

Urban Land Use

Human Ecology and Urban Land Use Models

Slides by Urmi Sharma

Models of

- *Burgess*
- *Homer Hoyt*
- *Harris & Ullman*

Introduction

- The forces underlying the pattern of land use, process of urban growth and accessibility within and outward of a city can be generalized by means of a number of theories.
- It is true to a large extent that each city possesses a unique combination of various use of land, but to some degree a common pattern is visible.
- The commonly referred patterns are concentric, sectoral and the multiple nuclei.
- These are known as **models of city structure** or theories **explaining urban morphology**.

A brief note:

- Ernest W. Burgess, an American sociologist, proposed his model of urban land-use in 1925 – “Concentric Zone Model”
- The idea behind the concentric model is that the **development of a city takes place outwards from its central area in a series of concentric circles to form zones**
- Concentric zone – display zonal organization concentrically arranged around the city centre
- He explained that the development of functional regions of a town takes place in concentric zones around the city centre.
- He proposed his model in the book “The City” – 1925 in the chapter titled ‘The growth of the City: An introduction to a research project’
- Book by: Burgess and R.E. Park
- The model is derived from the observations of a large number of American cities and CHICAGO in particular

Assumptions of the model

1. A plain topography/ area
2. Universal accessibility in a central town
3. Free competition for space (*no involvement of Govts.*)
4. No remnants of previously developed land use

The structure

- Different Zone in the Burgess Model or Concentric Zone Model
- Various researchers and scholars have debated over the number of zones (concentric circles) in the Burgess concentric zone model.
- Some consider them to be five whereas some consider 6 zones to explain this urban land use model.
- The center is the oldest part of the city around which the city expands over time, and the newest development comes on the edges.

Chicago, 1920s

Model

The model



- I - Loop (downtown)
- II - Factory zone
- III - Zone of transition
- IV - Working class zone
- V - Residential zone
- VI - Commuter zone

Zone - I

(Central Business District - CBD)

- The inner-most zone
- Centre of the city: central business district is located and has highest land value.
- Centre of **Commerce, Trade, Transport**
- Aka: RETAIL-TRADING region, Light manufacturing industries
- Also those industries which require less space
- Non- residential area: due to commercial activity taking place here

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- Non- residential area: due to commercial activity taking place here
- The zone has tertiary activities and earns maximum economic returns.
- Very High Accessibility: because of the convergence and passing of transport networks through this part from surrounding and even far places in the city.
- This part has tall buildings and noticeably high density to maximize the returns from land.
- Characterized by: **Sky-scrappers, Shops, Theatres, Hotels, Offices**, etc.

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Nomenclature of CBD:

- ✓ **Chicago: LOOP**
- ✓ **Pittsburg: Golden Temple**
- ✓ **New York: Down-town**

Zone-II

(Transition Zone - ZoT)

- Zone encircling CBD
 - As it is located adjacent and around the CBD and is continuously changing manner, i.e. transition takes place.
 - Characterized by Mixed land use
 - Business and Light manufacturing as well as residential area
- Business + Residential**
- Car Parking, Cafe, Old Buildings

Zone-II

(Transition Zone - ZoT)

Why transitional?

- ✓ The zone lies b/w CBD (I) and Residential zones (III)
- ✓ These zones encroach ZoT in accordance to their use
- This zone of transition is considered to “decay” because of a large number of old structures as the buildings in transition zone were earlier used for factories and tenement housing blocks.
- This zone had a high population density when industrial activities were at their peak.
- Those residing in this zone were of the poorest segment and had the **lowest housing condition**.

Poor housing conditions of the residents:

- Slums
- Small house
- Criminal and unsocial activities are common
- **Ghetto region**: A ghetto, often the ghetto, is a part of a city in which members of a minority group live, especially as a result of social, legal, or economic pressure.

Ghettos are often known for being more impoverished **दरिद्र** than other areas of the city.

In USA Zot is generally reside by migrated people

Zone - III

(Inner City/ Working Class zone)

- Aka **Zone of Small, Inexpensive houses of Working Men**
- This area is occupied for residential purpose and also known as 'inner city' or '**inner suburbs**'.
- Inhabited by workers in industries who have escaped from the Zot because of its **deteriorating conditions** but who desire to live within **easy access to their work (in CBD)**.
- In Chicago: **Two-storeyed houses**
- This area has a mix of **new and old development**
- People living in this zone are **second generation immigrants** as many moves out of the transition zone to this zone whenever affordable.
- This zone is **nearest to the working area** with **modest living conditions**
- Another interesting feature includes the **large rental housing occupied by single workers**.

Zone - IV

(Outer Suburbs/ White Collar Homes)

Aka:

- ✓ **Zone of Better Residence or**
- ✓ **Zone of Middle Class Dwellers**

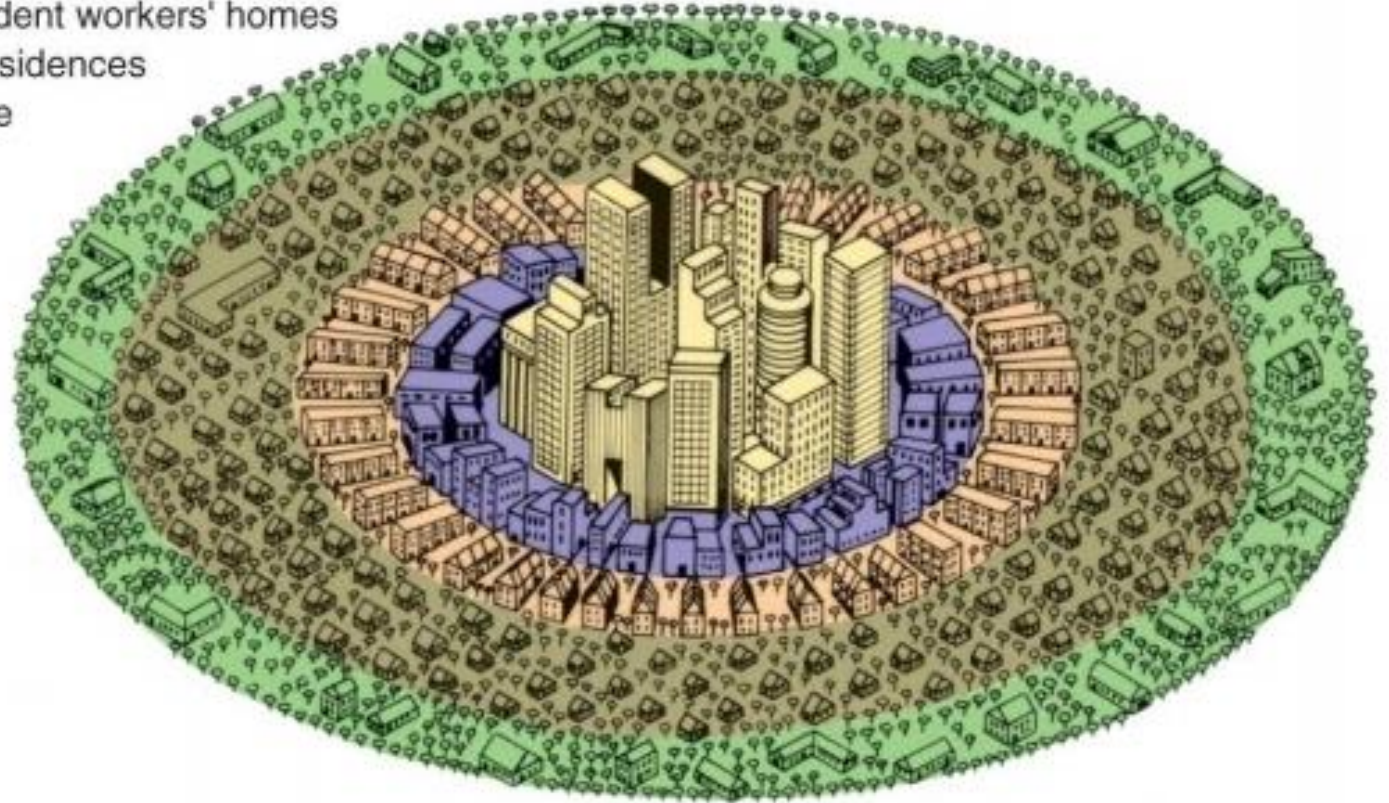
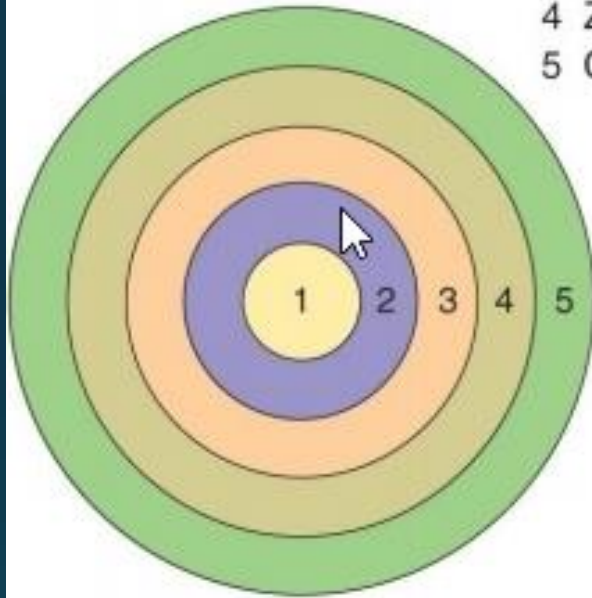
- This zone had bigger houses and new development occupied by the middle class.
- Many of the **homes are detached**, and unlike single occupants of inner suburbs, **families resided** in these homes.
- Better facilities are available to the residents like parks, open spaces, shops, large gardens but this comes at an **increased commuting cost**.
- This zone has a **large area of residential land**.
- People living in this outer ring look for **better quality of life**.

Zone – V

Commuter Zone/ Satellite Towns/ BED-ROOM towns

- This is the **peripheral area** and farthest from the CBD
- This resulted in **highest commuting cost** when compared with other zones.
- Significant commuting cost gave the name “**commuter zone**” to this part.
- People living in this part were **high-income groups** which could
 - ✓ afford large houses,
 - ✓ could pay commuting charges,
 - ✓ had access to different transportation mode,
 - ✓ enjoy modern facilities like shopping malls
- ✓ Low rise development,
- ✓ large gardens,
- ✓ less population density are some of the characteristics of this zone.
- This zone offered the **highest quality of life** and **facilities** but at a cost of higher commuting cost.

- 1 Central business district
- 2 Zone of transition
- 3 Zone of independent workers' homes
- 4 Zone of better residences
- 5 Commuter's zone



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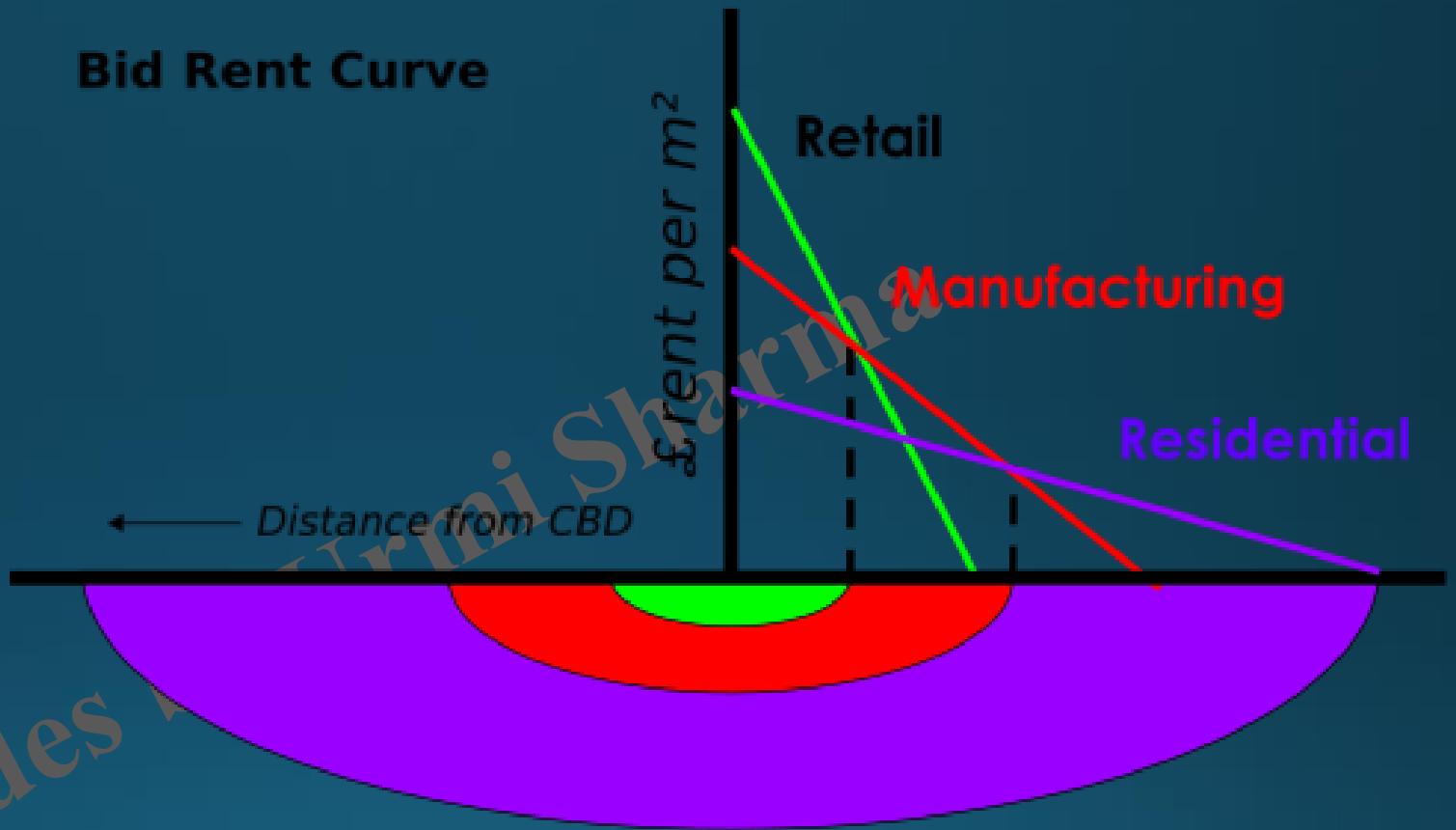
The Rationale Behind Concentric Zone Theory

- The Burgess model takes into account the positive correlation between **economic status** and **distance** from downtown.
- This considers, **better the economic status more the distance from the central area.**
- The central area has **high density**, and the **availability of land is scarce.**
- Because of this more affluent segment of the society reside away from the city center where they can build large houses.
- **Burgess described the changing spatial patterns of residential areas as a process of “invasion” and “succession”.**

The Rationale Behind Concentric Zone Theory

- As the city grew and developed over time, the CBD would exert pressure on the surrounding zone (the zone of transition).
- Outward expansion of the CBD would **invade** nearby residential neighborhoods causing them to expand outward.
- The process continues with each successive neighborhood moving further from the CBD.
- Zone of transitions are important part of the burgess model as they are very active and change of people & activities takes place constantly.

Burgess included the study of bid-rent curves according to which the land with the highest rent was occupied with economic activities of highest returns.



Merits of the Concentric Theory

- Quinn, the chief supporter of the Burgess theory, says: common-sense observations tend to confirm the theory.
- Urban-gradients' researchers indicate the probability of the concentric structure around the dominant retail area in various cities.
- Local irregularities may violate the symmetry of concentric ones, yet Quinn opined that most cities conformed at least roughly to the Burgess pattern.
- Haggett and Chorley too had appreciation about the contribution of Burgess's model which according to them was a normative model, 'a simplified structuring of reality presenting supposedly significant features of relationships in a generalized form.'
- To conclude, Burgess' model was plainly introduced to illustrate the expansion of the city in its comprehensible manner by a series of concentric circles designating both the successive zones of urban extension and the types of areas differentiated in the process of expansion.

Limitations and Criticisms of Concentric zone model

- Concentric zone model is one of the simplest model available. This model accounts for the economic forces which drive development and the study of patterns present at the time of the study. But with the evolution and passage of time urban areas grew more complex and this model cannot define the development of existing cities.
- Some of the limitations and criticism include:
- Although widely appreciated in the United States Burgess model is not applicable outside the US. This is so, as the pattern of growth is different because of various circumstances.
- The relevance of this model decreased over time. With the advancement in the mode of transportation, mass transit vehicles, motor vehicles, cars changed the way people commute. Accordingly, their preference for living in a particular zone changed.
- It does not take into account the effect of political forces and the restrictions imposed by the government for the improvement of living conditions.
- In reality, no distinct zones and boundaries exist as overlapping of areas is possible in every town. The preference of people changes over time depending on the importance they associate for a particular benefit.
- This model is not applicable to polycentric cities as many CDB exists in such towns. Moreover, every city is different, and the factors influencing the growth of a city are diverse.

References

- <https://www.dustinstoltz.com/blog/2015/12/02/burgess-concentric-zone-model-of-urban-development>
- Book by Harold Carter, 1972, “The study of Urban Geography”

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Models of
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➤ *Homer Hoyt*
➤ *Harris & Ullman*

Introduction

- Geographers have formulated models of urban land use to show how a 'typical' city is laid out.
- One of the most distinguished of these is the "Burgess" or "concentric zone model". This model is based on the concept that land values are highest in the centre of a city or town.
- **As the competition (competition for space) is greater in the central parts of the settlement.**
- This leads to *high-density buildings, high-rise* being found near the Central Business District (CBD), with sparse, low-density developments on the edge of the town or city.
- Another such model is the '**Hoyt model**' or popularly known as the '**SECTOR MODEL**'.

Introduction...

- The most **constructive criticism of Burgess** was best presented in a volume by Homer Hoyt published in **1939** by the United States Federal Housing Administration '**The Structure and Growth of Residential Neighborhoods in American Cities**'.
- Hoyt conducted a factual examination of **Residential Rent Patterns** in **25** widely distributed cities in the **USA**
- The model explains **how cities grew**.
- The benefits of the application of this model include the fact it allows for an **outward progression of growth**.
- It is a **modification of the concentric zone model** of city development.
- Rather quoted as an **improved version** of Burgess model.



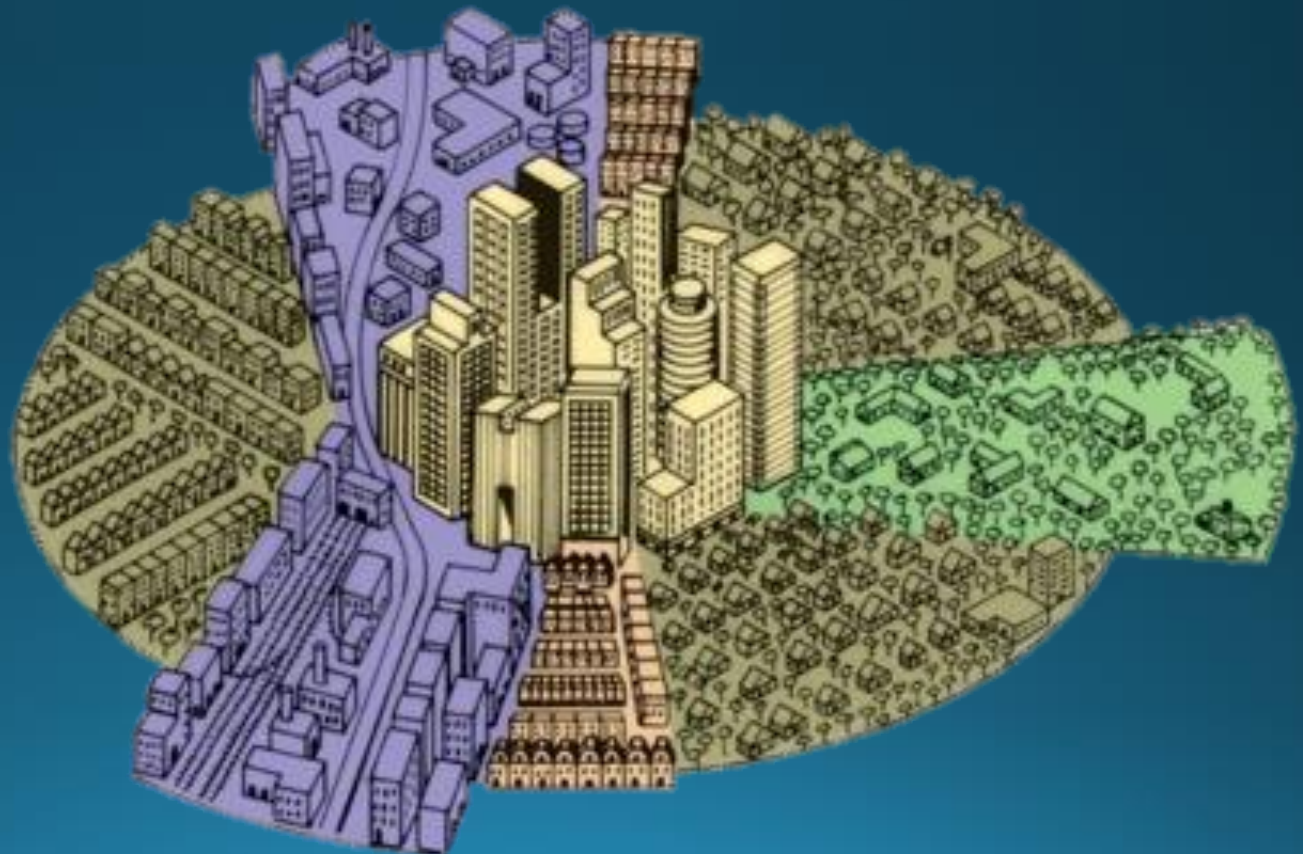
1. CBD

2. Wholesaling and light
manufacture

3. Low-class residential

4. Middle-class residential

5. High-class residential



Components of Hoyt Model

- Hoyt argued that **cities do not develop in the form of simple rings, instead, they have “sectors.”**
- Homer Hoyt suggested that **few activities grow in the form of sectors which radiates out along the main travel/ transport links.**
- Activities in a **sector are considered to be the same** throughout the sector because of the purpose/function it serves.
- **Land use within each sector would remain the same because like attracts like.**
 - ✓ The *high-class sector* would stay high-class because it would be the most sought after area to live, so only the *rich could afford to live there*.
 - ✓ The *industrial sector* would remain industrial as the area would have a typical advantage of a *railway line or river*.
 - ✓ These sectors can be housing, industrial activities, etc. These sectors grow along railway lines, highways or rivers.

The **SECTORS** in **HOYT MODEL**

1. He emphasizes on the **ribbons of development** that extended along commercial streets leading out of the central business district and the **tendency of industrial establishments to concentrate along railroad lines and rivers.**
2. He further notes the **existence of poor and middle-income housing along the rich residential areas** in the peripheries of the cities.
3. He opined that the **internal structure of the American cities was more axial than concentric resulting in the formation of different sectors.**

Components...

1. A city develops in a series of sectors, not rings. These sectors follow a definite path - extending outward along communication axes.
2. As the city grows, activities within it grow outward in a wedge shape from the Central Business District (CBD).
3. The **DIRECTIONAL** element will control the land use contrasts rather the **DISTANCE**.
4. As growth occurs, similar activities stay in the same area and extend outwards.
5. The whole city is assumed to be a circle whose different regions are having a sector pattern.
6. The land use which is found at the centre of the city is also found extending upto its periphery.
7. As the population of the city increases the high rent areas expands to its periphery in a sectoral manner.



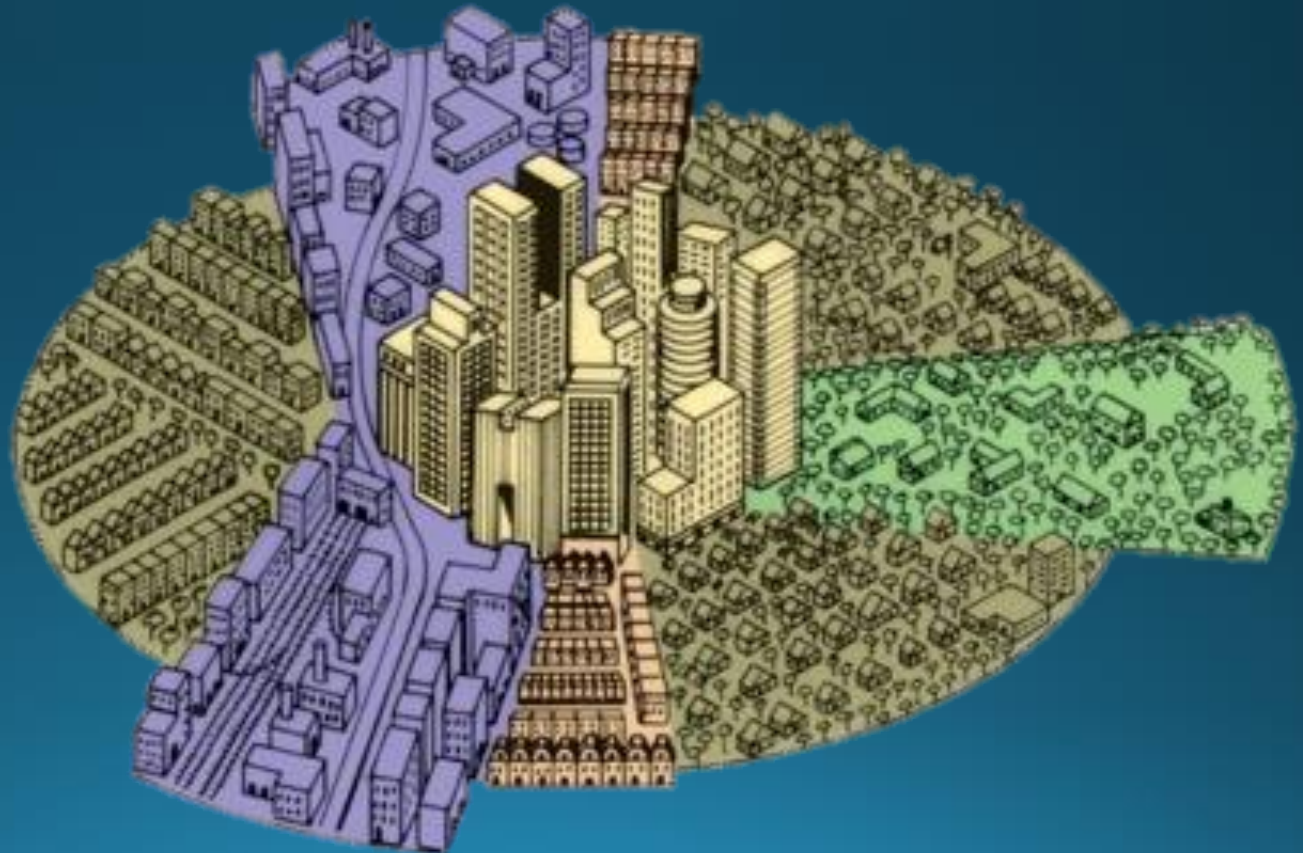
1. CBD

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Forces behind:

Hoyt suggested that high rent sector would expand according to four factors:

1. It moves from its point of origin near the Central Business District(CBD), along established routes of travel, **in direction of another nucleus of high-rent buildings.**
2. It will **progress along waterfronts** or toward **high ground**, when these areas are not implemented for industry.
3. It will **move along the route of fastest transportation.**
4. It will **move toward open space.**

Advantages of the Sector Model:

1. It looks at the effect of transport and communication links.
2. Numerous cities do seem to have followed this model. If turned 90 degrees anti-clockwise, the Hoyt model fits the city of Newcastle upon Tyne reasonably accurately.
3. Pie shaped wedges made by Hoyt compensated for the drawbacks of the Ring model.
4. Though not perfect it takes into account the lines of growth.

Limitations

- The theory is based on early twentieth-century rail transport and does not make allowances for private cars that enable commuting from cheaper land outside city boundaries.
- This occurred in Calgary in the 1930s when many near-slums were established outside the city but close to the termini of the street car lines. These are now incorporated into the city boundary but are pockets of low cost housing in medium cost areas.
- The theory also does not take into account the new concepts of edge cities and boom burbs, which began to emerge in the 1980s, after the creation of the model.
- **EDGE CITY** is a term that originated in the United States for a concentration of business, shopping, and entertainment outside a traditional downtown or central business district, in what had previously been a suburban residential or rural area.
- **BOOMBURBS** rapidly growing city in the United States that remains essentially suburban in character, even as it reaches populations more typical of urban core cities.
- Since its creation, the traditional Central Business District has diminished in importance as many retail and office buildings have moved into the suburbs.
- **The theory too lacks the idea based on land topography.** Physical features - physical features may restrict or direct growth along certain wedges
- The growth of a sector can be limited by leapfrog land.

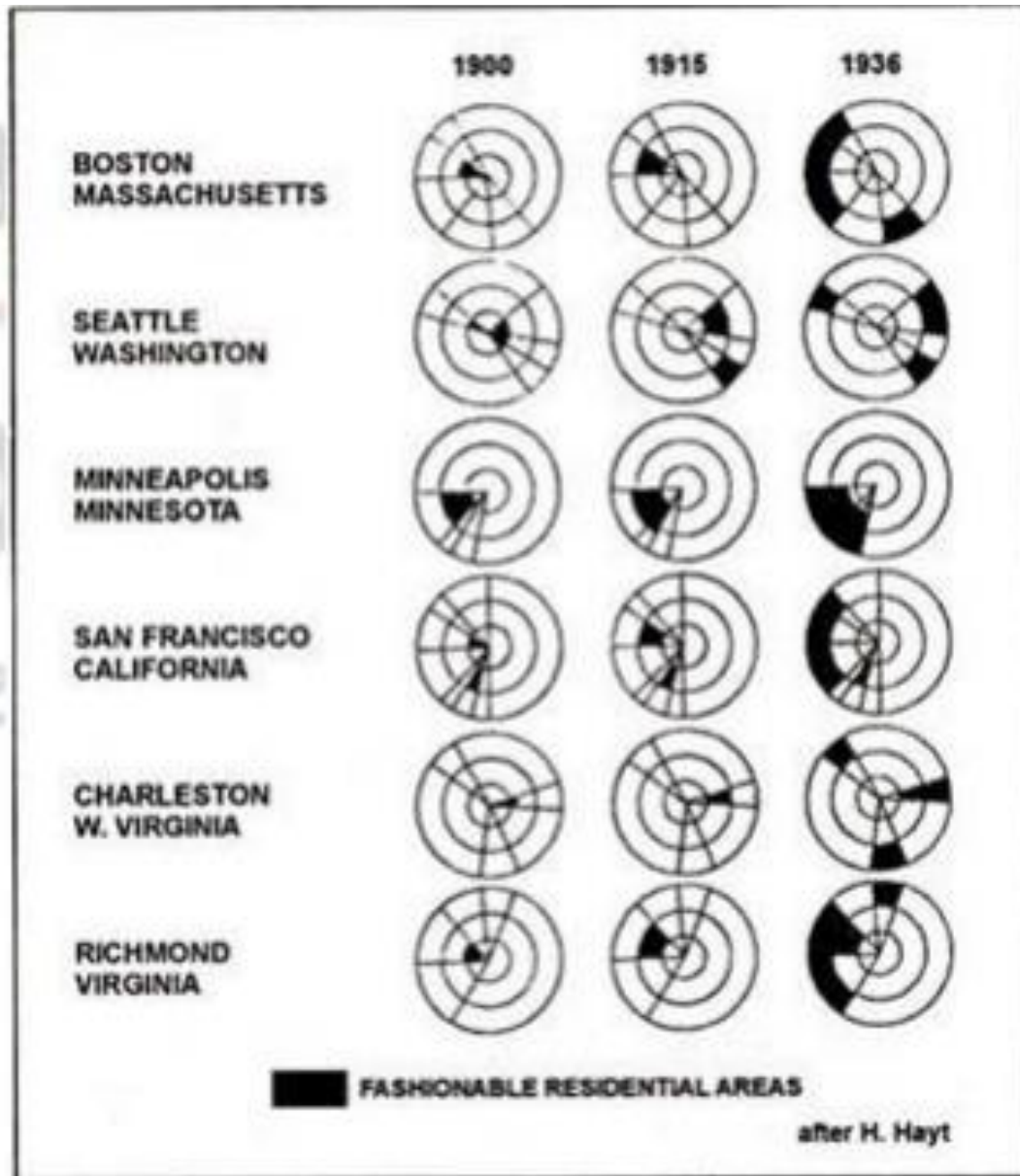
Final word

- Hoyt's theory, **deals only with residential land use**; the other types of land uses are considered because of their influence upon the residential areas of the city.
- Rent areas in cities tend to conform to a pattern of sectors rather than of concentric circles.
- The **highest rent areas** tend to be located in **one or more sectors** of the city.
- But various **rent areas are not static**.
- High quality residential areas tend to migrate outward in the sector, older houses remaining behind to become medium-quality areas.
- Hoyt stated that the **sector theory is of fundamental importance** in analyzing neighborhoods especially in the American cities **for locating markets for retail sales**.

The high rent neighborhoods of a city do not skip about at random in the process of movement, **they follow a definite path in one or more sectors of the city.**

Figure 4: Shift in the Location of Fashionable Residential Areas

Source: N.R.Fyfe and J.T. Kenny (2005) *The Urban geography Reader*, Routledge, London, pp. 30.



No city conforms to the ideal pattern but the general figure is useful as in American cities the different types of residential areas tend to grow outward along rather distinct radii and the new growth on the arc of a given sector tends to take on the character of the initial growth of that particular sector (Figure)

Examples of application of the sector model: (Student Assignment)



<https://pranilblogs.wordpress.com/2016/10/08/sector-model-a-brief-analysis/>

List some world cities and briefly explain their structure matching the sector model

References

- Hoyt, H. (1939) The Structure and Growth of Residential Neighborhoods in American Cities Washington, Federal Housing Administration
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Multiple Nuclei theory

- The multiple nuclei model is an **economical model** created by C.D. Harris and Edward Ullman in the 1945 article "**The Nature of Cities**"

Harris, Chauncy D.; Ullman, Edward L. (1945-01-01). "The Nature of Cities". The Annals of the American Academy of Political and Social Science. 242: 7–17. doi:10.1177/000271624524200103. JSTOR 1026055.

- This theory suggests that land use pattern in most of the large cities develops around a number of discrete centres or nuclei rather than a single centre as described in the concentric or sector models.
- The cities have an essentially cellular structure in which distinctive types of land use within an urban area have developed around certain growing points recognized as 'nuclei'.

Assumptions

The model assumes that:

1. Land is not flat in all areas
2. Even Distribution of Resources
3. Even Distribution of people in Residential areas
4. Even Transportation Costs
5. Profit maximization

Explanation

1. **The land is not flat** : It is difficult to find flat land for big cities, and the terrain features affects the activities, development, and direction of growth of an urban area.
2. **Even distribution of resources** – Resources are evenly distributed within the city, no one enjoys privileges or have exclusive access to resources.
3. **Even distribution of people in Residential areas** – People are distributed homogeneously and not concentrated in a particular area or pocket. This is essential as an unevenly distributed population has a direct impact on markets.
4. **Even transportation cost** – Transportation cost is even in the city and not influenced by location.
5. **Profit maximization** – A particular activity will locate itself where maximum profit can be earned.
 - For this, a different combination of rent, transportation costs, labor cost, proximity to market may be tried, and the combination which yields the best result gives the final location for the activity.
 - This location also takes into account the *restrictions over the activity* and the need to be separated from other non compatible activities such as locating residential areas away from industrial, locating large industries with more accessibility to reduce transportation cost and to ease the movement of goods.

The model

1. In some cities these nuclei of different land use are found before the development of the city.
2. The **number of these nuclei** is greatly decided by:
 - a) HISTORICAL development
 - b) LOCATIONAL forceswhich are responsible for the concentration as well as diffusion of activities.

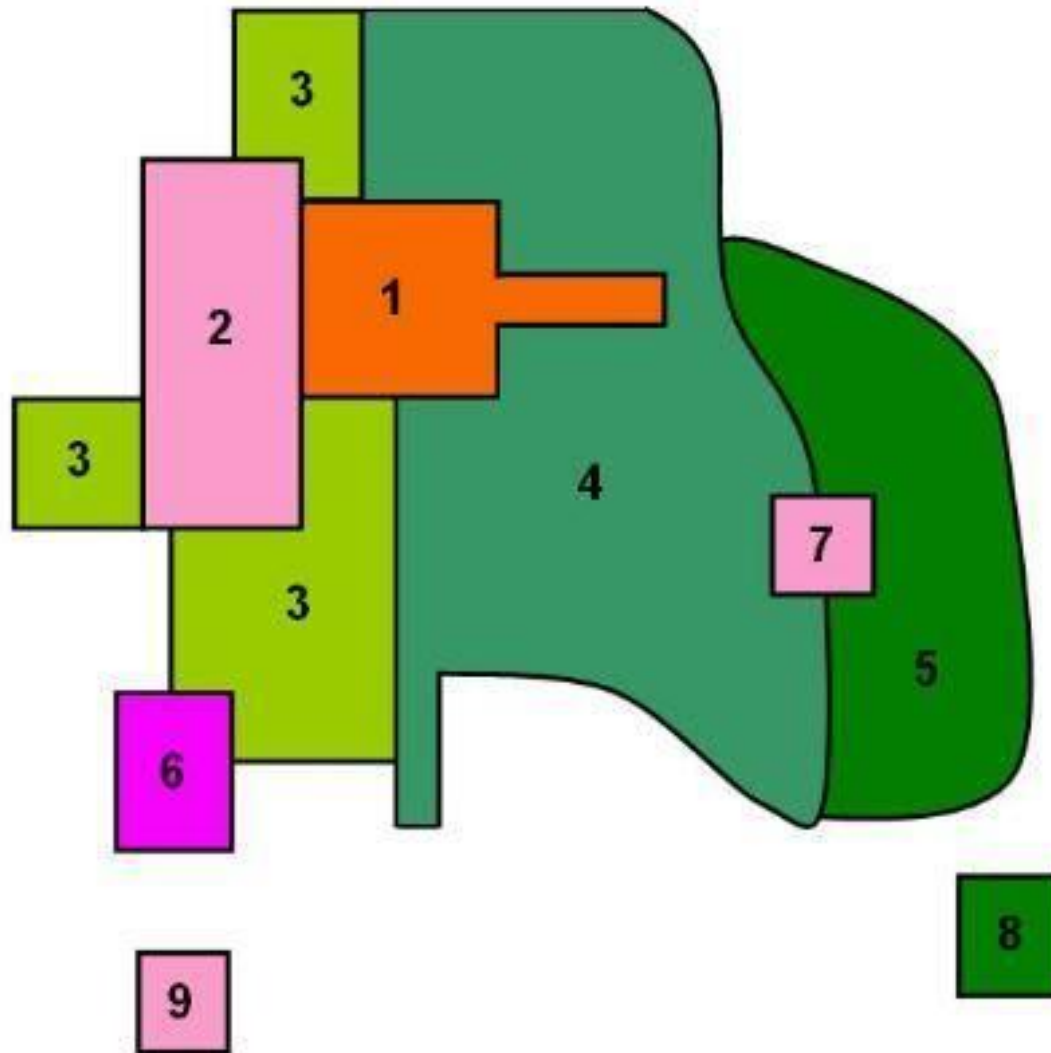
The model...

3. The **growth of such nuclei** are bound by number of controls which produce a pattern of characteristic associations between the nuclei. These are-
 - a) **Certain activities require specialized facilities** (e.g. *CBD or retail district is located at the point of maximum intra city accessibility*)
 - b) **Like activities group together since they profit from association** (For example, in an industrial area several functions are located around the industrial nucleus e.g. retail trade area, zone of financial and office buildings due to the facility of transport and communication)
 - c) **Some activities repel each other** (For example, heavy industry and high class residential areas are rarely located in close proximity)
 - d) **Some activities can not afford the high rents which the most desirable site demand** (e.g. *the location of areas of cheaper housing or bulk storage facilities*)

The model...

- The model describes the **layout of a city**, based on **Chicago**.
- It says that even though a city may have begun with a central business district, or CBD, other smaller CBDs develop on the outskirts of the city near the more valuable housing areas to allow shorter commutes from the outskirts of the city.
- **This creates nodes or nuclei** in other parts of the city besides the CBD thus the name multiple nuclei model.
- Their **aim was to produce a more realistic**, if more complicated, model. Their main goals in this were to:
 1. Move away from the concentric zone model
 2. To better reflect the complex nature of urban areas, especially those of larger size

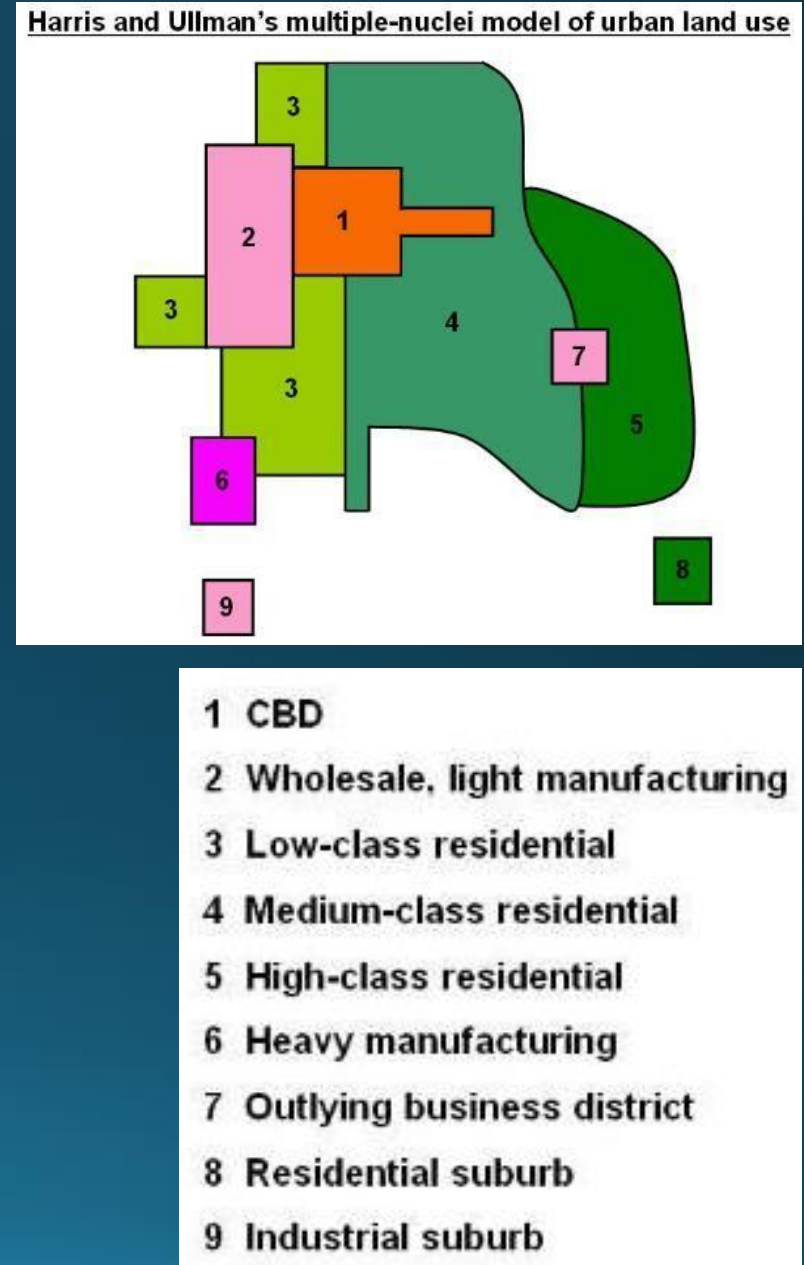
Harris and Ullman's multiple-nuclei model of urban land use



- 1 CBD
- 2 Wholesale, light manufacturing
- 3 Low-class residential
- 4 Medium-class residential
- 5 High-class residential
- 6 Heavy manufacturing
- 7 Outlying business district
- 8 Residential suburb
- 9 Industrial suburb

Model...

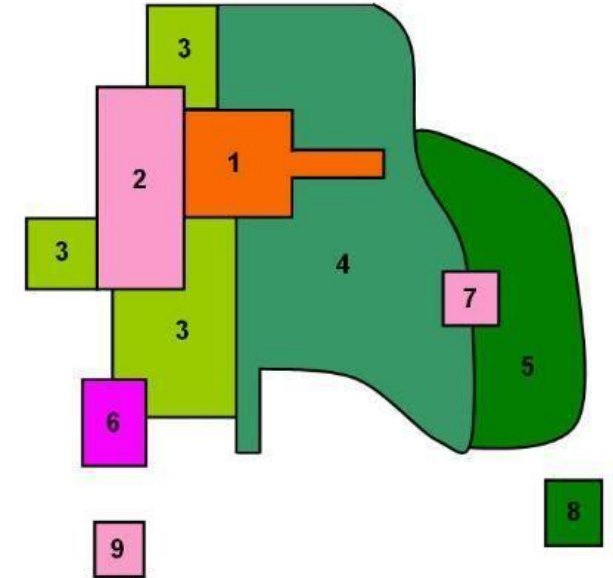
- An analysis of multiple nuclei model by Harris and Ullman suggests certain guiding principles.
1. **CBD** is the focus of the city is the zone of most convenient access from all parts of the city.
 - Here transportation lines converge and it is the point of highest land value.
 2. **The wholesale and high- manufacturing** district is located at inconvenient accessibility.
 - Normally it is located near the focus of extra city transportation because it principally serves a tributary region with which it is attached.
 - Therefore, this type of land use is located along railroad lines and also adjacent to CBD.
 3. Adjacent to CBD and zone of wholesale and light manufacturing **low class residential areas** are located.



Model...

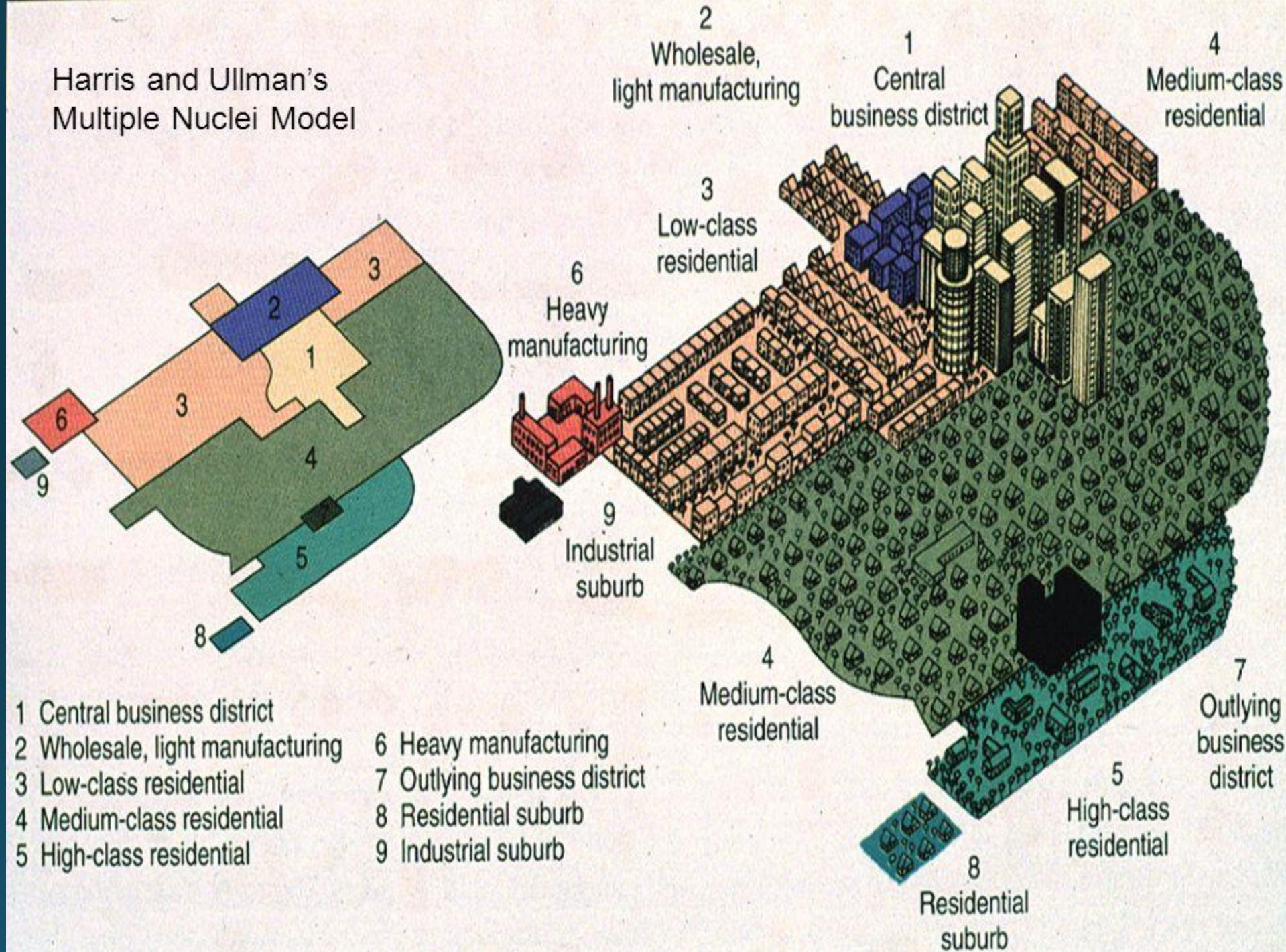
4. **High class residential area** is located on well drained high land away from noise, smoke, odors of CBD, industrial or low class residential areas.
5. **The medium class** or low class residential areas is located in between low class and high class residential areas.
6. The **zone of heavy industries** is found near the present or former edge of the city because they require large tracts of land as well as good transportation facilities by rail, road or water ways.
7. Beside Harris and Ullman suggested **minor nuclei**, **industrial suburb**, **residential suburb and commuter's zones** all lying in outer zone or periphery of the city.
 - With the growth of the city more such nucleus of the city grows along the periphery of the city.
 - It is apparent that views of Harris and Ullman argued that during the historical growth process these influence would decide the emergence of separate areas which would not be in the form of concentric circles or sectors.

Harris and Ullman's multiple-nuclei model of urban land use



- 1 CBD
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- 3 Low-class residential
- 4 Medium-class residential
- 5 High-class residential
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Harris and Ullman's Multiple Nuclei Model



- Multi Nuclei model is based on the **structure of Chicago** just like the Burgess model or Concentric zone model of 1925.
- However it is **contrary to the monocentric model** of Burgess Model.
- This model can be considered as an attempt to **explain the structure of the city taking into account the complexity and growth over time**, influence of central area & the city centre.
 - ✓ Harris and Ullman argued that a city might start with a single central business district (CBD), but over the time the activities scatter and gets modified.
 - ✓ The scattered activities attract people from surrounding areas and act as smaller nuclei in itself.
 - ✓ These small nuclei gain importance and grow in size and start influencing land value and the growth of activities around them.

Limitations and criticism of the Harris & Ullman's Multiple Nuclei Model

- Another drawback is the limited activities which are considered in the model along with the very rigid and specific boundaries of the activities.
- Non-existence of abrupt divisions between zones.
- Each zone displays a significant degree of internal heterogeneity and not homogeneity.
- No consideration of the influence of government policy.
- The concepts may not apply to Asian cities with different cultural, economic and political backgrounds.

Final Word

- The need for this model was to provide a **more realistic explanation of the cities**.
- The **influence of cars on personal** travel and greater movement of goods offered opportunity in different places instead of concentrating all economic activities in one place.
- This model is considered to be **more suitable for cities which are large and expanding**.
- This model was found to be applicable to multiple cities and not just **American** Cities like California, New York, Chicago. Multi nuclei model could explain a few **European** cities as well.

Conclusion

- At the present time there is a strong tendency to reject the idea of a simple model or theory to explain pattern of urban landuse.
- It is now widely acknowledged that all three theoretical elements concentric, sector and multiple nuclei may be found in any large city and that they are not mutually exclusive.
- Alternatively, it has been suggested that different processes operate at different periods in the city's growth.
 - ✓ Firstly, **early growth may be around the central area** following concentric zone or may be growth through separate nuclei.
 - ✓ Secondly, **later growth along transportation routes** creates a sector element.
 - ✓ Finally, adjustment of land use and land values, dependent on distance from the city centre as well as socio economic and site factors will give a **complex pattern of urban landuse which can be explained by multiple nuclei theory**.
- In these urban centres there are job in offices, financial offices, commercial establishment and service units. The people who are engaged in minor jobs with less income prefer to settle near their work place. The distance between their work place and residence depends upon the mode of transportation.

References

- https://en.wikipedia.org/wiki/Multiple_nuclei_mode
- <http://www.dspmuranchi.ac.in/pdf/Blog/A%20IV.pdf>
- <https://geographycasestudy.com/urban-land-use-patterns-and-models/>

Central Business District केंद्रीय व्यापार जिला (CBD)

- Criteria and Methods of areal definition
मानदंड और क्षेत्रीय सीमांकन की विधियाँ
- Historical process and CBD
ऐतिहासिक प्रक्रिया और CBD

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Sharma

Defining CBD

- The CBD is characterized by a **concentration of high order service activities that include retailing, office, legal, and other municipal functions.**
- The literature suggests that there are three main reasons for the clustering of these activities
 1. High transport accessibility उच्च परिवहन गम्यता
 2. Advantages of external economies बाहरी अर्थव्यवस्थाओं के लाभ
 3. Prestige प्रतिष्ठा associated with the central part of the city

1. High Transport Accessibility

उच्च परिवहन गम्यता

- 'Unique accessibility' being the first and most important.
- This is an 'all roads lead to Rome' type scenario and places the CBD at the hub of the primary transport network.
- Chicago's famous Loop is designed in this way with office complexes built above railway stations to fully exploit the local labor force.

2. Advantages of external economies बाहरी अर्थव्यवस्थाओं के लाभ

- The clustering of commercial activity can also bring economic advantages.
- While land use varies in the CBD, most of the functions are **complimentary and independent**.
- Firms can achieve external economies of scale by having access to what is, in effect, a **proximate pool of common services**.
- Numerous studies of London show the extent of spatial linkages **between different types of office activities that include press, industry, insurance, banking, and commodities**.

3. Prestige प्रतिष्ठा associated with the central part of the city

- There are also **behavioral reasons** that help explain the centrality of high order service activities.
- **In the business world a city center address arguably carries more prestige and the ability to afford such an expensive location is perceived as a sign of success.**
- The 'skyscraper infatuation' that swept through 1920s America was characterized by the erection of prestigious tower buildings established as landmarks to illustrious entrepreneurs.
- Furthermore, the **social scene** and **leisure economy** concentrated in and around the CBD further **facilitates personal communication**, favored by many businesses.

Just as the CBD has evolved through a number of different stages there have been various attempts to delimit its boundaries traditionally defined by a 'blighted zone' (of discard), characterized by obsolete and deteriorated property.

At the most visible level the CBD can be delimited by the **highest buildings, the heaviest concentration of traffic and pedestrian flows, and a large daytime working population and a low residential population.**

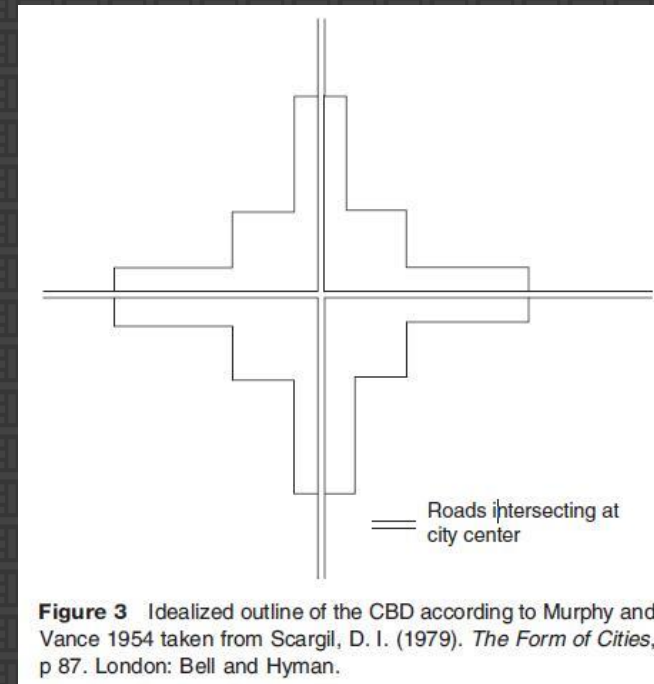
However, there is general agreement that these observations **only provide crude indicators** of the CBD's magnetism and are therefore not entirely satisfactory.

The main theoretical contributions for delimiting the CBD have come from approaches that employ land values and indices.

In urban environments the general assumption with land value delimitations is that **individual land uses will compete for the most desirable central location in or as near to the CBD as possible.**

Potential benefits can include unique attributes such as **strategic location, local market demand, integration with regional clusters, and human resources.**

- However, these potential benefits come at a cost of having to pay the highest amount of rent to be closest to or at the **peak land value intersection (PLVI)**.
- A useful generalization based on North American cities shows how the CBD builds up around the PLVI first before extending out along the main transport corridors.
- Any further increases in distance away from the PLVI means a drop in land values which in turn produces changing physical urban land use patterns (retail, office, and residential).



- Figure shows that retailing (usually malls, department stores, and flagship stores) is most dependent upon accessibility followed by offices and then residential land uses.
- The resulting type of land use pattern is also associated with steeper declines in the offer price curve for those functions (retailing) that are most dependent upon a central location.

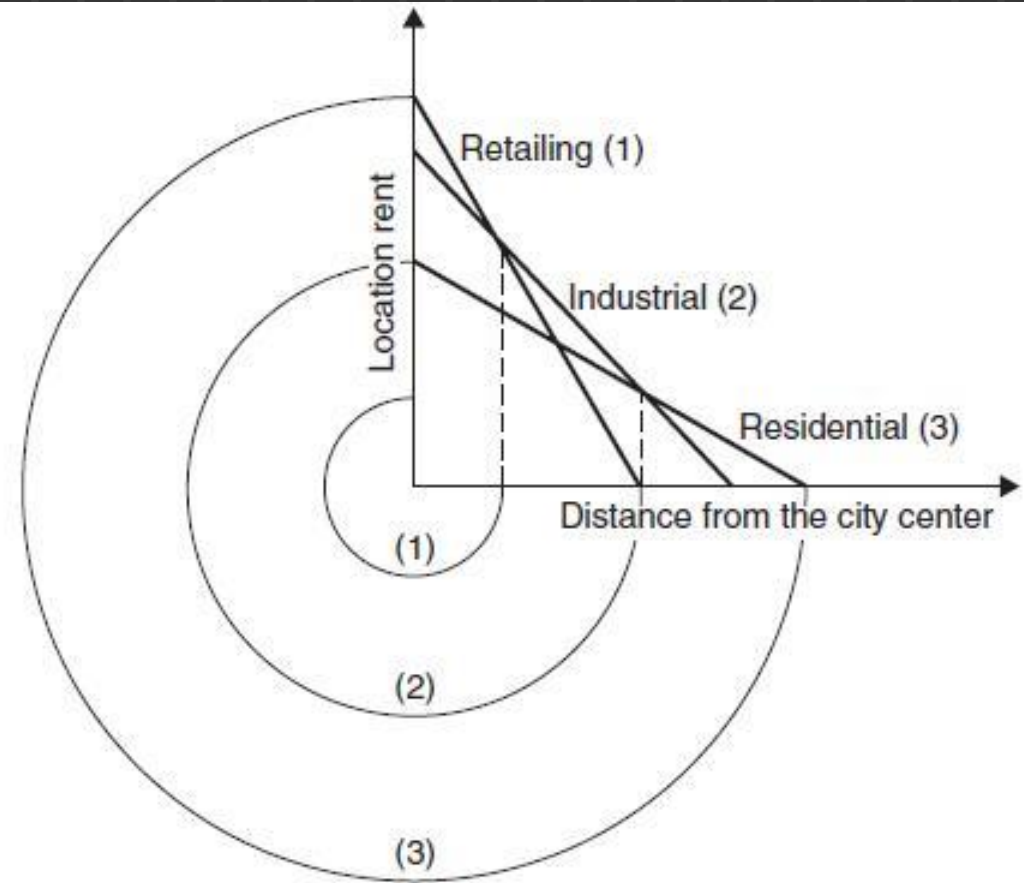


Figure 4 The Alonso Model after Alonso, W. (1946). *Location and Land Use: Toward a general theory of land rent*. Cambridge, MA: Harvard University Press taken from Johnston, R. J., Gregory, D., Pratt, G. & Watts, M. (2000) (eds.) *The Dictionary of Human Geography* (4th edn.), p 21 Malden, MA: Blackwell, (See also <http://www.xreferplus.com/entry/733934>)

Methods of Areal Definition

1. **Total height index (HI)** = Total floor Area/ Ground floor Area
2. **Central Business Height Index (CBHI)** = Total Central Business (Uses) Floor area/ Ground Floor Space
3. **Central business Intensity Index (CBI)** = Central business floor space $\times 100$ / Total floor space

The most widely accepted method of delimiting CBDs is provided by **Murphy and Vance (1954)**.

The method employs *four* steps.

1. Characteristic CBD functions are identified.

Retailing,
Offices,
Financial Services,

But not

Manufacturing,
Wholesaling Activities, or
Government Services and
Residential Land Use

2. The floor area devoted to CBD functions is measured for all floors in each building on a block by block basis.
3. The **intensity of CBD functions** for each block is expressed in the form of two indices,

**Central Business Height Index (CBHI) and,
Central Business Intensity Index (CBII).**

1. The CBHI

- Indicates the extent to which CBD functions are vertically concentrated within each block.
- For each block, the CBHI is determined by dividing the cumulative floor area in CBD functions on all floors of each building by the total ground floor area of the block.

$$\text{Central Business Height Index (CBHI)} = \frac{\text{Total Central Business (Uses) Floor area}}{\text{Ground Floor Space}}$$

- A **CBHI of 1.0** =
CBD functions cover an area equivalent to the entire ground floor area of the block.
- **Indices greater than 1.0** signify varying intensities of vertical concentration or stacking of CBD functions.

2. The Central Business Intensity Index (CBII)

- Measures the floor area occupied by CBD functions in relation to total floor area.
- It too is determined by simple division of the two measurements.
- $\text{Central business Intensity Index (CBII)} = \frac{\text{Central business floor space}}{\text{Total floor space}} \times 100$
- This index indicates the relative dominance of CBD functions in a block, with the **value of 0.5** being selected as **an indication of dominance**.

Finally, the **two indices are used in combination** to delimit the CBD.

Essentially, the CBD is identified as an area of contiguous blocks in each of which the minimum values of the CBHI and CBII are 1.0 and 0.5 respectively.

Other studies have refined these criteria to identify the core of the CBD

- Horwood and Boyce 1959;
- Davies (1960) who judged that a **CBHI of 4.0** and a **CBII of 0.8** delimits its extent.

Delimitation of CBD:

- ✓ It is a **difficult job** to delimit CBD accurately because land uses in the central part of a city also vary from cities to cities.
- ✓ **There is not yet any standard method of its delimitation.**
- ✓ There is lot of **difference** in the central areas of the **developed** and **developing** countries.
- ✓ Whatever methods are used by the western authors **hardly suit universal urban environment.**

Delimitation of CBD:

However, some of the methods have been given here:

(1) W. William – Olsson Technique:

- This method takes into account a '**shop rent index**' which is the total of shop rents of a building divided by the length of its frontage.
- But because of the difficulties involving in the collection of such data, it is impracticable. In India nobody discloses the correct value of rents.

(2) Sund and Isachsen

- Used **Total Turnover** or **Trade** instead of total shop rents.
- But, again, this is rather more **unreliable to obtain**
- In the **developing countries** this type of data obtained from the Municipal Council (Department of Marketing) are **totally fake**. Therefore, it is very difficult to prepare a map out of the aforesaid data and the picture which is thus obtained is mostly diffused.

Delimitation of CBD...

(3) **Proud foot method** used to **locate intra-city business areas by block-frontage-volume** of sales for each side of a block of all stores whose addresses indicate that they front on that side.

But Proud foot method too involves weaknesses being unconcerned about the activities of offices and banks.

(4) Other possible efforts include the data on:

- ✓ Building heights,
- ✓ Population distribution,
- ✓ Traffic and pedestrian flows,
- ✓ Land valuation data and land uses

An appropriate criterion varies from **city to city, to their size, to economies, to culture and to various activities** which are centripetal to the area.

Zone of Transition

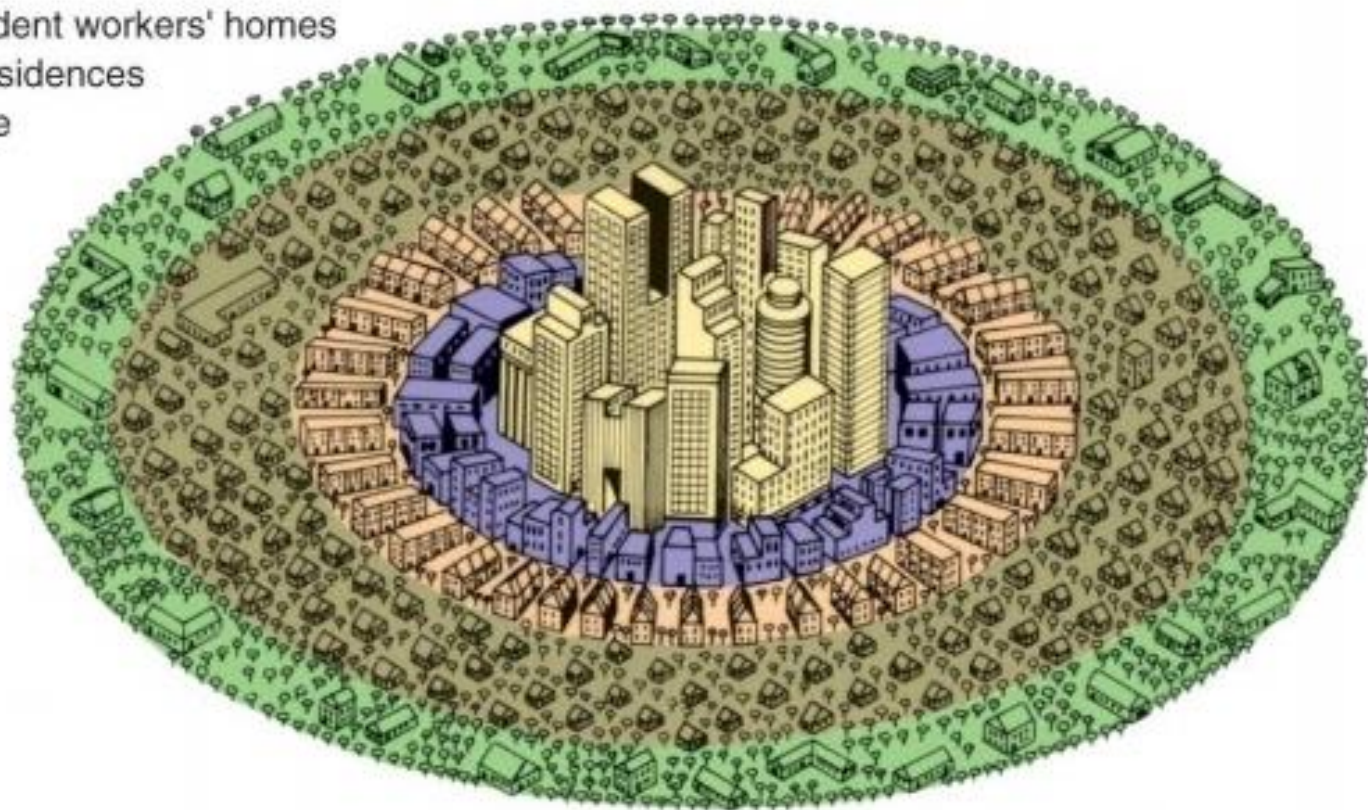
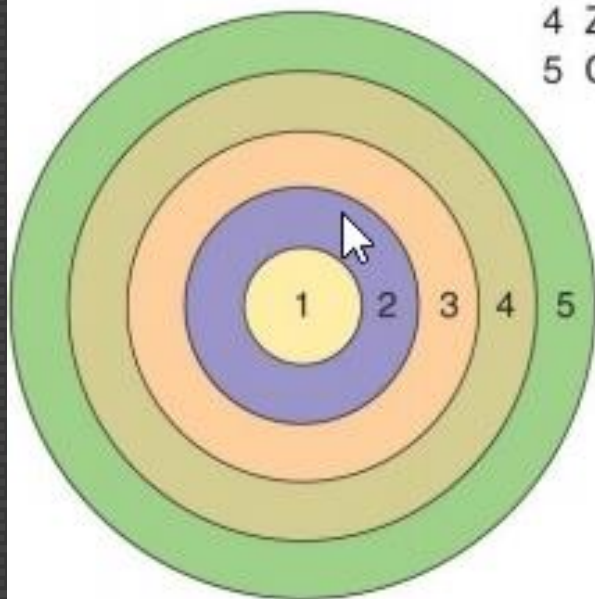
संक्रमण की पेटी

Compiled by Urmi Sharma

“The Zone in Transition a Study of Urban Land Use Patterns”: Richard Preston

- Peripheral to the central business district of the city there exist a transition zone embracing a large portion of the so-called ‘**gray area**’
- It usually presents **serious problems**, aging structures, general instability and **changes in a wide range in type and quality of functions**
- **Housing** exhibit all degrees of obsolescence (पुराने मकान)
- Many of its public facilities **ribbon-shopping concentrations and industrial wholesale storage districts are outmoded** and **suffer from high vacancy rates** and the presence of numerous marginal operations
- **Population** increasing numerically is trending towards **ethnic or racial aggregation** and at the same time to a **lower education and income levels**
- It **neither possesses locational advantages** of a central business district nor conditions which are readily adaptable for **desirable pattern of residential living**
- Consequently the **transition zone lies neglected by both public and private enterprise**

- 1 Central business district
- 2 Zone of transition
- 3 Zone of independent workers' homes
- 4 Zone of better residences
- 5 Commuter's zone



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The Zone in Transition (Tz)

Robert E. Preston and D.W. Griffin

They point out that traditionally Tz was viewed

- ✓ as an area of **mixed commercial and non-commercial land use**;
- ✓ tending towards **deterioration हास** and **blight कष्टप्रद**; and
- ✓ **locationally** separating the retail heart of the city from surrounding residential neighborhoods or heavy industrial districts
- ✓ Non-retail activities are:
 - Off-street parking,
 - Warehousing
 - Light manufacturing
 - Wholesaling with Stocks
 - Transportation Terminals
 - Multi-family
 - Residences
 - Special professional organization services

The Zone in Transition (Tz)...

The basic notion of Tz is:

- ✓ residential uses are extending outward and
 - ✓ as more space is demanded by central users
 - ✓ so the enough residential areas are taken over in the process of **INVASION** and **SUCCESSION**

The **greatest change of use is concentrated in this inner zone** which is, therefore, in transition

Why this zone is in state of deterioration and blight????

- ✓ The **VERTICAL Growth** of CBD
- ✓ The **suburban** development of **industry** and
- ✓ of **retail trade in suburban** or out of town shopping centres

results in a **diminution of demand for space in the zone** and consequently in a **lack of renewal of oldest building stocks** here results in **deterioration and blight**

The
structure
of Zone of
Transition

Heavy Industry Barriers



Old High-Quality Residences



Low-Quality Residences



Low-Quality Residences

The **Tz** is seen as a

1. **Sector of Active Assimilation**

where the new uses and process of development often being taken into the CBD, characterized by high-quality uses.

2. **Sector of Passive Assimilation**

- here *changes* are slower
- it is *a zone of discard from the CBD* to some extent where non-CBD uses are taking over

3. **Discontinuous Sectors of General Inactivity** *little changes are in progress*

In attempting to define Tz, Preston adopts a procedure parallel to that of Murphy and Vance and postulates a contrast between

Transitional Zone Uses and **Non-transitional Uses**

Government Organization 24.5 %

Parking 4.6%

Wholesale and Storage 10.9%

Residences 19.6%

Light Industry 7.8%

Heavy Industry 7%

Retail 7%

Vacancy 7.7%

Transport 4.1%

➤ The **Tz** is isolated by

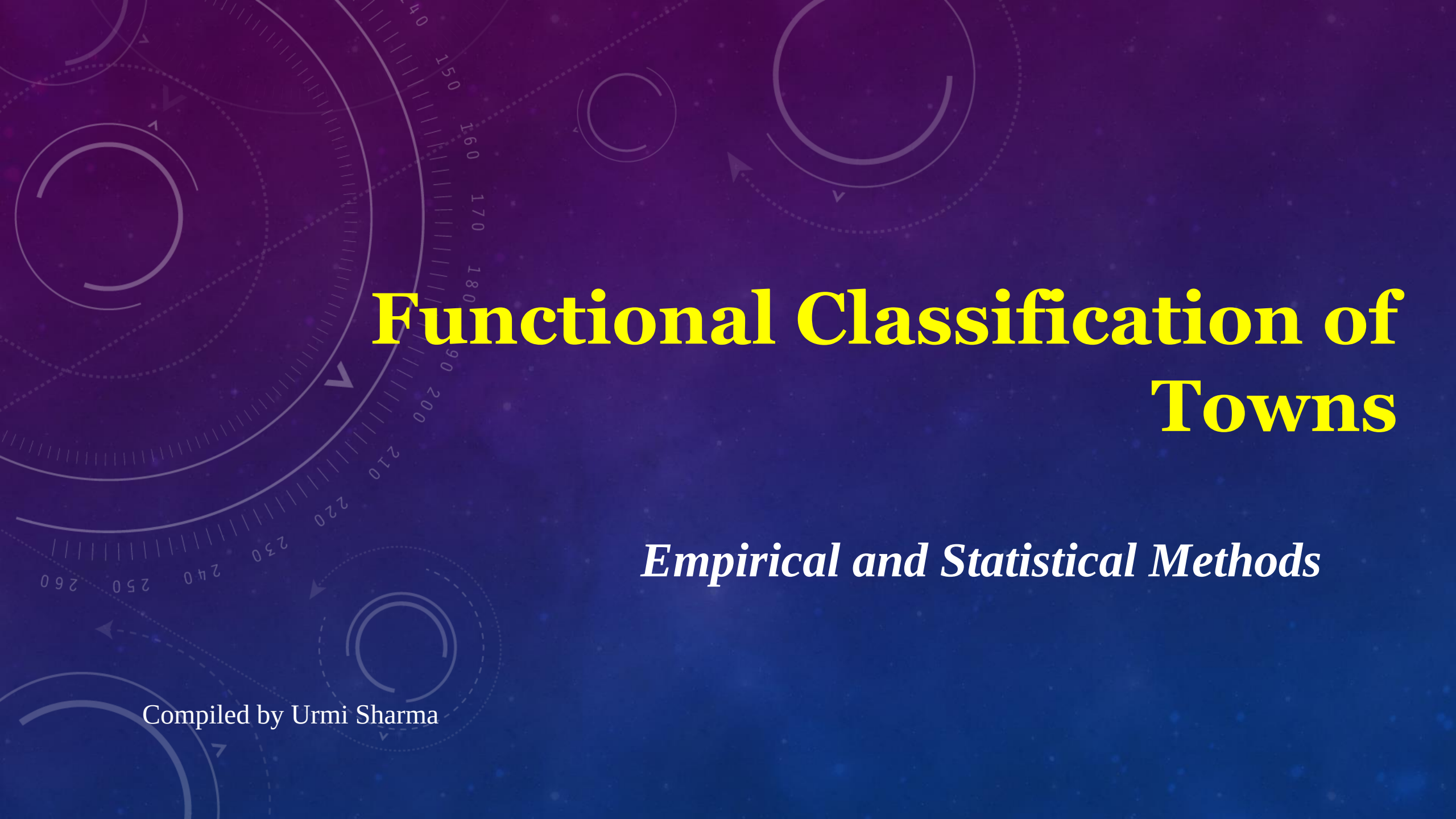
- taking out from the centre the CBD as identified by Murphy and Vance method and then
- by establishing an outer boundary with the amount of land in Tz uses **falls below 30%** (a value chosen by a trial and error process)

Therefore, the basic motion behind this is –

**“The Uses Chosen Defines The Area and Area
Reflects The Uses”**

➤ L. S. Bourne's comment on Tz

- He developed a critique of the Tz concept which is based on **“emphasizing the concept of structural adjustment as a continuous process of change in the spatial structure of the city as a system in contrast to the approach of defining areas which of asserting characteristics of transition.”**
- The whole city is in a process of change not solely the area adjacent to the CBD and in many ways the real problems are related to the areas which are not experiencing the change and not in transition in that sense but are **derelict** and **decayed**.

The background features a dark blue gradient with faint, light blue geometric patterns. On the left side, there is a large, semi-circular scale with numerical markings ranging from 140 to 260 in increments of 10. Several concentric circles and dashed lines with arrows are scattered across the background, creating a technical or scientific aesthetic.

Functional Classification of Towns

Empirical and Statistical Methods

Compiled by Urmi Sharma

Functional Classification of Towns

Empirical and Statistical Methods

the basis of

people are engaged in secondary, tertiary
ban places,

- In India the Census Authority conceived a scheme to standardize and define urban area.
- Three qualifying tests were laid down:
 1. **a concentration population of more than 5000,**
 2. **a population density of not less than 400/sq. km, and**
 3. **absorption of 75 per cent of the adult male population in nonagricultural occupations.**

The classification

Classification is helpful in comparing towns of similar and dissimilar nature

1. **Urban hamlet: 5000**
2. **Urban village: 5000 -**
3. **Town: less than 1 lac**
4. **City: More than 1 lac**
5. **Metropolitan city: 1 – 5 million**
6. **Megalopolis: More than 5 M**

Size Class Population

<i>I</i>	<i>100,000 & above</i>
<i>II</i>	<i>50,000-99,999</i>
<i>III</i>	<i>200,000-49,999</i>
<i>IV</i>	<i>100,000-19,999</i>
<i>V</i>	<i>5,000-9,999</i>
<i>VI</i>	<i>Less than 5,000</i>

Functional basis of classification

- *“Functions are driving force of the city life, and influence to a very large extent to its growth and morphology”* R.E. Dickinson
- Similar functions of towns may vary in proportionate
- The population of town has direct relationship with its functions.
- No. of functions increases with the increase in population
- Large size towns More complexities of functions
- But that's not the case always.....?????

Methods

- 1. Empirical or Qualitative**
- 2. Empirical cum Statistical**
- 3. Pure statistical**
- 4. Multi - Variate analysis**

Empirical or Qualitative

- Aka **non-statistical method**
- Search for **dominant functions** from observations
- Not rational as they do not examine the **intensity of the functions**

1. **M. Auroousseau**: Administrative, Cultural, Defence, Production, Communication, Recreation towns
2. **R.D. McKenzie**: four categories
 - (i) Primary service community
 - (ii) Commercial community
 - (iii) Industrial community
 - (iv) Service centres

Empirical cum Statistical Methods

- Combination of Qualitative and Quantitative techniques
 - William F. Ogburn: Percentage of total population of the cities in particular activities to denote types. Manufacturing, Trade, transportation (statistics) & Mining, recreation Health, College towns (Qualitative)

- C.D. Harris:
 - ✓ American cities
 - ✓ Occupational structure
 - ✓ Dominant function and quantified it

Type	Criteria	Denotation
Manufacturing	60 – 74 % population in industrial activities	M
Retail trade	Min. 50 % in retail trade	R
Wholesale trade	20 %	W
Diversified	60% manufacturing + 20% wholesale	D
Transport & Communication	Min. 11%	T
Mining	Min. 5%	S
University centres	Min. 25%	E
Resort/ Recreation	Considerable presence	X
Political centre	Considerable presence in military, finance, capital, professional activities	P

Pure statistical methods

- Arithmetic devices
- More reliable
- Precise

➤ G.L. Pownell: New Zealand towns

1. National Mean (N): Average % of function of all towns in a region
2. Individual Mean (m): Average % of function in that town
3. Deviation from the national mean (m-N)
4. Deviations could be '+' or '-'
5. Positive deviation = Town may be recognized for that town or vice versa

N (manufacturing) = 65,

m (manufacturing) = 80 (of Town 'A')

D = m - N

80 - 65 = +15 (Town 'A' is a manufacturing town)

H.J. Nelson

- More systematic form of Pownell's method
 1. **Percentage of workers in each function in every town of a region**
 2. **Regional percentage of each function**
 3. **Standard deviation of each function**
- Identified **9 or 10 functional groups of American cities**
- Introduced 3 degrees of variations: (**Z scores**)
 - i. **Mean + 1 SD**
 - ii. **Mean + 2 SD**
 - iii. **Mean + 3 SD**

Nelson's Nine Activity Groups (1950)

	<i>Manu- facturing</i>	<i>Retail Trade</i>	<i>Professional Service</i>	<i>Trans- portation and Communi- cation</i>	<i>Personal Service</i>	<i>Public Adminis- tration</i>	<i>Wholesale Trade</i>	<i>Finances Insurance and Real Estate</i>	<i>Mining</i>
	<i>Mf</i>	<i>R</i>	<i>Pf</i>	<i>T</i>	<i>Ps</i>	<i>Pb</i>	<i>W</i>	<i>F</i>	<i>Mi</i>
Average	27.07	19.23	11.09	7.12	6.20	4.58	3.85	3.19	1.62
Standard Deviation	16.04	3.63	5.89	4.58	2.07	3.48	2.14	1.25	5.01
Average Plus 1 SD	43.11	22.86	16.98	11.70	8.27	8.06	5.99	4.44	6.63
Average Plus 2 SD	59.15	26.49	22.87	16.28	10.34	11.54	8.13	5.69	11.64
Average Plus 3 SD	75.19	30.12	28.76	20.86	12.41	15.02	10.27	6.94	16.65

- ✓ Suppose, any city which is classified as Pf 2F, it means that
 - ✓ it has 22.87 or more but less than 28.76 per cent of its workers employed in professional service and
 - ✓ 4.44 or more but less than 5.69 per cent employed in finance, insurance and real estate.

Multi Variate analysis

- The meaning of this method is to take into consideration of **all type of data for the classification of towns**
- Whether such data are static or dynamic
- This method is used on statistical analysis of all types of features while all the above discussed methods rely on one set of data only
- it is true that all these methods use the data occupational structure of population with the help of various measures
- this method proposes the functional classification on the basis of
 - ✓ occupational data
 - ✓ wages and salaries
 - ✓ value added and
 - ✓ Production
- Difficulty is in obtaining such data with reliability
- **By using multivariate techniques it is possible to examine how towns are related to a series of variables**

Multi Variate analysis

- The study of **Social and economic differences of British towns** by **G.A. Moser and wolf Scott**
- They have presented a study to classify the towns on the basis of their social-economic and demographic characteristics
- They confined their work to towns of over 50,000 population
- Assembled a total of **57 variables** generally grouped under the headings - *population size and structure, population change, households and housing, economic character, social class, voting characteristics, health and education.*
- The investigation now leads to a study of **how much of the total variation can be accounted for by small number of independent variable called COMPONENTS.**
- **Method = FACTOR ANALYSIS**

Multi Variate analysis

- Four components have been identified
 1. Social class
 2. Population growth development 1931-1951
 3. Development after 1951 and the working population in 1951
 4. Housing conditions
- The process of classification is based on the **weightings recorded in the first two components**
- The other **two components are used when needed**
- **Such scheme produced 14 group of towns**

Centripetal and Centrifugal Forces

अभिकेंद्रीय एवं अपकेंद्रीय
बल

Growth of Urban Centres

Background...

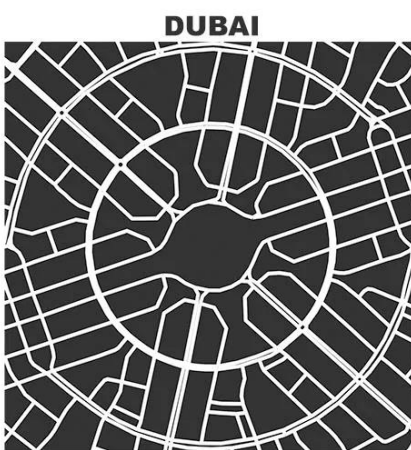
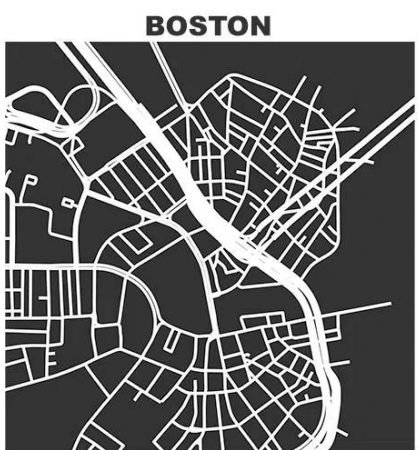
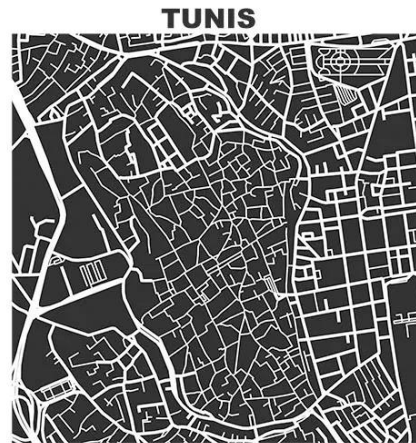
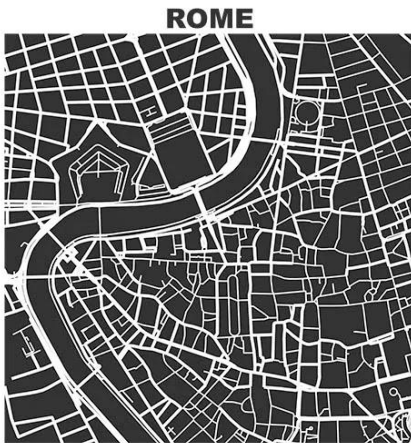
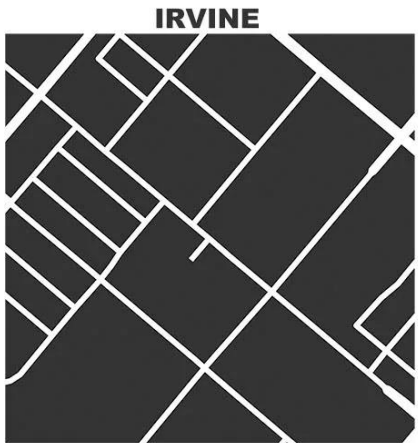
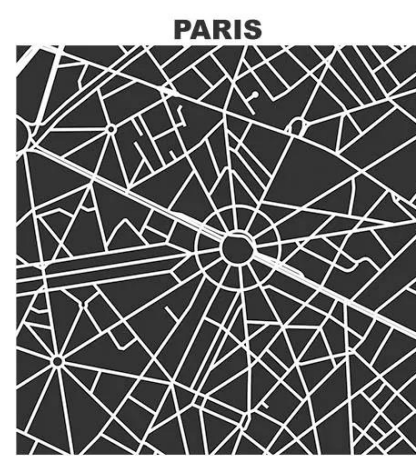
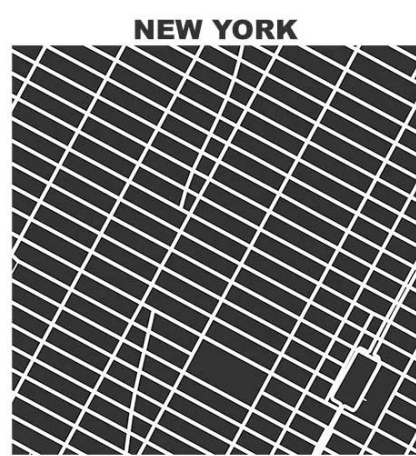
- ❑ Why are we talking about these forces?
- ❑ Growth of Urban centres?Evolutionary perspective (विकासवादी दृष्टिकोण)

To understand the PRESENT status..... In order to understand the PAST and FUTURE

- ❑ Present form in terms of Urban morphology
- ❑ The Process of Urbanization

MORPHOLOGY: URBAN (नगरीय आकारिकी)

- ✓ 'Morphos' = form/ structure/ shape
- ✓ 'Logy' = the manner of gaining knowledge/ the study
- ✓ **Urban Morphology = The physical form and arrangement of the *spaces* and *buildings* defining the townscape**
(भौतिक स्वरूप एवं विन्यास)



Layout of various cities:

- Grid
- Regular
- Radial
- Checker-board

Urban Growth

- The modern city is a **dynamic organism** (गतिशील जीव) constantly in process of evolution (*modification of long-established functions and the addition of new ones*)
- The centre of the city functions as a **nuclei**
- The city records its **growth around this nuclei**
- Forces responsible for this growth:

Centripetal and Centrifugal forces

- Development of town is the result of these two forces

Centripetal Movements

- Centripetal Movements involve the migration of people into towns and cities
- Inward Movement (Centripetal)
- Processes that leads to this inward movement:

1. Rural to urban migration



Rural Push



Urban Pull

2. Gentrification

3. Re-urbanization:

(Urban Renewal)

Centripetal Movements...

A. Rural-Push Factors:

- High rates of population growth have put **pressure on natural resource** especially...land...in rural scenario
- **Reduced the size of land holdings**
- New farming technology favors the rich farmer, but for others it leads to unemployment or underemployment
- **Migration for work** is often the only option

Centripetal Movements...

B. Urban-Pull Factors:

- Economic Growth: Urban economies are almost always **more productive than rural ones**
- **Higher wages**
- More **varied employment**
- Educational opportunities
- **Industrial productivity is higher** in cities
- Cities are usually responsible for a **greater percentage of total GDP**

2. Gentrification

- **Gentrification is a general term for the arrival of wealthier people in an existing urban district,** (a related increase in rents and property values, and changes in the district's character and culture)
- The term is often used negatively, suggesting the **displacement of poor communities by rich outsiders.**
- Gentrification often **increases the economic value** of a neighborhood
- In addition to these potential benefits, gentrification can lead to population migration and displacement.
- More homeowners and businesses will pay taxes and the amount of property taxes each pays, will rise as property value increase.
- The **Reinvestment of capital into inner-city areas.**
- **Improvement in residential areas**
- It is a type of **filtering** that may lead to the **social displacement सामाजिक विस्थापन** of poor people

3. Re-urbanization: (Urban Renewal)

- The development of activities to increase residential population densities within the existing built-up area of a city.
- This may include
 - The **redevelopment** of vacant land and
 - The **refurbishment** of housing and
 - The **development** of new businesses
- रिक्त भूमि का पुनर्विकास
- आवास का नवीनीकरण
- नए व्यवसायों का विकास

Centrifugal Movements

- Centrifugal Movements also known as Decentralization
विकेन्द्रीकरण is the outward movements of a population from the center of a city towards its edge or periphery, resulting in the expansion of a city.
- a combination of
 1. uprooting impulses in the central zone and
 2. attractive qualities of the Periphery

Centrifugal Movements...

- **Suburb**: a residential area just outside the boundaries of a city.

उपनगर: किसी शहर की सीमाओं के बाहर एक आवासीय क्षेत्र।

- **Suburbanization**: the outward growth of towns and cities to engulf surrounding villages and rural areas.

उपनगरीयकरण: कस्बों और शहरों की बाहरी वृद्धि आसपास के गांवों और ग्रामीण क्षेत्रों को घेरने के लिए

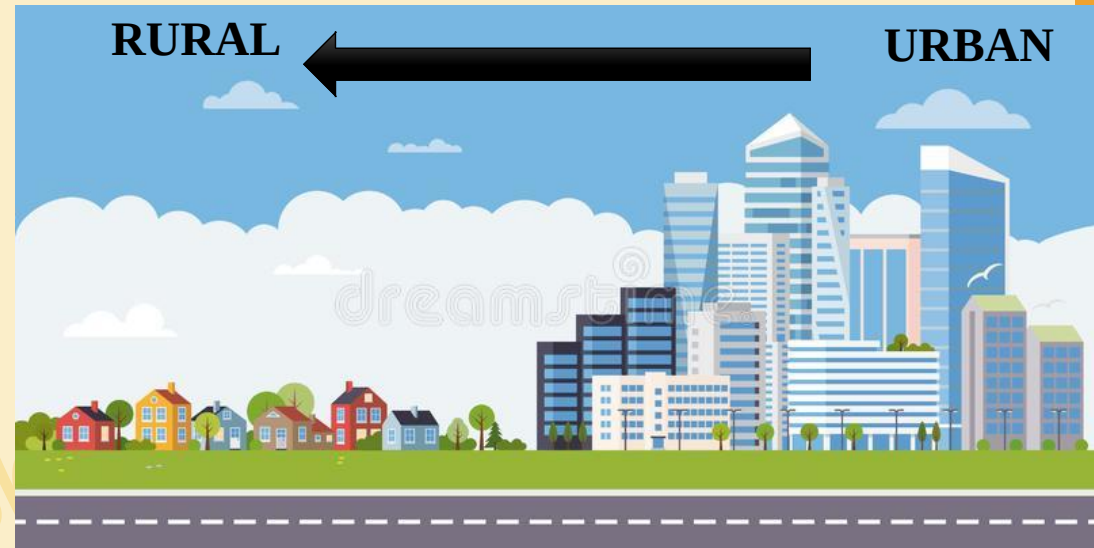
- This may result from the **out-migration of population** from the inner urban areas to the suburbs.
- यह आंतरिक शहरी क्षेत्रों से उपनगरों तक **आबादी के बाहर-प्रवास** के परिणामस्वरूप हो सकता है।

Centrifugal Movements...

- **Urban Sprawl अनियोजित नगरीय विस्तार:** The unplanned and uncontrolled physical expansion of an urban area into the surrounding countryside.
आसपास के ग्रामीण इलाकों में एक शहरी क्षेत्र के अनियोजित और अनियंत्रित भौतिक विस्तार।
- It is also closely linked with the process of suburbanization.
यह उपनगरीयकरण की प्रक्रिया के साथ निकटता से जुड़ा हुआ है।

Centrifugal Movements...

- **Counter-Urbanization:** A process involving the movement of populations away from inner urban areas to a **new town, new estate, commuter town** on the edge or just beyond the city limits or rural-urban fringe



- **Counter urbanization**, or **de-urbanization**, is a *demographic and social* process whereby people move from urban areas to rural areas

Centrifugal Movements...

- It is a response to increasing stress of overcrowding, congestion, pollution and crime. भीड़भाड़, प्रदूषण, बढ़ती अपराधिक गतिविधियाँ
- Reasons for counter-urbanization:
 - Increased car ownership
 - Increased wealth
 - De-industrialization

Centrifugal Movements...

- Relocation of industry/employment to rural-urban fringe
- Desire for safe, pleasant environment, the rural ideal/utopia
- Perception of urban areas as dangerous, high levels of crime, racial/ethnic problems नस्लीय समस्या– ‘white flight’
- Change in tenure from public/renting to private ownership. Sell property and move out.

According to Charles Colby, 1933

- The present form of urban morphology is the result of three main forces
1. Centripetal forces
 2. Centrifugal forces and
 3. Spatial differentiation forces

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Centrifugal and Centripetal Forces in Urban Geography

CHARLES C. COLBY

The modern city is a dynamic organism constantly in process of evolution. This evolution involves both a modification of long-established functions and the addition of new functions. Such functional developments call for new functional forms, for modification of forms previously established, and for extensions of, and realignments of, the urban pattern. Apparently these developments of function, form, and pattern are governed by a definite although as yet imperfectly recognized set of forces. Among these forces, two groups stand out prominently. The first group is made up of the centrifugal forces which impel functions to migrate from the central zone of a city towards, or actually to

Centripetal Forces:

- The **primary stage of development** of the urban morphology is the **result of centripetal forces**
- It **originates** after the **formation of main nucleus**

Centripetal Forces

- The resultant outcome of the centripetal forces appears in the form of **concentric development** **संकेन्द्रित विकास** in the built-up area
- This force holds certain functions in the central zone and attracts others to do it
- This central zone primarily attracts people to settle here more in number.....**Concentration of Population.....Density increase**
- Among the important centripetal forces:
 - ✓ The **temples** & most **shrines** are the important attracting nuclei for the concentration of population and various establishments
 - ✓ In ancient period the **river banks** function as a nuclei in the development of Indian cities
 - ✓ **Administrative functions** available in the immediate vicinity of king's palace

Centripetal Forces...

- ✓ Education centres
- ✓ In mediaeval period **forts** functioned as administrative seat
- ✓ The **commercial areas** are the congested parts of the centres:
 - Chandni Chowk of Delhi,
 - Chowk Bazar Varanasi,
 - Chauda Bazar market of Ludhiana,
 - Residency Bazaars of Hyderabad

Centripetal Forces:...

He has put these forces into five groups:

1. Site attraction स्थिति आकर्षण

- In this force the religious nucleus like the **temples, mosques** and **vihar** serves as important attractive forces for the concentration of population in various institutions

2. Functional convenience कार्यात्मक सुविधा

- The next of centripetal forces is found in the localization/ concentration of administrative functions in the immediate vicinity of kings or chiefs residences

Centripetal Forces:...

3. Functional magnetism कार्यात्मक चुंबकत्व

- When the established centres and functions try to attract the like and independent functional establishments
- Such a force is termed as functional magnetism
- All these three forces help in the development of morphology of unplanned cities

4. Functional prestige कार्यात्मक प्रतिष्ठा

- This force is the outcome of combined necessities of many functions coupled with the individual functional magnetic force. (Govt. offices and nearby govt. residential areas).....to avoid the inconvenience to the employees

5. Human equation

- The wealthy families try to cling to the sites of functionally rich areas
- Such sites are very valuable and are located in the heart of the city

2. Centrifugal Forces

- After the centripetal forces are well-established and problems in the central areas are observed: Congestion....Large patches of unoccupied lands at the periphery.....low land values
- The stage of such development of centrifugal force is reflected in the following classes of the forces
 1. **Spatial force:** due to heavy congestion and suffocation the people are compelled to search the new areas for living
 2. **Site force:** Other attractions (other religious, commercial, recreational establishments & landscape attraction)

2. Centrifugal Forces: ...

3. **Situation force:** no proper functional spacing between residential and work places
4. **Social evolution:** difficulty to pay high taxes. Increasing land values in CBD....Development of SLUMS in the outskirts of the city
5. **Status and Organization of occupance:** residential and industrial areas shifts outward
6. **Human equation**

3. Spatial Diffusion Forces स्थानिक प्रसार बल

- When the city is enormously increased in its size, and the periphery areas are unable to fulfill its needs, then the city has its **expansion along the main roads** in the **outer distant areas**.
- **Large scale industries** and **residential colonies** are developed there
- **These functions invite the concentration of certain essential functions:** the establishment of aerodrome, large warehouses, industries increasing pollution, large education institutions, administrative offices are developed here.
- **Now they act as centripetal force**
- Each function has the **variation in the force of attraction**