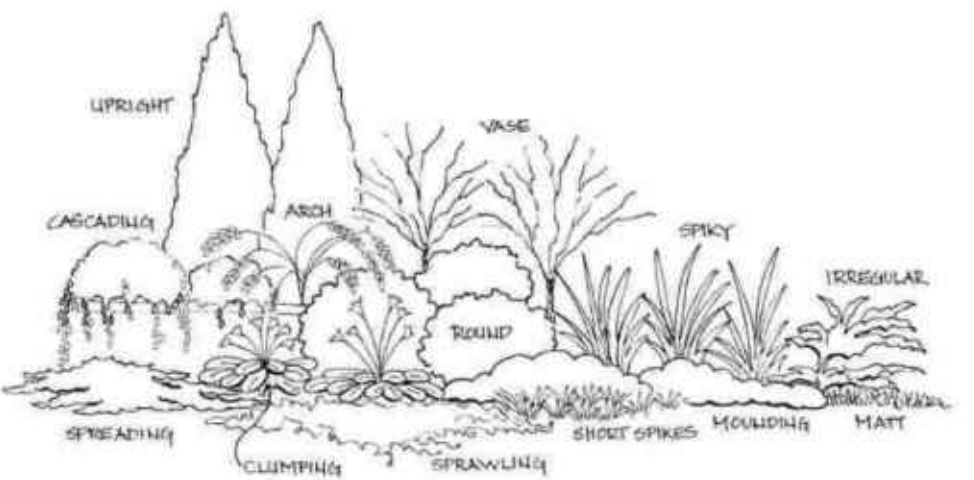

FIGURE 7. Shrub and groundcover forms

and the space feels smaller, or enclosed. Texture is also found in the hardscape, including on buildings, patios, walls, and walkways.

Coarse texture

Plant characteristics that create coarse texture include large leaves; leaves with very irregular edges; bold, deep veins; variegated colors; thick twigs and branches; leaves and twigs with spines or thorns; and bold, thick, and/or irregular forms. Each leaf of a coarse-textured plant breaks up the outline, which gives the plant a looser form. Examples of plants with coarse texture include philodendrons, agaves, bromeliads, hollies, palms, and hydrangeas. Hardscape with coarse texture includes rough-cut stone, rough-finished brick, and unfinished wood with knots and a raised grain. Aged or old construction material that maintains a weather-beaten surface is often coarse in texture.

Fine texture

Characteristics that create fine texture include small foliage; thin, strappy leaves (grasses) or tall, thin stems; tiny, dense twigs and small branches; long stems (vines); and small, delicate flowers. They are often described as wispy and light or with a sprawling, vining form. Fine-textured plants sometimes have a stronger form because the small individual leaves are densely packed (e.g., boxwoods) to create a solid edge. Plants with a fine texture include grasses, ferns, Japanese maples, many vines, and junipers with fine needles. Hardscape with fine texture includes smooth stone, wood or ceramic pots, and glass ornaments. Smooth water, such as that found in a reflecting pool, or water with a very fine spray is considered fine textured.

Medium texture

Most plants are medium texture, in that they cannot be described as having either coarse or fine texture. They are characterized by medium-sized leaves with simple shapes and smooth edges. The average-sized branches are not densely spaced nor widely spaced, and the overall form is typically rounded or mounding. Medium-textured plants act as a background to link and unify the coarse- and fine-textured plants. Plants with medium texture include agapanthus, ardisia, camellia, euonymus, pittosporum, and viburnum. Hardscape with a medium texture includes standard flagstone pavers, broom-brushed concrete, and finished woods.

PROPERTIES OF TEXTURE

Texture affects the perception of distance and scale. To make a space feel larger, locate plants so that the fine textures are along the outer perimeter, the medium textures are in the middle, and the coarse textures are closest to the viewer. The small size of the fine texture recedes in the landscape and is perceived as being farther away. To make a space feel smaller, place the coarse textures along the outer perimeter and the fine textures closest to the viewer. The detail of the coarse texture makes the plants appear closer and makes the space feel smaller. The perceived texture of plants can also change with the distance from the plant. Plants that are coarse close-up can look fine textured from a distance. Bold colors increase the contrast and make the texture appear coarser, while muted colors can flatten texture. Hardscape with a coarse texture—such as very rough rocks and bold, large timbers—tends to make all plant material appear more medium textured. Designers often develop a texture study (Figure 8) on paper to help decide the arrangement of plant materials. The drawing mimics texture by using different line weights and spacing to represent fine, medium, and coarse textures.

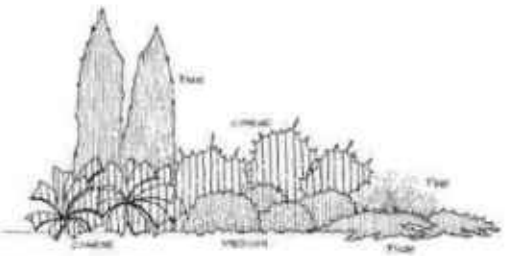

FIGURE 8. Texture study

Color

Color in plant material and hardscape adds interest and variety to the landscape. Color is the most conspicuous element in the landscape and is usually the focus of most homeowners; however, it is also the most temporary element, usually lasting only a few weeks a year for individual plants. The use of color is guided by color theory (use of the color wheel) to create color schemes. A simple description of the color wheel includes the three primary colors of red, blue, and yellow; the three secondary colors (a mix of two primaries) of green, orange, and violet; and six tertiary colors (a mix of one adjacent primary and secondary color), such as red-orange. Color theory explains the relationship of colors to each other and how they should be used in a composition. The basic color schemes are monochromatic, analogous, and complementary.

Monochromatic scheme

A monochromatic color scheme uses only one color. In landscaping, this usually means one other color besides the green color in the foliage. A garden that is all green depends more on form and texture for contrast and interest. One color can have many light and dark variations, which can add interest. An example of a monochromatic scheme is a white garden with white flowers, white variegated foliage, and white garden ornaments.

Analogous scheme

Analogous (sometimes called harmonious) color schemes are any three to five colors that are adjacent on the color wheel, such as red, red-orange, orange, yellow-orange, and yellow, or blue, blue-violet, and violet. The colors are related to each other because they typically include two primary colors mixed to form a secondary and two tertiary colors, which means they share common properties.

Complementary scheme

Complementary colors are those that are opposite each other on the color wheel. They tend to have high contrast between them. The most common sets are violet and yellow, red and green, and blue and orange. Complementary colors are often found naturally in flowers; a common pair is yellow and violet.

COLOR IN PLANTS AND HARDSCAPE

Color is found in the flowers, foliage, bark, and fruit of plants. Foliage typically provides the overall background color for flower colors. Green foliage in all its various shades is the dominant color by quantity, but other colors capture attention more readily because of their high contrast to the color green.

Color is also found in buildings, rocks, pavers, wood, and furniture. Most colors in natural materials, such as stone and wood, are typically muted and tend to be variations of brown, tan, and pale yellow. Bright colors in the hardscape are usually found in man-made materials, such as painted furniture, brightly colored ceramic containers or sculptures, and glass ornaments.

PROPERTIES OF COLOR

Color is an important element for creating interest and variety in the landscape. Colors have properties that can affect emotions, spatial perception, light quality, balance, and emphasis. One property of color is described relative to temperature—colors appear to be cool or warm and can affect emotions or feelings. Cool colors tend to be calming and should be used in areas for relaxation and serenity. Warm colors tend to be more exciting and should be used in areas for entertaining and parties. The "temperature" of colors can also affect the perception of distance. Cool colors tend to recede and are perceived as being farther away, making a space feel larger. Warm colors tend to advance and are perceived as being closer, making a space feel smaller.

Color can also be used to capture attention and direct views. Focal points can be created with bright colors. For example, bright yellow, which has the highest intensity, also has a high contrast with all other colors (often described as a "pop" of color) and should be used sparingly. A small amount of intense color has as much visual weight as a large amount of a more subdued or weaker color. Color schemes in the garden can change with the seasons. Summer colors are usually more varied and bright with more flowers, while winter colors tend to be monochromatic and darker with more foliage. Color is also affected by light quality, which changes with the time of day and time of year. Brighter, more intense summer sun makes colors appear more saturated and intense, while the filtered light of winter makes colors appear more subdued. When choosing a color scheme, consideration should be given to the time of day the yard will be used. Because color is temporary, it should be used to highlight more enduring elements, such as texture and form. A color study (Figure 9) on a plan view is helpful for making color choices. Color schemes are drawn on the plan to show the amount and proposed location of various colors.

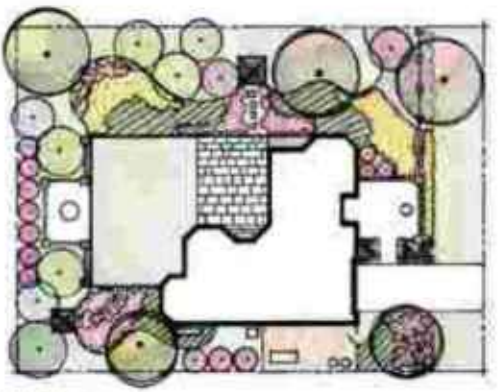

FIGURE 9. Color study

Visual Weight

Visual weight is the concept that combinations of certain features have more importance in the composition based on mass and contrast. Some areas of a composition are more noticeable and memorable, while others fade into the background. This does not mean that the background features are unimportant—they create a cohesive look by linking together features of high visual weight, and they provide a resting place for the eye. A composition where all features have high visual weight often looks chaotic because the eye tends to bounce between the features. High visual weight usually comes from a group of plants with one or a few of the following characteristics: upright or unusual forms, large size, bright colors, bold texture, and diagonal lines. Low visual weight is found in low horizontal lines, prostrate or low forms, fine texture, and subdued or dull colors (Figure 10).

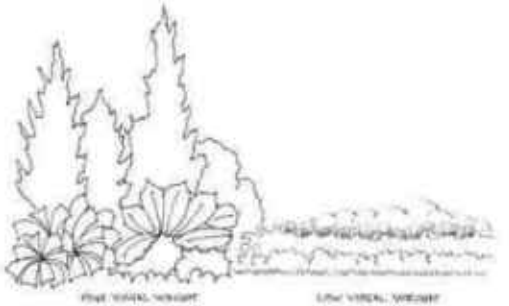

FIGURE 10. Visual weight by mass and contrast

Principles of Design

Design principles guide designers in organizing elements for a visually pleasing landscape. A harmonious composition can be achieved through the principles of proportion, order, repetition, and unity. All of the principles are related, and applying one principle helps achieve the others. Physical and psychological comfort are two important concepts in design that are achieved through use of these principles. People feel more psychologically comfortable in a landscape that has order and repetition. Organized landscapes with predictable patterns (signs of human care) are easier to "read" and tend to make people feel at ease. Psychological comfort is also affected by the sense of pleasure that a viewer perceives from a unified or harmonious landscape. Users feel more physically comfortable, function better, and feel more secure in a landscape with proportions compatible to human scale.

Proportion

Relative proportion is the size of an object in relation to other objects. Absolute proportion is the scale or size of an object. An important absolute scale in design is the human scale (size of the human body) because the size of other objects is considered relative to humans. Plant material, garden structures, and ornaments should be considered relative to human scale. Other important relative proportions include the size of the house, yard, and the area to be planted.

Proportion in plants

Proportion can be found in plant material relative to people (Figure 9), the surrounding plants, and the house. When all three are in proportion, the composition feels balanced and harmonious. A feeling of balance can also be achieved by having equal proportions of open space and planted space. Using markedly different plant sizes can help to achieve dominance (emphasis) through contrast with a large plant. Using plants that are similar in size can help to achieve rhythm through repetition of size.

Proportion in hardscape

Features are most functional for people when they fit the human body. Benches, tables, pathways, arbors, and gazebos work best when people can use them easily and feel comfortable using them (Figure 11). The hardscape should also be proportional to the house—a deck or patio should be large enough for entertaining but not so large that it doesn't fit the scale of the house.

FIGURE 11. Proportion in plants and hardscape

Proportions in voids

Human scale is also important for psychological comfort in voids or open spaces. People feel more secure in smaller open areas, such as patios and terraces. An important concept of spatial comfort is enclosure. Most people feel at ease with some sort of overhead condition (Figure 11) that implies a ceiling. The enclosure does not have to be solid; in fact, an implied enclosure, such as tree branches, serves as a good psychological enclosure that still allows light and views of the sky.

Order

Order generally refers to the spatial layout or organization of the design and is most often achieved through balance. Balance is the concept of equal visual attraction and weight, usually around a real or imaginary central axis. Form, color, size, and texture all affect balance. Balance can be symmetrical, asymmetrical, or perspective. Order can also be achieved by massing features or elements into distinct groups and arranging them around a central point.

Symmetrical balance

Symmetrical balance is achieved when the same objects (mirror images) are placed on either side of an axis. Figure 12 shows the same trees, plants, and structures on both sides of the axis. This type of balance is used in formal designs and is one of the oldest and most desired spatial organization concepts. This is because the mind naturally divides space by assuming a central axis and then seeks an even distribution of objects or mass (visual weight). Many historic gardens are organized using this concept.

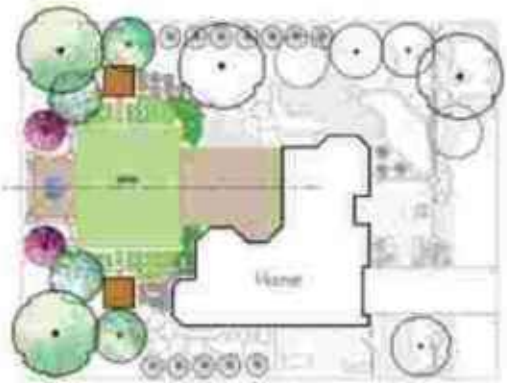

FIGURE 12. Symmetrical balance around an axis

Asymmetrical balance

Asymmetrical balance is achieved by equal visual weight of nonequivalent forms, color, or texture on either side of an axis. This type of balance is informal and is usually achieved by masses of plants that appear to be the same in visual weight rather than total mass. Figure 13 shows groupings of trees and structures that are approximately equal in visual weight on either side of the axis. The mass can be achieved by combinations of plants, structures, and garden ornaments. To create balance, features with large sizes, dense forms, bright colors, and coarse textures appear heavier and should be used sparingly, while small sizes, sparse forms, gray or subdued colors, and fine texture appear lighter and should be used in greater amounts.

FIGURE 13. Asymmetrical balance around an axis

Perspective balance

Perspective balance is concerned with the balance of the foreground, midground, and background. When looking at a composition, the objects in front usually have greater visual weight because they are closer to the viewer. This can be balanced, if desired, by using larger objects, brighter colors, or coarse texture in the background. In most cases, either the foreground or background should be dominant.

Mass collection

Mass collection is the grouping of features based on similarities and then arranging the groups around a central space or feature. A good example is the organization of plant material in masses around an open circular lawn area or an open gravel seating area.

Repetition

Repetition is created by the repeated use of elements or features to create patterns or a sequence in the landscape. Repeating line, form, color, and texture creates rhythm in the landscape. Repetition must be used with care—too much repetition can create monotony, and too little can create confusion. Simple repetition is the use of the same object in a line or the grouping of a geometric form, such as a square, in an organized pattern.

Repetition can be made more interesting by using alternation, which is a minor change in the sequence on a regular basis—for example, using a square form in a line with a circular form inserted every fifth square. Inversion is another type of alternation where selected elements are changed so the characteristics are opposite the original elements. An example might be a row of vase-shaped plants and pyramidal plants in an ordered sequence.

Gradation, which is the gradual change in certain characteristics of a feature, is another way to make repetition more interesting. An example would be the use of a square form that gradually becomes smaller or larger.

Repetition does not always create a pattern; sometimes it is simply the repeated use of the same color, texture, or form throughout the landscape. Figure 14 illustrates repetition of a square form in an entry courtyard, lawn panels, a patio, and a water feature.

FIGURE 14. Repetition of square form

Repetition in plants and hardscape

Using the same plant repeatedly in a landscape is simple repetition. A grass garden is a good example of subtle plant repetition. Gradation can be achieved with a gradual change in height or size (e.g., using small grasses in front, backed by medium grasses, and then large grasses). A more obvious gradation is plants that transition from fine to coarse texture, or from light green to dark green.

Material can be used repeatedly throughout the yard for unity, but interest can be created by slightly varying the size, texture, or color of hardscape material. Repetition and pattern can be made most obvious in the hardscape because duplication is easiest with built materials that are manufactured to exact dimensions.

Unity

Unity is achieved by linking elements and features to create a consistent character in the composition. Unity is sometimes referred to as harmony—the concept of everything fitting together. By comparison, scattered groupings of plants and unrelated garden ornaments are the opposite of unity. Unity is achieved by using dominance, interconnection, unity of three (described below), and simplicity to arrange colors, textures, and form. Although hardscapes and plants can be unified by the blending of similar characteristics, some variety is also important to create interest. The simplest way to create unity is through the use of a design theme or a design style. Design themes and styles have a well-defined set of features that have maintained their popularity over time because they are visually pleasing to many.

Unity by dominance

Dominance or emphasis is the property of a plant or object that attracts and holds attention, making the object an important feature. The ability of an object to capture attention usually depends on contrast with adjacent objects. A typical example for a garden would be a very brightly colored ceramic pot among green foliage.

Dominant features that capture attention are called focal points. Focal points are used to draw attention to a particular location, move the eye around the space, or guide circulation. Emphasis is created through contrast in size, color, form, or texture.

Plants that draw attention are often called specimen plants. These are plants with a unique form, size, or texture that stand out from the surrounding plants. Ordinary plants can also be used for emphasis by isolating the plant in a container (Figure 15) or an open space. Purposefully placing plants in this way draws attention to the plant. Specimen plants are usually used to draw attention to entrances, pathways, or statuary. Garden ornaments also work well to attract attention because they are often dramatically different from plant material. Form and color are usually the characteristics that contrast the most with plants. Sculptures, planters, and furniture have forms that are easily recognizable and distinguishable from plants.

FIGURE 15. Emphasis by isolation of plant material in a container

Unity by interconnection

Interconnection, the concept of physical linkage (touching) of various features, is present in all designs. Although all features are linked to other features, the key is to make the linkage seamless so that the features blend or fit together. Hardscape is important to interconnection because it typically serves to organize and link spaces in the garden. Continuation of a line, such as a path, the edge of a built object, or a defined edge of a plant bed, can create unity through interconnection.

Unity of three

Features that are grouped in threes, or in other groups of odd numbers, such as in groups of five or seven, feel more

balanced to the eye and give a stronger sense of unity. Odd numbers allow for staggered variations in height, such as small, medium, and large, that provide more interest. Odd numbers are often seen or perceived as a group and are not as easily split or visually divided as even numbers.

Unity by simplicity

Simplicity is the concept of reducing or eliminating nonessentials to avoid a chaotic look. This brings clarity and purpose to the design. Many designers achieve simplicity by thoughtfully removing features from a design while still preserving its integrity.

Applying the Principles and Elements of Design

While it is useful to know the elements and principles of design, it is sometimes difficult to understand how to apply them to your ideas for your yard. Each site presents challenges and opportunities for individual design and expression and requires unique application of the elements and principles. Studying how the elements and principles have been applied in an existing design that appeals to you is a good place to start. The best way to create a good design is to borrow ideas from designs that you find attractive and adapt them to your particular site conditions.

PERSONAL STYLE AND SENSE OF PLACE

To discover and identify your personal style, think about other yards or landscapes you enjoy. Observe the landscapes in your neighborhood and other neighborhoods in your community. Study those that appeal to you and note the features and types of plant material. Also try to identify the elements of design, such as color, texture, and form, and determine how line is used in the landscape. Study the view and try to determine how balance and rhythm are created. Also, look for dominance and try to figure out how unity is produced. Studying landscapes in your neighborhood and community is important because most people feel more comfortable when they "fit in" with their neighbors. There is often a strong social desire to feel like part of the community and contribute to the neighborhood fabric. The concept of fitting in is referred to as "genus loci," or having a sense of place. Sense of place also refers to the regional context—the surrounding landscapes, both natural and planned, that have an influence on the design and plant materials to be used.

Other sources of inspiration include demonstration gardens or landscapes, local botanical gardens, and displays at local nurseries. Avoid the large national chain store nurseries, as their plants are not often grown locally, and their plant selection may not be as suitable to your area. They can be good, however, for buying temporary annuals for small areas. Visit demonstration gardens and botanical gardens to look for interesting and appealing plant groupings. Note the type of microclimate for each group to determine if it will work in your yard. Because these gardens are designed for your area, you can use the exact combination of plant material, as long as it fits the sun and shade requirements. Ask about growing and maintenance requirements to determine if the plants will fit your needs. At local nurseries, you can gather and arrange several potted plants to see how they look together. Although they are small, you can still get a good idea about texture and color composition.

Another way to identify your personal style is to look through magazines and books for ideas. Study the images and note the details. What do you like about the design? Will it work in your space? You will not be able to duplicate the exact design because your site will be different in location, size, and shape, but there are often many features you can adapt to your site. Appropriate hardscape materials and plants for your region can be substituted for those in the sample design by choosing materials and plants with the same characteristics. Try to picture how the features will look in your yard and where they might be placed. Several different ideas may be knitted together to create a final design. It is important to keep in mind that the gardens and yards you see in magazines and books are chosen because they are outstanding examples, and they are typically gardens that are cared for by people with extensive gardening knowledge. Keep in mind your (or your contractor's) maintenance abilities and knowledge and adjust the design appropriately.

SITE CONDITIONS

How do you know if a design you like will work in your yard? First, compare the architectural style of the houses and try to find similarities between your house and the sample house. Study the hardscape materials in the sample design. Do the same colors and materials work with your house? If necessary, what substitutions could you use and still retain the desired look? Imagine your house with the same or similar plant materials—remember that the plants can be arranged differently to fit the dimensions of your yard. For more information on plant selection, see *Right Plant, Right Place: The Art and Science of Landscape Design – Plant Selection and Siting* (http://edis.ifas.ufl.edu/EP416).

Second, look at the shape and size of the footprint (outline) of your house in relation to your lot size and shape. For this you will need an official boundary survey that shows the exact footprint, with dimensions, and it's location within the property boundaries. This will tell you if you have room for the features you desire and where those features can be located. Pay particular attention to the shape of the spaces or voids between your house and the property lines. These are the areas where your features will be located and will help determine the potential form or shape for those

features. For example, a rectangular yard may look best with rectangular shapes in the hardscape. The shape of the house will also provide clues as to the type of shape you should use in the yard. If the house has diagonal walls or hexagon shapes, this could inspire a diagonal or hexagon shape in the landscape. Designers will often draw lines on the plan that extend from the house edges or corners to the property lines. Figure 16 illustrates lines used to delineate the shape of spaces and locate the patio and focal features. These are called regulating lines because they help regulate space and define forms that extend from the house or between the house and the property lines.

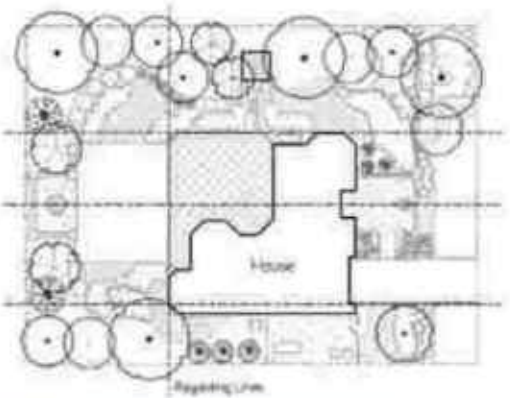

FIGURE 16. Regulating lines from house walls and doors

Third, thoroughly understand your site and how you want to use the space. Begin with a site inventory and analysis. Note all the conditions of the space and analyze how the conditions might affect your design. Each condition can be seen as an opportunity—a positive condition that will help achieve your design—or a constraint—a negative condition that might impact your design, but could possibly be turned into an opportunity. Examples of opportunities and/or constraints include land forms, such as slopes and flat areas, and natural features, such as trees and rocks, or built features, such as swimming pools and fences. Depending on the desired design, each could present an opportunity or a constraint.

LOCATING FEATURES AND DEFINING OUTDOOR ROOMS

Once you have determined the architectural style, the shape of the yard spaces, and the opportunities of your site, you can begin to locate the features and give them form. Most features will have a logical location based on the use or type of feature and the site opportunities. The yard is typically considered an extension of the house, and it makes sense to locate the most heavily used features of the yard close to backdoor entrance. For example, the outdoor dining/seating area (patio or deck) is typically located adjacent to the house for convenience and physical comfort. Other features, such as dog runs and vegetable gardens, are often located on the side of the house to hide them from view, and play or recreation areas are often located in full view of the kitchen or family rooms so that parents can watch children at play.

Spatially dividing a yard into separate uses is often referred to as creating outdoor rooms (Figure 17) and is a fundamental concept of outdoor design. Logical arrangement of the "rooms" creates a functional and aesthetically pleasing landscape. Spaces can be delineated through the use of different materials, such as the edge of a stone patio against a lawn panel; through a change in elevation (steps); through the use of a form, such as a square lawn panel; through the use of a feature, such as a low garden wall or small trees; or through the use of plants to create implied walls and ceilings. The elements and principles of design are particularly useful when creating rooms because they help to define spaces, add interest, and create a unified, functional, and aesthetically pleasing landscape.

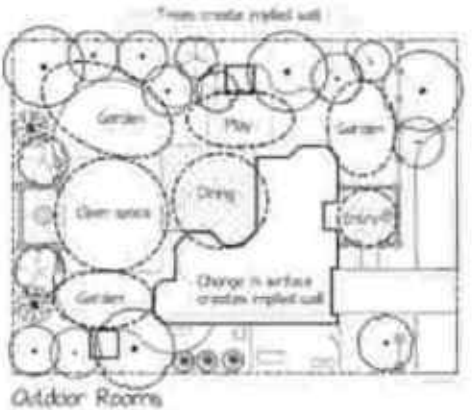

FIGURE 17. Outdoor rooms for separate uses

Color and texture can also be used to differentiate spaces by making each area visually unique or distinct. The hierarchy of spaces or rooms can also be delineated through the use of visual weight. Areas of high importance can include features and elements that give them high visual weight and attract attention. Scale and proportion are also useful principles for spatial organization and hierarchy. A space with a distinctly different size relative to the other spaces tends to assume more importance because of the contrast. Scale is also very important in determining the type of features that can be used in the landscape; different uses require different square footage to be functional. For example, features such as swimming pools, dog runs, and

vegetable gardens have a minimum required size, and a patio has a minimum size depending on the number of people expected to use the patio at one time.

Spaces can be connected through the use of lines, such as pathways, or they can be visually connected through the use of emphasis (focal points) that captures attention and leads the eye, or through repetition of elements that connects spaces through similar objects. Another important concept of outdoor design is direction or physical movement within a space. Movement or circulation can be controlled through the use of different materials, spatial organization, focal points, and intentional marking of pathways. Using all of the elements and principles will tie the entire landscape together in a unified, functional manner.

Summary

The fundamental concept of landscape design is problem solving through the use of horticultural science, artful composition, and spatial organization to create attractive and functional outdoor "rooms" for different uses. The elements (visual qualities)—line, form, texture, color, and visual weight, and principles (guidelines) —proportion, order, repetition, and unity of design are used to create spaces, connect them, and make them visually pleasing to the eye.

A previous version of this publication by Dewayne L. Ingram has been permanently archived. Please visit http://www.uflib.ufl.edu/ufdc/?b=IR00000113&v=00001 to view the archival copy.

ORGANIZATION OF SPACES AND CIRCULATION

UNIT-4

Compiled by: Ar Mythili Madhusudhan, Professor, SOA MCE

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Space within a Space

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Interlocking Spaces

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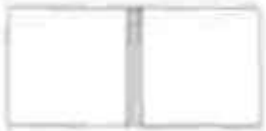

Adjacent Spaces

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Spaces Linked by a Common Space

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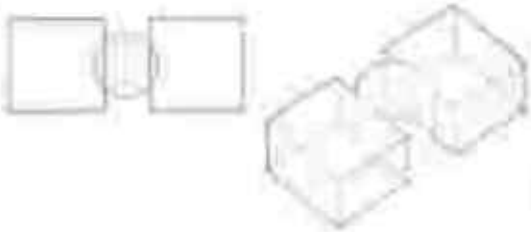


Centralized Organization

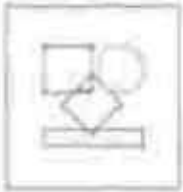
A central, dominant space around which a number of secondary spaces are grouped.

Linear Organization

A linear sequence of repetitive spaces.

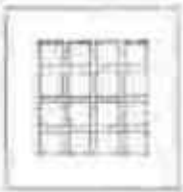
Radial Organization

A central space from which linear organizations of space extend in a radial manner.



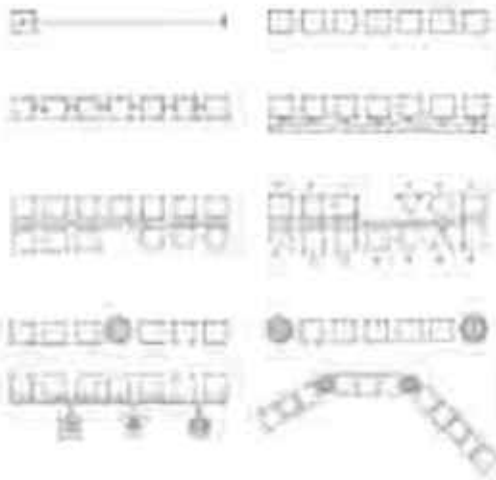
Clustered Organization

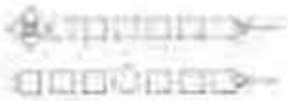
Spaces grouped by proximity or the sharing of a common visual bond or relationship.

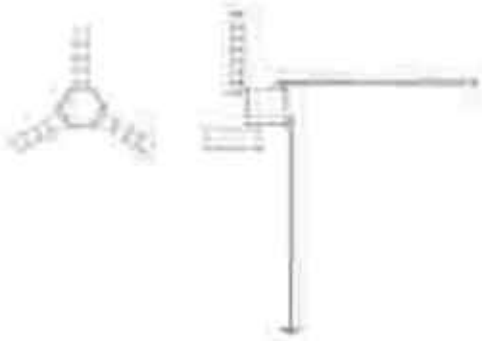


Grid Organization

Spaces organized within the field of a structural grid or other three-dimensional framework.







1. Linear

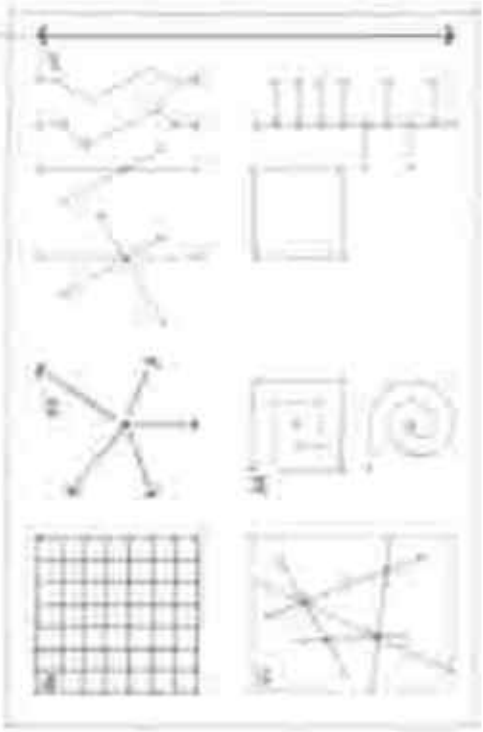
2. Radial

3. Spiral

4. Grid

5. Meandering

6. Composite



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Parks & Open Spaces

STRATEGIES FOR PLAY

Next to streets, public spaces like neighbourhood parks and playgrounds are important elements of daily urban life for ITCs. While streets are primarily used for movement and for connecting, the open spaces of the neighbourhoods are the destinations and used primarily for recreation.

Toddlers need a safe outdoor space for play. Babies and caregivers need fresh air and the stimulation of plants, trees, wind, and connection to the natural. Playing is a prime activity for small children. For the 0-5 age group especially, playing is a way to have fun, to socialize but also to learn. A big portion of this valuable playing time happens in designed playgrounds, where the playing environment is designed especially for playing. Small tot-lots, playgrounds in parks, squares or green areas, are all examples of designated play areas for children. If a city invests in better quality play areas for children, it also invests in creating better citizens for tomorrow.

Outdoor play gives children physical exercise, closer contact with nature and a means of socializing with their peers. However, playing outdoors can also be dangerous and unhealthy, due to bad design choices and poor planning. But this should not be a reason for children to spend less time outdoors. This is all the more reason why designing play areas for children requires special consideration.

TYPE OF OPEN SPACES

According to the present guidelines, the open spaces in a neighbourhood have been segregated into majorly three categories.

This has been done on the basis of the minimum area each of these spaces require, the minimum distance from a residential zone and density required as per the population present in the neighbourhood.

Tot-lots being the smallest require a minimum of 125sqmt. Whereas, a housing area park and a neighbourhood park require 5,000sqmt and 10,000sqmt respectively. The average per capita open space stands at 3sqmt as per norms. [12]

12 Open Spaces, Page 362-63, URDPFI Guidelines 2014, Ministry of Urban Development

NEIGHBOURHOOD PARK (A)
Jalandhar

HOUSING GARDENS/ NEIGHBOURHOOD PARKS

Neighbourhood parks/ Housing Area parks are the main recreation spaces for children in the age group of 3-5 and beyond. These parks serve in strengthening social ties in a neighbourhood and create more coherent societies. They can offer an excellent form of recreation and bring children closer to nature.

The URDPFI norms suggest placing three housing area parks that are 5000sqm in size in a neighbourhood. These can, however, be smaller, starting at 2500sqm and more in number so that the access to these parks is increased. Similarly, one neighbourhood park of 10,000sqm is suggested. However, as per international standards, two such parks can be provided. (page 19)

POCKET GREENS

In neighbourhoods where there is no space to add parks and public gardens due to lack of open space, some form of green can still be added in very small pockets. These small 'pockets' when viewed together, can make a visible different to the streetscape and soften the hard surfaces of the street. These 'pockets' can take on different forms, such as a green façade, small planters positioned in the pavement area or even turning a neglected car parking space into a greener area. Although individually small, together these pockets of green can have an impact and help to improve the air quality of a neighbourhood and contribute to the mitigation of the heat island effect of paved areas. This in turn will improve the environment for small children and their minders.

Small spaces can be converted to green areas

TOT-LOTS

Small children in the 0-5 age group do not need large areas for play. Instead, they need many smaller areas, near their home. The guidelines for the density and proximity of tot-lots (page 19) suggest placing at least 6 to 15 such spaces in a neighbourhood of fifteen thousand people; within 300 metres of most residential homes. Additionally, the size of tot-lots can vary between 50 to 125sqm.

Keep the following in mind:

- Have at least three different play objects in the tot-lot.
- Choose play objects specially designed for the youngest children.
- A low fence around a tot lot is sufficient to confine children to the tot-lot. Caregivers relax better if they do not have to keep a constant eye on the toddlers.
- Try to create tot lots where there are existing trees, or plant trees at the tot-lot.
- Place tot-lots along routes that are frequently used by ITC's. For example the route to the shops, or on the way to a health centre.
- Consider how caregivers will wait while the children are playing. Place a bench, or design a planter with a wide edge, or design a bench with the fence, etc.

Children skate under Matunga Flyover, Mumbai

USE OF SEMI-PRIVATE SPACES & URBAN LEFTOVERS

In neighbourhoods one often comes across small underutilized spaces in the public realm. These are 'left over' spaces, unbuilt because they have an awkward shape, or not used for car parking because they do not have the correct dimensions. These areas may-be found next to building entrances, besides parking zones, or may be a forgotten and neglected pocket of green. Toddlers do not need large playgrounds, and it is often possible to transform these small 'left-over' spaces into a play area for children in the 0 – 5 age group.

Scrutinize the neighbourhood for the following types of spaces to transform:

- Are there any underutilized areas in the neighbourhood, no matter how small?
- Are there any areas with forgotten parking spaces, that are seldom used?
- Are there any neglected planted areas, that could better be transformed into a small neighbourhood play area?

GUIDELINES FOR PARK AND OPEN SPACES

There are many elements that need to come together to make open spaces that are welcoming, safe and inclusive of young children and their caregivers. These have been sub-divided on the basis of the five objectives for a healthy ITC neighbourhood.

PARKS AND OPEN SPACES	
Safe Open Spaces	• Ligibility and sightlines • Lighting • Fencing/ Permable Perimeter • Camera Monitoring
Green Open Spaces	• Green/ Planting • Shading & Cooling Elements • Natural Play Elements
Accessible & Playful Open Spaces	• Furniture for ITC • Play Equipment • Entrances & Ramps for ITC • Art • Amount & Combinations of Uses/Activities
Inclusive Open Spaces	• Toilets & Drinking Water • Lactation Booths

SAFE OPEN SPACES

The design of a park can have a direct impact on a caregiver's perception of its safety and their willingness to use the space. If parents or caregivers know that their children are safe within the boundaries of a play area, they will relax more and be less stressed. Safety in parks needs to consider its overall layout, clear sightlines, passive and active surveillance, permable boundaries and a clear signage and lighting system. [12]

[12] https://www.pps.org/article/what-role-can-design-play-in-creating-safer-parks

Lighting in Walthamstow Town Centre, London, UK. Landscape and Lighting by BDP

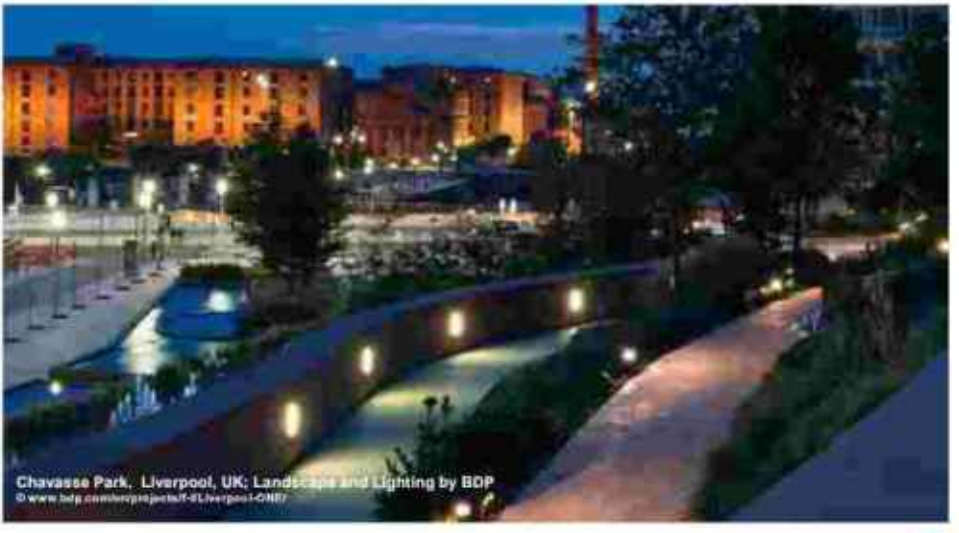
LEGIBILITY AND SIGHTLINES

The 'eyes on the street' approach towards planning parks is important. This ensures that parks and open spaces are overlooked by active facades, and hence informal surveillance. In bigger parks, and those with a diverse landscape of trees, shrub thickets etc, it will be difficult to achieve natural surveillance everywhere.

The layout of the park should then be clearly understandable to a first time user. Visibility and clear sightlines are an important factor in enhancing the perception of safety. Creating this sense of open-ness in parks needs to be balanced with the desire to create a diverse and natural landscape.

Take the following into account for a legibile park:

- Entrances and exits should be easy to locate for a first time user, and especially for a caregiver with young children.
- Have pathways connect with destinations, and well sign-posted.
- Locate active areas such as playing fields within a park such that there is clear visibility between them to encourage surveillance.
- Make sure that there are no solid walls, planting edges along main routes that obstruct sightlines



Chavasse Park, Liverpool, UK; Landscape and Lighting by BDP
© www.bdp.com/en/projects/f-t/Liverpool-ONE/

LIGHTING AND SIGNAGE

Good lighting in a park provides a caregiver with a good overview of the situation by emphasizing paths, focal points, entrance and exits and gathering places. Lighting and signage sytems can be coordinated to provide a sense of order and clarity in a park.

Take the following into account for a well-lit park:

- Establish a hierarchy of lighting types and intensities in a parks layout. The main activity areas and routes should be the first priority.
- Cluster night time activities in parks such that they are connected by a well illuminated routes
- Provide lighting at the perimeter to complement street lighting and ensure that the park is inviting to enter from the street.
- Choose a lighting type to reflect the use of the public realm being lit: High unadorned lights to shine onto grassed surfaces, and lower, attractive armatures to light footpaths and pavements.
- Add low level lighting where the paving is uneven, or where there are steps to better illuminate these obstacles.
- Place lighting elements for pavement areas at frequent intervals. As a general rule of thumb, at least every 20 meters.
- Ideally the lighting level along the whole length of the pavement area should be constant.
- Consider the position lighting elements relative to the position of trees and other plants. Make sure that branches do not obstruct any light.
- Ensure that play areas are well lit. Also lighting levels should not cause excessive glare.
- Always keep in mind that, apart from safety, lighting can give added value to a place in many and creative ways.
- Locate signage at key entry points and activity areas. Ensure that signage is positive, informational and well lit.

Fencing in Walthamstow Town Centre, London, UK. Landscape and Lighting by BDP

FENCING/ PERMEABLE PERIMETER

Fencing around a playground or play area is required for a variety of reasons. If the perimtere of the park is permable and inviting from the street, people will be more inclined to enter it. Also fencing as a safety measure, will prevent children from accidentally running out onto oncoming traffic and wandering off. A fenced playground may be closed and locked at night, to deter, if not prevent vandalism.

When designing fencing around play areas, keep the following in mind:

- Fencing does not necessarily mean using of actual fences. Depending on the needs of a public space, fencing can be achieved with the use of hedges or plants in general, other objects and street furniture or simple ground demarcation.
- Consider where most pedestrians will be coming from and how they will arrive at the playground.
- Position gates and entrances accordingly.
- Carefully consider how high the fence needs to be. A fence with the main purpose of keeping stray animals out or prevent small children from accidentally wandering off, can be kept low. A fence around a field where ball games are played needs to be extra high.
- Keep fencing permeable, with frequent openings every 50-80 metres.
- Make entrances welcoming and with large dimensions. Caregivers carrying small children or pushing a pram need gates that are fairly wide to pass through.
- Consider the fence as an attractive object. It can add value to a space, by doubling up as a trellis plants, having benches incorporated in the fence, or having an attractive pattern.
- Fences can also be seen as a field for the development of creativity; other uses can be combined with fences like playing and climbing for children, or combined with street art.

SURVEILLANCE

In parks, having a camera monitoring system can makes parents feel safer, because they have the perception that some-one is keeping an eye on activities on the play space.

At the same time cameras also act as a deterrent for criminals simply by the mere existence of the camera monitoring system.

The presence of parks staff, gardeners, or regular patrols will also provide a sense that help is available is needed.

Consider placing cameras at the following areas:

- In corners of the public realm obstructed from views from overlooking windows.
- Use cameras that are vandal-proof.
- Place cameras in high positions, where they give a good overview of the space and are not easily reached.

Child running in a green park in New Delhi

GREEN OPEN SPACES

Increased contact with nature has benefits that impact the child's overall development.[14,15] Similarly for caregivers, access to a green space will have a direct bearing on their mental health.[16] A study by Finnish researchers showed that even a ten minute visit to an urban park or woodland significantly improved stress indicators. Parks and open spaces should have a diverse landscape and varied vegetation, natural groundcover, shading and natural play materials.

GREEN/ PLANTING

Plants and trees provide shelter from the sun, mitigate the effects of heat stress and they clean the air. The Indian climate supports planting in urban areas. The challenge can be to find creative ways to incorporate more plants and trees in our cities and in an efficient way such that young children come into close contact with them while being safe from other dangers, so that they can explore freely.

A concern to improve safety in parks can sometimes result in a sterile landscape, which will more likely result in less frequent use of the park. It is important that parks have a diverse and visually rich mix of landscape elements that are balanced throughout the various seasons.

Consider the following when adding green to neighbourhoods:

- Choose planting and green elements with a range of colour, texture, shape and use.
- Consider that the open space should be interesting to visit at different times of the day and the year.
- Look at all scales of planting, from avenues of trees, large beds with flowers to shrub thickets
- Choose indigenous plants, that suit the climatic conditions of the area
- Plan for the future: consider how much space fully developed trees and plants will need above and below ground and plan accordingly.

14 Childhood development and Access to nature https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3162362/
15 The importance of outdoor play for young children's healthy development https://www.sciencedirect.com/science/article/pii/S2444866416301234
16 The influence of urbangreen environment on stress relief measures https://www.sciencedirect.com/science/article/abs/pii/S0272494413000959

Shade Structures in Yagan Square, Perth

SHADING & COOLING ELEMENTS

A well-used open space provides a comfortable environment year round to its users. In India, this often means protection from extreme heat, for most parts of the year.

A caregiver is less likely to bring a young child to a park, if he/she does not have a shaded and comfortable spot to rest whilst children play. Providing shade in outdoor play areas is crucial for small children and their minders.

Shade structures can be provided over seating areas, protect playground equipment and allow visitors to spend more time at parks.

Consider the following shading elements:

- Ideal shading is natural shading, where possible: use trees, bushes and climbers.
- Besides built canopies, consider trellises overgrown with climbing plants. These provide shade while also having a cooling factor.
- Provide shaded spots where caregivers need to wait and have good sightlines of play areas.
- Consider providing shading over play areas and play equipment as well to ensure that children are cool and comfortable during the hot months.

Logs become natural climbing elements at Mountsfield Park, London, UK, Landscape by BDP ©bdp.com

Children love playing with soil and water ©

NATURAL PLAY ELEMENTS

Children have an unlimited imagination and they never miss a chance to use it, especially when they are playing. Apart from the pre-designed play devices that children love playing with, less defined objects offer countless possibilities of play.

Natural playing objects are open ended materials. A stick can be used to darw patterns on the ground or become a boat in a puddle. "In this process of reinvention and assigning new meaning to objects, it is possible to mobilize skills related to divergent thinking, creativity, problem solving, among others."[17]

Natural materials are eco-friendly, cheap, easy-to-find and they can offer children a unique experience: to get contact with nature and the materialization natural objects have: textures, smells, properties and colors. Contact with such elements can also stimulate their learning ability in a very creative way, whilst also developing a sensibility towards nature from a young age.

Think of the following:

- There is an abundance of such, simple, materials in low prices: water, sand, tree branches and trunks, stones and pebbles, different plants or insects and way more.
- Be sure that the used materials are clean and non-allergenic
- Keep in mind that natural materials are maintained under different conditions compared to artificial materials.
- Be sure of safety regulations.

17 The importance of outdoor play for young children's healthy development https://www.sciencedirect.com/science/article/pii/S2444868416301234

ACCESSIBLE AND PLAYFUL OPEN SPACES

Making sure that open spaces are accessible to infants, toddler and their caregivers needs to be given special concern. This includes measures such as age specific play equipment, resting facilities, inclination ramps for strollers and safety from stray animals. Similarly, playing facilities need to be age specific and allow adventurous and sensory play for a child's overall development, accessible for all children, including those with disabilities.


Adventurous Play equipment Mountfield Park, London, UK, Landscape by BDP

PLAY EQUIPMENT

Indian playgrounds are still dominated by manufactured steel or plastic equipment, that consists of the standard suite of slides, see-saws, swings and monkey bars. These have limited repeat play value for a young child.

It is important to consider other equipment that promotes adventurous and sensory play. Besides the use of natural play elements, other objects such as balance beams, vine walks, playhouses, treehouses, use of sound enabling objects can be considered.

Another point to consider is to allow risk-taking opportunities in children's play. Parent's risk-averse approach towards play has resulted in boring playgrounds.[18] Allow children to run around, climb, make and discover.

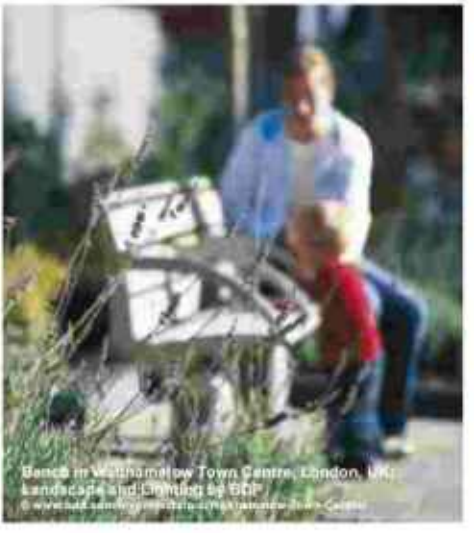
Kilburn Grange Park- Erect Architecture [19]

The playpark is an adventure playground that consists od new topographies, and climbing structures designed around the theme of playing in and around trees.

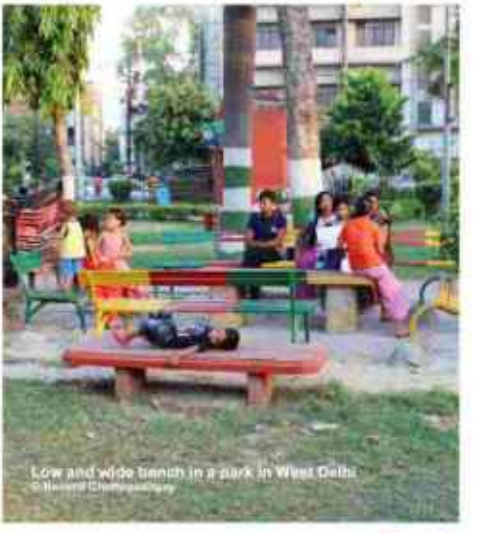
Think of the Following:

- Combine playing objects with the adequate floor covering: soft, elastic, artificial rubber, sand or cork etc.
- Carefully check safety regulations
- Introduce equipment that promotes adventurous and sensory play.
- Always combine a minimum of 3 playing objects for a successful playground.

18 Risky Play: Losing a Childhood "right" of passage https://www.childrenandnature.org/2018/04/05/risky-play-losing-a-childhood-right-of-passage-and-a-tool-to-help-protect-that-right/
19 http://erectarchitecture.co.uk/projects/play/141-p-kilburn-grange-park-play.html



Bench in Walthamstow Town Centre, London, UK; landscape and planting by BDP



Low and wide bench in a park in West Delhi

BENCH TYPES

Well chosen and well design resting equipemnt can extend the time spent in a space.

Resting equipment for caregivers needs to provide a comfortable space where they can sit and watch their children play. Also, parks are an ideal place for caregivers to meet other adults. Grouping benches together make it possible for relaxation and socialising.

Small children need more downtime than bigger children and would want to rest between playing. Consider benches that are low in height for toddlers to crawl onto, wide for a young child to lie down on and safe.

Vandalised and broken furniture make a park or open space feel neglected. Choose robust, vandal proof furniture and furniture that is easy to maintain.

Caregivers and small children spend longer time in a park than along a street. They may become thirsty or hungary. Consider where and how a drink or a snack may be eaten in the open space.

A few suggestions for seating are:

- Group benches together, so that care givers can socialise
- Position benches so that they give a clear view of the area where small children will be plaing.
- Choose benches that can be used by both caregivers and small children.
- Consider the material of the furniture. Concrete and steel benches absorb heat and can be uncomfortable to sit on in the summer. Wood stays cooler.
- Besides benches, consider how a drink or a snack can be given at the playground. Place an element with a flat top close to the benches.
- Place litterbins close to benches.
- Provide shade over benches.

A combination of steps and inclination ramps at Tres Aguas, Madrid. Landscape by BDP.

ENTRANCES & RAMPS FOR ITC

Open spaces need to consider that young children, either independently or with their caregivers in strollers, have limited accessibility. Narrow entrances, a level difference such as a 10cm high kerb, steps are all obstacles for a small child and for a caregiver with a stroller.

Consider the following:

- Entrances should have at least a clear 1.8m passage to allow a person with stroller move easily.
- Kerbs should be inclined wherever there is a designated entrance to the park to ensure a safe and easy access.
- Ramps are necessary where there are larger level differences from the access streets, to ensure easy passage for all children, wheelchair-users, caregivers with buggies
- The entrances should directly connect to a continuous dedicated stroller-friendly walkway inside the park.

Giant ant is both public art, and play

PUBLIC ART

There is a natural synergy between combining Public art with play spaces. Artwork can give identity to a playground, and make it a destination. Children naturally engage with art and works of art can stimulate young children's imagination. Public art can be combined with play as an interactive element, or also as individual art works/elements integrated with the play spaces. Sometimes park spaces are fronted with dead walls, which could be an excellent canvas for young children to paint on, or engage. Or litter bins and toilet walls could be painted on. Engaging children and their caregivers in co-creating art can have a powerful impact.

Consider the following:

- Use bright colors, that stimulate children
- Think about what the artwork looks like, from a children's eye level
- Depict scenes that relate to and interest small children, such as animals or everyday activities.
- Consider how children can learn through the artwork; add numbers to the work, use distinct shapes.
- Engage caregivers and children when designing street art.

Slimey at Commercial Club Park Chicago ©Chicago Public Art Group

Painting bins in Lodhi Park, Delhi St Art with NDMC in 2013

AMOUNT & COMBINATIONS OF USES/ACTIVITIES

The design of a successful public space is more than just choosing play objects from a catalogue. Thinking how space will be used and designing the space to accommodate those uses, should be the main objective of designers.

Children of different age groups will use neighbourhood play areas. Games and play objects should be chosen that serve the need of different age groups.

How the space of a playground is allocated between different users should also be considered, as small children could interfere with the games and irritate older children. Only a good mix of activities and a careful allocation of the space can guarantee a successful public space, to be used by all.

Consider the following when designing combinations of activates in playgrounds:

- Consider that children of different age groups will be using a playground. Choose play objects that suit the needs for a diverse age group.
- As a rule of thumb, at least three different play objects are required for each playground.
- Provide seating for caregivers that allow supervision, but is still far away enough for children to feel free.
- A cafeteria next to the play area is a positive addition and provides space for caregivers to relax and meet with other adults while also keeping an eye on the children.
- Design for flexible use: ensure that a part of a playground is also free of objects, leaving space for a ball game, skipping, hop-scotch, a picnic, etc. This will maximize the use of the space.

AMOUNT AND COMBINATIONS OF USES/ACTIVITIES

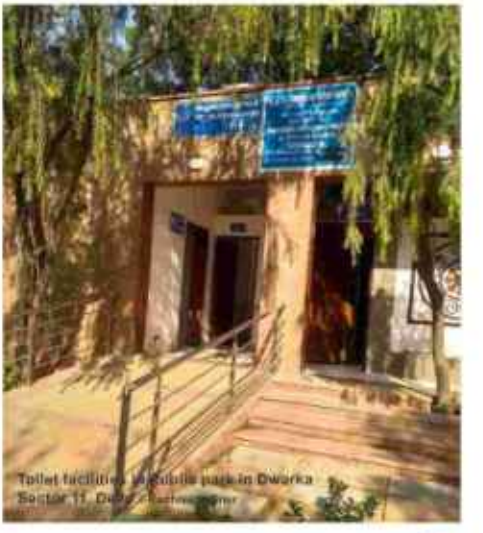
Jake's Place, Cherry Hill, NJ, USA

Jake's Place in Cherry Hill, New Jersey is an all-inclusive and accessible playground for children of all abilities. The playground has:

- A cushioned, synthetic surface that accommodates wheelchairs and other assistive devices
- Wide ramps for easy wheelchair access throughout the playground
- Various types of bridges, balance beam and stepping circles to work on coordination and balance skills
- Various sensory & tactile play activities for learning
- Specialized areas for people with Autism
- Swings with molded bucket seats
- A wheelchair-accessible glider
- Rock walls and various climber equipment
- Various freestanding play areas throughout the playground
- Shaded areas, picnic tables, & plenty of seating, and restrooms
- A security fence around the perimeter of the playground

INCLUSIVE OPEN SPACES

Inclusive spaces are important to make sure that parks and open spaces serve everyone in a neighbourhood equally. An inclusive space is thoroughly and consistently supportive of everyone who uses it. Facilities such as drinking water, toilets, lactation pods should be provided in parks to ensure that ITC needs are catered for. Inclusive parks should cater to children of all abilities and social classes. (see case study on the left)


Toilet facilities in a public park in Dwarka Sector 11, Delhi

TOILETS AND DRINKING WATER

ITCs are especially vulnerable to the lack of toilet facilities in and around parks, where they spend a subsequent amount of their time in a day.

Free water sources in public spaces, historically provided by philanthropists or cities themselves, were one of the major progressive steps forward for civilization.[20]

Young children and toddlers frequently require fresh drinking water while they are engaged in high-energy activities in the park. And along with them, their caregivers as well. Thus, it is necessary to have fresh drinking water sources in all parks, which can also be independently accessed by children.


Girl drinking water from a fountain
© Shutterstock

Consider the following :

- Ramp access to toilets with min. 1.8m width;
- Provision of handrails, hoists;
- Toilets as safe and convenient ITC friendly amenity;
- Drinking water facility easily accessible by kids;
- Stroller-friendly walkway access to drinking water taps
- Maintenance of both these facilities is as important as installing them. Provision of toilets should only be undertaken if there is a clear programme for maintenance; otherwise the facility will seek to drive away people, rather than attract.

20 http://www.ideas.swagroup.com/the-importance-of-drinking-fountains/

Lactation Booth in San Jose, Costa Rica
© Municipalidad de San Jose

LACTATION BOOTHS

Lactation booths or pods are an integral part of a child-friendly neighbourhood. Breastfeeding is associated with everything from better resistance to disease to the healthier bodyweight of the infant. With cities worldwide integrating lactation stations or booths in their neighbourhood design, it is necessary to keep in mind some of the most important aspects for booth setup.

Consider the following :

- The space should be fitted with comfortable seats, washing facilities;
- The space should be homey and not shabbily put up;
- The space should be checked routinely for cleanliness;
- The room should be dimly lit and quiet;
- The access to the space should be stroller-friendly and the room should have sufficient area to accommodate a stroller;
- Availability of a change table or a diaper deck is necessary;
- Ideally, should overlook a tot-lot.

HOW TO APPROACH THE DESIGN OF PARKS AND OPEN SPACES

Similar to streets, the components toolkit can be very useful when designing parks and open spaces. However, it is important to carefully consider the effect that a combination of the several tools will have. To illustrate the use of the components, examples of how they can be applied are given here.

In the examples, the inter-relationship between the components become clearer and the relevance in the current urban scenario more meaningful.

The ITC destinations are a network of daily mobility chains which connect a parent or a caregiver to its surroundings. Apart from babies homes, destinations may also be open spaces, health facilities, education areas and community utilities. These spaces too need to create an ITC friendly atmosphere for a far-reaching impact in the neighbourhood.

In applying the components to the ITC destinations, the following has been assumed:

- The distance covered by an ITC in within a certain timeframe is less than an adult would cover in the same time.
- Spaces need to be defined for different age groups. This ensures that the specific requirements of the younger / early childhood group are met
- Parent and caregiver interaction space needs to be created to support communication and encourage contact between them.


Children play with musical installations by ar
Jim Brenner in Mt Greenwood Park, Chicago
© Chicago Public Art Group


Picnic in Public Park in Dwarka, New
Delhi © Rachna Mehta


Children love Greenery
© Rachna Mehta

TOT-LOT

Figure 21: Model Tot-Lot

Size - **50sqm - 125sqm**
Distance - **@ 300m**
Density - **6 to 15 nos. every neighbourhood; total 750sqm minimum**
Guidelines/Standards - **Existing URDPFI standard of 20nos. tot lots for 5000 population**

Must have:
- Accessible footpaths
- Natural ground
- Soft surface play area
- Resting equipment
- Shade
- Fencing
- Green/ planting area

Should have:
- Play equipment
- Lighting

Good to have:
- Visually porous fencing
- Special play equipment
- Plants
- Toilets
- Lactation Booth


Tarr Coyne Tot Lot, NY, USA

PLAYGROUND

Figure 22: Model Playground

Size - **4500-6000sqm**
Distance - **@ 200-300m**
Density - **3-6 nos. every neighbourhood**
Guidelines/Standards - **Exisitng standard is 1 No. 10,000sqm. The Dutch standard is min 300sqm**

Must have:

Delineated areas for younger age group
Resting equipment
Play equipment
Lighting

Should have:

Toilets
Lactation Booth

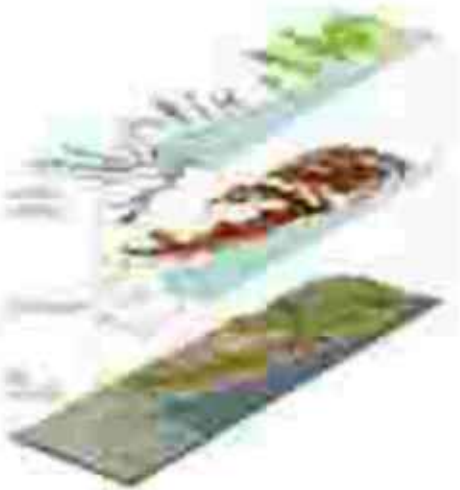
Good to have:

Multi-functinal space
Fencing


Playground in Strathcona, Canada

UNIT IV

COMPILED BY MYTHILI MADHUSUDHAN




Site Analysis

Site Evaluation Checklist

Floyd Dissemination Website, ed. n.

This is a checklist of the factors that may be assessed in evaluating a site. Although [leading this] is not all-inclusive, site factors are added from time to time. Information is usually collected only for those factors that are pertinent for the project.

PHYSICAL FACTORS

Climate

A. Prevailing winds
   1. Direction
   2. Maximum, minimum, and average velocities
   3. Special forces (e.g., tornadoes, hurricanes)

B. Solar orientation
   1. Sun angles
   2. Days of sunlight
   3. Obstructions
   4. Shading of the most adjacent structures, natural features, and vegetation

C. Temperature
   1. Ranges of variation
   2. Maximums and minimums

D. Humidity
   1. Ranges of variation
   2. Maximums and minimums

E. Precipitation
   1. Mean (annual/daily)
   2. Annual and seasonal totals

Topography

A. Legal property descriptions, including limits of property, easements, rights of way, and water boundaries

B. Topographic maps and aerial photos
   1. Contours and spot elevations
   2. Bearings, azimuths, metes, coordinates
   3. Scale(s)
   4. Benchmarks
   5. Extent, location, and general configuration of roads, bridges, railroads, ridges, drainage lines, and other natural features
   6. Aerial photographs
   7. Historical profiles or engineering cross-sections (flooding, erosion, etc.)

C. Analysis of physical features, including slope, land and drainage, aerial and cross-sectional profiles, area, and soil characteristics

D. Existing access and circulation
   1. Vehicular
   2. Pedestrian

E. Easements

F. Existing lower limits
   1. Location, size, depth, direction of flow
   2. Water quality
      (Note: sufficient inspection conditions, etc.)
   3. Use, seasonal, environmental
   4. Significant ecological features
   5. Invasive species (weed, exotic, etc.), wetlands, etc.
   6. Coastal features

G. Drainage system (ditches, streams, riverbed, lakes, ponds, etc.)
   1. Natural and built
   2. Alignments and gradients
   3. Patterns and divisions

H. Existing watershed characteristics
   1. Surface
   2. Subsurface

I. Surface drainage
   1. Rainfall/run-off characteristics
      (location of wetlands and aquifers)
   2. Assessing of floodplains
      a. Maximum flood levels
      b. Frequently flooded areas
   3. Local detention areas, amount of runoff collected, and location of outfalls
   4. Overlay and compare areas of soil and erosion, positive drainage, and other obstacles that may interrupt or obstruct natural surface drainage
   5. Proposed areas for impoundment, detention/retention ponds

J. Ground water features

Geotechnical Data

A. Bearing surface soil types: sand, clay, silt, rock, shale, gravel, loam, foundation, etc.

B. Rock and soil type: character, formation and origin
   1. Geologic formations present and extent of
   2. Orientation
   3. Bearing capacity

C. Subsoil
   1. Depth to bedrock
   2. Bedrock classification

D. Seismic conditions

E. Environmental hazards

Utilities

A. Potable water

B. Electricity

C. Gas

D. Telephone

E. Cable television

F. Sanitary sewer service

G. Storm drainage (surface, subsurface)

H. Fire protection

Associated Surroundings

A. Neighborhood (features, buildings, vehicle lanes, etc.)

B. Building and site scale

C. Views from streets, pedestrian ways, parks, etc.

D. Noise

E. Views and vistas

Practice in Transition

General Service

A. Fire and police protection

B. Transit/mass transport service

C. Snow removal, including on-site storage

CULTURAL FACTORS

Site History

A. Former use and
   1. Historical/cultural designs
   2. Land
   3. Old foundations
   4. Archaeological grounds

B. History of existing structures
   1. Historic value
   2. Utilization
   3. Ownership
   4. Location
   5. Construction
   6. Type
   7. Condition
   8. Use in present

Land Use, Ownership, and Control

A. Present zoning of site and adjacent property

B. Adjacent (environmental) land uses
   1. Present
   2. Proposed
   3. Probable effects on the development of the site

C. Type of land ownership

D. Patterns and policies of land use, public services, form (type, grading, ordinances)
   1. Present
   2. Trends

E. Location, type, and size of adjacent community services
   1. Schools and churches
   2. Shopping centers
   3. Parks
   4. Municipal services
   5. Recreational facilities
   6. Banks
   7. Retail services
   8. Health services
   9. Access to highways and transportation

Economic Data

A. Political jurisdictions and taxing bases

B. Economic "service area"

C. Future potential

D. Factors surrounding site and approximate price ranges

REGULATORY FACTORS

Zoning Codes

A. Restricted uses
   1. By ordinance
   2. By special use permits
   3. Guidelines and other

B. Minimum site area requirements

C. Building height limits

D. Yard (setback) requirements

E. FAR coverage
   1. Floor area ratio (FAR)
   2. Percentage of coverage
   3. Open space requirements

F. Off-street parking requirements

G. Landscaping requirements

H. Sign requirements

Subdivision, Site Plan Review, and Other Local Requirements

A. Lot requirements
   1. Area
   2. Configuration
   3. Setbacks and coverage

B. Street requirements
   1. Widths
   2. Grades, profile, curves
   3. Curbs and curb cuts
   4. Road construction standards
   5. Placement of utilities
   6. Dead-end streets
   7. Intersection convexity
   8. Sidewalks
   9. Curbs

C. Drainage requirements
   1. Retention of existing and surface water
   2. Storm sewers
   3. Flood subject to flooding
   4. Detention/retention ponds

D. Parks
   1. Open space requirements
   2. Park and playground requirements
   3. Screening from adjacent uses

Environmental Regulations

A. Water, sewer, recycling, solid waste disposal

B. Clean air requirements

C. Soil contamination

D. Protected areas, wetlands, floodplains, coastal zones, cold and warm areas

E. Fish and wildlife protection

F. Protection of archaeological resources

Other Codes and Requirements

A. Historic preservation and landmarks

B. Archaeological (design) controls

C. Special districts

D. Miscellaneous, e.g., scenic routes, billboards, noise

E. Site-related taxes or licensing codes
   1. Building permit
   2. Parking and access for persons with disabilities
   3. Service and emergency vehicle access and opening

What are the different levels of open spaces to be provided as per regulations and discuss their components in detail.

- **Local or Small Local Open space** serving a local catchment such that users are within safe walking distance. This could be in the range of 150m or 300m, depending on the population density and presence of barriers, etc. Size is usually less than .5 hectare and could be quite small sites. A minimum width of 30m could be required to achieve a reasonable proportioned open space. Examples include parklands, gardens and civic spaces.
- **Neighbourhood Open space** serving an area generally with a walking distance of around 400 metres from dwellings. Size generally a minimum of .75 or 1 hectare and can be up to 2ha. A minimum width of 50m could be required to achieve a reasonable proportioned open space. Generally provided for residents in a single neighbourhood. Examples include parklands and gardens.
- **Sub District Open space** serving three neighbourhoods. Size generally 5-6 hectares Generally provide several recreation nodes offering a range of opportunities. Provision of sporting facilities will depend on the settlement type and the specific catchments that relate to individual sports and types of facilities. Passive recreation provision is important as either the primary open space provision or to complement a sporting use.
- **District Open space** serving around six neighbourhoods or a population catchment area of 15,000 to 25,000 people. Size generally up to 10 hectares Generally provide for a wide range of recreational activities including facilities for organised sports. Informal recreation and passive use of open space at this level is also very important. Accessible to residents by safe walking and cycling routes. Where provided beyond 1km from residences, will also cater for visitors arriving by car. Examples include district sports fields and conservation reserves

What are the different levels of open spaces to be provided as per regulations and discuss their components in detail.

- **Township** Typically used in rural areas to describe open space that services a local township area and its surrounding localities / villages. Size can up to 10 hectares and this open space is likely to be home for the towns outdoor sporting and recreation facilities such as playing fields, outdoor courts, pavilion / hall and parkland. The passive recreation use and connectivity features of this open space will be important to ensure accessibility for the whole community. Will usually be central in a township and accessible by car for the surrounding community. Municipal Open space providing for the needs of the whole municipality. Might be located a minimum of 2km from residences, not necessarily needing to be in safe walking distance, therefore would provide car parking capability. Minimum of 3 ha would be reasonable for municipal open space.
- **Open space at a municipal level** may be specialised for specific sporting infrastructure. It will be important to ensure that informal recreation and passive activities are well provided for.
- **Regional Open space** serving catchment including and beyond the municipality, including neighbouring municipalities. Size generally 10-30 hectares. Also includes significant sites of local or state historic, cultural and/or environmental significance. State Open space serving an intra or interstate catchment. Usually associated with site specific environmental, landscape or cultural values. State significant open spaces usually managed by state agencies, often in partnership with Council. Examples include National Parks and State Forests / Forest Parks.

Role of landform in landscape design

- Land form refers to the lay of the land or the shape taken by the ground
- surface of the designed landscape. It is a play of visual design, landscape engineering, (including drainage, cut and fill etc.,) and various other disciplines. A classic example is the design of tees in a golf course, which calls for the expertise of a landscape architect, to provide smooth curvilinear land forms, with smooth lawns.
- The working principle is cut and fill. Land reclamation projects, projects with major elevational sculptural forms etc., are examples of land form design. Shakti sthal, the famous Samadhi of late Prime minister, Smt.Indira Gandhi has a landscape design of trees on mounds enclosing a stupa. The mounds are huge landforms, on the bank of the Yamuna, and these were filled with earth and flyash from the nearby industries.
- Design of swales (vegetated drains), grassy mounds, are manifestations of landform design. One works out a proposed contour plan with proposed contour levels and proposed spot levels. The most important aspect to be looked into is drainage. Water should not leave the site. Water should be harvested to the single last drop within the site boundaries.

Squares and Plazas

- Squares and plazas are specific typologies of open spaces in urban areas. A square is generally perceived as a busy open space in the midst of the dense city, often commercial in character. Many streets open out into a square. It may be found in core-areas of modern cities.
- A plaza is a term used to refer to an open space, European in origin, belonging to the renaissance period, where a group of monuments opened out into a large urban open area, used for the public to gather in. The St.Peter's cathedral group of monuments is famous for its plaza. These spaces were also referred to as 'piazzas'. It is a more specific kind of square while the square is a more generic term for spaces which developed into outdoor areas, commercial in nature.
- Squares should be differentiated from streets for their width-to-height ratio. A square may have a width to height ratio of 1:1 with its adjacent buildings. A plaza has a similar proportion, maybe with greater width.
- Squares, as the name suggests, are geometric in nature, whereas plazas may be more informal and irregular. Both may comprise of other elements such as street furniture, sculptural elements etc., A temple tank in Indian core towns is may also be contained in a square belonging to the temple precinct.
- In the modern context, urban open spaces associated with commercial buildings are very successful in their ability to attract people, especially shoppers, office goers, youngsters who want to 'hang out' etc., these urban open spaces, have a life of their own in space and time, and treatment of these spaces is one of the important tasks a space designer has to do. Choice of materials, design details, scale of space, circulation within and to and from the spaces, its interaction with its neighbouring activities, the way it is maintained and run – all depend on the decisions made by the designer.

- Lovejoy fountain – Landscape architect Lawrence Halprin (modern example)

Campus planning

- FIVE PRINCIPLES OF THE CAMPUS LANDSCAPE VISION
- Principle One: Building Siting
- its topography, the river, the distant hills, and its historic structures – with thoughtfully sited buildings. New construction and renovation projects on campus must be sited to reinforce the campus character and engage the campus topography and setting to create connections and spaces outside the building that are as positive as those within. • Site buildings to use topography and other resources to enhance the campus landscape • Site buildings to shape successful campus spaces • Site buildings to strengthen campus connections
- Principle Two: Campus Spaces
- Enrich the University with a comprehensive network of campus spaces that refl ect the University's mission to embody excellence in learning. Approach the design of campus spaces in a comprehensive manner – prime consideration must be the space's contribution to the entire campus open space system and the embodiment of excellence, not the enhancement of a particular building
- Principle Three: Campus Connections
- Optimize campus pedestrian connections above all others. Campus landscapes are, above all, places for people; in order for the campus to be perceived as a cohesive, welcoming, and attractive space, its pedestrian connections must be positive ones, vehicular connections must be downplayed, and alternative transportation promoted. • Reinforce campus pedestrian connections • Minimize the impact of vehicles on campus - design streetscapes and vehicular zones for pedestrian comfort • Enhance alternative transportation on campus '
- Principle Four: Campus Plantings
- Enhance all campus spaces and connections with healthy, well-sited, and wellmaintained plantings and turf. Campus plantings play a critical supporting role in shaping successful campus spaces and connections; the health, performance, and maintenance level of those plantings and lawns are essential to providing the campus with a high-quality image • Shape campus spaces with plantings • Create high quality and high performance landscapes
- Principle Five: Sustainability
- Augment the integrity and performance of the campus landscape by employing sustainable practices. • Implement sustainable landscape principles and practices • Support sustainable practices for construction and maintenance.

Campus planning

- About IIT Kanpur, architect: Achyut Kanvinde
- The site for IIT was located on the outskirts of the industrial city of Kanpur. Envisioned as a self-contained residential campus capable of growth, it had to be planned as an integrated urban environment which would fulfil the needs of living and studying. In his master plan, Kanvinde superimposed a layer of major and minor roads along cardinal directions which subdivided the site into interlocking quadrangular segments. A separation of vehicular and pedestrian traffic which was commonly accepted as a fundamental principle of urban design internationally underpinned the scheme with each quadrangle planned as a pedestrian precinct surrounded by a vehicular road. A 50 acre precinct for academic buildings was planned centrally surrounded by residential and recreational zones. Critical to the size and relation between precincts was the 20 minute walking radius that ensured a pedestrian scale – an idea based on the concept of a "neighbourhood unit".6 Such a designated land use assured long-range reservation for need-based growth while retaining relationships to other parts of the campus – a principle which has continued to determine the character of campus today even after 50 years. The range of academic buildings required by the program included laboratories, workshops, lecture halls, library administrative offices and an auditorium.

Fig. 3 Banaras Hindu University Campus, site plan Kanvinde and Mitter, Campus Design in India, 91

Campus planning

Similar to ongoing educational experiments in the international context that emphasised an interdisciplinary approach, particularly initiated in the new British universities, the IITK management too envisaged an integrated and flexible academic setting. In response, Kanvinde grouped the activities as per functions rather than department. Clustered around informal open spaces, the buildings were modular (based on laboratory and non-laboratory requirements) which ensured flexibility and expansion and were constructed using reinforced concrete frame and exposed brick-skin walls. A dominant feature of the scheme was a series of double level-walkways that threaded through all the buildings. These linear pedestrian and bicyclefriendly linkages that functioned in climatic extremes of Kanpur (lower level shaded for summer and top level open for winter) were envisioned as vital street like settings where social interactions would occur in lush landscaped gardens. Additionally, service tunnels were planned underneath walkways. Kanvinde called the walkways "arteries and veins" thus reflecting their critical role in the effective functioning and vitality of campus life. However their particular manifestation in the Indian context can be understood further by looking at Kanvinde's book on campus design.

The search for a viable integration of the past and the future in campus design for India was reflected in the authors' reading of Louis Kahn's closely observed design of the Indian Institute of Management (IIM), Ahmedabad (1962-74). Noting Kahn's integration of academic and living areas, expression of indigenous brick and proposal of a water pond for evaporative cooling, they also drew attention to his creative fusion of Indian history with progressive campus design, "The special qualities and singular strength of character [of IIM] are reminiscent of the monastery unit of the old Nalanda University, yet incorporating the very latest ideas in university campus development. It is an exceptionally fine concept and could serve to renew an appreciation of the values of the historical institutions."

Campus planning

- 'Presenting Kahn's design as a compelling model for designing a 'modern-Indian' campus, the book thus addressed the issue of national identity. More specifically, Kanvinde and Miller's analysis of medieval and ancient Indian campuses in order to distil lessons for the present reflected both an effort to localise the international concepts through nature, materiality and climate but also an attempt to negotiate history. In their analysis of Haus Khas Madarsa (1352-88AD), a medieval Islamic centre of learning outside Delhi, Kanvinde and Miller highlighted the campus organisation in which nature played a functional as well as an aesthetic role. Comprised of learning cells, a palace and a tomb interwoven with landscaped terraces and gardens, the L-shaped building was built around an existing lake-reservoir that was originally constructed to combat the hot and dry climate of the Delhi region. In their appraisal of the ancient Ajanta Cave Monastery, Maharashtra (200BC-700AD) – a series of rock-hewn cave units carved into a crescent shaped cliff sporadically over a period of centuries, the integration with topography was argued as being critical to the cohesive character of the campus despite the absence of a master plan. These examples also enabled Kanvinde and Miller to make an argument for achieving contextual specificity through usage of natural materials, mainly local stone or brick which they praised for climatic benefits and permanence as much as for their assimilation of cultural expression of art, craft and sculpture. This preference for natural and local materials was not limited to the economic standpoint of a developing country

- An exemplar that brought together most of their discussion of post-war themes and located them within the appropriate national and typological context of India was that of the ancient Nalanda University (300BC-1200AD) in Bihar. Based on archaeological findings and surviving writings, it is deduced that the Buddhist University of Nalanda was a systematically planned campus. The campus constructed in local red brick and adorned with sculptures in its heyday, comprised of an integrated framework of linearly arranged monastery units comprising of cellular rooms (modules) interspersed with translucent water ponds and parks, communal and symbolic spaces such as the stupa (temples), had a large library and multi-storeyed lecture halls with towers that acted as visual landmarks.

Role of water in landscape design

- Waterfronts and urban waterfronts definitions The word meaning of waterfront get
- through as "the part of a town or city adjoining a river, lake, harbour, etc." in the Oxford American Dictionary of Current English in English Dictionaries and Thesauruses (Dong, 2004).
- The word "waterfront" means "the urban area in direct contact with water". According to the author, waterfront areas usually is occupied by port infrastructures and port activities. Yasin et al. (2010) indicated that waterfront is defined generally as the area of interaction between urban development and the water. Hou (2009), described the waterfront area as the conflux area of water and land.
- One reason for the importance of natural water source in urban area is aesthetic effects whose creates on human. This effects are visual, auidal, tactual and psychological effects.
- Water in urban areas is aesthetic effects as well as functional effects. These are climatic comfort, noise control, circulation effects and recreational aims. Water surfaces cool air by means of increasing the amount of moisture in an environment. Especially with continental climate, that is a great importance.
- Also, water is used to freshen up the outdoor's air. Wide water surfaces in regional-scale regulate air's temperature surrounding areas (Önen, 2007). Water element is an important in urban areas where is in this regions, because of its visual and climatic effects (Gençtürk 2006).
- In addition, water areas in urban spaces are composed of a barrier to artificial sounds with its creating the natural sounds (Önen, 2007). Eckbo (1950), water is in the organization of space as a limiting and concealer element. Because person has to walk around in suitable direction (Gençtürk 2006). It is possible to see mostly this effect at the riverfronts.
- Rivers taked on a spine task which is established cities and in the formation of streets, parks and other urban spaces have become a major factors. For example, (Figure 3) in Manhattan, Pittsburg, Philadelphia and Pekin (Hattapoğlu, 2004). Recreational use of water element is too varied. Natural and artificial water surfaces and its surrounding can be serve many recreational uses such as swimming, fishing, boat tour, entertaiment, walking etc.

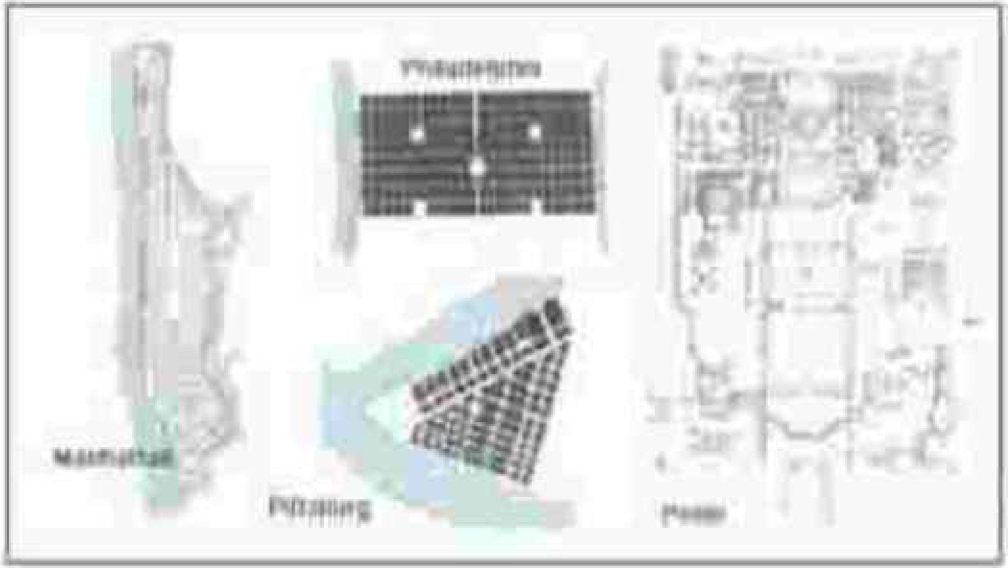


Figure 3. [illegible] (1994); urban schema of Manhattan, Philadelphia, Pittsburg and Pekin ([illegible] 2004)

Waterfront development-Case studies

- 11. Case studies 11.1. Porsuk Stream, Eskişehir, Turkey According to Anonim (2005), Ulu (2005), Eskişehir which was only a small settlement with under 30.000 residents until the period of the Republic increased the number of its population to 706.009 by 2000 with a rise of 4,5 times. Until 2001, Porsuk Stream and its banks within the city of Eskisehir has been exposed to intensive pressures because of the increasing number of the city population, and the following inaccurate use of the related lands. As a result, the stream has become almost an open sewage running through the city (Pekin, 2008). Eskisehir Greater Municipality took into consideration the fact that a city with a river running through is always under threat of possible floods and also the recent earthquake disaster (August 17, 1999) the city experienced and so initiated the Project of Porsuk Stream in 2001 (Figure 24) with the support of European Investment Bank with the aim of protecting the city from the damages of natural disasters and also minimizing the effects. This project is performed as the Project to Lessen the Damages of the Natural Disasters (Component 2) which is part of the Urban Development Projects with three main components (Büyükerşen & Efelerli, 2005). This project includes the 12 km long part of Porsuk Stream running through the city center. This project is basically project of flood defence, river rehabilitation was done to get over flood in a manner safe. The issue of floods in Eskişehir was examined by State Water Affairs in the frame of Porsuk Basin Water Administration Plan. In addition to this study, Porsuk Stream Urban Transition Rehabilitation Project was prepared. The according precautions may be summed up as follows (1) Building Sarısu Flood Detention Dam since Sarısu Stream which flows into Porsuk Stream within the city has an increasing effect on flood risk, (2)
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- Construction of Sarısu and Porsuk sand traps in order to detent swept down dregs and dirt and also cleaning of these traps before and after the flood season (3) Restoration of 9.6 km part of Porsuk Stream bed (4) Building nine bridges for vehicles, examination of four bridges for pedestrians against earthquake risk and building four new bridges for pedestrians (5) Construction of eight buildings for controlling water level in order to render the regulation of the river flow uniform in the restored parts and maintain full flow (6) Equipping water level buildings with automatic sensors which make them mobile in order to prevent those buildings to become any handicap during floods, (7) Rehabilitation of main irrigation canals that consists 3408 m. left bank and 5100 m. right bank (Büyükerşen & Efelerli 2005). Anonim (2006c), Beside, the stream flow is regulated by Porsuk Dam (Pekin, 2008). Also, it has been necessary to equip the water level buildings with boat transfer shutters in order not to prevent the waterborne transport within the stream (Büyükerşen & Efelerli 2005).
- Figure 25. Porsuk Stream in Eskişehir in Turkey Porsuk Çayı (a) before; (b) in application; (c) now (Eskişehir Greater Municipality, 2006)
- Smooth parts revived after the restoration process made waterborne transport on the stream possible. In addition, a comprehensive landscape project was prepared to accommodate the restoration to the very surrounding of the stream (Figure 26). According to this, a footpaths, recreational areas and parks was done on the banks and its environs (Büyükerşen & Efelerli 2005).
- Figure 26. (a) The water transport (Eskişehir Greater Municipality, 2006), and (b) Canoe competitions on the Porsuk Stream (Anonymous, 2013j), (c) Footpaths Eskişehir Greater Municipality, 2006).
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Waterfront development-Case studies

Figure 25. Pornak Stream in Eskişehir in Turkey: Pornak Çayı: (a) before, (b) an application, (c) [illegible]
(Eskişehir Greater Municipality, 2006)

(a) The water transport (Eskişehir Greater Municipality, 2009), and (b) Canoe ecosystem in the Stream (Anonymous, 2015); (c) Footpaths Eskişehir Greater Municipality, 2006)

Figure 27. An application River Elbe, Halenstr in Hamburg (Braun, 2012)

Waterfront development-Case studies

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- 11.2. Hafen City, Hamburg, Germany The city of Hamburg is located on the river Elbe which flows into the North Sea as Germany's second largest city and host to Europe's second-largest port (Waterfront Communities Project, 2007). While the important parts of the port are now located on the south bank of the river Elbe, most of the northwestern bank has become disused for port functions until 1997 and has thus been regenerated for urban use (Hans, 2008; Erkök, 2009). This regeneration area described as Hafen City. The Hafencity or harbour city Project (Figure 27) offers an amazing opportunity on the banks of the river Elbe. Because of its proximity to the central area, the project has the potential to become a comfortable extension to the city centre (Appleton, 2005). This project area (http://www.hafencity.com) takes place between the historic Speicherstadt warehouse district and the River Elbe, there will be a new city with a mixed uses. According to Hafencity Hamburg GmbH (2006), the area occasionally getting flooded required a smart solution for this problem, not cutting off land from water by high defenses. With the exception of the waterfront promenades, the entire area will be raised by 7.50 to 8.00 meters above mean sea level, creating a new and distinctive topography while preserving access to the water (Erkök, 2009). Beside, residental areas and promenades will be fixed on concrete piles (Mimdaporg, 2008). In the Project area, elevated footpaths, waterproof parking basements and the accessible waterfronts, as part of the new emergency infrastructure, have provided a successful combination of safety and spatial quality of urban spaces. As a solution for the accessibility of water at all tides in the very high quays, Enric Miralles designed a descending 'landscape' of surfaces (Figure 28, 29) (Erkök, 2009).
- Figure 27. In application River Elbe, Hafencity in Hamburg (Bruns, 2012)
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- The project which includes an area of 155 hectares, is currently under construction and application of it includes an ambitious 25 years period. When it is fully realised, Hafencity will have 5,500 apartments, 20,000 work places, 20 hectares of public open space and major cultural facilities to this waterfront. Also it involves approximately 10 km of quayside promenades (Appleton, 2005; Erkök, 2009). It is the largest inner city development project in Europe. With Hafencity project will be enlarged city center by 40 % and also it will be home 10000-12000 inhabitants (Erkök, 2009; Hans, 2008).
- Figure 28. A waterfront terraces and the descending 'landscape' of surfaces (Schneider, 2010)
- Figure 29. A views of public uses in Hafencity (Bruns, 2012)
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- Beside, in Hafencity Project points out with a highly attractive public transport system. According to this, pedestrian ways (Figure 29) are more dominant than vehicle ways. Also 70 % of pedestrian ways are away from the streets and bicycle paths take place in the area (Hans, 2008; Mimdaporg, 2008). In this project was considered sustainability principles. There was noticed economic use of energy. In this context, eco-friendly building materials were used (Mimdaporg, 2008). Numereous Projects which are developed by different architects, are together in Hafencity (Mimdap, 2008). Cultural highlights of the project range from the striking landmark Elbphilarmonie Concert Hall (Figure 30a), to International Maritime Museum of Hamburg (Figure 30b) and the new urban plazas being used for smaller events (Erkök, 2009). Beside, with reuse of warehouse, bridge and cranes were

Waterfront development-Case studies

Street furniture

Street furniture refers to various design elements and details which certainly do impart character to an area as a result of the choices made by the designer. The various aspects of street furniture include,

- Lighting
- Outdoor seating
- Services such as trash-bins, water fountains,
- Steps and ramps (outdoor)
- Bollards
- Tree-guards
- Signage
- Fences, railings, gates etc.,
- All of these come under architectural detail and each element comes in a
- wide choice of designs and character.For instance, lighting is a specialised area of design, light fixtures are mounted at various heights, for various types of lighting such as uplighting, downlighting, spotlighting, floodlighting etc., the fixtures are available in a range of characters, in a variety of materials, such as wrought iron, sleek steel fittings, colored or transparent luminaires, posts of various heights with vandal-proofed designs or otherwise. They lend a distinct urban character to an area apart from satisfying their functional requirement.
- **Outdoor seating:** these may be readymade furniture in various styles such
- as furniture for interiors, or they may be built-in seating, which is more resistant to outdoor weather. Materials such as brick, concrete, stone may be used for built-in seating, which can be designed as appropriate to the space and the requirement in the program. Readymade furniture may be of wrought iron or wood or even stainless steel. OATs are also a type of built-in seating. In campuses, or public parks one will find a variety of outdoor seating.

Street furniture

- **Services:** Trash bins, water fountains and ornamental fountains are available
- readymade for the outdoor areas. They act as fillers, in an otherwise empty urban / habitable public space.
- **Steps / ramps:** there are standards for design of outdoor steps / ramps, and
- these can be delightful spaces, as they can be designed with interesting flooring materials and located in strategic spots.
- **Bollards:** these are low-lights and also act as barricades bordering a space.
- Hence it is an interesting outdoor architectural element. Available in a variety of designs.
- **Tree guards:** maintaining of trees in urban areas is very important. One
- should try to have adequate tree cover and maintain all available trees in the urban roads. Hence tree-guards play an important role. Draining water to the roots, protecting the roots are important functions of tree guards.
- **Signage:** design of signage is a specialized area, as they are character-
- giving elements, by virtue of its inherent properties, scale, color, boldness or uniqueness, its readability and style play an important role.
- **Fences, railings, gates etc., :** these elements are designed in various styles,
- materials, colors and vary in scale and character. They can be coordinated with the predominant landmarks and the design character of the entire space by means of the choice of materials, color. The level of detail can also determine the importance of that element.