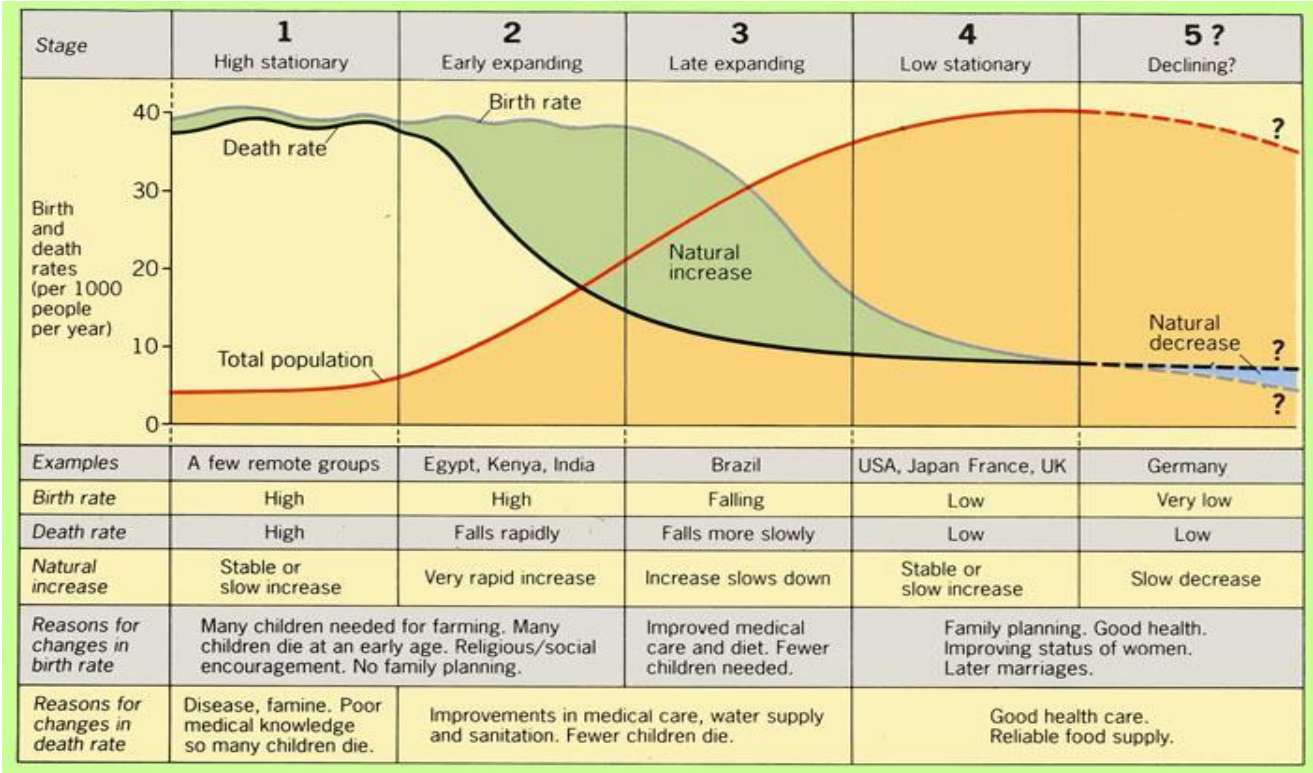
GEOGRAPHIC MODELS

DEMOGRAPHIC TRANSITION MODEL



The **demographic transition model** seeks to explain the transformation of countries from high birth and death rates to low birth and death rates as a country develops from a pre-industrial to an industrialized economic system. In developed countries this transition began in the 18th century and continues today. Less developed countries began the transition later and are still in the midst of earlier stages of the model. The theory is based on an interpretation of demographic history developed in 1929 by the American demographer Warren Thompson.

CBR and CDR

The model is based on the change in crude birth rate (CBR) and crude death rate (CDR) over time. Each is expressed as per one thousand population. The CBR is determined by taking the number of births in one year in a country, dividing it by the country's population and multiplying the number by 1000. In 2014, the CBR in the United States was 13 births per 1000 people, while in Kenya it was 35 per 1000. The crude death rate is similarly determined. The number of deaths in one year are divided by the population and multiplied by 1000. In 2014, the US CDR was 8; in the Ukraine it was 15.

Stage I

Prior to the Industrial Revolution, both the CBR and CDR were high in Western European countries. Births were high because more children meant more workers on the farm and more likelihood that the family would survive. Death rates were high due to disease, unsanitary conditions and a lack of healthcare. The high CBR and CDR were somewhat stable and meant slow growth of a population. Occasional epidemics would dramatically increase the CDR for a few years (represented by the "waves" in Stage I of the model.

Stage II

In the mid-18th century, the death rate in Western European countries dropped due to improvements in sanitation and medicine. Out of tradition and practice, the birth rate remained high. This dropping death rate but stable birth rate in the beginning of Stage II contributed to skyrocketing population growth rates. Over time, children became an added expense and were less able to contribute to the wealth of a family. For this

reason, along with advances in birth control, the CBR was reduced through the 20th century in developed countries. Populations still grew rapidly but this growth began to slow down.

Many less developed countries are currently in Stage II of the model. Their high CBRs and low CDRs contribute to a high rate of growth (as in mid-Stage II).

Stage III

In the late 20th century, the CBR and CDR in developed countries both leveled off at a low rate. In some cases the CBR is slightly higher than the CDR, while in other countries the CBR is less than the CDR. (You can obtain current CBR and CDR data for all countries through the Census Bureau's International Data Base). Immigration from less developed countries now accounts for much of the population growth in developed countries that are in Stage III of the transition. Countries like China, South Korea, Singapore and Cuba are rapidly approaching Stage III.

The Model

As with all models, the demographic transition model has its limitations. The model does not provide guidelines as to how long it takes a country to get from Stage I to III. Western European countries took centuries though some rapidly developing countries like the Economic Tigers are transforming in mere decades. The model also does not predict that all countries will reach Stage III and have stable low birth and death rates. There are factors such as religion that keep some countries' birth rate from dropping.

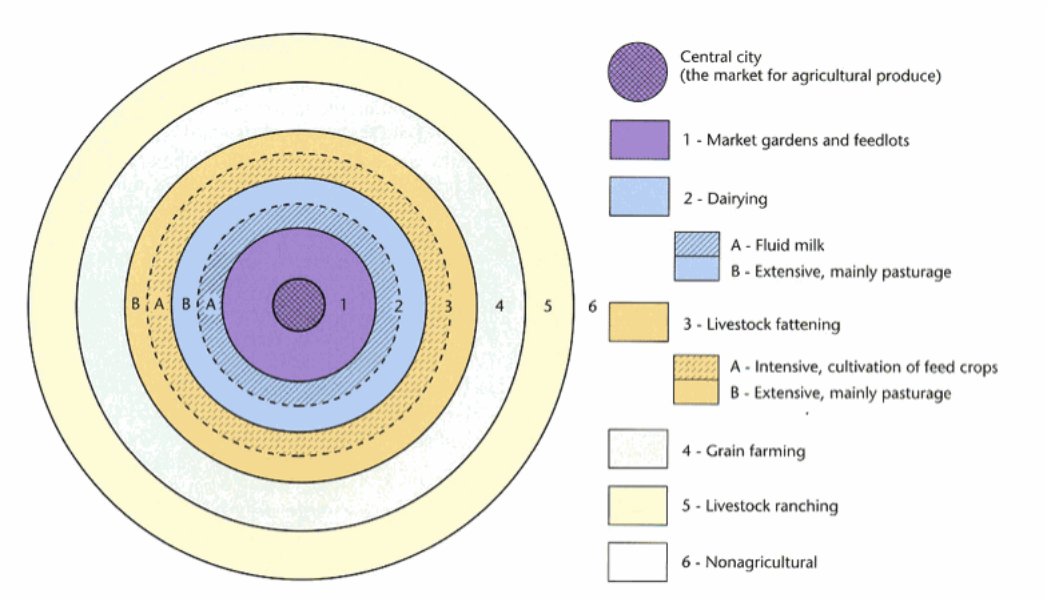
Though this version of the demographic transition is composed of three stages, you'll find similar models that include four or even five stages.

An understanding of this model, in any of its forms, will help you to better understand population policies and changes in developed and less developed countries around the world.

RAVENSTEIN'S LAWS OF MIGRATION (E.G. Ravenstein)

1. Most migrants move only a *short distance*.
2. There is a process of *absorption*, whereby people immediately surrounding a rapidly growing town move into it and the gaps they leave are filled by migrants from more distant areas, and so on until the attractive force [pull factor] is spent.
3. There is a process of *dispersion*, which is the inverse of absorption.
4. Each migration flow produces a *compensating counter-flow*.
5. Long-distance migrants go to one of the *great centers* of commerce and industry.
6. Natives of *towns are less migratory* than those from rural areas.
7. *Females are more migratory* than males.
8. *Economic factors* are the main cause of migration.

VON THÜNEN MODEL OF AGRICULTURAL LAND USE (Johann Heinrich von Thünen)



The **Von Thünen model of agricultural land use** was created by farmer and amateur economist J.H. Von Thünen (1783-1850) in 1826 (but it wasn't translated into English until 1966). Von Thünen's model was created before industrialization and is based on the following limiting assumptions:

- The city is located centrally within an "Isolated State" which is self sufficient and has no external influences.
- The Isolated State is surrounded by an unoccupied wilderness.
- The land of the State is completely flat and has no rivers or mountains to interrupt the terrain.
- The soil quality and climate are consistent throughout the State.
- Farmers in the Isolated State transport their own goods to market via oxcart, across land, directly to the central city. Therefore, there are no roads.
- Farmers act to maximize profits.

In an Isolated State with the foregoing statements being true, Von Thünen hypothesized that a pattern of rings around the city would develop.

There are four rings of agricultural activity surrounding the city. Dairying and intensive farming occur in the ring closest to the city. Since vegetables, fruit, milk and other dairy products must get to market quickly, they would be produced close to the city (remember, we didn't have refrigerated oxcarts!)

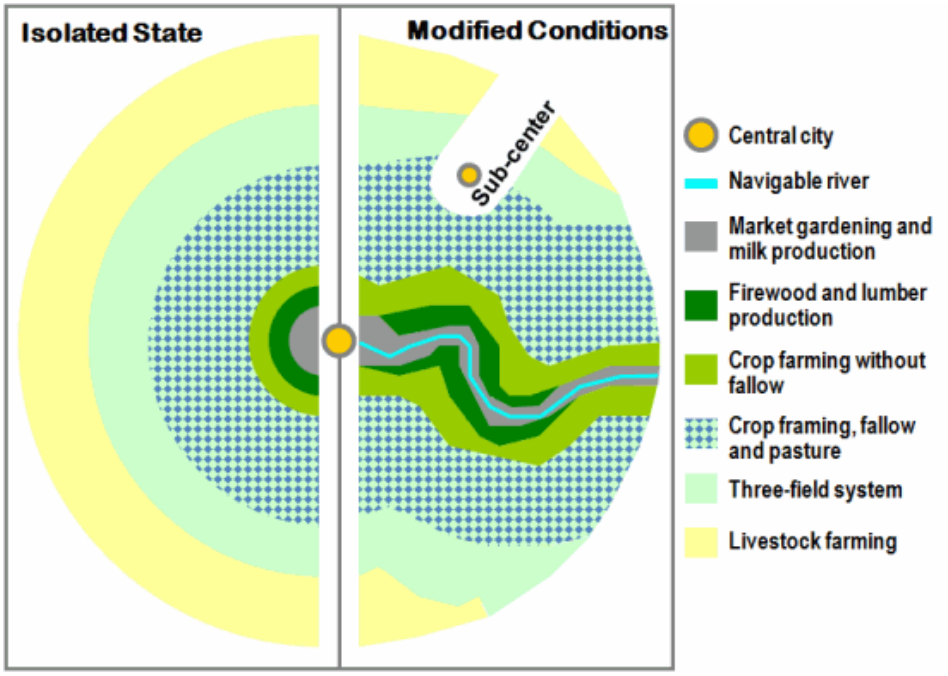
Timber and firewood would be produced for fuel and building materials in the second zone. Before industrialization (and coal power), wood was a very important fuel for heating and cooking. Wood is very heavy and difficult to transport so it is located as close to the city as possible.

The third zone consists of extensive field crops such as grains for bread. Since grains last longer than dairy products and are much lighter than fuel, reducing transport costs, they can be located further from the city.

Ranching is located in the final ring surrounding the central city. Animals can be raised far from the city because they are self-transporting. Animals can walk to the central city for sale or for butchering.

Beyond the fourth ring lies the unoccupied wilderness, which is too great a distance from the central city for any type of agricultural product.

The Von Thünen model is an excellent illustration of the balance between land cost and transportation costs. As one gets closer to a city, the price of land increases. The farmers of the Isolated State balance the cost of transportation, land and profit and produce the most cost-effective product for market.


Isolated State
Modified Conditions
Sub-center
Central city
Navigable river
Market gardening and milk production
Firewood and lumber production
Crop farming without fallow
Crop framing, fallow and pasture
Three-field system
Livestock farming

CENTRAL PLACE THEORY (Walter Christaller)

Central place theory is a spatial theory in urban geography that attempts to explain the reasons behind the distribution patterns, size and number of cities and towns around the world. It also attempts to provide a framework by which those areas can be studied both for historic reasons and for the locational patterns of areas today.

The theory was first developed by the German geographer Walter Christaller in 1933 after he began to recognize the economic relationships between cities and their hinterlands (areas farther away). He mainly tested the theory in Southern Germany and came to the conclusion that people gather together in cities to share goods and ideas and that they exist for purely economic reasons.

Before testing his theory however, Christaller had to first define the central place. In keeping with his economic focus, he came to the conclusion that the central place exists primarily to provide goods and services to its surrounding population. The city is in essence, a distribution center.

Christaller's Assumptions

To focus on the economic aspects of his theory, Christaller had to create a set of assumptions. He decided for example that the countryside in the areas he was studying would be flat, so no barriers would exist to impede people's movement across it. In addition, two assumptions were made about human behavior: (1) Christaller stated that humans will always purchase goods from the closest place that offers the good and (2) whenever demand for a certain good is high, it will be offered in close proximity to the population. When demand drops, so too does the availability of the good.

In addition, the threshold is an important concept in Christaller's study. This is the minimum number of people needed for a central place business or activity to remain active and prosperous.

Christaller divided goods into two groups: low-order goods and high-order goods. Low-order goods are things that are replenished frequently such as food and other routine household items. Because these items are purchased regularly, small businesses in small towns can survive because people will buy frequently at the closer locations instead of going into the city. High-order goods though are specialized items such as automobiles, furniture, fine jewelry and household appliances … goods that are bought less often. Because they require a large threshold and people do not purchase them regularly, many businesses selling these items cannot survive in areas where the population is small. Therefore, they often locate in large cities that can serve a large population in the surrounding hinterland.

Central Place Size and Spacing

Within the central place system, there are five sizes of communities. A hamlet is the smallest and is a rural community which is too small to be considered a village. The rank order of central places is:

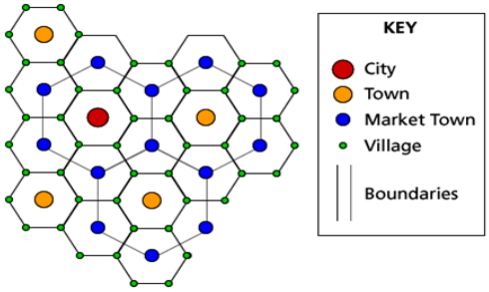
hamlet

village

town

city

regional capital



Examples of regional capitals are Paris France or Los Angeles California. These cities provide the highest order goods possible and have a huge hinterland.

Central Place Theory Geometry and Ordering

If visually imagined, the central place is located at the vertexes (points) of equilateral triangles. They then serve the evenly distributed consumers who are closest to the central place. As the vertexes connect, they form a series of hexagons- the traditional shape in many central place models.

This shape is ideal because it allows the triangles formed by the central place vertexes to connect and it represents the assumption that consumers will visit the closest place offering the good.

In addition, the central place theory has three orders or principles. The first is the *marketing principle* and it is shown as K=3 (K is a constant). In this system, market areas at a certain level of the central place hierarchy are three times bigger than the next lowest one. The different levels then follow a progression of threes, meaning that as one moves through the order of places, the number of the next level goes up three times. For example, when there are two cities, there will be six towns, 18 villages and 54 hamlets.

There is also the *transportation principle* (K=4) where areas in the central place hierarchy are four times bigger than the area in the next lowest order. Finally, in the *administrative principle* (K=7), the variation between the lowest orders and highest orders increase by a factor of seven. Here, the highest order trade area completely covers that of the lowest order, meaning that market serves a larger area.

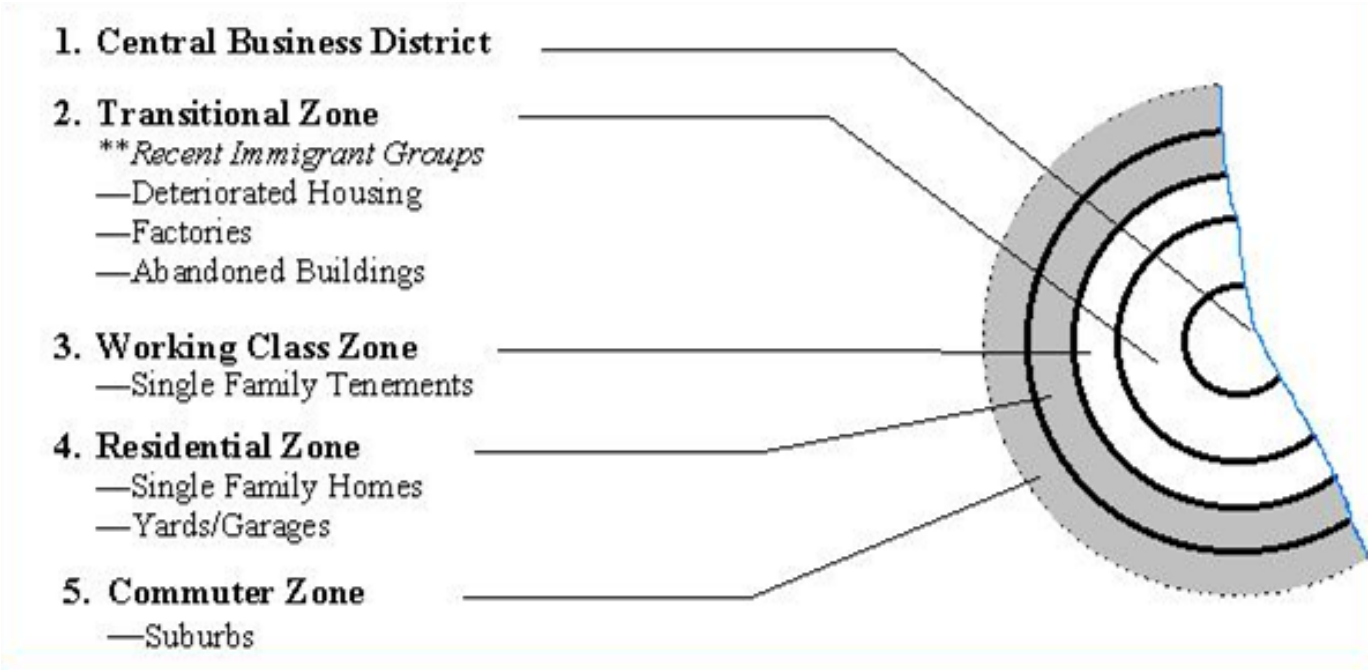
Losch’s Central Place Theory

In 1954, German economist August Losch modified Christaller's central place theory because he believed it was too rigid. He thought that Christaller's model led to patterns where the distribution of goods and the accumulation of profits were based entirely on location. He instead focused on maximizing consumer welfare and creating an ideal consumer landscape where the need to travel for any good was minimized and profits were held level, not maximized to accrue extra.

Central Place Theory Today

Though Losch's central place theory looks at the ideal environment for the consumer, both his and Christaller's ideas are essential to studying the location of retail in urban areas today. Often, small hamlets in rural areas do act as the central place for various small settlements because they are where people travel to buy their everyday goods. However, when they need to buy higher value goods such as cars and computers, they have to travel into the larger town or city -- which serves not only their small settlement but those around them as well. This model is seen all over the world in the many small communities that are served by larger towns, cities and regional capitals.

CONCENTRIC ZONE MODEL (E.W. Burgess)



The model

Based on human ecology theories from E. W. Burgess and applied to Chicago, the **concentric zone model** was the first to explain the distribution of social groups within urban areas. This model depicts urban land use in concentric rings: the central business district (or CBD) is in the middle of the model and the city expands in rings with different land uses. It contrasts with the Homer Hoyt's sector model and the multiple nuclei model.

The zones identified are:

the central business district

transition zone with mixed residential and commercial uses

working-class residential homes (inner suburbs, in later decades called inner city)

better quality middle-class homes (outer suburbs)

commuter zone

Burgess observed that there was a correlation between the distance from the CBD and the wealth of the inhabited area; wealthier families tended to live much further away from the Central Business District. As the city grew, Burgess also observed that the CBD (Central business District) would cause it to expand outwards; this in turn forced the other rings to expand outwards as well.

The model is more detailed than the traditional down-mid-uptown divide by which downtown is the CBD, uptown the affluent residential outer ring, and midtown in between.

Burgess's work is based on the *bid rent curve*. This states that the concentric circles are based on the amount that people will pay for the land. This value is based on the profits that are obtainable from maintaining a business on that land. The center of the town will have the highest number of customers so it is profitable for retail activities. Manufacturing will pay slightly less for the land as they are only interested in the accessibility for workers, 'goods in' and 'goods out'. Residential land use will take the surrounding land.

Criticisms of the model

The model has been challenged by many contemporary urban geographers for several reasons. The model does not work well with cities outside the US, especially those that developed under different historical contexts. Even in the US, due to changes in transportation and information technology and to the transformation of the global economy, cities are no longer organized with clear zones.

The concentric zone model assumes:

an isotropic plain … an even, unchanging landscape

physical features may restrict growth of certain sectors

the decentralization of shops, manufacturing industry and entertainment

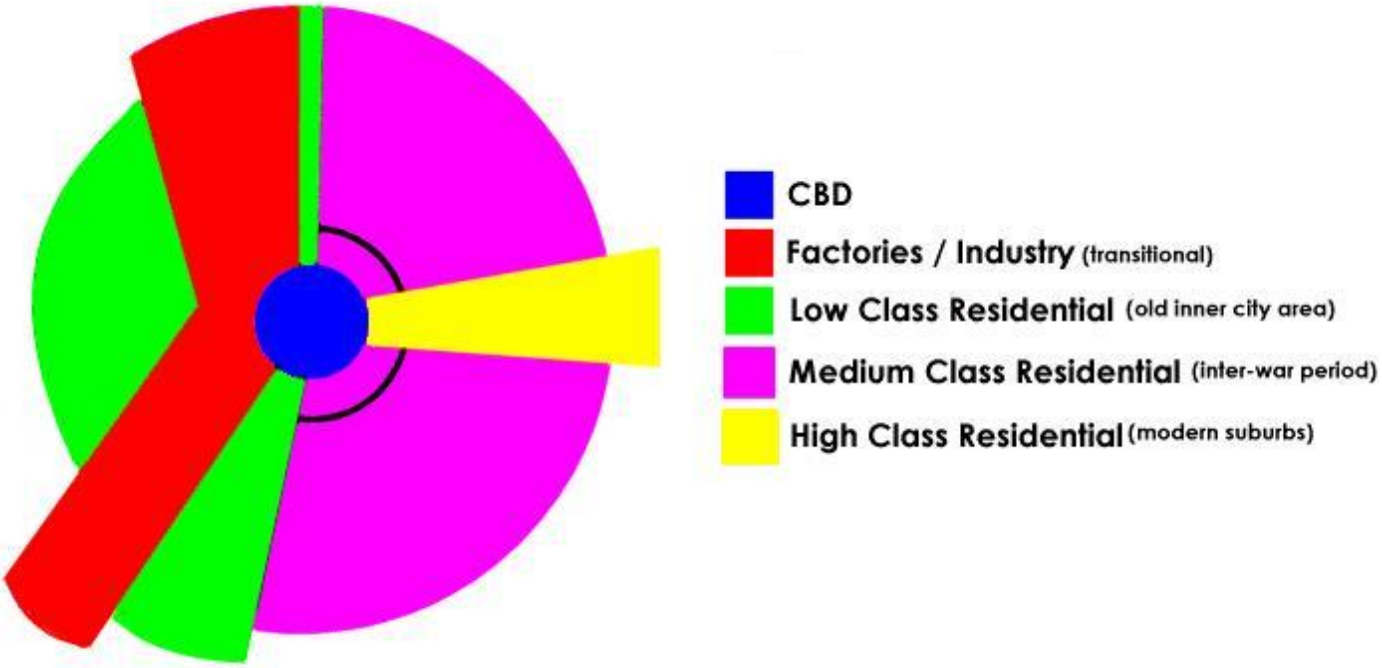
urban regeneration and gentrification: more expensive property can be found in lower cost housing areas

Commuter villages defy the theory, being in the commuter zone but located far from the city.

The concentric zone model does not address local urban politics or the forces of globalization.

The model does not work well for cities which are essentially federations of similar sized towns.

SECTOR MODEL (Homer Hoyt)



The **sector model** also known as the **Hoyt model** was proposed in 1939 by economist Homer Hoyt. It is a model of urban land use and modified the concentric zone model of city development. The benefit of the application of this model is that it allows for an outward progression of growth. However, like all models of urban form its validity is limited.

Explanation of the Model

While accepting the existence of a central business district, Hoyt suggested that zones expand outward from the city center along railroads, highways, and other transportation arteries. Using Chicago as an example, an upper class residential sector evolved outward along the desirable Lake Michigan shoreline north of the central business district, while industry extended southward in sectors that followed railroad lines.

In developing this model Hoyt observed that it was common for low-income households to be near railroad lines, and commercial establishments to be along business thoroughfares. Recognizing that the various transportation routes into an urban area – including railroads, sea ports and tram lines – represented greater access, Hoyt theorized that cities tended to grow in wedge-shaped patterns -- or sectors -- emanating from the central business district and centered on major transportation routes. Higher levels of access meant higher land values, thus, many commercial functions would remain in the CBD but manufacturing functions would develop in a wedge surrounding transportation routes. Residential functions would grow in wedge-shaped patterns with a sector of low-income housing bordering manufacturing/industrial sectors (traffic, noise and pollution makes these areas the least desirable), while sectors of middle- and high-income households were located furthest away from these functions. Hoyt's model attempts to state a broad principle of urban organization.

In general, older cities tend to follow the Hoyt model and more recent cities tend to follow the Burgess model.

Limitations of the Model

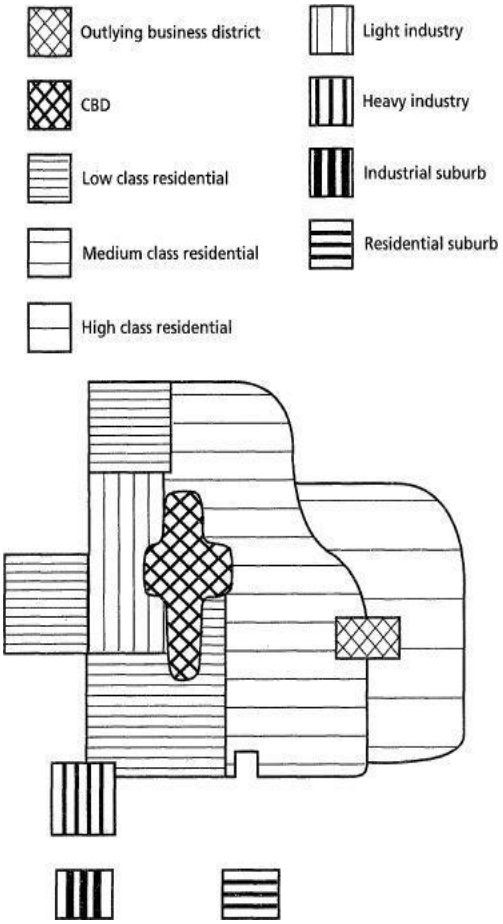
Hoyt's theory is based on early 20th century transport and does not make allowances for private cars that

enable commuting from cheaper land outside city boundaries.

Physical features may restrict or direct growth along certain wedges.

The growth of a sector can be limited by leapfrog land use (a land-use pattern in which new development does not connect coherently to existing development, often leaving haphazard tracts of undeveloped land).

MULTIPLE NUCLEI MODEL (Harris and Ullman)



The **multiple nuclei model** is an ecological model put forth by Chauncy Harris and Edward Ullman in the 1945 article "The Nature of Cities." The model describes the layout of a city. It notes that while a city may have. started with a central business district, similar industries with common land-use and financial requirements are established near each other. These groupings influence their immediate neighborhood. Hotels and restaurants spring up around airports, for example. The number and kinds of nuclei mark a city's growth.

The theory was formed based on the idea that people have greater movement due to increased car ownership. This increase of movement allows for the specialization of regional centers (e.g., heavy industry, business parks, etc). There is no clear central business district in this type of model.

PERIPHERAL MODEL (Chauncey Harris)

Harris (1997) updated the multiple-nuclei model, suggesting that recent urban developments in the US and other countries meant that a **peripheral model** is needed. The main feature of this model is the existence of a *peripheral belt* which lies within the metropolitan area but outside the central city. This peripheral belt, as the name suggests, has little to do with the central city but is linked to other developments in the periphery.

The model has a number of features:

1. It is linked by a radial transport route.
2. It has large blocks of land for development.
3. It has similar social, economic and housing characteristics.
4. It is free from the problems of inner city areas.
5. There is land available for the development of regional shopping malls, industrial districts, theme parks, airports with motels and hotels, conference centers and parks.
6. The residents of the peripheral belt have most of their ties within this sector of the city and have little to do with the central city.