URBAN DEMOGRAPHY

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UNIT - II

- Urban demography: Population density models – age and sex structure – Occupational structure – Economic base – Basic and Non basic function – Functional classification of urban centres. Rural urban fringe – Suburbs –concept of city region.

Demography

- Demography, in fact, originated when human beings started forming civilized society. As the time passed, every society and nation realized the need and necessity of maintaining proper records of human population for smooth running of administration and for solving many social as well as economic problems associated with growth of population. Different countries began registration of vital events in different periods and for variety of reasons.
- The economists, geographers, social scientists and others have defined it in different ways suiting to their convenience and viewpoints. According to Frank Lorimer (1959): "*In broad sense, demography includes both demographic analysis and population studies. Demography studies both qualitative and quantitative aspects of population*."

Important concepts in Demography

- **Crude Birth Rate:** The annual number of live births per 1,000 people.
- **General Fertility Rate:** The annual number of live births per 1,000 women of childbearing age (often taken to be from 15 to 49 years, but sometimes from 15 to 44).
- **Age-Specific Fertility Rates:** The annual number of live births per 1,000 women in particular age groups (usually 15-19, 20-24 and so on).
- **Crude Death Rate:** The annual number of deaths per 1,000 people.
- **Infant Mortality Rate:** The annual number of deaths of children less than 1 year-old per 1,000 live births.
- **Life Expectancy:** The number of years which an individual at a given age can expect to live at present mortality levels.
- **Total Fertility Rate:** The number of live births per woman completing her reproductive life, if her childbearing at each age reflected the current age-specific fertility rates.
- **Gross Reproduction Rate:** The number of daughters who would be born to a woman completing her reproductive life at current age-specific fertility rates.
- **Net Reproduction Rate:** The number of daughters who would be born to a woman according to current age-specific fertility and mortality rates

Nature of Demography

Broader view:

- According to this view, the scope of demography is wide and it studies the causes of slow or rapid change in birth rate, death rate, population growth, sex ratio, health conditions, etc.

Narrower view:

- As against the broader view, there is also a narrower view about the nature and scope of demography. This view, among others, is represented by Phillip and Otis. According to them the scope of demography is not as wide as we have been made to believe by some thinkers.

Balanced view:

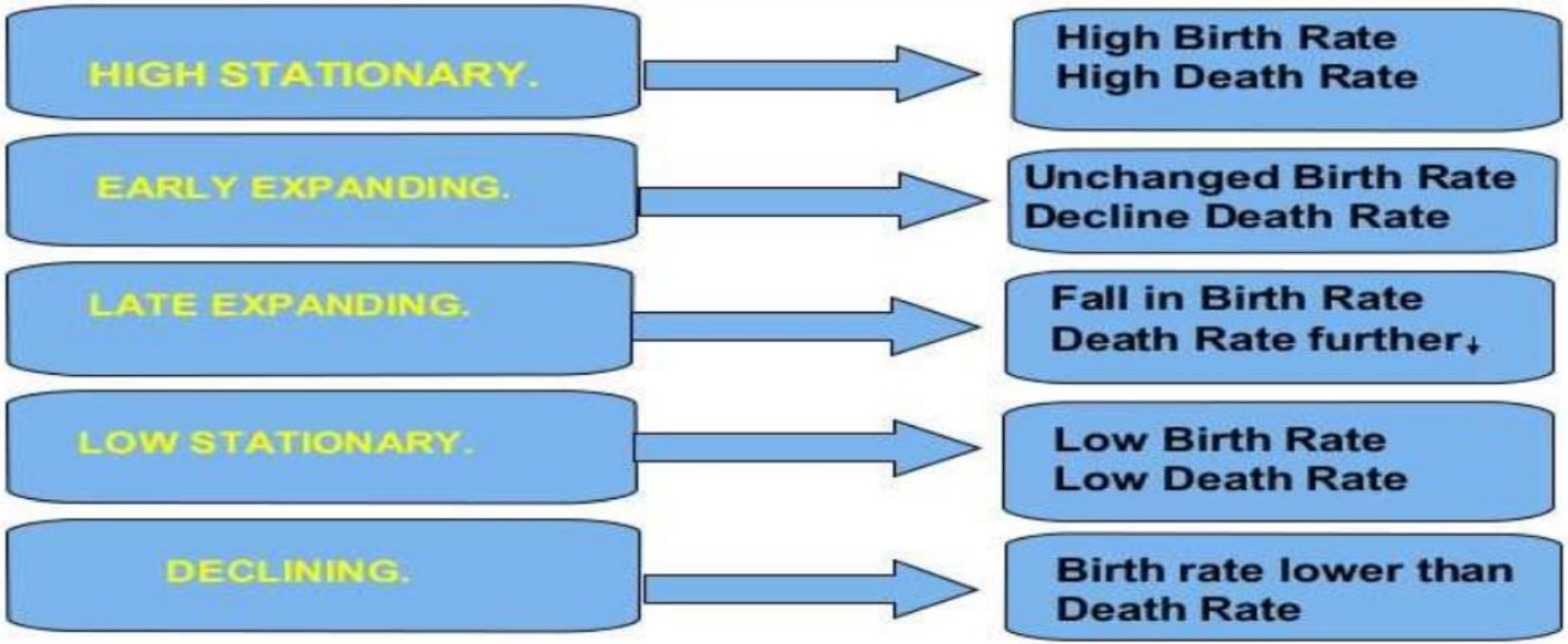
- There is a third school of thought which claims to have presented balanced view of the nature and scope of demography. According to Warren, S. and Thompson (1953), under demography, we can study death, birth and actual rates of growth of population, information about female population, their education, health conditions, marital status, distribution of population and their classification according to their occupations, their socio-economic conditions, etc. In fact, today it is accepted that demography is the study of human society and has very little to do with individualistic human problems. While dealing with groups it takes the help of figures and arithmetic.

Relationship of Demography with other Disciplines

- **Sociology and Demography:** Demography primarily studies and is concerned with collecting data and information about biological, economic and social problems. Sociology believes that man is a social animal. Similarly, demography also accepts human being as a unit of a society and a group in which a man is born, lives and dies. The group, however, continues.
- **Demography and Anthropology:** Demography is concerned with population figures of the whole world, whereas anthropology is concerned only with the study of few sections of society. In anthropology we are concerned with the development and growth of only few tribeslsections and not with the whole data which a demographer will collect.
- **Demography and Human Ecology**: Population is an outcome of births, Education: An Overview and birth of human beings and their living is the main concern of human ecology. In human ecology along with human births and environment, relationship between them is also studied.
- **Demography and Geography**: Importance of human geography has increased more as compared to physical geography. In other words, geographers have also started keenly studying population growth and problems

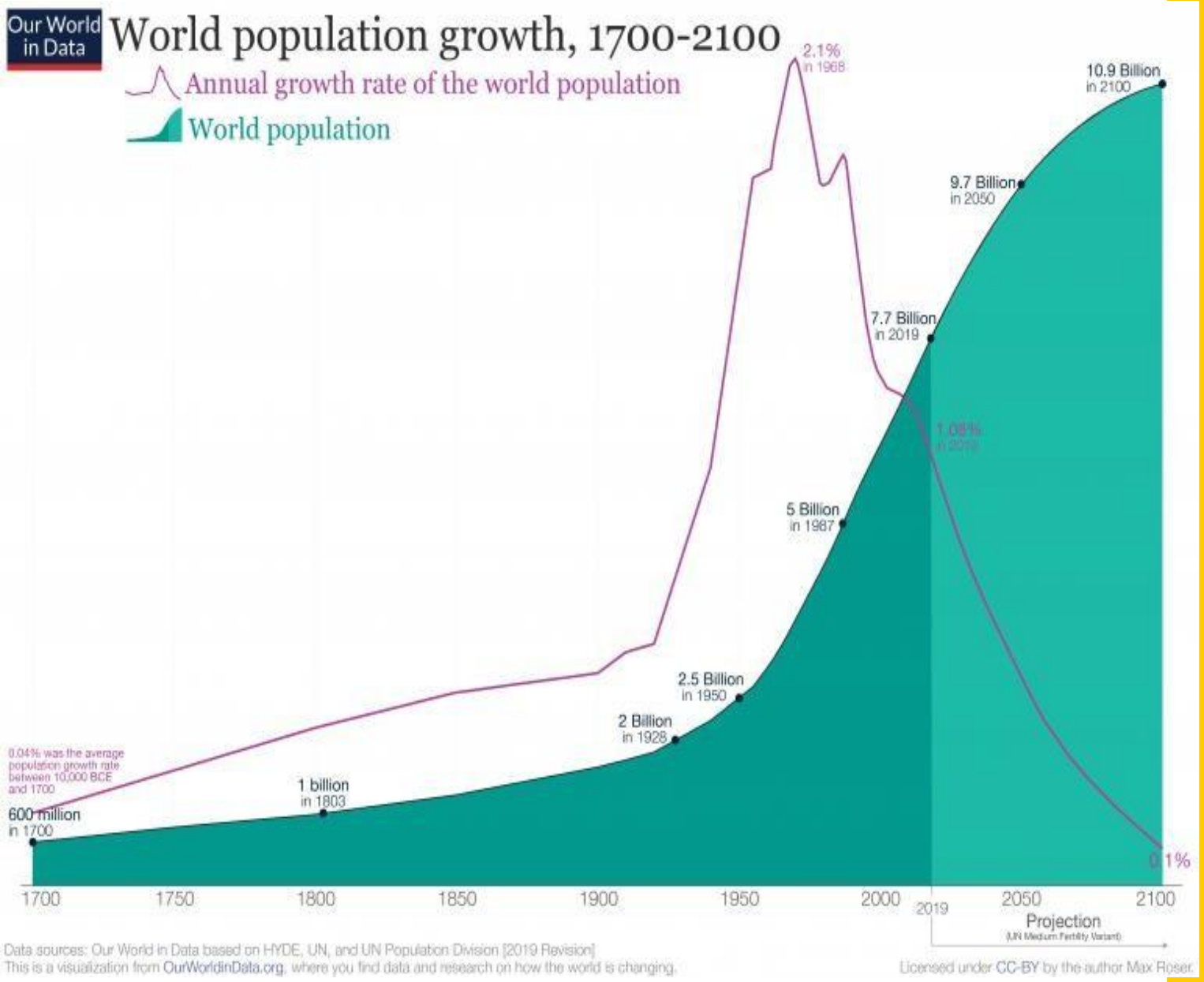
- **Demography and Economics**: Relationship between demography and economics has considerably increased during 20th century and both the subjects have come quite closer and nearer to each other. This perhaps, is the reason that today demography is considered as a branch of economics. Where there is more population, economic activities are bound to increase. Population problems are directly linked and connected with education, employment, transportation, rehabilitation, industrialization, per capita income, etc**.**
- **Statistics and Demography**: There is no social science subject which can do without statistics. Demography is rather more dependent on statistics than many other disciplines. Main aim of a statistics is to collect figures1 data and leave its interpretation to the social scientist

DEMOGRAPHY CYCLE

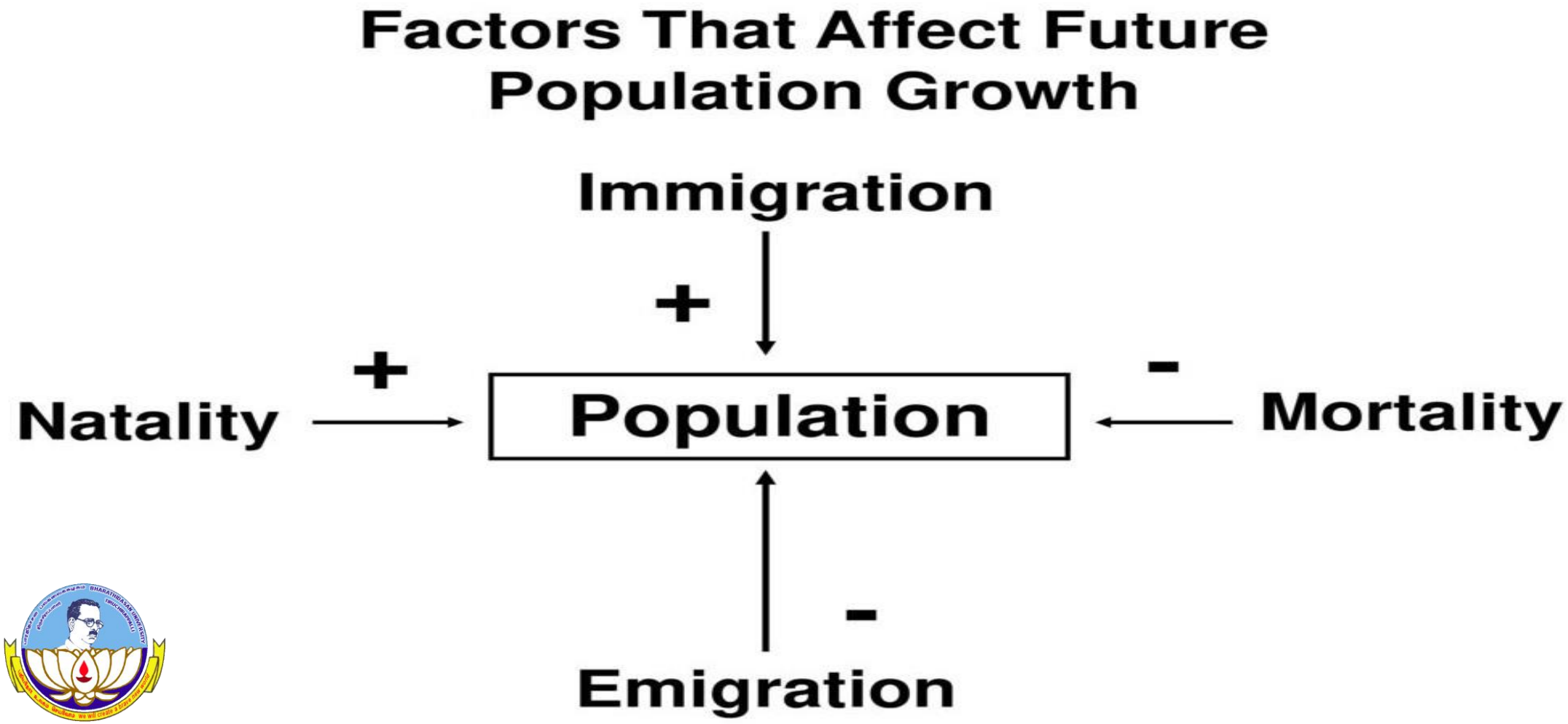


POPULATION GROWTH

- Population growth or population change denotes the change in the number of people of a region between two points of time.
- The change in the number of inhabitants can be both positive or negative.
- It can be expressed in terms of the absolute numbers or percentage.



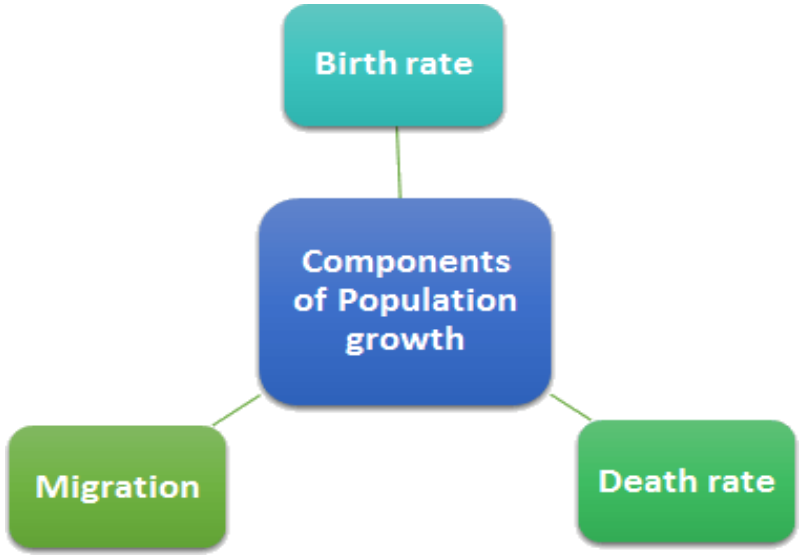
FACTORS AFFECTING THE FUTUR POPULATION GROWTH



COMPONENTS OF POPULATION CHANGE

- The three main components of population change :

1) Crude Birth Rate (CBR)
2) Crude Death Rate (CDR)
3) Migration



$$CBR = \frac{Bi}{P} \times 1000$$

$$CDR = \frac{D}{P} \times 1000$$

Here, **CBR** = Crude Birth Rate; **CDR** = Crude Death Rate;
Bi = live births during the year;
P = Mid year population of the area;
D = Number of deaths.

TRENDS IN POPULATION GROWTH

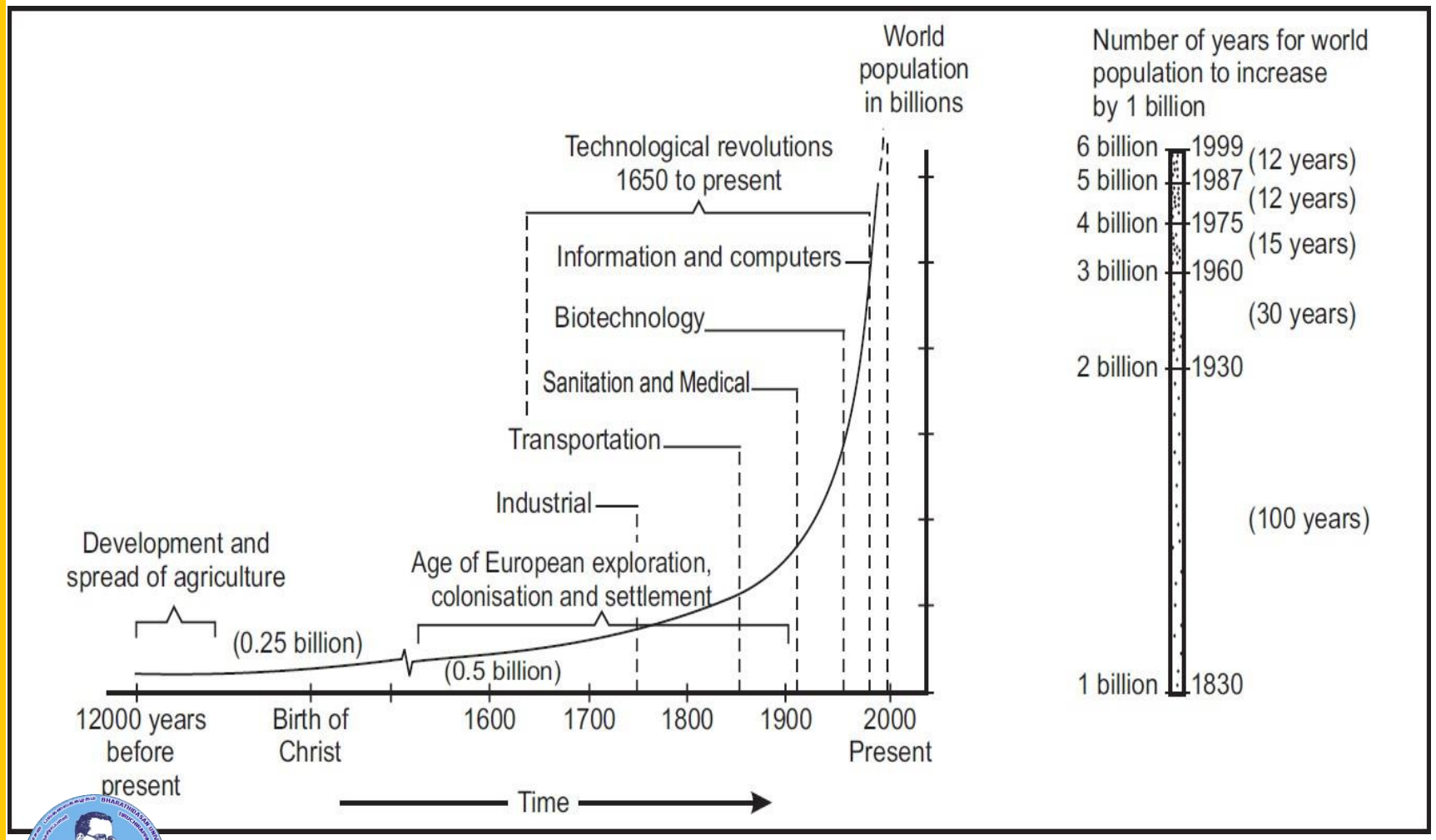
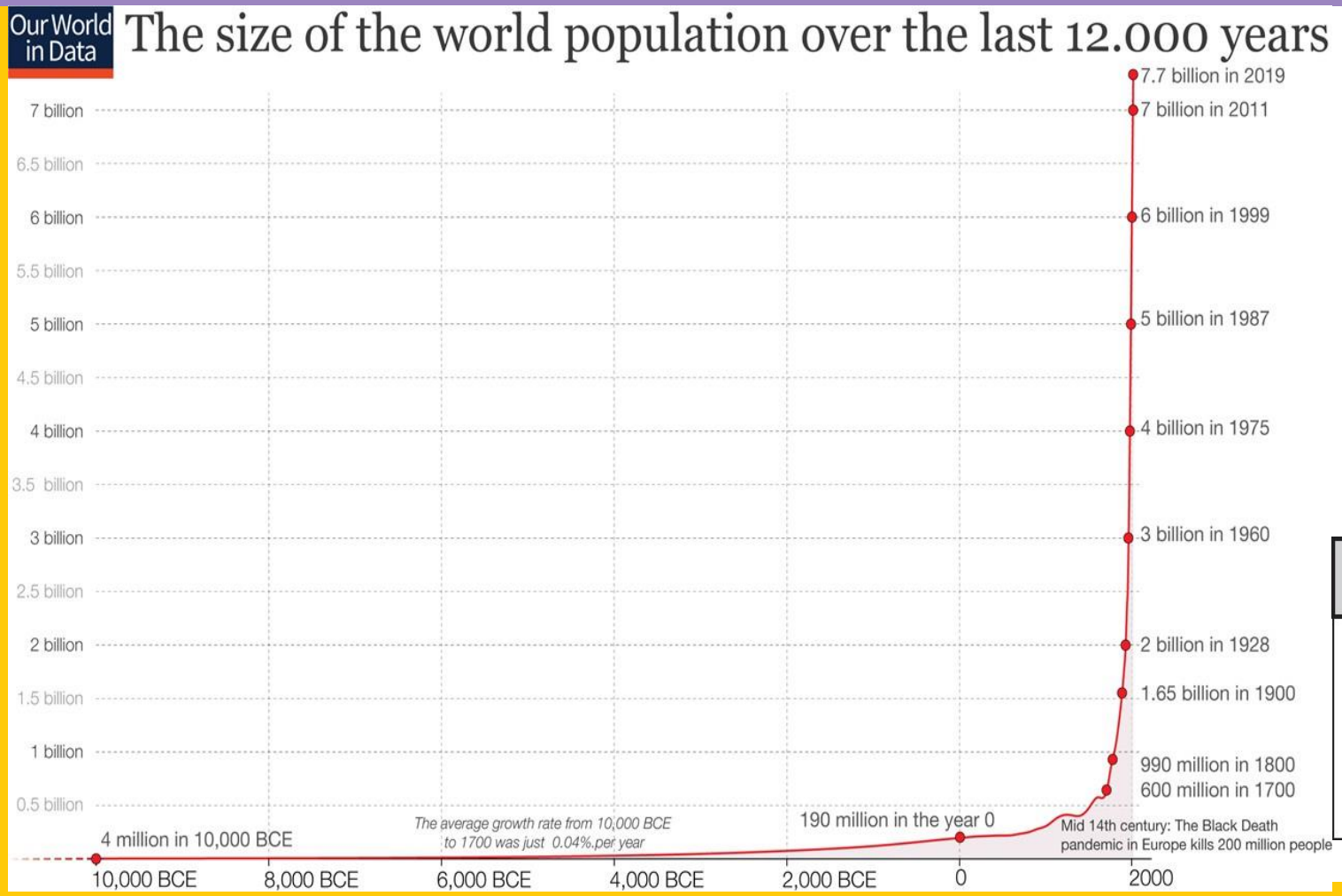


Figure: Resource, Technology and Population Growth

- In the early stage of evolution the growth rate was very slow.
- Man was totally dependent on nature for survival.
- Cultural and technological changes that influenced population growth came in the 20th century through the Medical Revolution.

DOUBLING TIME OF WORLD POPULATION

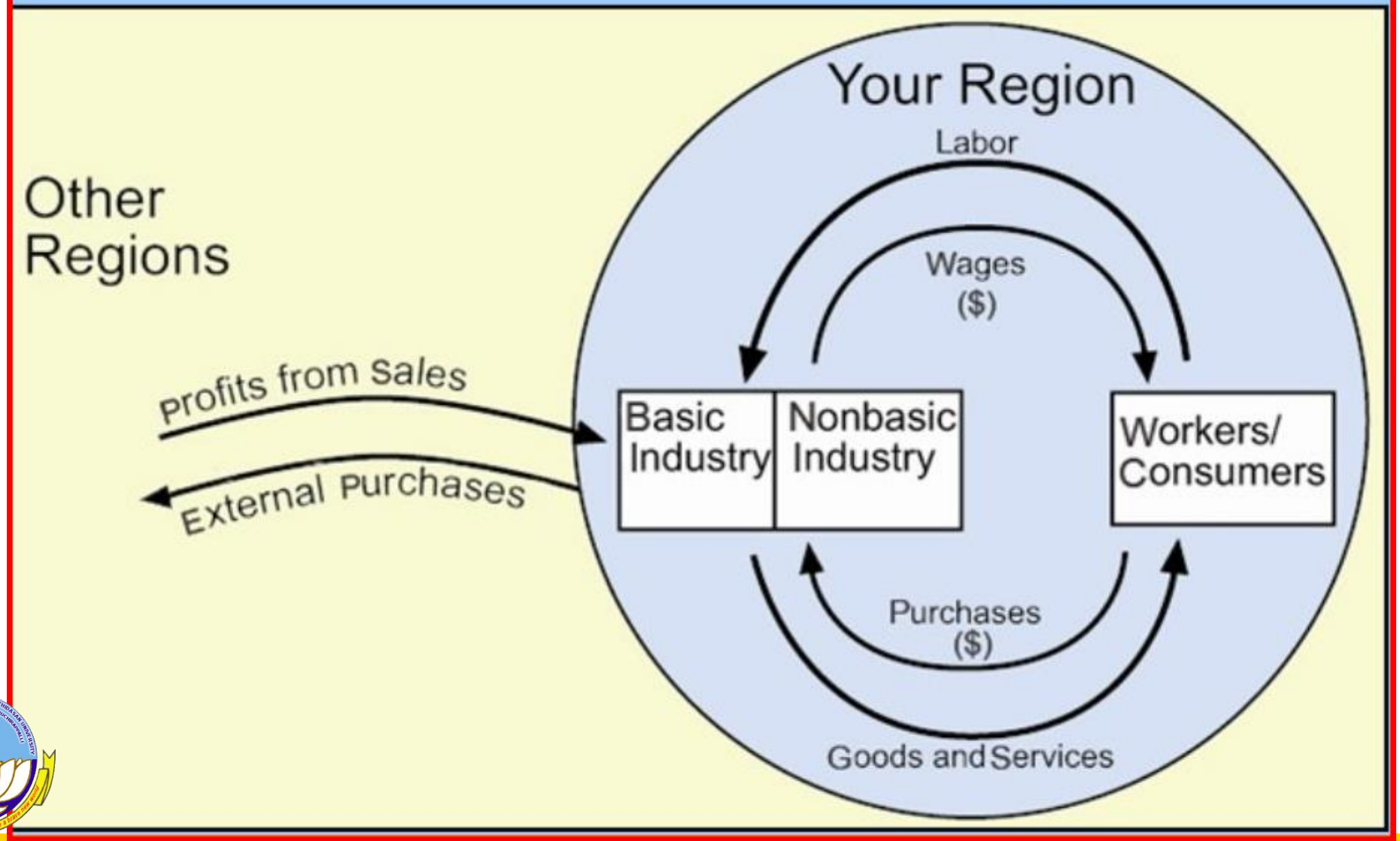


- Time taken to double the population of an area at the current rate of growth is referred to as the population doubling time.
- For the world population, it took millions of years to attain the 1 billion mark, but it only took twelve years to rise 5 to 6 billion.

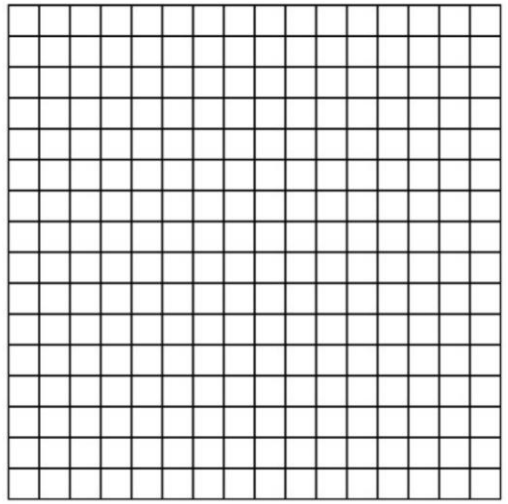
Period	*Population*	*Time in which Population Doubles*
10,000 B.C.	5 million	
1650 A.D.	500 million	1,500 years
1850 A.D.	1,000 million	200 years
1930 A.D.	2,000 million	80 years
1975 A.D.	4,000 million	45 years
2012 A.D.	8,000 million projected figure	37 years

Figure : Doubling Time of World Population

Economic Base Model

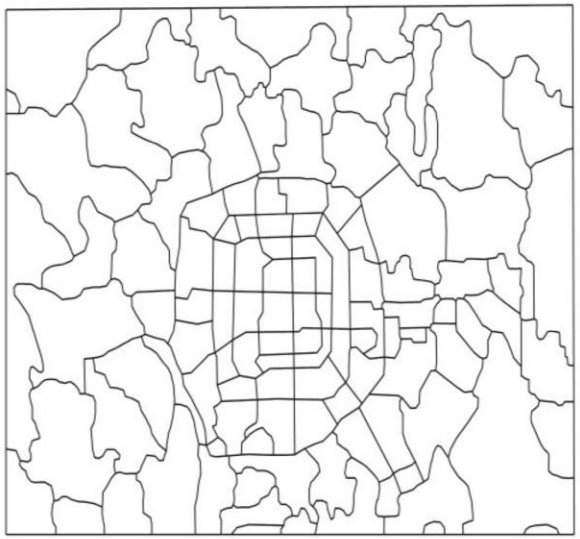


- ***City*** *is concentrated by non-agricultural industries and non-agricultural population. It is an organic complex formed by the interaction of multiple functional groups. Urban area can be divided into the structure of spatial, social, cultural, economic, population, and function.*
- The fourth Congrèss International Architecture Modern held in 1993 proposed a theme of "**functional city**". Scholars raised an idea of "urban functional districts" including the function of dwelling, work, transportation, and recreation, according to the relationship between architecture and urban planning.



(a)

(b)



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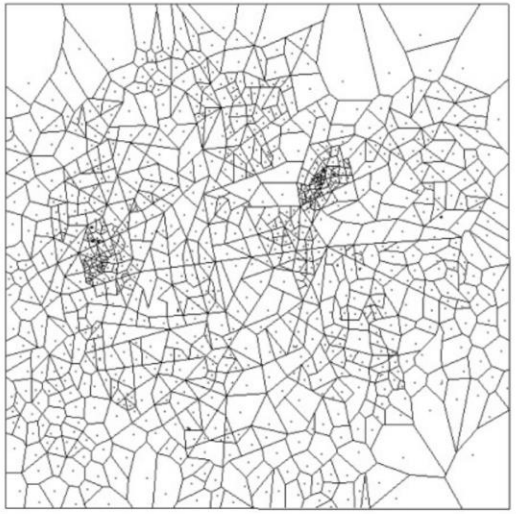


(d)

(e)

(f)

Different units of urban functional zone (a) grid, (b) block, (c) traffic analysis zone (TAZ), (d) clustering unit, (e) geoscene, (f) building unit.

Classification	Basis	Amount	Category
National standards	Urban land intensive utilization potential evaluation regulation (Trial)	5 categories	Special function land, residential function land, commercial function land, industrial function land, educational function land
	Standard for Basic Terminology of Urban Planning	11 categories	Residential land, industrial land, public facilities, municipal utilities, road and squares, intercity transportation land, warehouse land, specially-designated land, green space, waters, and miscellaneous
Urban planning	Regulatory plan	4 categories	Residential, living, and commercial areas, production areas, leisure and green areas, urban supporting functional areas
	Constructive-detailed plan	3 main categories	Production service functional area, infrastructure type functional area, special function area
		16 categories	Administrative office, financial business district, commercial service area, tourism and entertainment area, scientific research industry zone, cultural education district, industrial R&D zone Transportation hub, city facility service area (water, electricity, heating and other facilities), historical sites, logistics park, residential area, green ring environmental area (rivers and lakes) Military facility area, civil air defense construction area
Main nature of land use	Main functional area planning	4 categories	Prohibited zones, restricted development zones, key development zones, optimized development zones
	Functional characteristics	6 categories	Residential areas, industrial areas, commercial areas, public management and public service areas, green space and square areas, road and traffic facility areas
	Trajectory characteristics	4 categories	Residential areas, industrial parks and office areas, commercial and leisure areas, nightlife areas
	Image characteristics	4 categories	Commercial office zones, urban green zones, industrial warehouse zones, residential zones
	Functional and trajectory characteristics	7 categories	Developed residential areas, emerging residential areas, scenic areas, commercial and entertainment areas, science/education/technology areas, and other areas to be developed
	Functional and image characteristics	8 categories	Urban green, industrial districts, public services, shanty towns, residential districts, schools, commercial districts, hospitals
Social environment	Regional economy	2 main categories	Economic functional areas Non-economic functional areas
		6 categories	Commercial areas, business areas, industrial areas, tourist areas residential areas, administrative areas
	Urban functions (culture)	10 categories	Capital administrative areas, commercial central areas, financial and business areas, historical preservation areas, transportation hub areas, cultural and entertainment areas, hospitals, schools and other crowded areas, public leisure areas, and residential areas
	Urban functions (ecology)	4 categories	Ecological conservation development areas, new urban development areas, urban function expansion areas, capital functional core areas

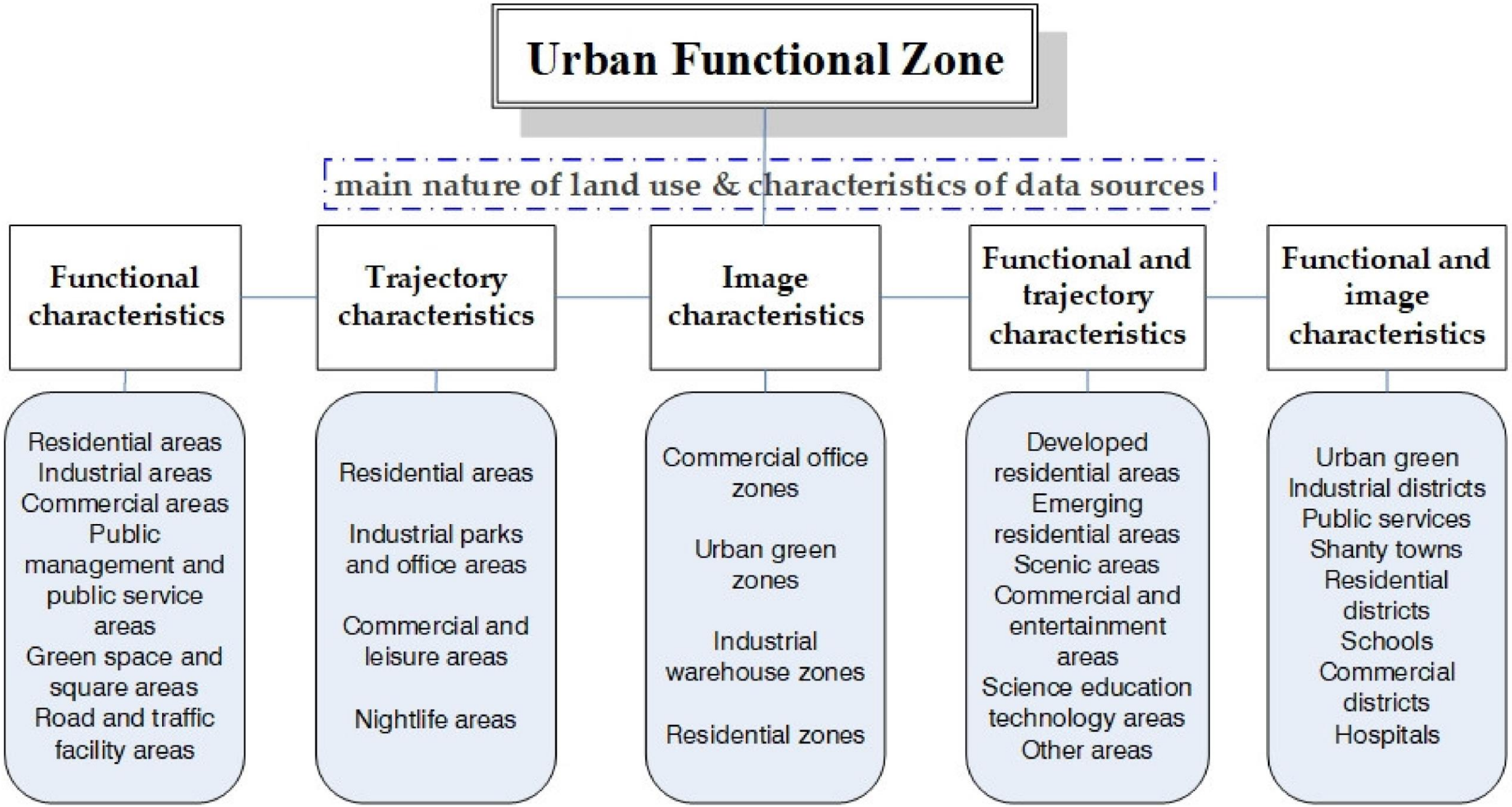
General classification schemes of urban functional zones

Type	Method	Data	Accuracy
Urban functional zone division based on traditional methods	expert knowledge	Statistical data	/
	Remote sensing image information + GIS technology	Image data	Classification accuracy = 95.08%
Urban functional zone division based on density analysis	Quadrate density method	POI data	/
	Point level score assignment + Quadrate density	POI data	Conformity accuracy = 88%
	Kernel density estimation (KDE) + Quadrate density	POI data	Mixed accuracy = 93.3% Single accuracy = 82.02%
	Kernel density estimation + Head/tail breaks	POI data	/
	Network kernel density estimation + Kriging interpolation	POI data	Average F1-score = 0.582
	Quadrate density + Principal component analysis	POI data	/
	Term frequency-inverse document frequency	POI data	/
	K-means algorithm	Cell phone data	Overall accuracy = 76.75%
	K-medoids algorithm	Social media data	
	Partition around medoids (PAM)	Traffic travel data	Recognition accuracy = 86%
	Fuzzy c-means clustering	Cell phone data, POI data	Overall accuracy = 73%
	Spectral clustering algorithm + Self-organizing map (SOM)	Social media data, Cell phone data, POI data	/
	Gaussian mixture model (GMM)	Cell phone data, traffic travel data	Recall ratio = 51.08%

Methods of identifying and dividing urban functional zones.

Urban functional zone division based on cluster analysis	Iterative DBSCAN clustering algorithm + Support vector machine (SVM)	Traffic travel data	Recognition accuracy = 95%
	Ordering points to identify the clustering structure (OPTICS) + Hierarchical clustering	Social media data, POI data	Conformity accuracy = 77.7%
	Ant colony clustering	Traffic travel data, POI data	/
	K-nearest neighbor (KNN)	Cell phone data	Recognition accuracy = 72%
Urban functional zone division based on an advanced framework	Logistic regression + Analysis of Variance (ANOVA)	POI data	/
	Logistic regression + Cellular Automata (CA)	POI data, Image data	/
	Classification tree	Traffic travel data	Total accuracy = 83.5%
	random forest (RF)	Cell phone data	Total accuracy = 54%
	expectation maximization (EM) algorithm	Traffic travel data, POI data	Average accurate rate = 60.83%
	Discovers regions of different functions (DRoF)	POI data, traffic travel data	/
	LDA + DMR + OPTICS clustering	POI data, traffic travel data	/
	Hierarchical semantic cognition (HSC)	POI data, image data	Overall accuracy = 90.8%
	Hierarchical semantic cognition + Inverse hierarchical semantic cognition (HSC + IHSC)	Image data	Overall accuracy = 90.9%
Urban functional zone division based on deep learning	Word2Vec model	POI data	Overall accuracy = 87.28%
	Place2vec model	POI data	Overall accuracy = 74.24%
	D-Link Net	POI data, image data, Traffic travel data	Overall accuracy = 82.37%
	Convolutional neural network (CNN)	Image data	Classification accuracy = 91.8%
	super object (SO)-CNN model (SO-CNN)	POI data, Image data	Producer's accuracy = 91.09%
	deep-feature convolutional neural network (DFCNN)	POI data, Image data	Accuracy = 96.65%

Methods of identifying and dividing urban functional zones.



The classification of urban functional zones based on the main nature of land use and data sources.

Rural-Urban Fringe

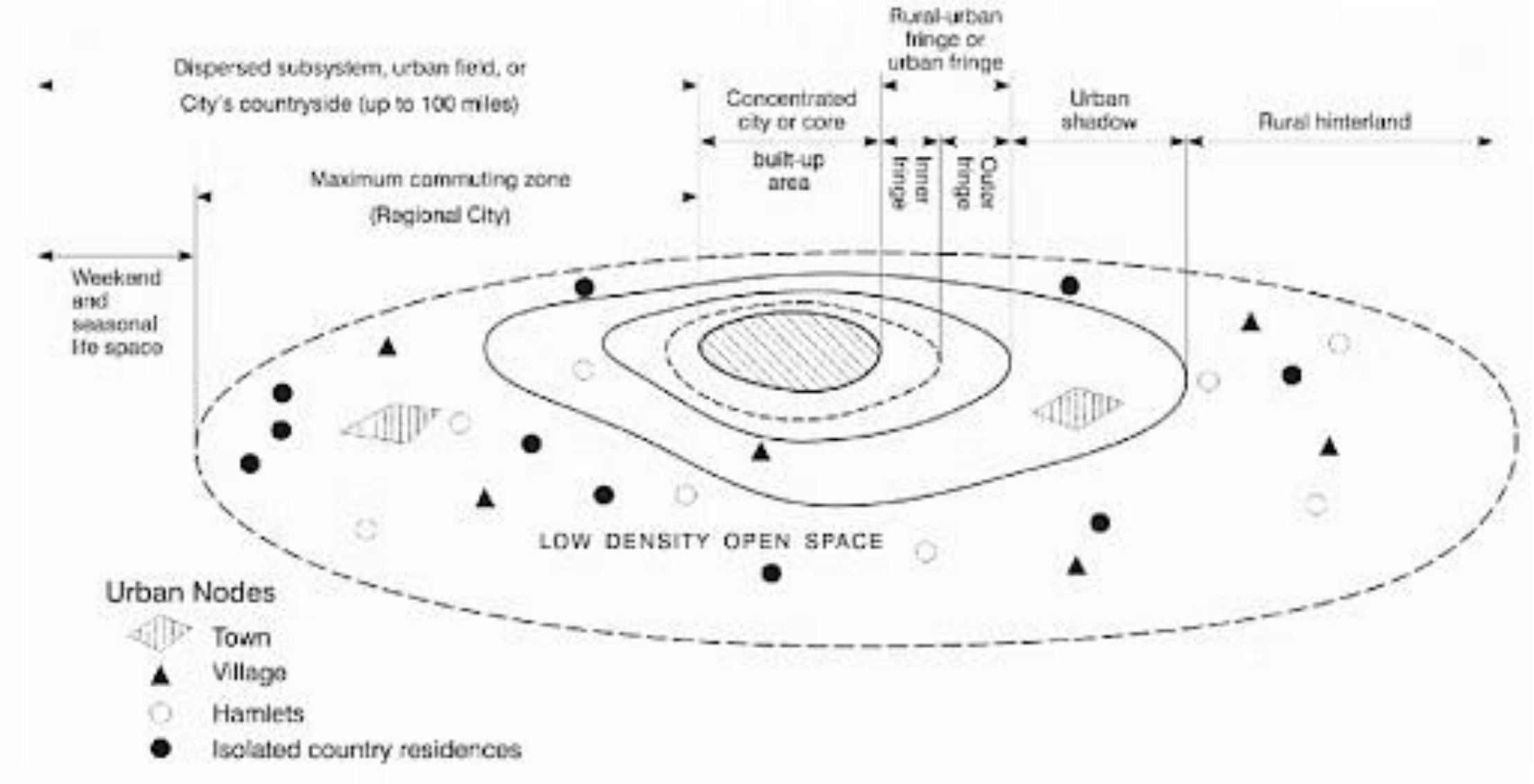
- Wehrwein, an ***American land economist was the first social scientist to define the rural-urban fringe. According to him, this is the "area of transition between well recognised urban land uses and the area devoted to agriculture"*.**
- Rodehaver (1956) identified it loosely as an area in which land is utilised in an urban manner while at the same time certain attributes of rural are present. ***Rural-Urban fringe is a transitional zone as it has a presence of both rural and urban characteristics and social groups. The modern means of transport and communications, as well as frequent movement of people & goods are making the social attitudes between the two groups of rural and urban, practically much diffused*.**
- The Rural-Urban fringe is a zone or frontier of discontinuity between city and country in which rural and urban land use are fused. The internal structure of the fringe has too been described in several ways

Rural Urban Fringe

- The **interface zone** between the city's entirely urban industrial, urban commercial physical expansion and the absolute rural agricultural landscape with village panchayat system, where **new urban land** use is replacing rural land use as well as occupational pattern, is referred to as the rural-urban fringe.
- It's the point where the city and the countryside collide.
- It is a **transitional zone** between agricultural and other rural land uses and urban land uses.
- The fringe, which is well inside the urban sphere of influence, is defined by a diverse range of land use, including dormitory communities and houses for middle-income commuters who work in the centre metropolitan region.
- At the municipal border of the **rural-urban fringe**, suburbanization occurs.
- Many academics have attempted to draw attention to the differences in such comparable circumstances.
- **Kurz and Fletcher** attempted to define the distinction between fringe and urban regions in 1958. **Wissink** coined the terms fringe, suburb, and faux suburb in 1961.
- It is outside of the city's formal boundaries, the rural-urban fringe is a neglected area. Many academics refer to the peripheral area by various names.
- Burgess refers to it as a "peripheral zone," whereas the Census of India refers to it as an "**Out Urban Area**." Some refer to it as the "**Rural-Urban Continuum**."

Rural-Urban Fringe - Historical Development

- Following WWII, there was a flurry of inner-city buildings. However, this did not provide adequate homes for everyone who needed it.
- Others were constructed on the outskirts of towns and cities.
- The majority of residential development is occurring in the suburbs. The population density is lower than in the city centre, and the residences are often larger due to the reduced cost of land.
- As residential development extended to the suburbs, a transportation network grew, strengthening the suburbs' access to the metropolis.
- Out-of-town retail areas have benefited from decreased land prices and additional space since the 1970s.
- Many cities have been losing population due to counter-urbanization since the late 1970s, with individuals departing for a variety of reasons.
  - People seek a better quality of life in a rural setting that is calmer and cleaner.
  - More individuals are willing and able to travel longer distances to work. Businesses are relocating to areas with better transportation links and lower construction costs.
  - Part-time home working has risen as a result of flexible working and new technologies.
  - People who have retired depart the city where they formerly worked.
- As a result, smaller towns and villages in locations with good communication links have expanded, lting in a lot of 'in-filling.' Up-filling is the process of filling in gaps inside a village or town's laries.


Dispersed subsystem, urban field, or
City's countryside (up to 100 miles)
Rural-urban fringe or urban fringe
Concentrated city or core
built-up area
Inner fringe
Outer fringe
Urban shadow
Rural hinterland
Maximum commuting zone
(Regional City)
Weekend and seasonal life space
LOW DENSITY OPEN SPACE
Urban Nodes
Town
Village
Hamlets
Isolated country residences

Rural-Urban Fringe - Structure

- Suburban expansion, the urban corridor, housing complexes, and village panchayats that have been converted into newly residential urban villages characterise the urban fringe.
- It includes urban land uses such as crematoriums, sewage treatment facilities, **polluting industrial units**, **industrial slums**, and the unplanned expansion of urban commercial marketplaces.
- **Rural land use** continues to dominate, and occupational shifts are more visible than **landscape shifts.** This is the city's rubbish dump or dumping site.
- **Urban shadow:** This is the region where the fringe will spread in the future, and it is experiencing increased land pressure, urbanisation, and is mostly characterised by market gardening.
- The **area is still rural,** and land prices are skyrocketing.
- The daily **urban system,** also known as the commuter's zone, is a zone where individuals commute to the rural urban edge to sell, buy, do business, and trade with city businesspeople.
- There are functionally connected villages that serve as daily city demand suppliers.
- The broadest possible area of urban impact is referred to as a city region.

Rural-Urban Fringe - Demarcation

- The delineation of the Fringe zones is a serious issue.
- Many academics have expressed various points of view. Cities have different qualities and purposes.
- In determining the boundaries of the region, the researchers took into account a number of elements.
- There are two strategies for separating the rural and urban areas.
  - **Empirical method**
  - **Statistical method**

Empirical method

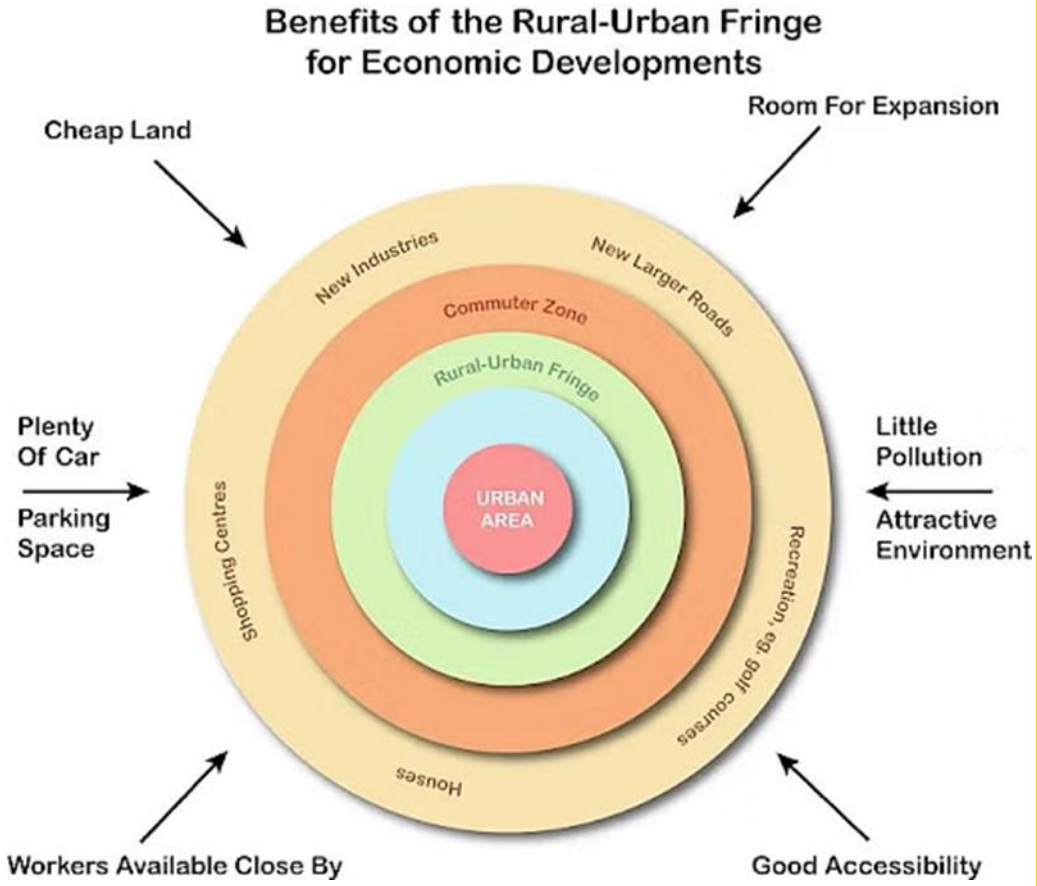
- The empirical approach is a very old method that assumes a continuous built-up region as a demarcation foundation.
- For the delimitation of the fringe belt zone, the following indices might be used as a starting point.
  - alterations in land usage
  - In the built-up area, there have been several changes.
  - House types Occupational structure of the population
  - Industrial and non-agricultural activities are distributed.
  - Essential services are limited.
  - The distribution of educational institutions..
- Based on direct observation, the Rural Urban Fringe was studied at a distance of 10-20 kilometres from the city's municipal limits.
- The following criteria were observed during the Indian census:
  - The population density must be fewer than 400 people per square kilometre.
  - The population growth rate over a decade should be at least 40%.
  - There should be more than 800 girls for 1000 males in the sex ratio (due to outmigration for work)
  - Bus or local train service should be available at the city's outskirts.
  - Male workers in non-agricultural occupations account for 50% or more of the workforce.

Statistical method

- In 1980, **Dr. M.M.P. Sinha** used statistical approaches to demarcate the urban outskirts.
- With the aid of Isochrone, he attempted to determine the influence area first. He calculated the word limit to be (T) 100.
- Outside, the region is regarded as 0. The urban index ranges from 0 to 100, with values assigned to the number of settlements.
- A link has been discovered between all of the village's elements. Villages with values of less than +30 and -30 have been omitted. The scale of urbanity is determined by taking the mean value of all other parameters.
- The population density diminishes as we walk out from the city. Away from the metropolis, the sex ratio rises. This results in a positive correlation.
- It is now appropriate to classify it as
  - **Inner fringe zone** or area of convenience
  - **Outer fringe zone** or slowly progressive zone

Rural-Urban Fringe - Benefits

- **Land is less expensive** - since the Rural-Urban Fringe is less accessible than the inner city, and because most people must commute to the inner city for employment, fewer people are prepared to reside there.
- As a result, land prices are lower.
- There is less **traffic congestion and pollution** - because the neighbourhood is a new development on the periphery with a smaller population than the central city, there is less traffic congestion and pollution.
- It is a modern development with plenty of land, it has simpler access and improved road infrastructure.
- More **open space creates** a more pleasant atmosphere; yet, as development progresses, the quantity of open space reduces, as does the friendly environment.
- The rural-urban fringe is defined by a diverse range of land uses, the majority of which need enormous tracts of land.
  - As urban sprawl continues, new housing projects are being built.
  - Parks for science and business
  - Supermarkets and hypermarkets
  - Out-of-town shopping malls and retail parks
  - Changes in the workplace
  - Hotels and conference centres are available.
  - Expansion of the airport



Benefits of Rural-urban Fringe

- The **city region** is an area around the city over which the city exercises a dominant influence in relation to other neighbouring cities of equal importance. ***City regions are the products of various orders of cities and their surrounding area. A city has its ' dependents ' which are linked by virtue of their dwellers' requirements fulfilled by the city's various service institutions.*** Dependent centers of a city are generally smaller in size and they do not possess those specialized services which are only available at the neighbouring city of higher order than the dependent centers.

Structure of city region

- The structure of the city region is very complex. It consists of a series of areas of influence and areas of dominance . It is pertinent at this stage to examine three basic notions in relation to the structure of city region :

a) The concept of area of influence

b) The concept of area of dominance

c) The concept of city region

a)**The concept of area of influence** :

- The area of city influence are contiguous areas around a city from where people commute to the city to obtain certain goods and services. Various institutions in the city such as hospitals, schools, colleges and so on have their corresponding areas of influence. The areas of influence for different services and goods may cover smaller or larger areas around the city and their shape may also differ.

Nature of area of influence :

- Nature of a city of influence may differ from every hierarchical and functional classification.
- 1) The area of influence for small towns (population 5000 to 20000) may, for example, be delimited on the basis of the data on :
- A) addresses of account holders of a local bank.
- B) addresses of patients coming to a private allopathic doctor or govt. dispensary.
- C) Place of residence of customers visiting a local cloth store on selected days.
- D) Place of residence of customers coming for cycle repairs or cycle rentals.
- E) villages from which farmers bring their tractors to the local tractor mechanic.
- F) villages from which students come to the local secondary schools or junior college.
- G) village of origin of persons coming to the cinema house in town.

The area of influence of the city (population 100000 or more):

- The criteria of a small town to be unsuitable. The city certainly will provide a wider range of services than a small town. It is necessary to select services that correspond to the hierarchical level of the city. Such services in the Indian context may include :
- a) Treatment by a specialist in a major hospital.
- b) college or university education
- c) Purchase of high value agricultural equipment such as tractors.
- d) Purchase of expensive clothing for a special occasion and so on.

- **The criteria used to delimit the areas of influence of a city should not only depend on the hierarchical level of the city, but also on the nature of the city's functional specialization.** For example , for an agricultural marketing centre, the criteria would focus on the catchment area of specific agricultural products for which the city region is known. For a recreation centre , the places of origin of the tourists would be more appropriate. **In the study on Indian cities R.L.Singh's study of Varanasi stands out as a unique and pioneering effort. For Varanasi , Singh used 6 criteria :**
- a) vegetables supply
- b) milk supply
- c) supply of grain
- d) bus service
- e) newspaper circulation and
- f) administrative area boundaries

b)The concept of area of dominance :

- In any landscape one would expect to find a number of cities of the same or similar importance, and the areas in between these cities are often served by more than one city. In other words, the areas of influence of neighbouring cities tend to overlap, thus generating a zone of competition in between. In the middle of the zone of competition one can define a boundary which separates the areas of dominance of the competing cities. Within this boundary , the city exercises a dominant influence; its influence there is greater than the influence of any other city. The area of dominance of a city is an exclusive area and is, therefore of great significance in terms of territorial or regional divisions. Further the dominant area in reality is dominant not only with respect to one or two services, but with respect to all services of equal importance. Thus the area of dominance is a multifunctional area, while the area of influence is essentially an unifunctional area.