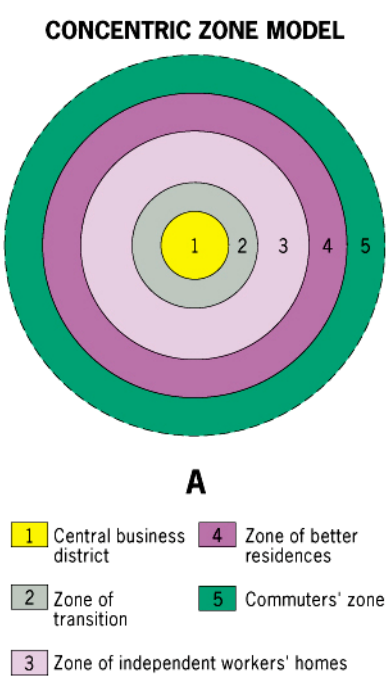
Models of Urban Structure

Cities are not simply random collections of buildings and people. They exhibit functional structure: they are spatially organized to perform their functions as places of commerce, production, education, and much more. One of the most important forces determining where certain buildings or activities are located within a city deals with the price of land. This tends to be the highest in the downtown area and declines as one moves outward from the center. The United States is the only country in the world in which the majority of the people live in the suburbs. Even though house prices may be higher in the suburbs, the land value is lower (a downtown apartment complex will produce much more revenue per year than a few suburban homes occupying the same amount of space). In every other country the majority resides in either rural or urban areas.

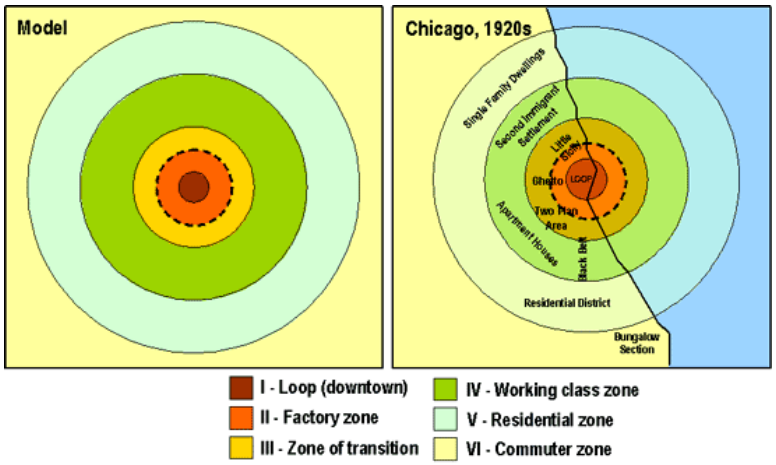
Before preceding, it is important to define some commonly used terms in referring to city structure. The **central business district (CBD)** (or "downtown") is the core of the city. High land values, tall buildings, busy traffic, converging highways, and mass transit systems (e.g., South Florida's "Tri-Rail") mark the American or European CBD. An **urban zone** is a sector of a city within which land use is relatively uniform (e.g., an industrial or residential zone). The term **central city** is often used to denote the part of an urban area that lies within the outer ring of residential suburbs. A suburb is an outlying, functionally uniform part of an urban area, often (but not always) adjacent to the central city. All of these urban regions or zones lie near or adjacent to each other and together make up the **metropolis**. The term **hinterland** is a German word meaning the "land behind" the city (the surrounding service area).

Modeling the North American City

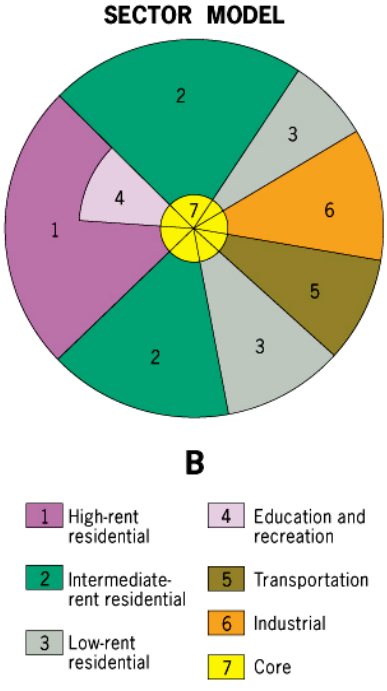


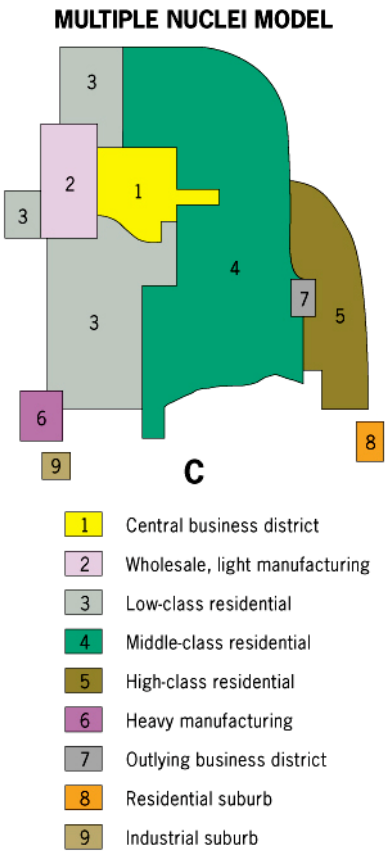
As cities evolved, they displayed increasing complexity over time. The **concentric zone model** (A) resulted from a study of Chicago in the 1920s by Ernest Burgess. This model was drawn up at a time when the full impact of the Industrial Revolution came to bear on the American City. Burgess recognized five concentric functional zones. At the center was the CBD (1). The zone of transition (2) was characterized by residential deterioration and encroachment by business and light manufacturing. The zone of independent workers' homes (3) was primarily occupied by the **blue-collar** (wage-earners, manual laborers) labor force. The zone of better residences (4) consisted mainly of the middle-class. Finally, the commuters' zone (5) was the suburban ring, consisting mostly of **white-collar** workers who could afford to live further from the CBD. This model was dynamic. As the city grew, the inner zones encroached on the outer ones.

Remember, the model was developed for American cities and had limited applicability elsewhere. It has been demonstrated that pre-industrial cities, notably in Europe, did not at all followed the concentric circles model. For instance, in most pre-industrial European cities, the center was much more important than the periphery, notably in terms of social status. The Burgess concentric model is consequently partially inverted in these instances.

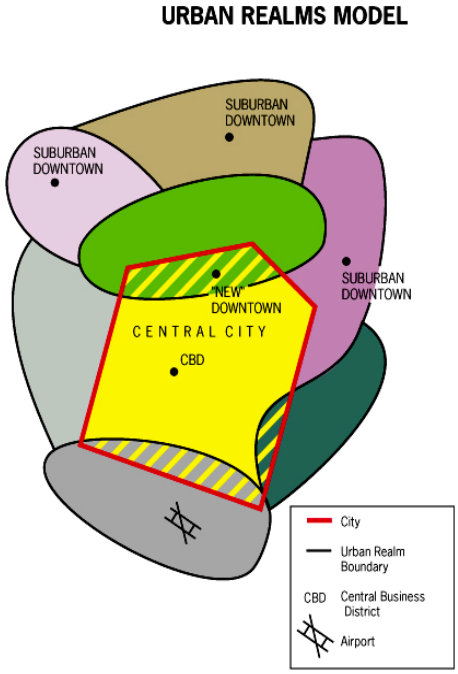


In the late 1930s, Homer Hoyt's **sector model** (B) was published, partly as an answer to the drawbacks of Burgess' concentric zone model. As technology dealing with transportation and communication was improving, growth alone created more of a pie-shaped urban structure. Hoyt discovered that land rent (for residential, commercial, or industrial) could remain consistent all the way from the CBD to the city's outer edge.

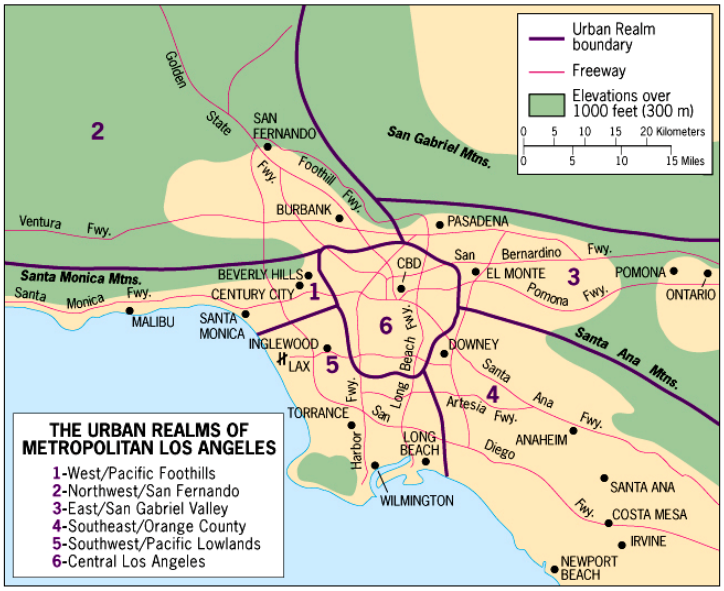




In the 1940s, Chauncy Harris and Edward Ullman, arguing that neither of the earlier models adequately reflected city structure, proposed the **multiple nuclei model** (C). This model was based on the notion the CBD was losing its dominant position and primacy as the nucleus of the urban area. Several of the urban regions would have their own subsidiary but competing "nuclei." As manufacturing cities became modern cities and modern cities became increasingly complex, these models became less and less accurate.



Today, there are urban realms, components of giant conurbations (connected urban areas) that function separately in certain ways but are linked together in a greater metropolitan sphere. In the early postwar period (1950s), rapid population diffusion to the outer suburbs created distant nuclei, but also reduced the volume and level, of interaction between the central city and these emerging suburban cities. By the 1970s, outer cities were becoming increasingly independent of the CBD to which these former suburbs had once been closely tied. Regional shopping centers (e.g., malls) in the suburban zone were becoming the new CBDs of the outer nuclei.



The term **"edge city"** was coined by Washington Post journalist and author Joel Garreau in 1991. We can equate the growing edge cities at major suburban freeway interchanges around America as the latest transformation of how we live and work. These new suburban cities are home to glistening office towers, huge retail complexes, and are always located close to major highways. According to Garreau, several rules must apply for a place to be considered an edge city:

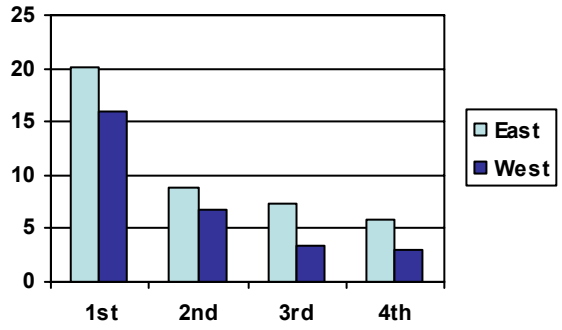
1. The area must have substantial office space (about the space of a good-sized downtown) & substantial retail space (the size of a large regional shopping mall);
2. The population must rise every morning and drop every afternoon (i.e., there are more jobs than homes);
3. The place is known as a single end destination (the place "has it all;" entertainment, shopping, recreation);
4. The area must not have been anything like a "city" in 1960 (cow pastures would have been nice).

Edge cities represent the third wave of our lives pushing into new frontiers in this half century. First, we moved our homes out past the traditional idea of what constituted a city. This was the **sububranization** of America, especially after World War II. Then we wearied of returning downtown for the necessities of life, so we moved our marketplaces out to where we lived. This was the "**malling**" of America, especially in the 1960s and 1970s. Today, we have moved our means of creating wealth, the essence of urbanism - our jobs - out to where most of us have lived and shopped for two generations. That has led to the rise of the edge city.

The Rank-Size Rule

We discern not only the hierarchy of urban places (hamlet, village, town, city, etc.) but also the so-called **rank-size rule**, established by George Zipf in 1949. This rule holds that in a model urban hierarchy, the population of a town or city will be inversely proportional to its rank in the

urban hierarchy. For example, if the largest city has 12 million people, the second city will have around 6 million (½ the population of the largest city); the third will have 4 million (⅓ the population of the largest city); the fourth city 3 million; and so on. The rank-size rule does not apply in all countries, especially those with dominant primate cities (e.g., France, Mexico), but it does apply in several countries with complex economies. The United, for example, displays a **binary distribution** of the rank-size rule. When a country has two large cities of similar size in separate regional areas; the rank-size rule may apply regionally – as in the case of the U.S. The eastern U.S. is anchored by the largest city, New York, followed by Chicago, Washington D.C., and Philadelphia. The largest city in the west, Los Angeles, is followed by San Francisco, Seattle, and Phoenix. The chart below illustrates that the rank-size rule does generally apply in a regional sense.



Urban Functions

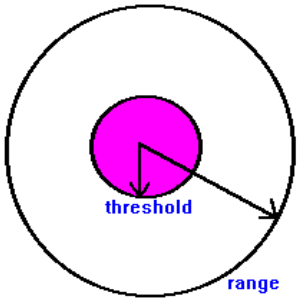
It is important to note that every town and city has an economic base. For example, workers in a manufacturing plant are in the city's **basic sector**; their work produces goods for export and generates an inflow of money. On the other hand, workers in the **nonbasic sector** (the service sector) are responsible for the functioning of the city itself (e.g., teachers, street cleaners, office clerks, etc.). The ratio of basic to nonbasic workers gives an impression of the city's **economic base**. The ratio is about the same for most large cities (about 1:2). When a business is established with 50 production (basic) workers, it adds 100 nonbasic workers to the workforce. Economic expansion of this kind therefore has a **multiplier effect** on the workforce and the urban population (most workers have dependents (e.g., children) who consume goods and services). Data on the number of people employed in basic and nonbasic jobs (the **employment structure**) can help discern the primary functions of a city.

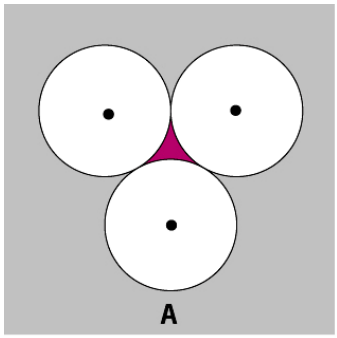
Although it is becoming increasingly more uncommon, some cities are dominated by one particular activity. This **functional specialization** was more evident in the past – Detroit's automobiles, Pittsburgh's steel, and Houston's aerospace industry were but a few examples. Today these cities are much more diversified. Some functional specialization can still be seen today – Orlando's theme parks and vacation spots, Las Vegas' casinos, etc.

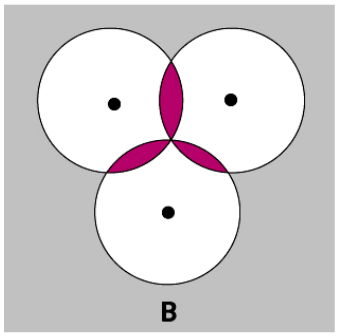
Central Place Theory

How do service areas relate to each other? Do they overlap? Do towns of approximately the same size lie about the same distance away from each other? Every urban center has a certain economic reach that can be used as a measure of its centrality.

In 1933, Walter Christaller, a German, laid the groundwork for central place theory. He attempted to develop a model that would show how and where central places (hamlets, villages, towns, cities,…) would be functionally and spatially distributed. In his model, the ideal region would have flat terrain with no physical barriers. Soil fertility, population distribution, purchasing power, and transportation networks would all be uniform. Finally, he assumed that a constant maximum distance or range of sale of any good or service produced in a central place would prevail in all directions from that urban center. Christaller's idea was to compare his model to real world situations and try to explain any variations and exceptions. He defined **central goods and services** as those provided only at a central place (e.g., bowling alley, professional sports team,…). The **range of sale** was the distance people would be willing to travel to acquire the goods or services. The limit would lie halfway between one central place and the next where the same product was sold at the same price (all things being equal, you wouldn't travel 10 miles to a movie theater if one was 5 miles away). The **threshold** is the minimum market area needed to bring a firm or city selling goods and services into existence, and to keep it in business.

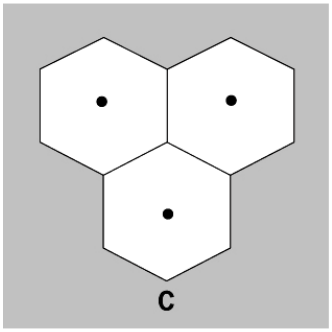






In Christaller's urban model, each central place has a surrounding **complementary region**, an exclusive hinterland within which the town has a monopoly on the sale of certain goods or services because it alone can provide these within the range of sale. If all his assumptions were in effect, such complementary regions would be circular, but this would create some significant problems. The issue is that either the circles adjoin and leave unserved areas (A), or they overlap; in the latter situation (B) the central place no longer has a monopoly.

These two problems are resolved by a model consisting of perfectly fitted **hexagonal regions** (C). If, for example, the hexagonal complementary region was focused on a hamlet (where the fewest goods and services are available), that hamlet and its region form a complementary region of a village. And that village and its complementary region would be part of a town's complementary region, and so on. Thus, a **nesting pattern** is revealed (region-within-region); each larger region is centered on a higher-order urban place. The image below displays Christaller's interlocking model of a hierarchy of settlements and their service areas (H=hamlet; V=village; T=town; C=city).



Like von Thünen, whose model was based on a series of assumptions, Christaller knew that conditions would be different in the real world. His model did yield some practical conclusions, however. First, he showed that the ranks of urban places do in fact form an orderly hierarchy of central places in spatial balance. Second, his model implied that places of the same size with the same number of functions would be spaced the same distance apart. Third, larger cities would be spaced farther from each other than smaller towns and villages. His model confirmed that the general pattern we see on the map is not an accident but a product of specific forces that tend to create regular rank-size patterns. Christaller's ideas may be applied to the real world, but keep in mind – it is still a model, not reality.

Christaller's ideas may be applied to regions in Europe, North America, and elsewhere. Studies in the U.S. Midwest suggested that while the square layout of the township-and-range system imposed a different kind of regularity on the landscape (square, not hexagonal), the spatial forces at work there tended to confirm Christaller's theory. Relatively flat lands in China display some similarities to the central place model.

Keep in mind, when central place theory was first formulated, the world was a simpler (and much less populated) place than it is today. Take, for example, the so-called Sunbelt phenomenon since the 1960s – the movement of millions of Americans from northern and northeastern States to the South and Southwest. Some of this was through involuntary, internal migration made possible by social security and retirement money. It has also resulted from governmental economic and social policies that favor "Sunbelt" cities through federal spending on military, aerospace, and research facilities. In addition, millions of Middle and South American migrants moved northward – into the same urban centers already growing for domestic reasons. The overall effect of this was to create a changed **urban hierarchy** in the Sunbelt region. Many cities – Miami, Atlanta, Dallas, and Phoenix – have become major central places in the United States.