# HABITAT TECHNOLOGY

## Module 1

## HABITAT

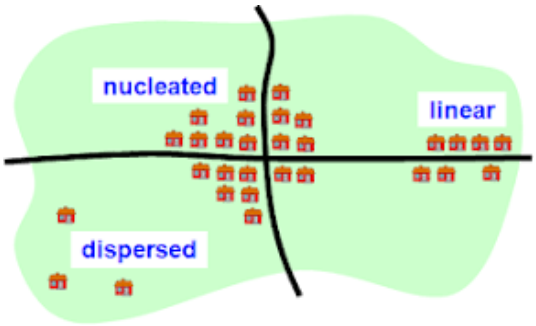
It is the natural environment in which an organism lives, or the physical environment that surrounds a species population.

A habitat is a place in which a particular plant or animal lives. It is often used in the wider sense referring to major assemblages (a group of species found in the same location) of plants and animals found together.

## Settlement Patterns

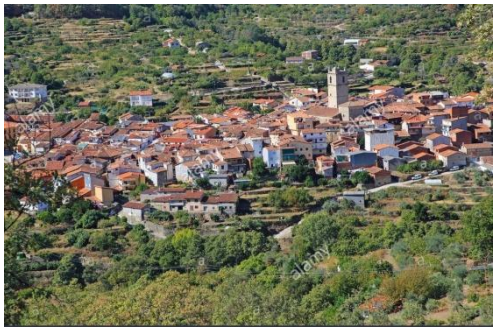
A settlement is any form of human dwelling, from the smallest house to the largest city. Settlements range from a small village to a megacity with millions of people. People choose to settle in different areas for a variety of reasons. As settlements grow they develop identifiable patterns which are used to classify them. Geographers study settlements because it is a reflection of the relationship between humans and their environment. These patterns are also used to project future settlement development.

There are three main settlement patterns: **nucleated, linear and dispersed.**




### *A) Nucleated settlements*

Nucleated settlements comprise of buildings that are situated close together, usually clustering around a central area such as a river crossing or road junction.



***B) Linear or ribbon settlements***

Linear or ribbon settlements consist of structures that are built in a line, usually along a major transport route such as a road.

C) ***Dispersed or scattered settlements***

Dispersed or scattered settlements occur mostly in rural areas. Buildings are spaced across a wide area and usually consist of farms.

**DWELLING/ HOUSING TYPOLOGY**

1. BUNGALOWS

The bungalows are a popular Indian house design. They are large home used as solitary family units. We can see these types of houses in India the urban spaces. The biggest advantages of these houses are the area of space in and around your home that gives you enough room for a garden or stroll.

## 2. APARTMENTS

Apartment means whether called block, chamber, dwelling units, flat, office, showroom, shop, godown, premises, suit, tonement, unit or by any other name, means a separate and self-contained part of any immovable property, including one or more rooms or enclosed spaces, located on one or more floors or any part thereof, in a building or on a plot of land, used or intended to be used for any residential or commercial use such as residence, office, shoo, showroom or godown or for carrying on any business, occupation, profession or trade, or for any other type of use ancillary to the purpose specified.


## 3. PENTHOUSE

A penthouse is an apartment or unit on the highest floor of an apartment building, condominium or hotel. The term penthouse originally referred, and sometimes still does refer to a separate smaller house that constructed the roof of an apartment building.


## 4. STUDIO FLATS

Studio apartments are a new concept which is gaining popularity across the world. The little ones with no separate bedrooms are called studio apartments and are rented by the young working individuals who wish to stay in a cozy space with all the amenities confluence together. The flat consists of sections without any barrier of walls or divisions, where one could use the space as bedroom and living room. There are separate rooms.


5. VILLAS

Villas have always been referred to the stylish upper-class state homes. The size of villas ranges from a king size houses to ultra large houses with a private lawn, gardens, swimming pools and driveway. The more private built aspect of the villas is what attracts the travelers for renting it over hotels, during their trips. Villas are gaining popularity for the reason of it providing a space by rejuvenating lush greenery.

6. CONDOMINIUMS

Each housing unit comes up in a wide range of styles but the kind of ownership is what makes it different from other types of accommodation. A condominium is a unit that's owned individually, with the access to the few of the common areas of the complex like rooftops, clubhouse, swimming pool, playrooms and outdoor areas, which is co-owned equally by all condo owners under the umbrella of an association.

7. FARM HOUSES

Farmhouses and vacations houses are located away from urban crowd have also become a common feature to attract hi-end buyers. In the last decade or so a large chunk of the kind of supply has become part of organized supply of housing, even as these are sporadic in nature.

8. HUTS

These are crude shelters mostly found in the rural part of the country. It is made up of naturally obtainable materials like mud, bricks, wood and leaves. Such huts are widely found in the tribal areas of India. It consists of mud wall that keeps it cool during summers. It is slowly evolving with the features like a chimney on the roof to release the smoke during cooking.

## TOWN PLANNING

The term 'Town Planning' is used to indicate the arrangement of various components or units of a town in a very organized manner. It also includes ways to improve and develop the existing town or for the extension of towns. Thus, the knowledge of town planning helps in achieving the best possible advantages of the town with respect to its land and the surrounding environment.

### Growth of Towns

The towns grow during passage of time in number of ways and various forces which contribute to the overall development of a town are transportation facilities, industries, safety for public, proximity of agricultural lands, availability of electric power, political importance, etc. Some of the reasons why the people would like to stay in urban areas can be enumerated as follows:

1. It is quite likely that people have often found to stay in groups or societies to safeguard themselves from dangers of theft.

2. The humans by nature are social animal and they get much satisfaction of living their life in the company of friends and community.

3. An urban man can develop contacts and make friends with like-minded people having common interest.

4. The urban dwellers can maintain a very high degree of privacy.

5. The urban areas are provided with reliable water supply, good market for business, large amount of opportunities to succeed, etc.

Also the facilities of transport and communication increase the population and lead to the growth of towns. The means of transport may take up the following forms:

1. **Aerial ports**: In some cases, the airports also play an important role in the growth of a town.

2. **Railways:** If the town is connected with railways, there will be increase of passengers and goods traffic even from long distances.

3. **Roadways:** The neighboring area is connected with the town and it leads to overall expansion of trade and industry.

4. **Waterways:** If facilities of waterways are available, the town can grow as a harbor with possibility of foreign trade and business.

The above mentioned means of transport have led to the horizontal growth of town. But the availability of mechanical lifts, escalators and elevators has made it possible to have vertical growth of town in the form of skyscrapers.

**Types of Growth**

The growth of towns and cities can be studied in the following two ways:

I. Growth according to origin.

II. Growth according to direction.

***I. Growth according to origin:*** The growth of towns and cities according to the origin can be divided in two categories:

**1. Natural Growth:** Most of the towns in the past have grown in a natural way, that is, the development of the town as such has taken place without any future planning. The provisions of various essential amenities such as road system, parks, playgrounds, schools, industrial units, commercial centres, hospitals, cinemas, etc., are made in an irregular way without consideration for future expansion of the town. The natural growth of a town may be in the form of following four types:

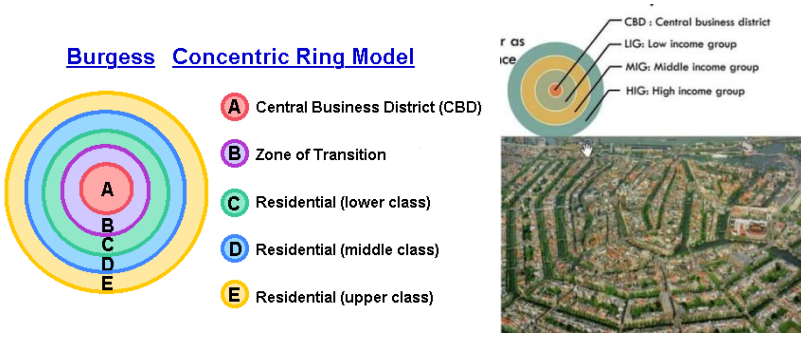
a. Concentric spread

b. Ribbon development

c. Satellite growth

d. Scattered growth.

a) *Concentric spread:*



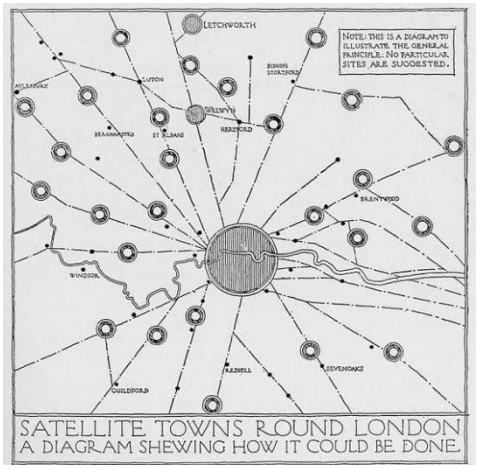

- It is the natural tendency of the people to be as near as possible to town or city, therefore the town develops in form of concentric rings with nucleus as town.
- These type of growth create many complicated problems such as traffic congestion, narrow streets, concentration of population, improper housing, etc.
- The town growth is represented by a series of concentric circles or rings.
- The first zone represents central business like commercial and social life of the town.
- The second zone represents low-income housing, better-class residences and high-class residences are subsequently formed.
- The idea of concentric spread is based on the fact that similar or functionally related activities will be located at the same distance from the centre of an urban area.

*b) Ribbon development:*

· It has been observed that because of improvement of road surface and growth of motor traffic, everyone build or occupy the places as near as possible to the main road.

· The building activity therefore expands in a natural way along the sides of main road and long fingers or ribbons of houses, factories, shops, etc.,

*c) Satellite growth:*

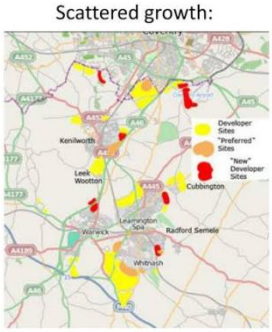



When a town reaches a certain size, satellite growth is bound to take place. The satellite town is mainly due to the metropolis and it indicate a body under the influence of a more powerful body but possessing its own identity

The features of a satellite town are as follows:

- It has its own local government and corporate life.
- It is a town in the full sense but it depends to a certain extent upon a nearby large town or city.
- It is connected to the parent city by local trains, buses, etc. in such a way the people can reach to the parent city easily.
- It is free to decide its economic, social and cultural activities.
- It is generally situated beyond the green belt of the parent city.
- It is mainly residential area having only local shops, schools for children, etc.
- No industries are permitted, the people will have to depend on the parent city for employment opportunities.

*d)* *<u>Scattered growth:</u>*




- The growth of the town takes place in very irregular way.
- It results in traffic congestion.
- Encroachment of industries on residential areas.

- Development of slums.
- Lack of parks and various other problems which prove to be too difficult to be solved in future.

**2. Planned growth**: In case of a planned growth, a town develops in a predetermined line as conceived by the town planner. The overall growth of the town is controlled by the enforcement of suitable rules and regulations. There is a rational distribution of various blocks such as residential, industrial, commercial, etc.

The provision of various amenities such as widths of streets, drainage lines, water supply lines, parks, playgrounds, etc. is made to meet with the future requirements. The modern concepts of town planning can very well be seen and appreciated in some of the recent new towns in many parts of the world.

**Growth according to direction:** With respect to direction, the growth of towns and cities can take place in the following two ways:

**1. Horizontal growth**: The town expands and develops horizontally in all directions. It is clear that such a growth will be possible at places where land is available in plenty at nominal cost.

Horizontal Growth

*Advantages*:

- In general, there will be saving in cost as the buildings will usually consist of two or three floors.
- It does not require the service of high technical personnel.
- Maximum possible use of the natural light in the buildings.

*Disadvantage:*

- It uses more land and hence, it will prove to be uneconomical where the land value are very high.
- The foundation cost per unit area will be more.
- There will be absence of group living.

**2. Vertical growth:** The buildings of the town are designed and developed as multi-storied flats. It is quite evident that such a growth will be possible at places where land is costly.

Vertical Growth:

*Advantages:*

- A sense of group living and unity develops as many families live in same building.
- The foundation cost will be distributed between all the floors, therefore the foundation cost per unit area will be in the reasonable limit.
- For floor above certain height, the natural sceneries such as sea view, river view, etc. can be enjoyed in a better way.

*Disadvantages:*

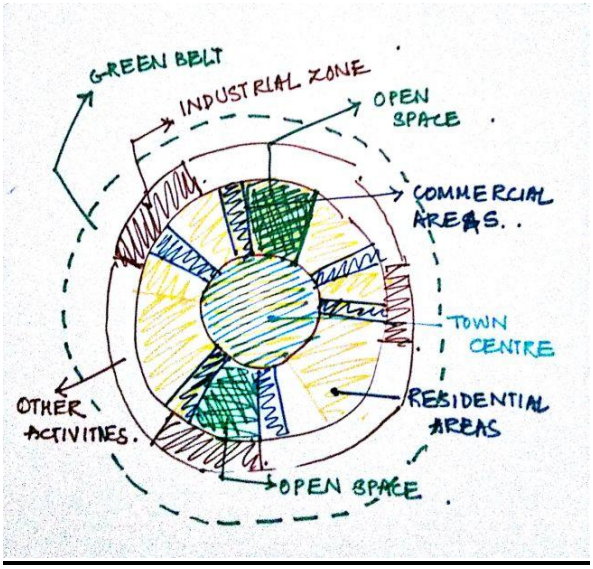
- In case of natural calamities such as earthquakes or fire, it will be difficult for the inhabitants (dwellers) of the upper floors to escape safely.
- The density of population will be more.
- The design of flats will be stereo-typed and there is no scope for personal likes or dislikes.

## Principles of Town Planning

The subject of town planning demands knowledge of various professions, especially those of engineering, architecture and surveying. The town should be designed to satisfy the future growth and development, therefore avoiding development of town in any haphazard fashion. Some of the guiding principles of town planning are as follows:

1. **Zoning:** The town should be divided into suitable zones such as commercial zone, industrial zone, residential zone, etc. and suitable rules and regulations should be formed for the development of each zone.
2. **Green belt**: The provision of a green belt on the border of the town results in the limitation of its size and hence, the final size of the town can be anticipated.
3. Housing: Good care should be taken to provide housing accommodation to various categories of people. The development of slums should be avoided, if slums are existing, they should be cleared by providing alternative arrangement for the slum dwellers.
4. **Public buildings:** There should be well-balanced grouping and distribution of various public buildings throughout the town. The unnecessary concentration of public buildings at certain spots of the town should be avoided.
5. **Recreation centers**: Depending upon the size of the town, enough space should be reserved for the development of recreation centers for the public.
6. **Road systems**: The efficiency of any town is measured by the layout of its roads. A well designed road system reflects good impression of the town. Faulty road system in the initial stages of town formation proves to be too difficult and costly to repair.
7. **Transport facilities**: The town should be provided with suitable transport facilities so that there is minimum loss of time in travelling from work place to residence.

## ZONING




Zoning describes the control by authority of the use of land, and of the buildings thereon. Areas of land are divided by appropriate authorities into zones within which various uses are permitted. Zoning is the process of planning for land use by a locality to allocate certain kinds of structures in certain areas. Zoning also includes restrictions in different zoning areas, such as height of buildings, use of green space, density (number of structures in a certain area), use of lots, and types of businesses. Levels or types of zoning include open space, residential, retail, commercial, agricultural, and industrial.

Zoning is the application of common sense and fairness to public regulation governing the use of private land. Zoning can be defined as the creation by law of the zones such as residential, commercial, industrial, civic, institutional and recreational in which regulations prevent misuse of lands and buildings and limit their height and densities of population differing in different zones. Zoning sets apart different areas in the town for specific purposes. It prevents encroachment of one zone upon another adjacent to it. While planning a city the area of town can be divided into following zones.

1. Industrial zone

2. Administrative zone

3. Business zone

4. Open space

5. Residential zone

   a) Different zone for different height

   b) Zone for single family

   c) Zone for two family

   d) Zone for apartment houses

6. Recreational zone

7. Local administrative zone

8. Agricultural zone

## BYE-LAWS

The building bye-laws or building codes are defined as the standards and norms set by the government authorities to ensure the health and comfort of users, to safeguard the workers during construction; and to provide enough safety to the public in general.

An order prescribed is known as the regulation while the law of a local authority is known as bye-law.

***The Objective of Building Bye-laws:***

- To provide guidelines to the designing architects and engineers. It becomes easier to pre-plan building provisions and activities.
- The building bye-laws prevent unplanned development.
- It provides safety to human beings who work and live in them against fire, noise, health hazard and structural failure.

*Occupancy of buildings. -*

All existing or proposed buildings shall be classified, in one of the following occupancies,

according to the use or character of occupancy, namely:

Group A1- Residential

Group A2 - Lodging Houses & special residential

Group B - Educational

Group C - Medical/Hospital

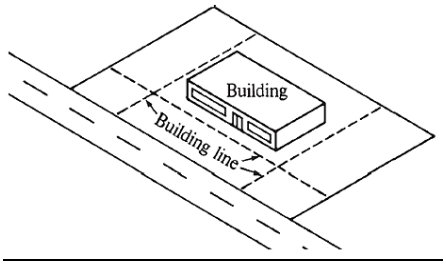
Group D- Assembly

Group E- Office

*The bye-laws and regulations govern the following building aspects:*

*Set-back or Building line:*

The frontage margin or open space in front of the abutting road is called as set-back or building line. Beyond this line, nothing can be constructed towards the plot boundaries.




The Need for Building line::-

- If absolutely necessary, the land contained in set-back may be acquired for the purpose of widening the road.
- The setback at corner improves visibility and impart safety to the moving traffic.
- The space of setback can be used as a parking place or for developing a garden.
- It provides protection of buildings from street disturbances.
- It reduces the danger of fire by increasing the distance between the opposite buildings.

*Floor Space Index or Floor area ratio:-*

The ratio of the total floor area inclusive of all the floors to the area on which the building stands is known as the floor space index or floor area ratio. It controls the development activity on the plot. It can be used as a measure to check the density of the population.

Floor area ratio = ( Gross Floor Area) /(Area of the plot)

- For example, if the total floor area of a building across two floors is 300 sq m and the plot area is 200 sq m,

FAR = 300/200 = 1.5

*Built-up area or Covered area:-*

The plot area minus the area due for open spaces is known as the built-up area. Following are the limitations of the built-up area mentioned in the National Building Code.

| No. | Plot Area | Maximum permissible built-up area |
|---|---|---|
| 1 | Less than 200 sq m | 60% with two-storeyed structure |
| 2 | 200-500 sq m | 50 % of the plot area |
| 3 | 500-1000 sq m | 40 % of the plot area |
| 4 | more than 1000 sq m | 33.33 % of the plot area |

*Size of rooms:-*

Considering the health and proper ventilation, NBC has fixed a certain minimum area for individual rooms and apartments as below:

| S. No. | Type of Room | Minimum area |
|---|---|---|
| 1 | One habitable room | 9.5 sq m width 2.4 m |
| 2 | Two habitable room | Minimum area of one room 9.5 sq m and of other 7.5 sq m width 2.4 m |
| 3 | Kitchen only | 4.5 sq m width 1.8 m |
| 4 | kitchen with store room | 5.5 sq m width of kitchen 1.8 m |
| 5 | Kitchen cum dining room | 9.5 sq m, minimum width 2.4 m |
| 6 | Bathroom | 1.8 sq m or minimum size 1.5 m x 1.2 m |
| 7 | Water Closet (w.c.) | 1.1 sq m |
| 8 | Bath WC combined | 2.8 sq m, minimum width 1.2 m |

*Height of rooms and Buildings:-*

- As per NBC, the general criteria to determine the height of a building is 1.5 times the width of the street to which the building abuts on its front side.
- For street width of 8-12 m, the building height should not be more than 12 m
- For street width more than 12 m, the height of a building should not be more than the width of the street and in case more than 24 m.

*Lighting and ventilation of Rooms:-*

For sufficient lighting and ventilation of rooms of buildings, opening like windows and ventilators or direct opening should be provided.

- The area of such openings excluding the area of doors should be minimum 1/10th of the floor area for dry and hot climate and minimum 1/6th of the area for wet hot climate.
- The aggregate area of doors and windows should not be less than 1/7th of the floor area of the room.

Note: Floor area means built-up area excluding areas of walls.

*Water supply and sanitary positions:-*

Certain minimum water supply and sanitation convenience like water taps, sink, water closets, wash basins etc. shall be provided as per NBC for different types of buildings.

*Structural Designs (Size and section):*

Each structure should be designed for safe loads, earthquake resistance, bearing capacities etc. as per relevant IS codes and NBC.

*Some general thumb rule for structural design::-*

**Depth of foundation**: 0.75 m to 1.0 m for single-storeyed building below ground level and 1.0 m to 1.3 m for two-storeyed building.

**Width of the foundation of the wall:** Double the thickness of the wall just above the plinth and then add 30 cm to it will give the width of the foundation.

**Concrete in Foundation of the wall**: It should be nearly equal to 5/6th the thickness of wall above the plinth.

# MASTER PLAN OR DEVELOPMENT PLAN


A MASTER PLAN or a DEVELOPMENT PLAN is thus a blueprint of various proposals that are intended to improve the existing conditions and to control the future growth of the town in a coordinated manner. Such a plan must be realistic, ideal to be aimed at, preserving the individuality of the town.

*Objects of Master Plan*

- It serves an overall picture and program for the future development of the town
- Its purpose is to place various functions the town has to perform in such physical relation to each other as to minimize the chances of mutual conflict. It helps to bring harmony and understanding between the different groups of people.
- It stimulates wider interest in community problems and brings well-coordinated development.
- It provides for intelligent and economic spending of public funds as per the fixed program for general welfare of the community.

*Drawings to be prepared*

Following are the details contained in the usual drawings prepared for the development plan
1. Boundaries of land of different types such as residential, agricultural, industrial, etc.
2. Boundary of green belt surrounding the town.
3. Contours of the whole city.
4. Different zones.
5. Landscape features.
6. Locations of the public buildings and town centers.
7. Open spaces including parks and playgrounds.
8. Positions of the public utility services such as water supply station, sewage

# HOUSING

Housing is both a simple and an extremely complex subject.

- It is simple, in its everyday sense, as A real, physical, durable & visible artifact, Vitally important to all of us as shelter
- It is immensely diverse and complex, as It is intimately interrelated to socio-economic, political and community environment for both researchers and policy makers

Housing has been a concern of individuals, families, groups as well as governments since the dawn of urban civilization.

Housing is defined as a physical facility unit of structure, which provides shelter to its occupants, but which also consumes land and demands the provision of physical services such as water & sewerage as well as social services to households.

HOUSING = SHELTER + INFRASTRUCTURE + FACILITIES

## *IMPORTANCE OF HOUSING*

1. Housing has central importance to everyone's quality of life and health

2. Housing, besides being a very valuable asset, has much wider economic, social, cultural and personal significance.

3. The way in which housing is produced and exchanged has an impact over development goals such as equity and poverty eradication

4. Construction techniques and location of housing can influence environmental sustainability and the mitigation of natural disasters;

5. The design of dwellings both reflects and protects important elements of culture and often religious beliefs

6. The difficulty in having access to housing development elements such as land, building materials and credit facilities have resulted in proliferation of informal settlements.

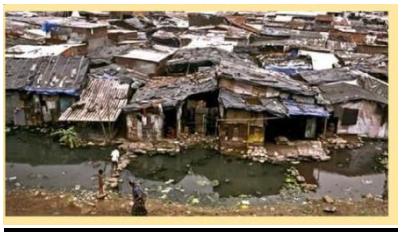
7. It is estimated that there are more than 100 million homeless and about 1 billion people inadequately housed in the world.
8. With the current rates of urban growth and the inability of housing delivery systems to cope with the need the housing crisis is likely to increase in the future.
9. It is estimated that in the next 2 decades, about 35 million units need to be constructed annually to accommodate newly formed households and replacement of inadequate units in urban areas.

10. As a starting point, housing should not be looked at as a problem area requiring major social spending but as a means for:

- promoting and mobilizing savings,
- expanding employment and
- economic activity particularly as a tool for poverty alleviation.

11. Income and employment opportunities generated by housing construction are amplified by multiplier effects in the economy.

## SLUM



- A Slum is predominantly an overcrowded area which is in an advanced stage of decay where dwellings are unfit for human habitation.
- slum is always an area, a single neglected building, even in the worst stage of deterioration, does not make a slum.
- It is like an area with basic amenities like water supply. drainage, for standard living are lacking, insanitary conditions prevail, and diseases flourish.
- It is a poverty stricken area, where there is a high rate of birth, infant mortality, illegitimacy, juvenile crime, delinquency and death, thus representing a state of hell on the surface of earth.
- Slum is a menace to health, safety, mortality and general welfare of inhabitants.
- The central Government in its slum area improvement act has adopted the definition of slum as "Any predominantly residential area where the dwelling which by reason of dilapidation overcrowding, faulty arrangement of design, lack of ventilation, light or Sanitary facility or any combination of these factors are detrimental to safety, health and morals".

- The movement towards town planning is born because of the realisation of the intolerable conditions in slums. In India, slums clearance authorities have been appointed to bring about improvement in the situation.

## Types of slums

*Notified slums*

All notified areas in a town or city notified as 'Slum' by State, Union territories Administration or Local Government under any Act including a 'Slum Act' are considered as Notified slums.

*Recognized slums*

All areas recognized as "Slum" by State, Union territories Administration or Local Government, Housing and Slum Boards, which may have not been formally notified as slum under any act are considered as Recognized slums.

*Identified slums*

A compact area of at least 300 population or about 60-70 households of poorly built congested tenements, in an unhygienic environment usually with inadequate infrastructure and lacking in proper sanitary and drinking water facilities are considered as Identified slums.

## Causes of Slums:

Decentralization, economic conditions, education, migration of people to urban areas, improper use of land, industrialization, lack of zoning, inadequate powers with local authority, etc. are the main causes which contribute to the formation of slums.

***Decentralization***:- Rich and middle class people move out of the extended portions of the town Poor people are left unattended in the overcrowded central area of the town

***Economic conditions:-*** Unemployment growth of population, poverty

***Education:-***Easily dragged into social evil without any attention to improvement of the living condition

***Improper use of land:-*** If the lands fit for particular use are utilized for industries or vice versa the slums are formed.

***Industrialization:-*** No proper planning of houses of labor

***Lack of zoning:-*** If the town is not divided into the suitable zones and development is allowed to take place at random, the slums may be created.

***Migrants***:- The persons migrating from the surrounding areas may occupy, usually illegally, the vacant or empty places in or out the city.

***Powers of local authorities:-*** If the local authority concerned does not possess adequate powers to control the development of town, the slums may be formed.

***Lack of Repair and maintenance:-*** If cheap houses constructed by the land owner for the purpose of collecting rents are not properly maintained, then the slums may forms.

## characteristics of slum:-

- *Appearance*:-The universal mark of the slum is its unpleasant appearance. The structures appear to be deteriorated and to be over aged.
- *Fire hazards*:- The slums area is often exposed to fire accidents and consequent damages. One stick of matches may prove sufficient to reduce the whole slum to ashes in no time.
- *Health and sanitation*:-The slum is characterized by low standard of sanitation and is often neglected most by the public service for sanitation. Refers an area of high sickness and Death rates.
- *Overcrowding*:-The slum is over crowded with buildings or the building are overcrowded with people.
- Moral:- The socially disorganized slum may prove to be an area of criminal behavior.
- Income criteria:- poverty area and it is occupied by people of the lowest group of the society.
- Social isolation:- The slum area is of the lowest social status and it is usually linked up with the rest of the community through its labor force.

## Slum Clearance:

The process of bringing about improvement in existing conditions of slums is called slum clearance. If slum clearance process is not properly carried out, it does not abolish but shifts and spreads in other parts of the town. Following are the two ways of slum clearance:

1. Complete removal Method. 2. Improvement Method

*1. Complete Removal Method :*

In this method, ill-constructed houses are demolished and open spaces are created which are used for widening roads, providing recreations, grounds or constructing houses of improved standards. This method of slum clearance is costly. The people of the slum who are dishoused are to be provided with alternative housing facilities.

*2. Improvement Method :*

The areas where slums are due to poor drainage and insanitary environment and houses are fairly good, need not be demolished. Steps like improvement of street system, fillingof low ground, improvement in drainage, removal of obstructing structure, removal of rubbish structure additions and alternation, realignment of streets etc. are undertaken to achieve the object of slum clearance.

## MASS HOUSING

Mass housing term was taken from the manufacturing sector into the construction industry to describe mass production techniques of housing development projects. It involves designing and constructing standard domestic house units. It can be at the same location or at several geographical locations. This is executed under the same contract and management within the same project schemes.

As urbanization keeps increasing around the world in search of various resources and to handle the finances, Mass housing is becoming the utmost necessity of urban planning. It is aimed to make housing affordable which makes their construction crucial because the mass housing projects are low-cost. This type of project is required in large numbers so it can have the ability to transform the lives of a large population.

Mass housing is a great solution to handle such a huge scale problem because ever-increasing prices of residential property or even private residencies make housing beyond the reach of a common man. That's why mass housing with higher density and floor area ratio seems to solve this giant problem.

In simple terms, it is an apartment-type multi-story building catering to the demand of producing superior homes and benefiting middle-class families.

## VERNACULAR ARCHITECTURE

Vernacular architecture is a term used to categorize architectural design which uses locally available resources and traditions to address local building and design needs. Vernacular architecture tends to evolve over time to reflect the environmental, cultural and historical context in which it exists.

**Construction materials:-**

Materials that are indigenous to a certain region and can be sourced naturally for the construction of buildings. They are usually climate responsive and tie to the culture and traditions.

Some of them are :

1. Cob
2. Rammed Earth
3. Bamboo
4. Stone
5. Lime
6. Thatch
7. Wood
8. Laterite

*1. COB*

▪ An abundant material seen in rural areas for construction of houses - cob is a material that is thermal resistant and windproof.

▪ It is suitable for extreme weather conditions - with porous and thick walls, creating a vacuum that does not allow heat to transfer easily.

▪ It is a mixture of the subsoil (ideally acquired during excavation for foundation), sand and straw along with water to bring it to the right consistency for moulding it into the required shape.

▪ The manufacturing of cob includes the following processes

▪ Mixture of materials

▪ Compression of mixture using bare feet

▪ Sculpting using large balls of the mixture to build the walls

*2. Rammed Earth*

- Rammed earth construction involves compacting different types of soil into plywood frames.
- Rammed earth construction is most suitable for areas with moderate temperatures and low rainfall. In case of extreme temperatures, additional insulation might be required.
- The framework is constructed – consisting of two parallel plywood panels, into which soil is filled and compacted in layers. The soil that is added is compressed to at least half its volume before adding the next layer.

*3. Bamboo*

- One of the strongest construction materials found in ample amounts in India – bamboo is a fast growing grass with many economic and structural benefits.
- After harvesting the bamboo, it must be treated with various processes before it is used for construction because when exposed to various natural factors it may easily deteriorate.
- Bamboo can be used in various parts of a building during construction – for roofing, flooring, walls, structural reinforcements, etc.

4. STONE

▪ Noted throughout the historical heritage sites of India - in temples and rock cut caves, stone is a material that is often carved to the required formwork.
▪ One of the most durable materials that will stand strong for generations, it requires very little maintenance and is suitable construction material for most climates.
▪ Putting up a stone wall requires skilled labour - the gaps between the larger stones are filled with mortar and smaller stones. Stones are also a heavy material, which makes it difficult to place them at a height.
▪ Stones can be used in flooring, foundation, walls, structure and various other parts of a building which makes it a versatile material.

5. LIME

▪ Best known as a plastering material - usually one can observe a yearly lime whitewash done in rural areas. This is done not only for aesthetic purposes but also due to its various other benefits.
▪ Lime in construction can be applied in buildings in the form of plaster, mortar, putty and other finishing work.
▪ It is best known for its self-healing property (in cracks), insect repellent property and often used as a weathering course to maintain a cooler temperature in the interior of a building.

6. THATCH

▪ An eye-catching feature of south India's houses are their thatched roofs- with dry fibers such as straw, reed and palm leaves bundled to form a roof.
▪ Thatch is versatile and can be used to cover different organic roof shapes - though thatched roofs are usually sloped for the water to run off quickly, in case of rainfall.
▪ It also proves to be a good material for insulation and roof covering because it is lightweight in nature and does not add load to the structure of a building. However, it is not fire-proof.

7. WOOD

▪ An eco-friendly material that is biodegradable, recyclable and easily available in different regions - when used in construction, it reduces the carbon footprint of a given building.
▪ Wood is known for its thermal and acoustic insulation, resistance to fire and structural stability in buildings.
▪ It can be used for the structural framework of a building or the framework of the interiors (such as door and window frames) and also in flooring, roofing and other parts of building construction.

8. LATERITE

▪ Traditionally used in the western coast of India for housing construction - in the Malabar region and Goa, this attractive red stone is formed due to compaction of red soil.
▪ This rustic red stone is not only aesthetically pleasing, but also provides good thermal insulation and is eco-friendly because it does not generate any carbon footprint.
▪ Laterite stone is extracted and cut out from the ground using machinery - which does not include much manufacturing cost - making it economical.
▪ Usually used in construction of walls - similar to construction of masonry walls, using lime and soil.

***Vernacular architecture of Kerala***

Kerala Architecture is one of the most exciting examples of preservation of vernacular styles. The evolution of the domestic architecture of Kerala followed closely the trend of development in temple architecture. The primitive models of circular, square or rectangular plain shapes with a ribbed roof evolved from functional consideration.

The climate of Kerala greatly influenced traditional architecture. The natural building materials available for construction in Kerala i.e. stones, timber, clay and palm leaves have anchored and guided the acceptance or rejection of outside influences.

*Materials for Vernacular Kerala Architecture:-*The natural building materials available for construction in Kerala are stones, timber, clay and palm leaves.

*Different types of Vernacular Kerala Architecture:-* The base model is normally circular, square or rectangular plain shapes with a ribbed roof evolved from functional consideration. The most distinctive visual form of Kerala architecture is the long, steep sloping roof built to protect the house's walls and to withstand the heavy monsoon, normally laid with tiles or thatched labyrinth of palm leaves, supported on a roof frame made of hardwood and timber. Structurally the roof frame was supported on the pillars on walls erected on a plinth raised from the ground for protection against dampness and insects in the tropical climate. Often the walls were also of timbers abundantly available in Kerala. Gable windows were evolved at the two ends to provide attic ventilation when the ceiling was incorporated for the room spaces. Vernacular Kerala Architecture into two parts, Nalukettu and Ettukettu.

*Elements of Nalukettu and Ettukettu*

Padippura- It is a structure containing a door forming part of the Compound wall for the house with a tiled roof on top. It is the formal entry to the compound with the house.

- Poomukham- It is the prime portico soon after steps to the house. Traditionally it has a slope tiled roof with pillars supporting the roof.
- Chuttu veranda- In Kerala architecture, the poomukham is appended with an open passage. the chuttu verandah, which leads to either side of the house, usually surrounding it.
- Charupadi – Along the chuttu veranda and the poomukham are parapet-style, traditional carved wooden or cement benches. These are called charupadi.
- Ambal Kulam- Almost every Nalukettu has its own Kulam or Pond for bathing of its members. At the end of Chuttu verandah there used to be a small pond built with rubble on sides where lotus or Ambal used to be planted. The water bodies are maintained to synthesize energy flow inside.
- Nadumuttam :- A typical Nadumuttam of Kerala Nalukettu Traditional Nadumuttam or central open courtyard is the prime center of the Nalukettu. There is an open area usually square shaped in the exact middle of the house dividing the house on its four sides. Due to this four side division of the house by having a Nadumuttam.