KEY ISSUE 1

Why Are Downtowns Distinctive?

- **Introducing Urban Patterns**
- **The Central Business District**
- **Competition for Space in CBDs**

LEARNING OUTCOME 13.1.1

Understand various definitions of urban settlements.

When you are staring at the Empire State Building, you know you are in a city (Figure 13-1). When you are standing in an Iowa cornfield, you have no doubt that you are in the country. Geographers help explain why urban and rural settlements are different.

Introducing Urban Patterns

Chapter 12 and this chapter are both concerned with urban geography, but at different scales. The previous chapter examined the distribution of urban settlements at national and global scales. This chapter looks at where people and activities are distributed within urban areas. Models have been developed to explain why differences occur within urban areas. In developing countries people are migrating into cities in large numbers, whereas in developed countries people are increasingly likely to be moving out to suburbs.

▼ FIGURE 13-1 NEW YORK CITY

CENTRAL CITY

Historically, urban settlements were very small and compact. As these settlements have rapidly grown, however, definitions have been created to characterize their different parts: the central city, the urban area, and the metropolitan area.

A **central city** (or simply **city**) is an urban settlement that has been legally incorporated into an independent, self-governing unit known as a municipality (Figure 13-2). Virtually all countries have a local government system that recognizes cities as legal entities with fixed boundaries. A city has locally elected officials, the ability to raise taxes, and responsibility for providing essential services. The boundaries of the city define the geographic area within which the local government has legal authority.

Population has declined since 1950 by more than one-half in the central cities of Buffalo, Cleveland, Detroit, Pittsburgh, and St. Louis and by at least one-third in more than a dozen other U.S. central cities. In contrast, other definitions of urban settlements reflect increasing population.

URBAN AREA

An **urban area** consists of a central city and its surrounding built-up suburbs (Figure 13-3). The U.S. census recognizes two types of urban areas:

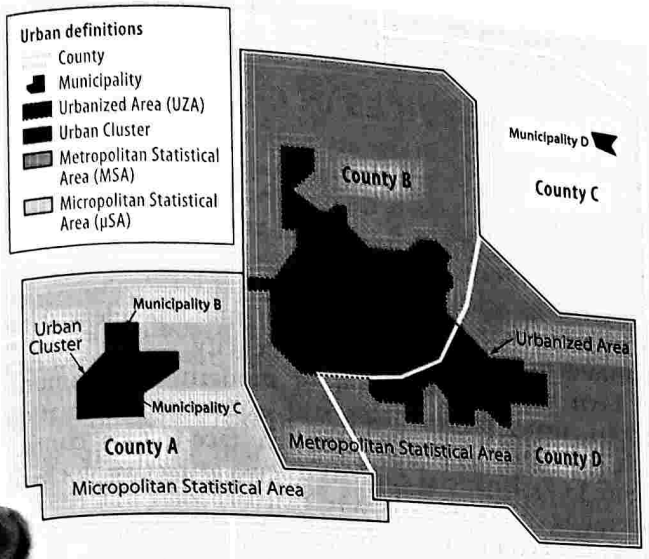
- The **urbanized area** is an urban area with at least 50,000 inhabitants.
- An **urban cluster** is an urban area with between 2,500 and 50,000 inhabitants.

The census identified 486 urbanized areas and 3,087 urban clusters in the United States as of 2013. Approximately 70 percent of the U.S. population lived in one of the 486 urbanized areas, including about 30 percent in central cities and 40 percent in surrounding jurisdictions. Approximately 10 percent of the U.S. population lived in one of the 3,087 urban clusters.

METROPOLITAN AREA

The economic and cultural area of influence of a settlement extends beyond the urban area in the United States as well as other countries (Figure 13-4). The U.S. Bureau of the Census has created a method of measuring the larger functional area of a settlement, known as the **metropolitan statistical area (MSA).** An MSA includes the following:

- An urbanized area with a population of at least 50,000.
- The county within which the city is located. In New England, towns are sometimes used instead of counties.
- Adjacent counties with a high population density and a large percentage of residents working in the central city's county (specifically, a county with a density of 25 persons per square mile and at least 50 percent working in the central city's county).



▲ **FIGURE 13-2 DEFINITIONS OF URBAN SETTLEMENTS** The census definitions can be applied to this illustration:

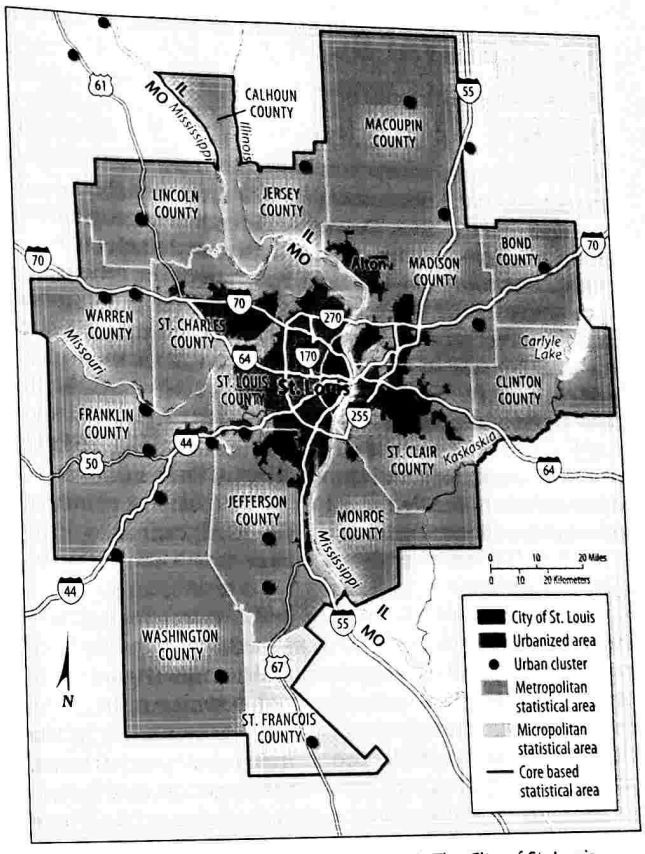
- MSA: Counties B and D.
- μSA: County A.
- CBSAs: The illustration has two (the MSA consisting of Counties B and D and the μSA consisting of County A).
- CSA: A CSA comprising Counties A, B, and D would be designated if the Census Bureau determined that the adjacent MSA and μSA are closely linked.
- PSA: If a CSA existed, that would constitute the PSA; if not, then the MSA and the μSA would be two separate PSAs.

Studies of metropolitan areas in the United States are usually based on information about MSAs. MSAs are widely used because many statistics are published for counties, the basic MSA building block in most states. The Census Bureau designated 388 MSAs as of 2013, encompassing 84 percent of the U.S. population.

The census has also designated smaller urban areas as **micropolitan statistical areas (μSAs).** A μSA includes an urbanized area of between 10,000 and 50,000 inhabitants, the county in which it is located, and adjacent counties tied to the city. The United States had 541 micropolitan statistical areas as of 2013, for the most part found around southern and western communities previously considered rural in character. About 9 percent of Americans live in micropolitan statistical areas.

The census combines MSAs and μSAs in several ways:

- A **core-based statistical area (CBSA)** is any one MSA or μSA (929 as of 2013, including the 388 MSAs and the 541 μSAs).
- A **combined statistical area (CSA)** is two or more contiguous CBSAs tied together by commuting patterns (169 as of 2013).
- A **primary statistical area (PSA)** is a CSA, an MSA not included in a CSA, or a μSA not included in a CSA (574 as of 2013, including the 169 CSAs, plus the 122 MSAs and 283 μSAs not included in a CSA).



▲ **FIGURE 13-3 DEFINITIONS OF ST. LOUIS** The City of St. Louis comprises only 6 percent of the land area and 11 percent of the population of the MSA.

PAUSE & REFLECT 13.1.1

Do you live inside or outside a central city? An urban area? A metropolitan area?

▼ **FIGURE 13-4 MEXICO CITY METROPOLITAN AREA** Mexico City's metropolitan area extends over nearly 10,000 square kilometers (4,000 square miles).

The Central Business District

LEARNING OUTCOME 13.1.2

Describe the distinctive features of the CBD.

Downtown is the best-known and the most visually distinctive area of most cities. Downtown is known to geographers by the more precise term **central business district (CBD).** The CBD is compact—less than 1 percent of the urban land area—but contains a large percentage of the public, business, and consumer services (Figure 13-5). Services are attracted to the CBD because of its accessibility. The CBD is the easiest part of the city to reach from the rest of the region and is the focal point of the region's transportation network.

The CBD is one of the oldest districts in a city, usually at or near the original site of the settlement. The CBDs of older cities are often situated along a body of water, a principal transportation route prior to the twentieth century.

PUBLIC SERVICES IN CBDs

Public services typically located in a CBD include city hall, courts, county and state agencies, and libraries (Figure 13-6). These facilities historically clustered downtown, in many cases in substantial structures. Today, many remain in the CBD to facilitate access for people living in all parts of town. Similarly, semipublic services such as places of worship and social service agencies also cluster downtown in handsome historic structures.

Sports facilities and convention centers have been constructed or expanded downtown in many cities. These structures attract a large number of people, including many suburbanites and out-of-towners. Cities place these facilities in the CBD because they hope to stimulate more business for downtown restaurants, bars, and hotels.

BUSINESS SERVICES IN CBDs

Offices cluster in a CBD for accessibility. People in business services such as advertising, banking, finance, journalism, and law particularly depend on proximity to professional colleagues. Lawyers, for example, choose locations near government offices and courts. Services such as temporary secretarial agencies and instant printers locate downtown to be near lawyers, forming a chain of interdependency that continues to draw offices to the center city.

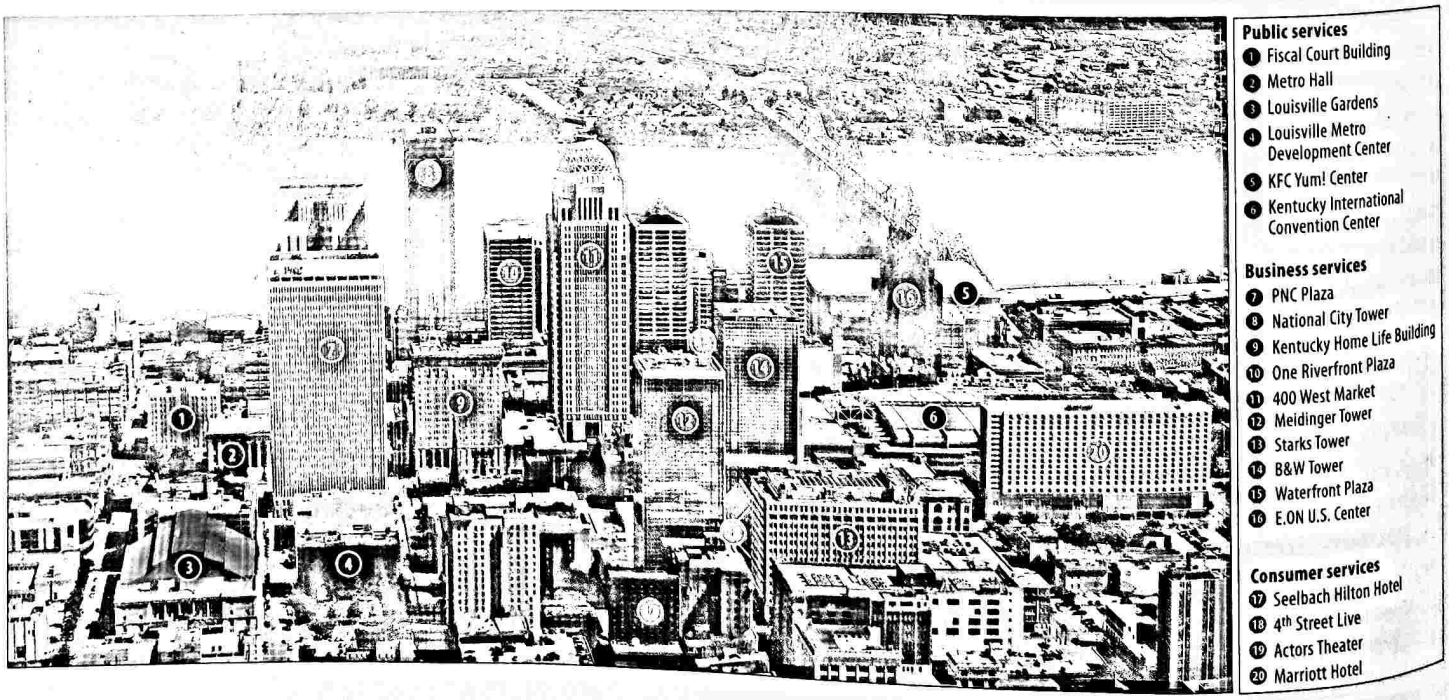
Even with the diffusion of modern telecommunications, many professionals still exchange information with colleagues primarily through face-to-face contact (Figure 13-7). Financial analysts discuss attractive stocks or impending corporate takeovers. Lawyers meet to settle disputes out of court. Offices are centrally located to facilitate rapid communication of fast-breaking news through spatial proximity. Face-to-face contact also helps establish a relationship of trust based on shared professional values.

A central location also helps businesses that employ workers from a variety of neighborhoods. Top executives may live in one neighborhood, junior executives in another, secretaries in another, and custodians in still another. Only a central location is readily accessible to all groups. Firms that need highly specialized employees are more likely to find them in the central area, perhaps currently working for another company downtown.

CONSUMER SERVICES IN CBDS

In the past, three types of retail services clustered in a CBD because they required accessibility to everyone in

▼ FIGURE 13-5 CBD OF LOUISVILLE, KENTUCKY.



▲ **FIGURE 13-6 PUBLIC SERVICES IN LOUISVILLE'S CBD** Muhammad Ali Center.

the region: retailers with high thresholds, those with high range, and those that served people working in the CBD. Changing shopping habits and residential patterns have reduced the importance of retail services in the CBD.

RETAILERS WITH HIGH THRESHOLDS. Retailers with high thresholds, such as department stores, traditionally preferred a CBD location in order to be accessible to many people. Large department stores in the CBD would cluster near one intersection, which was known as the "100 percent corner." Rents were highest there because that location had the highest accessibility for the most customers.

Most high-threshold shops such as large department stores have closed their downtown branches. CBDs that once boasted three or four stores now have none, or perhaps one struggling survivor. The customers for downtown department stores now consist of downtown office workers, inner-city residents, and tourists. Department stores with high thresholds are now more likely to be in suburban malls.

RETAILERS WITH HIGH RANGES. High-range retailers are often specialists, with customers who patronize them infrequently. These retailers once preferred CBD locations because their customers were scattered over a wide area. For example, a jewelry or clothing store attracted shoppers from all over the urban area, but each customer visited infrequently. Like those with high thresholds, high-range retailers have moved with department stores to suburban locations.

Some retailers with high ranges have located in CBDs because they are visited by tourists. Local residents also patronize shops in the CBD as a leisure activity on evenings and weekends (Figure 13-8).

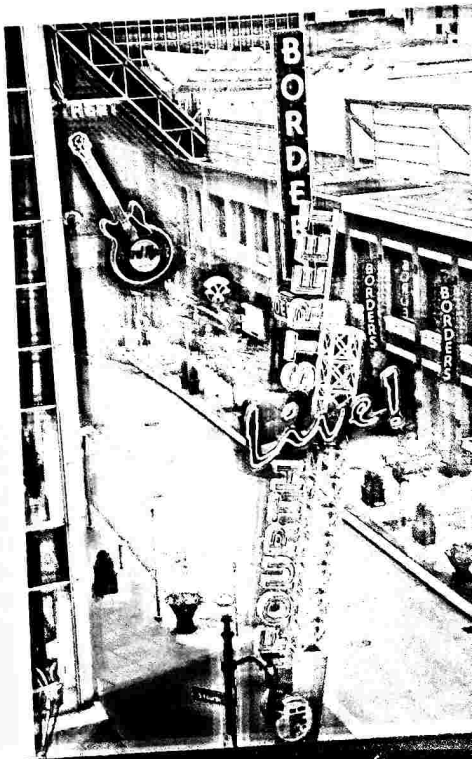
RETAILERS SERVING CBD WORKERS. A third type of retail activity in the CBD serves the many people who work in the CBD and shop during lunch or working hours. These retailers sell office supplies, computers, and clothing or offer shoe repair, rapid photocopying, dry cleaning, and so on. In contrast to the other two types of retailers, shops that appeal to nearby office workers are expanding in the CBD, in part because the number of downtown office workers has increased, and in part because downtown offices require more service.

Patrons of downtown shops tend increasingly to be downtown employees who shop during the lunch hour. Thus, although the total volume of sales in downtown areas has been stable, the pattern of demand has changed. Large department stores have difficulty attracting their old customers, whereas smaller shops that cater to the special needs of the downtown labor force are expanding.

PAUSE & REFLECT 13.1.2

Do you ever spend time in a CBD? If so, for what reasons?

◀ **FIGURE 13-7 BUSINESS SERVICES IN LOUISVILLE'S CBD** 400 West Market (formerly Aegon Center) is Louisville's tallest building.



▶ **FIGURE 13-8 CONSUMER SERVICES IN LOUISVILLE'S CBD** Fourth Street Live restaurant and entertainment district.

Competition for Space in CBDs

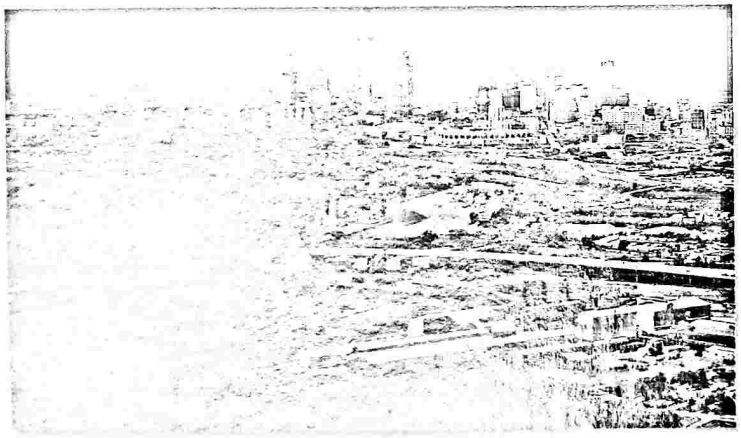
LEARNING OUTCOME 13.1.3

Understand the use of vertical space in the CBD and the exclusion of some land uses.

A CBD's accessibility produces extreme competition for the limited available land. As a result, land values are very high in the CBD. In a rural area a hectare of land might cost several thousand dollars. In a suburb it might run tens of thousands of dollars. In the CBD of a global city like London, if a hectare of land were even available, it would cost more than $200 million. If this page were a parcel of land in the CBD of London, it would sell for $1,000.

As a result of intense competition for land, the CBD has distinctive features:

- The CBD has a three-dimensional character, with more space used below and above ground level than elsewhere in the urban area.
- Land uses commonly found elsewhere in the urban area are rare in the CBD.



(a)

(b)

▲ FIGURE 13-9 MANUFACTURING IN DOWNTOWN CLEVELAND **(a)** A steel mill and some other factories still line the Cuyahoga River in downtown Cleveland. **(b)** Most of Cleveland's downtown factories have been converted to residences and commercial activities.

ACTIVITIES EXCLUDED FROM THE CBD

High rents and land shortage discourage two principal activities in the CBD—industrial and residential.

LACK OF MANUFACTURING IN THE CBD. Modern factories require large parcels of land to spread operations among one-story buildings. Suitable land is generally available in suburbs. In the past, inner-city factories and retail establishments relied on waterfront CBDs that were once lined with piers for cargo ships to load and unload and warehouses to store the goods (Figure 13-9). Today's large oceangoing vessels are unable to maneuver in the tight, shallow waters of the old CBD harbors. Consequently, port activities have moved to more modern facilities downstream.

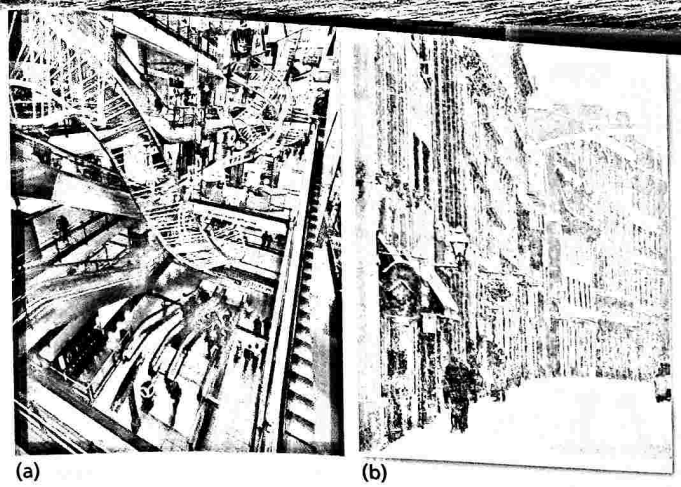
Port cities have transformed their waterfronts from industry to commercial and recreational activities. Derelict warehouses and rotting piers have been replaced with new apartments, offices, shops, parks, and museums. As a result, CBD waterfronts have become major tourist attractions in a number of North American cities, including Boston, Toronto, Baltimore, and San Francisco, as well as in European cities such as Barcelona and London. The cities took the lead in clearing the sites and constructing new parks, docks, walkways, museums, and parking lots. They have also built large convention centers to house professional meetings and trade shows. Private developers have added hotels, restaurants, boutiques, and entertainment centers to accommodate tourists and conventioneers.

LACK OF RESIDENTS IN THE CBD. Many people used to live in or near the CBD. Poorer people jammed into tiny, overcrowded apartments, and richer people built mansions downtown. In the twentieth century, most residents abandoned downtown living because of a combination of pull and push factors. They were pulled to suburbs that offered larger homes with private yards and modern schools. And they were pushed from CBDs by high rents that business and retail services were willing to pay and by the dirt, crime, congestion, and poverty that they experienced by living downtown.

In the twenty-first century, however, the population of many U.S. CBDs has increased. New apartment buildings and townhouses have been constructed, and abandoned warehouses and outdated office buildings have been converted into residential lofts. Downtown living is especially attractive to people without school-age children, either "empty nesters" whose children have left home or young professionals who have not yet had children. These two groups are attracted by the entertainment, restaurants, museums, and nightlife that are clustered downtown, and they are not worried about the quality of neighborhood schools. Despite the growth in population in the center of some U.S. cities, some consumer services, such as grocery stores, may still be lacking.

PAUSE & REFLECT 13.1.3

What might be the attractions of living in a former factory near the CBD?



(a) (b)

▲ **FIGURE 13-10 UNDERGROUND MONTRÉAL** **(a)** Montréal's Underground City is the world's largest underground complex. It is known as RÉSO, which is an abbreviation for Réseau Souterrain (underground network) and a homophone of the French word réseau (network). **(b)** Winter in Montréal discourages outdoor shopping.

VERTICAL FEATURES OF THE CBD

The CBD makes more intensive use of space below and above ground.

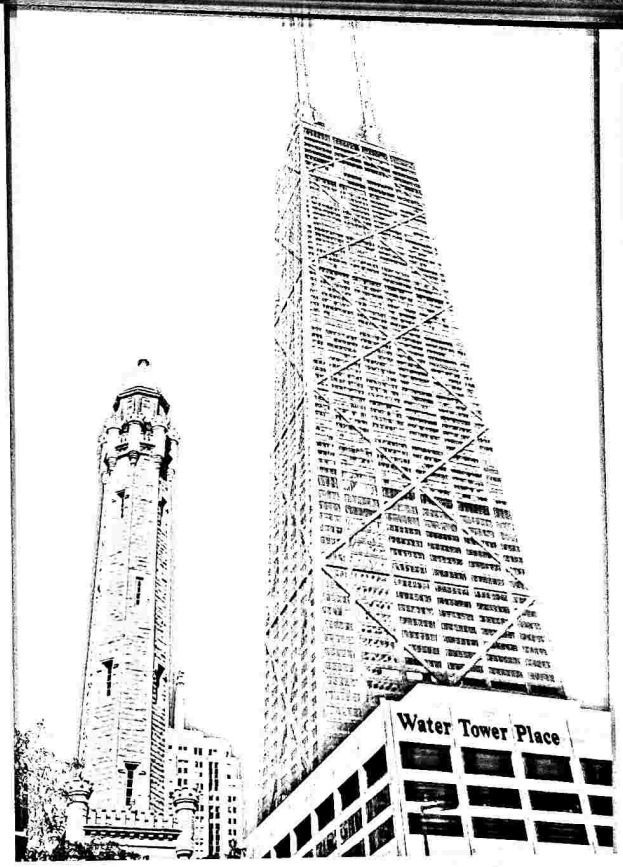
THE UNDERGROUND CBD. A vast underground network exists beneath most CBDs. The typical "underground city" includes garages, loading docks for deliveries to offices and shops, and pipes for water and sewer service. Telephone, electric, TV, and broadband cables run beneath the surface as well because not enough space is available in the CBD for the large number of overhead poles that would be needed for such a dense network, and the wires would be unsightly and hazardous. Subway trains run beneath the streets of large CBDs. And cities in cold-weather climates, such as Minneapolis, Montréal, and Toronto, have built extensive underground pedestrian passages and shops. These underground areas segregate pedestrians from motor vehicles and shield them from harsh winter weather (Figure 13-10).

SKYSCRAPERS. Demand for space in CBDs has also made high-rise structures economically feasible. Downtown skyscrapers give a city one of its most distinctive images and unifying symbols. Suburban houses, shopping malls, and factories look much the same from one city to another, but each city has a unique downtown skyline, resulting from the particular arrangement and architectural styles of its high-rise buildings.

The first skyscrapers were built in Chicago in the 1880s, made possible by several inventions, including the elevator, steel girders, and glass structures because they blocked light and air movement. Artificial lighting, ventilation, central heating, and air-conditioning have helped solve these problems. Most North American and European cities enacted zoning ordinances early in the twentieth century in part to control the location and height of skyscrapers.

Skyscrapers are an interesting example of "vertical geography" (Figure 13-11). The nature of an activity influences which floor it occupies in a typical high-rise.

The one large U.S. CBD without skyscrapers is Washington, D.C., where no building is allowed to be higher than the U.S. Capitol dome. Consequently, offices in downtown Washington rise no more than 13 stories. As a result, the typical Washington office building uses more horizontal space—land area—than in other cities. Thus the city's CBD spreads over a much wider area than those in comparable cities.



▲ **FIGURE 13-11 JOHN HANCOCK CENTER AND WATER TOWER PLACE, CHICAGO** The lower floors of the Hancock Center and neighboring buildings, such as Water Tower Place, are devoted to commercial activities. The middle floors are offices, the upper floors are apartments, and the top two floors are commercial activities (observation deck, restaurant, and bar) **1. Why might retail services wish to pay high rents for street-level space? 2. Why might residents prefer the upper floors? 3. In the image of the Hancock Center, note how the windows change between the lower business services floors and the upper residential floors. Why might the two types of land uses prefer different window styles?**

CHECK-IN KEY ISSUE 1

Why Are Downtowns Distinctive?

- ✔ **Business, public, and some consumer services cluster in the CBD.**
- ✔ **The CBD has relatively few manufacturers and residents.**
- ✔ **North American CBDs are characterized by vertical features above and below ground level.**

KEY ISSUE 2

Where Are People Distributed In Urban Areas?

- ▸ **Models of Urban Structure**
- ▸ **Applying the Models in North America**
- ▸ **Applying the Models in Europe**
- ▸ **Pre-modern Cities in Developing Countries**
- ▸ **Applying the Models in Developing Countries**
- ▸ **Changing Urban Structure of Mexico City**

LEARNING OUTCOME 13.2.1

Describe the models of internal structure of urban areas.

People are not distributed randomly within an urban area. They concentrate in particular neighborhoods, depending on their social characteristics. Geographers describe where people with particular characteristics are likely to live within an urban area, and they offer explanations for why these patterns occur.

Models of Urban Structure

Sociologists, economists, and geographers have developed three models to help explain where different types of people tend to live in an urban area—the concentric zone, sector, and multiple nuclei models. The peripheral model is a modification of the multiple nuclei model. The three models have been applied to cities in the United States and in other countries with varying degrees of success.

The three models describing the internal social structure of cities were developed in Chicago, a city on a prairie. Chicago includes a CBD known as the Loop because transportation lines (originally cable cars, now El trains) loop around it. Surrounding the Loop are residential suburbs to the south, west, and north. Except for Lake Michigan to the east, few physical features have interrupted Chicago's growth.

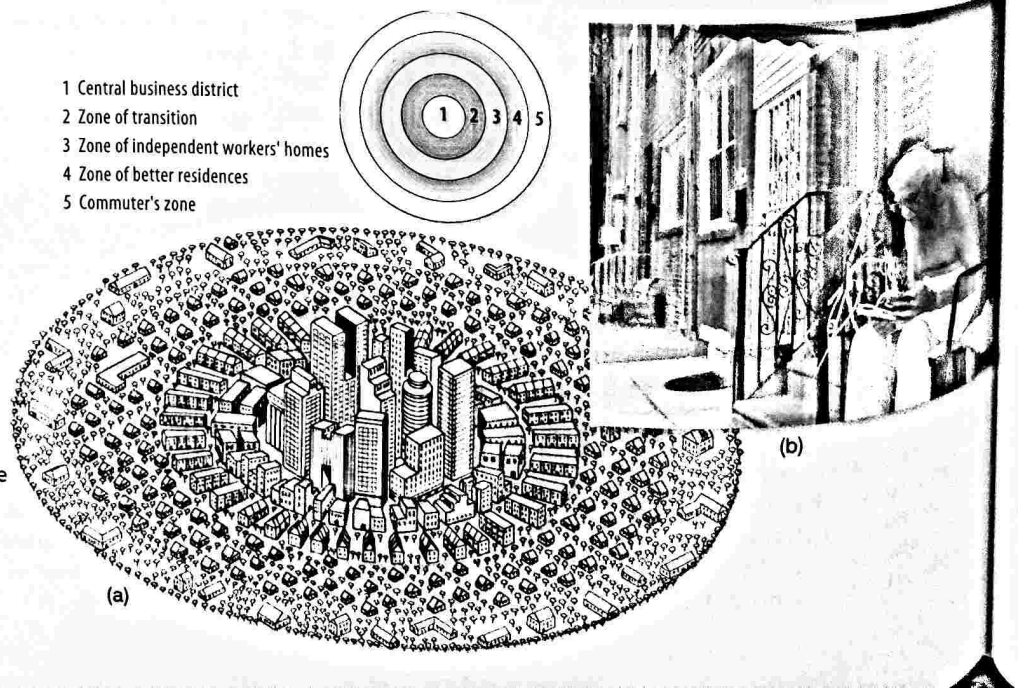
CONCENTRIC ZONE MODEL

According to the **concentric zone model,** created in 1923 by sociologist E. W. Burgess, a city grows outward from a central area in a series of concentric rings, like the growth rings of a tree. The precise size and width of the rings vary from one city to another, but the same basic types of rings appear in all cities in the same order. Back in the 1920s, Burgess identified five rings (Figure 13-12).

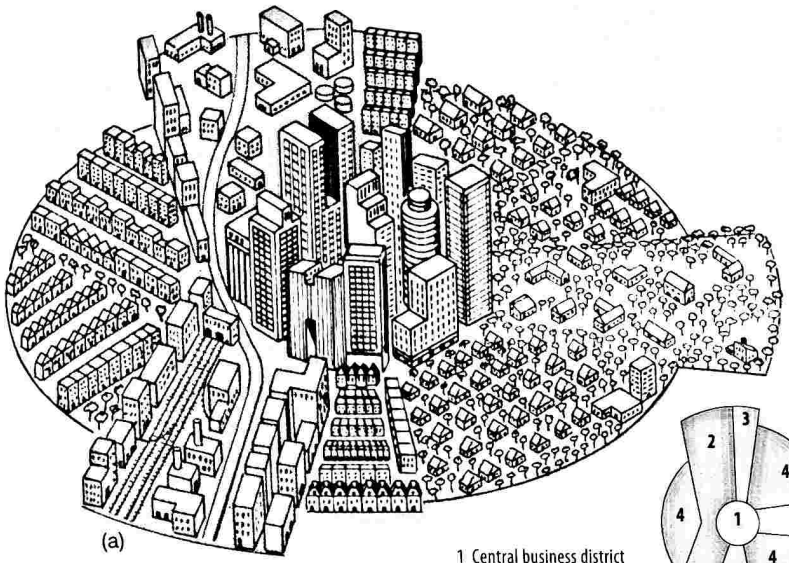
SECTOR MODEL

According to the **sector model,** developed in 1939 by land economist Homer Hoyt, a city develops in a series of sectors (Figure 13-13). Certain areas of the city are more attractive for various activities, originally because of an environmental factor or even by mere chance. As a city grows, activities expand outward in a wedge, or sector, from the center.

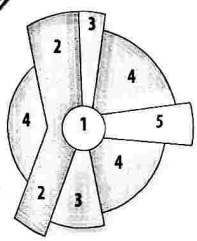
Once a district with high-income housing is established, the most expensive new housing is built on the outer edge of that district, farther out from the center. The



▸ FIGURE 13-12 **CONCENTRIC ZONE MODEL** **(a)** According to this model, a city grows in a series of rings that surround the CBD: 1. CBD: The innermost ring, where nonresidential activities are concentrated 2. Zone in transition: Industry and poorer-quality housing; immigrants to the city first live in this zone in small dwelling units, frequently created by subdividing larger houses into apartments 3. Zone of working-class homes: Modest older houses occupied by stable, working-class families 4. Zone of better residences: Newer and more spacious houses for middle-class families 5. Commuters' zone: Beyond the continuous built-up area of the city, where people live in small communities and commute to work in the CBD. **(b)** Zone of working-class homes, Philadelphia.



(a)



1 Central business district
2 Transportation and industry
3 Low-class residential
4 Middle-class residential
5 High-class residential

(b)

▲ **FIGURE 13-13 SECTOR MODEL** (a) According to this model, a city grows in a series of wedges or corridors, which extend out from the CBD. **(b)** Chicago's North Side, a high-income sector.

best housing is therefore found in a corridor extending from downtown to the outer edge of the city. Industrial and retailing activities develop in other sectors, usually along good transportation lines.

MULTIPLE NUCLEI MODEL

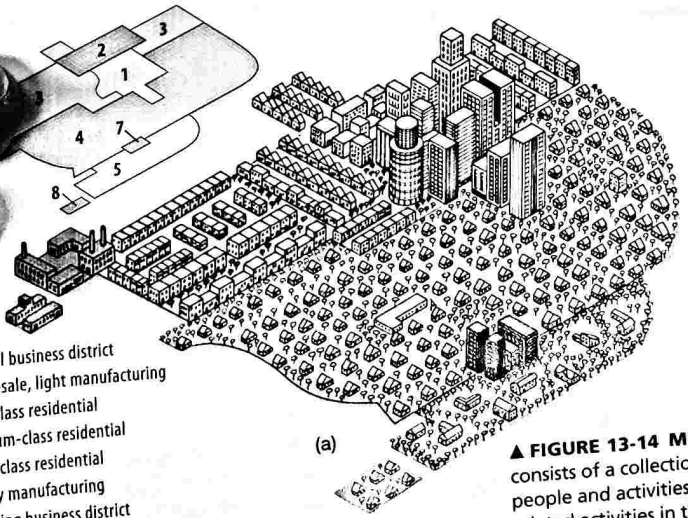
According to the **multiple nuclei model,** developed by geographers C.D. Harris and E.L. Ullman in 1945, a city is a complex structure that includes more than one center around which activities revolve (Figure 13-14). Examples of these nodes include a port, a neighborhood business center, a university, an airport, and a park.

The multiple nuclei theory states that some activities are attracted to particular nodes, whereas others try to avoid them. For example, a university node may attract well-educated residents, pizzerias, and bookstores, whereas an airport may attract hotels and warehouses. On the other hand, incompatible land-use activities avoid clustering in the same locations. Heavy industry and high-income housing, for example, rarely exist in the same neighborhood.

The nodes of consumer and business services around the beltway are called **edge cities.** Edge cities originated as suburban residences for people who worked in the central city, and then shopping malls were built to be near the residents. Now edge cities also contain business services.

PAUSE & REFLECT 13.2.1

If you cut down a large tree, which of the three models will the cross-section resemble? Why is the cross-section of a tree a good analogy for one of the models of urban structure?



1 Central business district
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

(a)

(b)

▲ **FIGURE 13-14 MULTIPLE NUCLEI MODEL** (a) According to this model, a city consists of a collection of individual nodes, or centers, around which different types of people and activities cluster. **(b)** Harvard Square in Cambridge is a node for student-related activities in the Boston urban area.

Applying the Models in North America

LEARNING OUTCOME 13.2.2

Analyze how the three models help to explain where people live.

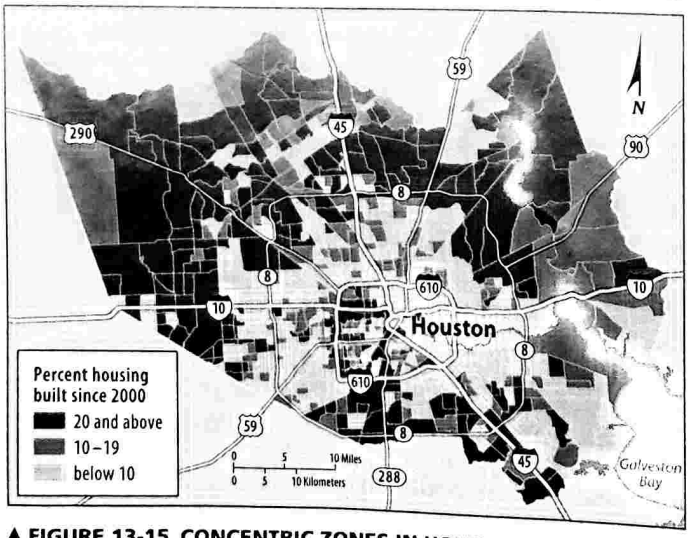
The three models of urban structure help us understand where people with different social characteristics tend to live within an urban area. They can also help explain why certain types of people tend to live in particular places.

SOCIAL AREA ANALYSIS

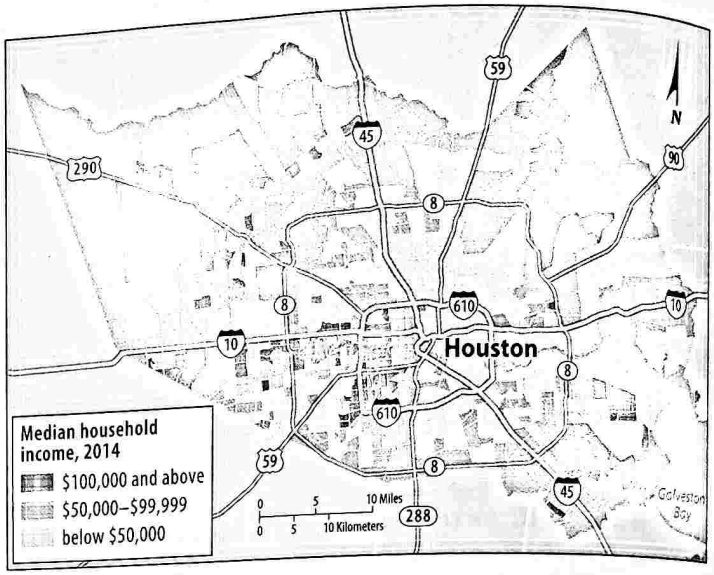
The study of where people of varying living standards, ethnic background, and lifestyle live within an urban area is **social area analysis.** Social area analysis helps to create an overall picture of where various types of people tend to live, depending on their particular personal characteristics.

Social area analysis depends on the availability of data at the scale of individual neighborhoods. In the United States and many other countries, that information comes from the census. Urban areas in the United States are divided into **census tracts** that each contain approximately 5,000 residents and correspond, where possible, to neighborhood boundaries. The census also divides the entire United States into blocks, which are typically a collection of several dozen houses; inside urban areas, blocks are typically bounded by four streets. A block group, as the name implies, is a collection of several neighboring blocks.

Every decade the U.S. Bureau of the Census publishes data summarizing the characteristics of the residents and the housing in each tract. Annual estimates are issued through the American Fact Finder service of the census's American Community Survey program. Examples of information the census provides at the tract level include



▲ **FIGURE 13-15 CONCENTRIC ZONES IN HOUSTON** The outer ring has a higher percentage of newer housing.



▲ **FIGURE 13-16 SECTORS IN HOUSTON** A sector to the west and northwest has the highest-income households.

the number of nonwhites, the median income of all families, and the percentage of adults who finished high school.

The spatial distribution of any of these social characteristics can be plotted on a map of the community's census tracts. Computers have become invaluable in this task because they permit rapid creation of maps and storage of voluminous data about each census tract. Relatively little is available at the block level because the number of people is so small that publishing the information could violate the privacy of individuals.

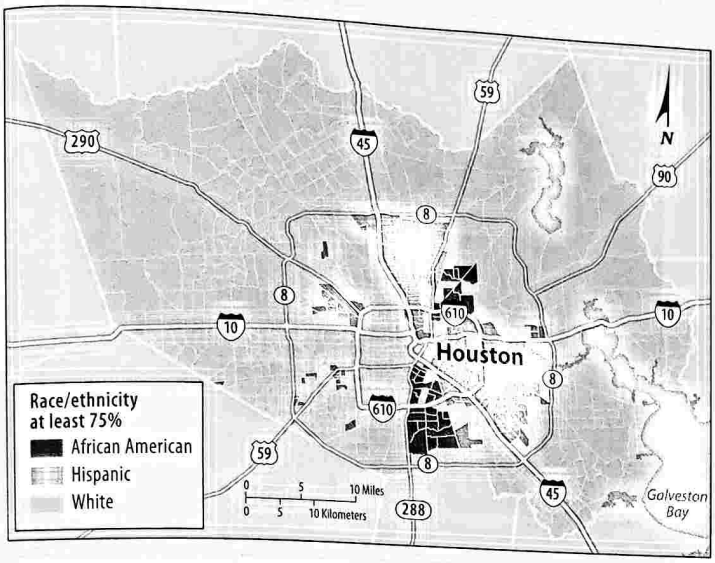
Social area analysis suggests the following:

- **Concentric zone model.** Consider two families with the same income and ethnic background. One family lives in a newly constructed home, whereas the other lives in an older one. The family in the newer house is much more likely to live in an outer ring and the family in the older house in an inner ring (Figure 13-15).
- **Sector model.** Given two families who own their homes, the family with the higher income will not live in the same sector of the city as the family with the lower income (Figure 13-16).
- **Multiple nuclei model.** People with the same ethnic or racial background are likely to live near each other (Figure 13-17).

Putting the three models together, we can identify, for example, the neighborhood in which a high-income, Asian American owner-occupant is most likely to live (Figure 13-18).

PAUSE & REFLECT 13.2.2

Would you expect the distribution of families with children to follow most closely the concentric zone, sector, or multiple nuclei model? Why?



▲ **FIGURE 13-17 MULTIPLE NUCLEI IN HOUSTON** The largest African American nodes are in the south and northeast. The largest Hispanic nodes are in the north and southeast.

LIMITATIONS OF THE MODELS

None of the three models taken individually completely explains why different types of people live in distinctive parts of a city. Critics point out that the models are too simple and fail to consider the variety of reasons that lead people to select particular residential locations. Because the three models are all based on conditions that existed in U.S. cities between the two world wars, critics also question their relevance to contemporary urban patterns in the United States or in other countries.

If the models are combined rather than considered independently, however, they help geographers describe where different types of people live in a city. People tend to reside in certain locations, depending on their particular personal characteristics. This does not mean that everyone with the same characteristics must live in the same neighborhood, but the models say that most people live near others who have similar characteristics.

(a)

(b)

(c)

◀ **FIGURE 13-18 COMPARING RINGS AND SECTORS IN HOUSTON** **(a)** House in an outer ring and a high-income sector. **(b)** House in the same ring as (a) but in a different sector. **(c)** Housing in the same sector as the house shown in (a) but in an inner ring.

Applying the Models in Europe

LEARNING OUTCOME 13.2.3

Describe how the three models explain patterns in European cities.

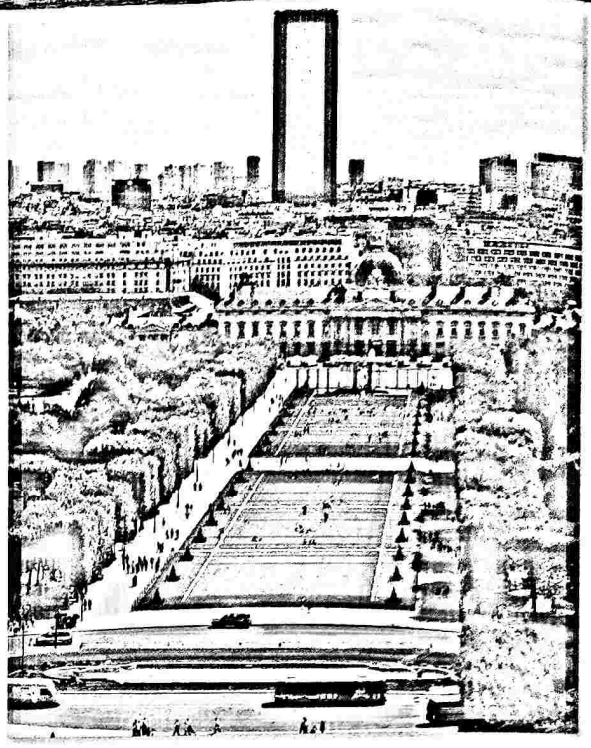
American urban areas differ from those elsewhere in the world. These differences do not invalidate the three models of internal urban structure, but they do point out that social groups in other countries may not have the same reasons for selecting particular neighborhoods within their cities.

CBDs IN EUROPE

Europe's CBDs have a different mix of land uses than those in North America. Differences stem from the medieval origins of many of Europe's CBDs. European cities display a legacy of low-rise structures and narrow streets, built as long ago as medieval times.

- **Residences.** More people live downtown in cities outside North America. The CBD of Paris, which covers around 20 square kilometers (8 square miles), has about 450,000 inhabitants. A comparable area around the CBD of Detroit has around 25,000 inhabitants.
- **Consumer services.** More people live in Europe's CBDs in part because they are attracted to the concentration of consumer services, such as cultural activities and animated nightlife. And with more people living there, Europe's CBDs in turn contain more day-to-day consumer services, such as groceries, bakeries, and butchers (Figure 13-19).
- **Public services.** The most prominent structures in Europe's CBDs are often public and semipublic services, such as churches and former royal palaces, situated on the most important public squares. Parks in Europe's CBDs were often first laid out as private gardens for aristocratic families and later were opened to the public.
- **Business services.** Europe's CBDs contain professional and financial services. However, business services in Europe's CBDs are less likely to be housed in skyscrapers than those in North America. Some European cities try to preserve their historic CBDs by limiting high-rise buildings (Figure 13-20). Although constructing large new buildings is difficult, many shops and offices still wish to be in the center of European cities. The alternative to new construction is renovation of older buildings. However, renovation is more expensive and does not always produce enough space to meet the demand. As a result, rents are much higher in the center of European cities than in U.S. cities of comparable size.

▼ **FIGURE 13-19 CONSUMER SERVICES IN PARIS** Aligre market is one of many street markets in Paris.

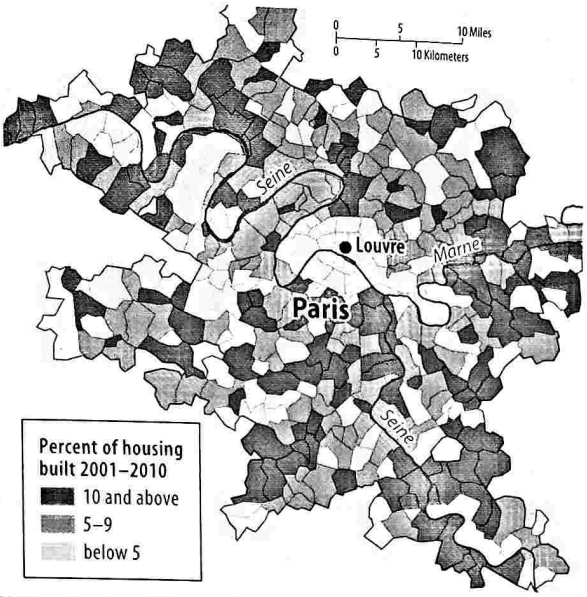


▲ **FIGURE 13-20 PUBLIC SERVICES AND BUSINESS SERVICES IN PARIS** École Militaire (Military Academy) in the foreground and Tour Montparnasse office tower in the background. Public outcry over the tower's disfigurement of the city's historic skyline was so great that officials have since set lower height limits for new buildings.

THE THREE MODELS IN EUROPE

The urban structure in Paris can be used to illustrate similarities and differences in the distribution of people in U.S. and European cities:

- **Concentric zones.** As in U.S. urban areas, the newer housing in the Paris region is in outer rings, and the older housing is closer to the center (Figure 13-21). Unlike in U.S. urban areas, though, much of the newer suburban housing is in high-rise apartments rather than single-family homes.
- **Sectors.** Again, as in U.S. urban areas, higher-income people cluster in a sector in the Paris region (Figure 13-22). The wealthy lived near the royal palace (the Louvre) beginning in the twelfth century and the Palace of Versailles from the sixteenth century until the French Revolution in 1789. The preference of Paris's wealthy to cluster in a southwestern sector was reinforced during the Industrial Revolution in the nineteenth century,



▲ **FIGURE 13-21 CONCENTRIC ZONES IN PARIS** The oldest housing is in the inner ring.

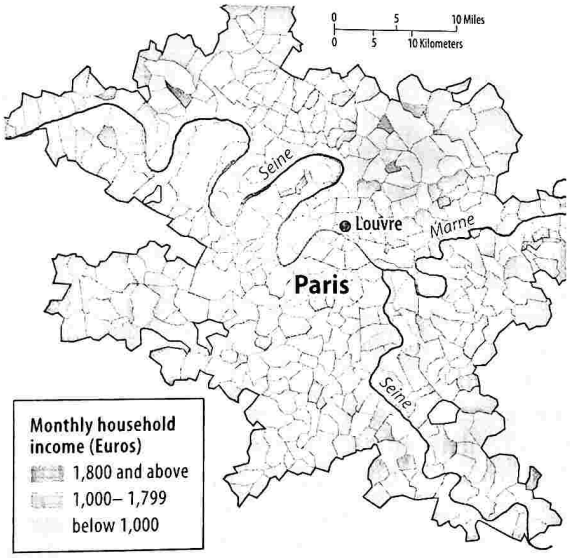
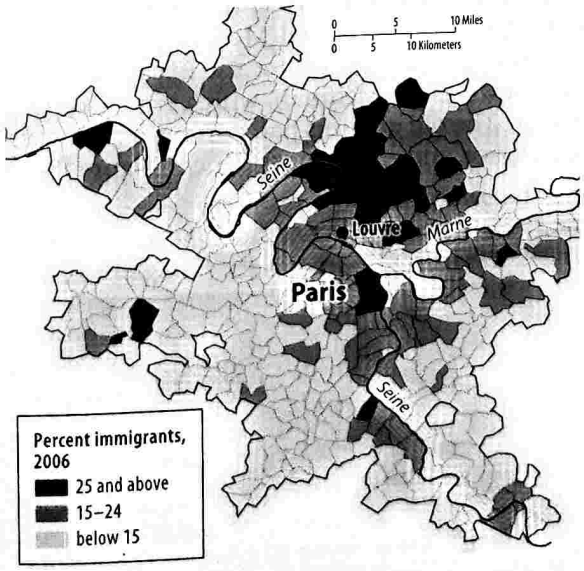


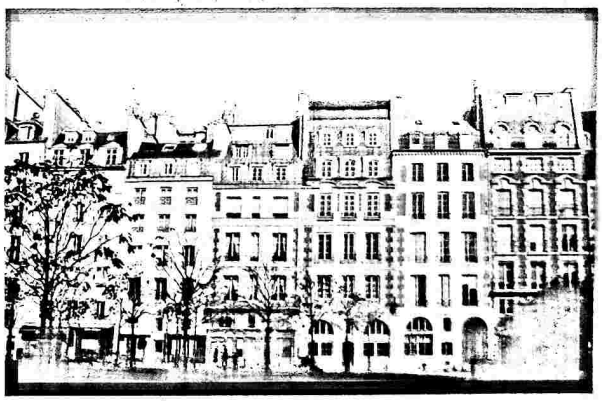
FIGURE 13-22 SECTORS IN PARIS The southwest is the highest-income sector, and the northeast is the lowest-income sector.



◀ **FIGURE 13-24 MULTIPLE NUCLEI IN PARIS** The highest percentage of immigrants is in a node in the northern suburbs.

(a)

(b)



(c)

▲ **FIGURE 13-23 COMPARING RINGS AND SECTORS IN PARIS** **(a)** Housing in an outer ring and a high-income sector. **(b)** Housing in the same ring as (a) but in a different sector. **(c)** Housing in the same sector as (a) but in an inner ring.

when factories were built to the south, east, and north along the Seine and Marne River valleys (Figure 13-23).

- **Multiple nuclei.** European urban areas, including Paris, have experienced a large increase in immigration from other regions of the world (see Chapter 3). In contrast to U.S. urban areas, most ethnic and racial minorities reside in the suburbs of Paris (Figure 13-24).

PAUSE & REFLECT 13.2.3

Are Europe's famous tourist sites located predominantly in inner or outer rings? Why might this be the case?

Pre-modern Cities in Developing Countries

LEARNING OUTCOME 13.2.4

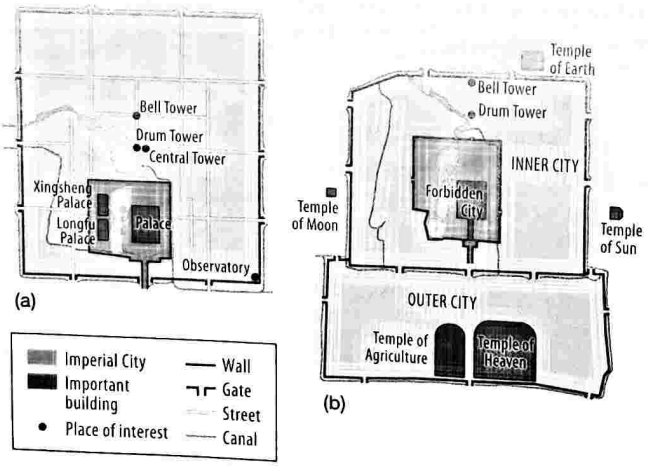
Describe patterns in precolonial and colonial cities in developing countries.

Cities in developing countries may date from ancient times. For most of recorded history, the world's largest cities have been in Asia. However, until modern times, most Asians lived in rural settlements. The ancient and medieval structure of these cities was influenced by the cultural values of the indigenous peoples living there. In most cases, these cities passed through a period of restructuring at the hands of European colonial rulers.

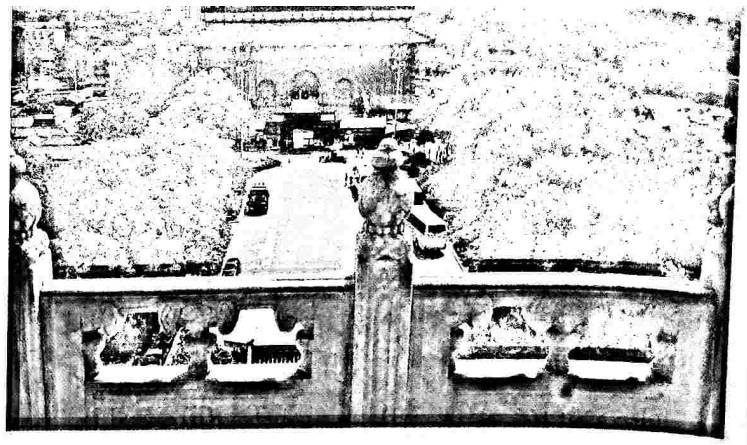
ANCIENT AND MEDIEVAL CITY: BEIJING

Archaeological evidence of Beijing dates from 1045 B.C., although the city may have been founded thousands of years earlier. A succession of invaders and dynasties shaped what is now the central area of Beijing. The Yuan and Ming dynasties had especially strong impacts on the early structure of Beijing.

BEIJING DURING THE YUAN DYNASTY. Kubla Khan, founder of the Yuan dynasty, constructed a new city called Dadu beginning in 1267 (Figure 13-25). The Drum Tower was constructed at the center of the city (Figure 13-26). The heart of Dadu was three palaces built on Qionghua Island in the middle of Taiye Lake. The two palaces to the west of the lake housed the imperial family, and the eastern one contained offices. Residential areas were laid out in a checkerboard pattern divided by wider roads and narrower alleys. Three markets were placed in the residential areas. An outer wall surrounded the residential areas, and an inner wall surrounded the palaces.



▲ **FIGURE 13-25 HISTORIC BEIJING** **(a)** Beijing (Dadu) during the Yuan Dynasty. **(b)** Beijing during the Ming Dynasty.



▲ **FIGURE 13-26 YUAN DYNASTY BEIJING** The Drum Tower was built in the thirteenth century. The image was taken from the Bell Tower, also from the thirteenth century.

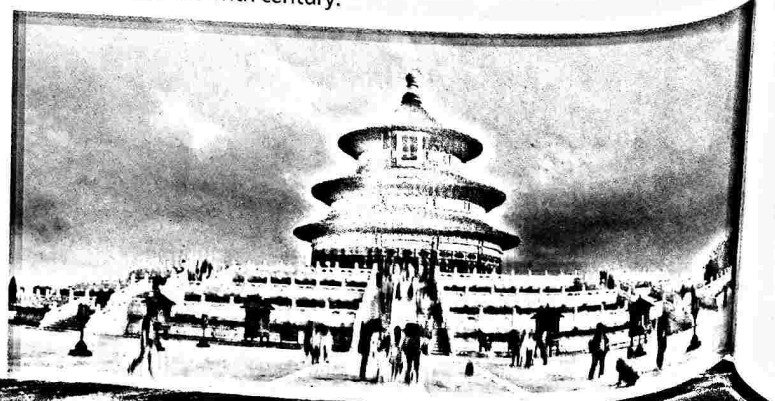
BEIJING DURING THE MING DYNASTY. After capturing Dadu in 1368, the Ming dynasty reconstructed it over the next several decades. The imperial palace was demolished and replaced with new structures, including the Forbidden City and the Temple of Heaven (Figure 13-27). Other temples were added in the sixteenth century. The city took on the current name Beijing ("Northern Capital") in 1403.

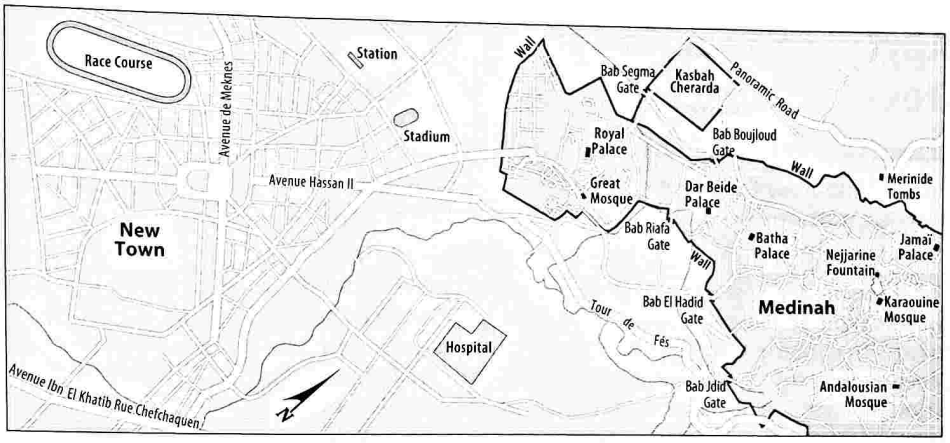
COLONIAL LEGACY

When Europeans gained control of much of Africa, Asia, and Latin America, their colonial policies left a heavy mark on many cities. One feature of European control was the imposition of standardized plans for cities. For example, all Spanish cities in Latin America were built according to the Laws of the Indies, drafted in 1573. The laws explicitly outlined how colonial cities were to be constructed—a gridiron street plan centered on a church and central plaza, walls around individual houses, and neighborhoods built around central, smaller plazas with parish churches or monasteries.

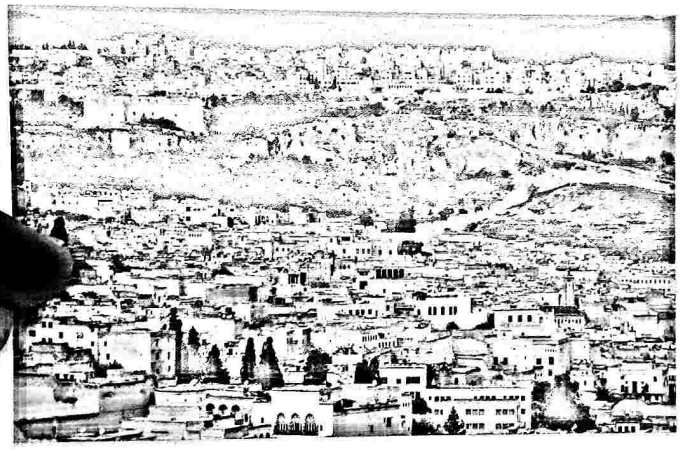
In some places, European colonial powers built a new city next to the existing one. Fès (Fez), Morocco, is an example of a city that consists of two separate and distinct nodes—a precolonial city that existed before the French gained control and one built by the French colonialists (Figure 13-28). The precolonial Muslim city was laid out surrounding a mosque. The center also had a bazaar or marketplace, known as the Medinah, which served as the commercial core. The old quarters had narrow, winding streets, little open space, and cramped residences (Figure 13-29).

▼ **FIGURE 13-27 MING DYNASTY BEIJING** The Temple of Heaven was built in the fifteenth century.

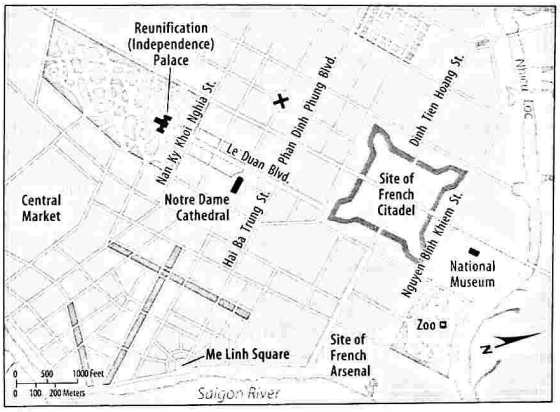




▶ **FIGURE 13-28 FÈS (FEZ) MOROCCO PLAN** The French colonial administration laid out an entirely new district in the west (New Town on the map), with geometrically arranged streets and squares. The precolonial town (Medinah on the map) to the east had narrow, irregularly arranged streets and numerous mosques.



▲ **FIGURE 13-29 FÈS (FEZ) MOROCCO OLD AND NEW TOWNS** The Medinah (Old Town) is in the foreground, and the French-built New Town is in the background. A portion of the wall that encircles the Medinah is visible between the Old Town and New Town.



(a)

(b)

▲ **FIGURE 13-30 HO CHI MINH CITY** **(a)** The French colonial administration demolished the precolonial city and replaced it with one built according to colonial principles, with wide boulevards, public squares, and public and semipublic buildings at key intersections. **(b)** Cathedral of Notre Dame, built by the French in 1863.

The new city was the location for colonial services, such as administration, military command, and international trade, as well as housing for European colonists. Compared to the precolonial node, the European district contained wider streets and public squares, larger houses surrounded by gardens, and much lower density. Similarly, the British built New Delhi near the existing city of Delhi, India. Old Delhi was characterized by narrow winding streets and densely packed buildings, whereas New Delhi had broad boulevards and large government structures.

In other cases, European colonial powers simply demolished the precolonial city. For example, the French colonial city of Saigon, Vietnam (now Ho Chi Minh City), was built by completely demolishing the existing city without leaving a trace (Figure 13-30). Mexico City, described later in this Key Issue, is another example.

PAUSE & REFLECT 13.2.4

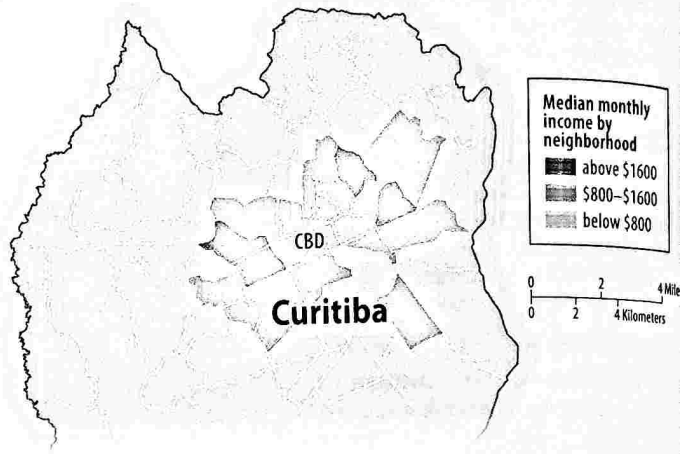
Which node in Fès do you think would be more interesting to visit, the Medinah or the French colonial center? Why?

Applying the Models in Developing Countries

LEARNING OUTCOME 13.2.5

Understand how the three models of urban structure describe patterns in cities in developing countries.

The three models of urban structure described earlier in this chapter (concentric zone, sector, and multiple nuclei) help to explain contemporary patterns within the urban areas in developing countries (Figure 13-31). Rapid growth of population and land area has strengthened the applicability of the models in some cities but reduced their usefulness in other cases.



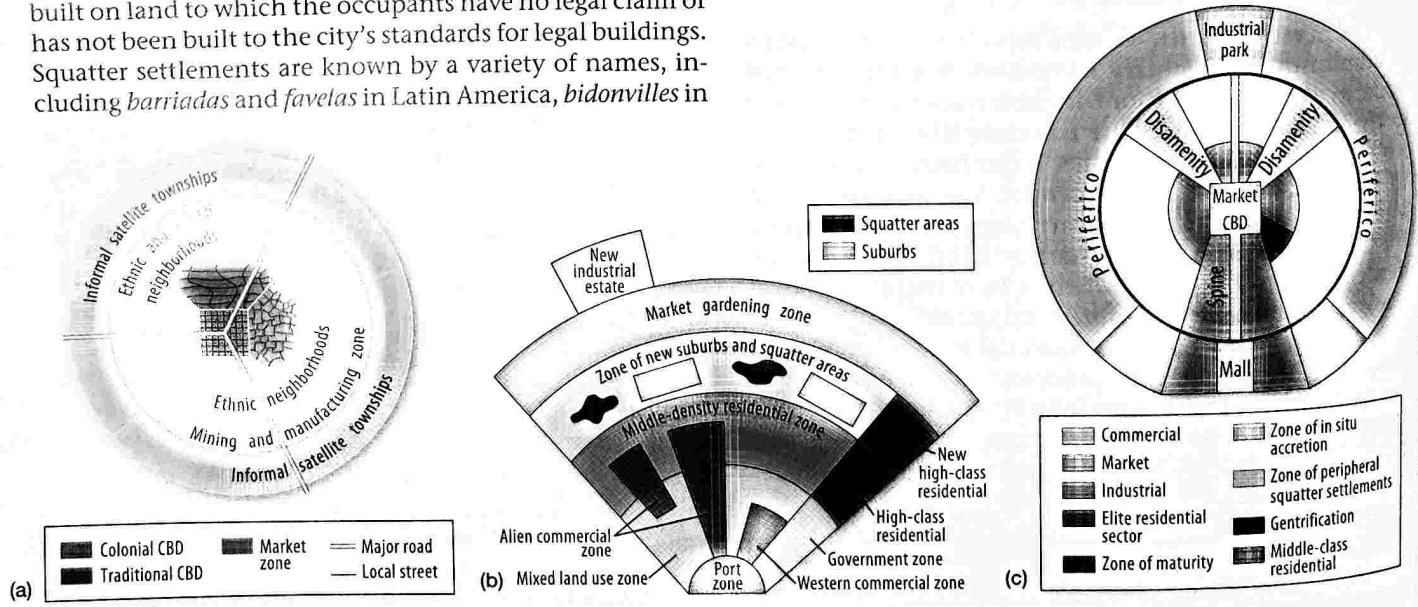
▲ **FIGURE 13-32 CONCENTRIC ZONES IN CURITIBA, BRAZIL** High-income people are more likely to live in an inner ring, whereas low-income people are in outer rings.

CONCENTRIC ZONES IN DEVELOPING COUNTRIES

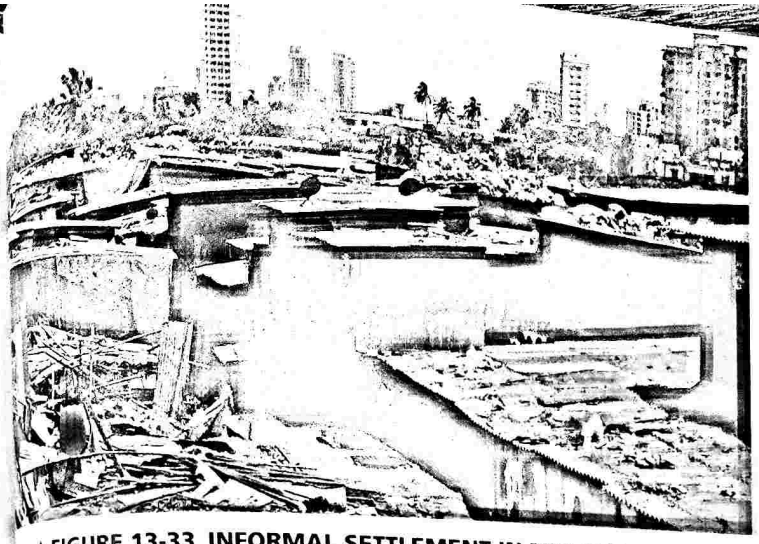
The concentric zone model has been applied most frequently to cities in developing countries. Geographer Harm deBlij's model of sub-Saharan African cities is an example (Figure 13-31a). The inner rings house higher-income people. Inner rings have the most attractive residential areas because they are near business and consumer services, and they offer such vital public services as water, electricity, paved roads, and garbage pickup.

As cities grow rapidly in developing countries, rings are constantly being added on the periphery to accommodate immigrants from rural areas attracted by job opportunities (Figure 13-32). Much of the housing in the outer rings is in informal settlements, also known as squatter settlements (Figure 13-33). The United Nations defines an **informal settlement** as a residential area where housing has been built on land to which the occupants have no legal claim or has not been built to the city's standards for legal buildings. Squatter settlements are known by a variety of names, including *barriadas* and *favelas* in Latin America, *bidonvilles* in North Africa, *bastees* in India, *gecekondu* in Turkey, *kampongs* in Malaysia, and *barong-barong* in the Philippines. Estimates of the number of people living in informal settlements worldwide vary widely, between 175 million and 1 billion.

Informal settlements have few services because neither the city nor the residents can afford them. Homes are in primitive shelters made with scavenged cardboard, wood boxes, sackcloth, and crushed beverage cans. Latrines may be designated by the settlement's leaders, and water is carried from a central well or dispensed from a truck. Electricity service may be stolen by running a wire from the nearest power line. In the absence of bus service or available private cars, a resident may have to walk two hours to reach a place of employment.



▲ **FIGURE 13-31 URBAN STRUCTURE MODELS IN DEVELOPING COUNTRIES** **(a)** DeBlij's concentric zone model of a sub-Saharan African city, **(b)** McGee's multiple nuclei model of a Southeast Asian city, **(c)** Griffin-Ford's sector model of a Latin American city.



▲ **FIGURE 13-33 INFORMAL SETTLEMENT IN MUMBAI, INDIA** The informal settlement of Dharavi is located in an outer ring to the north of the CBD.

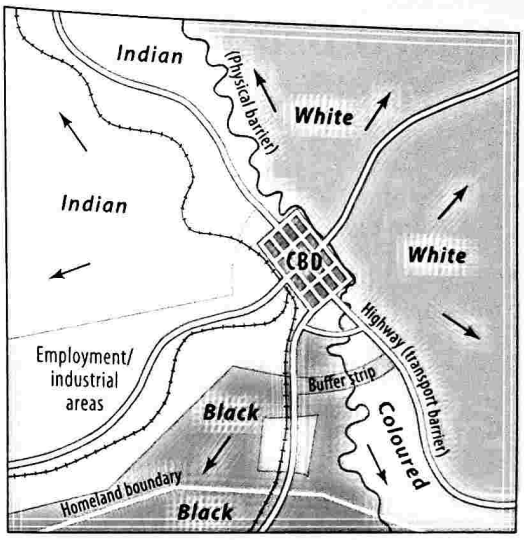
MULTIPLE NUCLEI IN DEVELOPING COUNTRIES

T. G. McGee's model of a Southeast Asian city superimposes on concentric zones several nodes of squatter settlements and what he called "alien" zones, where foreigners, usually Chinese, live and work (Figure 13-31b). McGee found that Southeast Asian cities do not typically have a strong CBD. Instead, the various functions of the CBD are dispersed to several nodes.

Cities in some developing countries show evidence of the multiple nuclei model by containing a complex mix of ethnic groups. During the apartheid era (see Chapter 7), South Africa's cities showed especially clear evidence of the multiple nuclei model because each race was segregated into distinct neighborhoods (Figure 13-34).

SECTORS IN DEVELOPING COUNTRIES

Geographers Ernest Griffin and Larry Ford show that in Latin American cities, wealthy people push out from the center in a well-defined elite residential sector. The elite sector forms on either side of a narrow spine that contains offices, shops, and amenities attractive to wealthy people, such as restaurants, theaters, parks, and zoos (Figure 13-31c). The wealthy are also attracted to the center and spine because services such as water and electricity are more



▲ **FIGURE 13-34 MULTIPLE NUCLEI MODEL IN PIETERMARITZBURG, SOUTH AFRICA, DURING APARTHEID.**

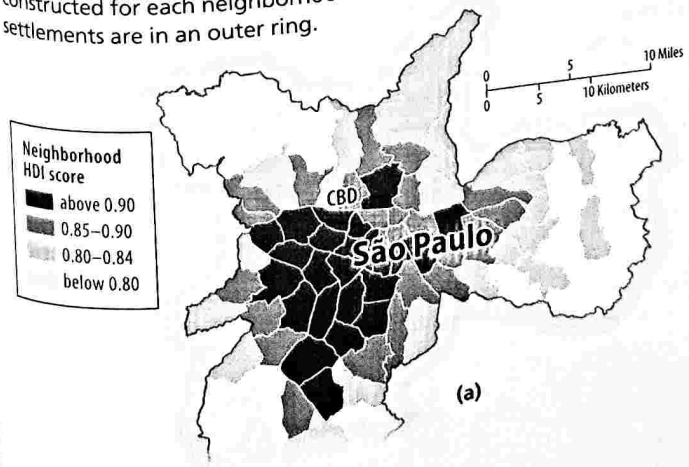
readily available and reliable there than elsewhere. Wealthy and middle-class residents avoid living near sectors of "disamenity," which are land uses that may be noisy or polluting or that cater to low-income residents.

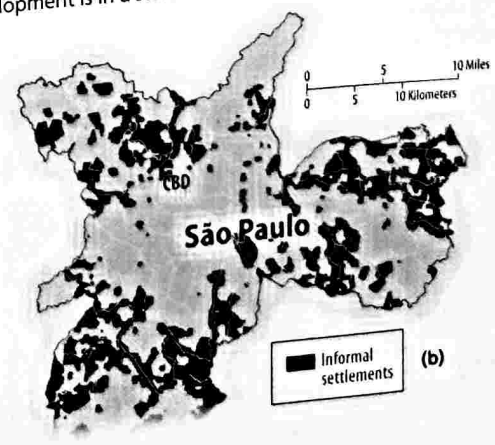
For example, São Paulo, Brazil, has an elite sector extending south from the CBD (Figure 13-35a). The U.N.'s Human Development Index (HDI), discussed in Chapter 10, can be used to display multiple factors characteristic of the elite sector, including relatively high incomes, education levels, and life expectancies. At the same time, São Paulo demonstrates elements of the concentric zone model, with most of the informal settlements located in an outer ring (Figure 13-35b). Informal settlements occupy 23 percent of São Paulo's land area and are home to around 1.8 million people, or 17 percent of the city's population.

PAUSE & REFLECT 13.2.5

Would you expect the distribution of families with children in developing countries to follow most closely the concentric zone, sector, or multiple nuclei model? Why?

▼ **FIGURE 13-35 SECTORS AND CONCENTRIC ZONES IN SÃO PAULO, BRAZIL** **(a)** An HDI score has been constructed for each neighborhood in São Paulo. The highest level of development is in a southern sector. **(b)** Informal settlements are in an outer ring.





KEY ISSUE 3

Why Do Urban Areas Expand?

- **Origin and Growth of Suburbs**
- **Suburban Sprawl**
- **Suburban Segregation**
- **Legacy of Public Transport**
- **Reliance on Motor Vehicles**

LEARNING OUTCOME 13.3.1

Understand the impact of suburban growth on local government.

A **suburb** is a residential or commercial area situated within an urban area but outside the central city. Suburbs have existed on a small scale since ancient times; residential areas were often located outside the walls surrounding a city. As cities grew rapidly during the nineteenth century, as part of the Industrial Revolution, more extensive suburbs appeared.

Origin and Growth of Suburbs

In 1950, only 20 percent of Americans lived in suburbs compared to 40 percent in cities and 40 percent in small towns and rural areas. The percentage living in suburbs climbed rapidly thereafter. Ten years later, one-third of Americans lived in cities, one-third in suburbs, and one-third in small towns and rural areas. In 2000, 50 percent of Americans lived in suburbs compared to only 30 percent in cities and 20 percent in small towns and rural areas.

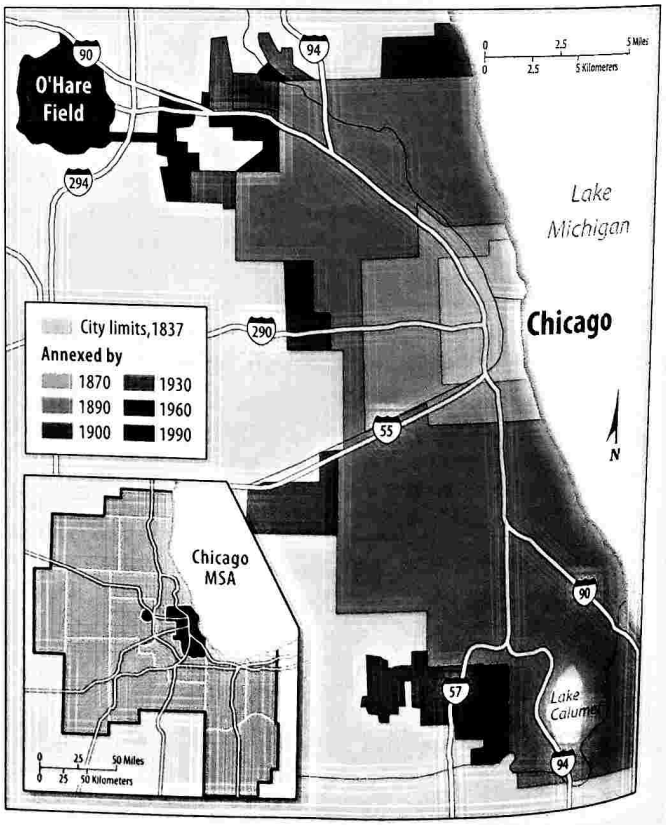
Suburbs offer varied attractions—a detached single-family dwelling rather than a row house or an apartment, private land surrounding the house, space to park cars, and a greater opportunity for home ownership. A suburban house provides space and privacy, a daily retreat from the stress of urban living. Families with children are especially attracted to suburbs, which offer more space for play and protection from the high crime rates and heavy traffic that characterize inner-city life. As incomes rose in the twentieth century, first in the United States and more recently in other developed countries, more families were able to afford to buy suburban homes.

ANNEXATION

Until recently in the United States, as cities grew, they expanded by adding peripheral land. Now cities are surrounded by a collection of suburban jurisdictions whose residents prefer to remain legally independent of the large city. The process of legally adding land area to a city is **annexation.**

Rules concerning annexation vary among states. Normally, land can be annexed to a city only if a majority of residents in the affected area vote in favor of the annexation. Peripheral residents generally desired annexation in the nineteenth century because the city offered better services, such as water supply, sewage disposal, trash pickup, paved streets, public transportation, and police and fire protection. Thus, as U.S. cities grew rapidly in the nineteenth century, the legal boundaries frequently changed to accommodate newly developed areas. For example, the city of Chicago expanded from 26 square kilometers (10 square miles) in 1837 to 492 square kilometers (190 square miles) in 1900 (Figure 13-42).

In contrast, in recent decades cities have been less likely to annex peripheral land because the residents have preferred to organize their own services rather than pay city taxes for them. Originally, some of these peripheral jurisdictions were small, isolated towns that had a tradition of independent local government before being swallowed up by urban growth. Others are newly created communities whose residents wish to live close to the large city but not be legally part of it.



▲ **FIGURE 13-42 ANNEXATION IN CHICAGO**

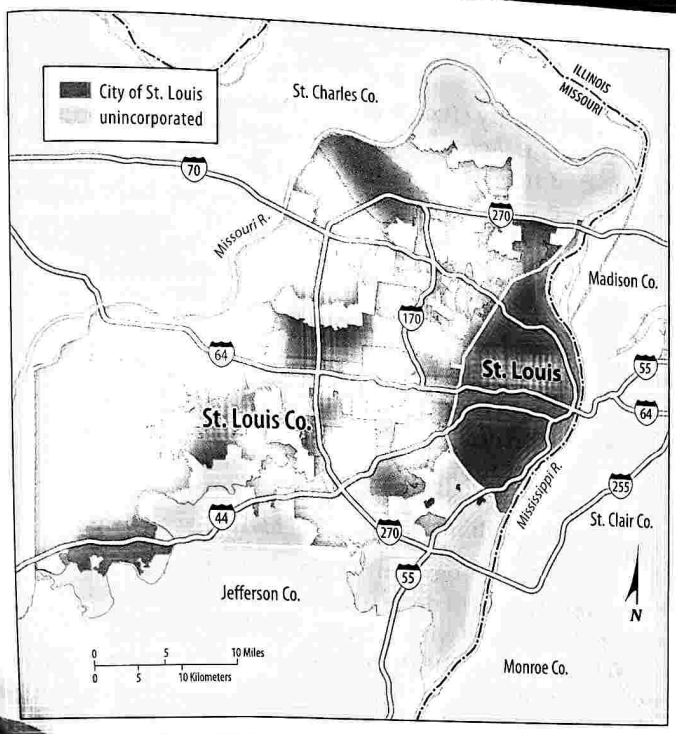


FIGURE 13-43 MUNICIPALITIES IN ST. LOUIS COUNTY

LOCAL GOVERNMENT FRAGMENTATION

Given the difficulty in annexing suburban jurisdictions, local government in the United States is extremely fragmented. According to the 2012 Census of Governments, the United States had 89,004 local governments, including 3,031 counties, 19,522 municipalities, 16,364 townships, 12,884 school districts, and 37,203 special districts. Special districts are organized to provide such services as fire protection, water supply, libraries, and public transportation. Illinois has by far the largest number of local governments (6,968), and Hawaii has the fewest (21).

The larger metropolitan areas have thousands of local governments, with widely varying levels of resources (Figure 13-43). The large number of local government units has led to calls for a metropolitan government that could coordinate—if not replace—the numerous local governments in an urban area. The fragmentation of local government in the United States makes it difficult to solve regional problems of traffic management, solid-waste disposal, and the building of affordable housing.

Most U.S. metropolitan areas have a council of government, which is a cooperative agency consisting of representatives of the various local governments in the region. The council of government may be empowered to do some overall planning for the area that local governments cannot logically do. Strong metropolitan-wide governments have been established in a few places in North America. Two kinds exist:

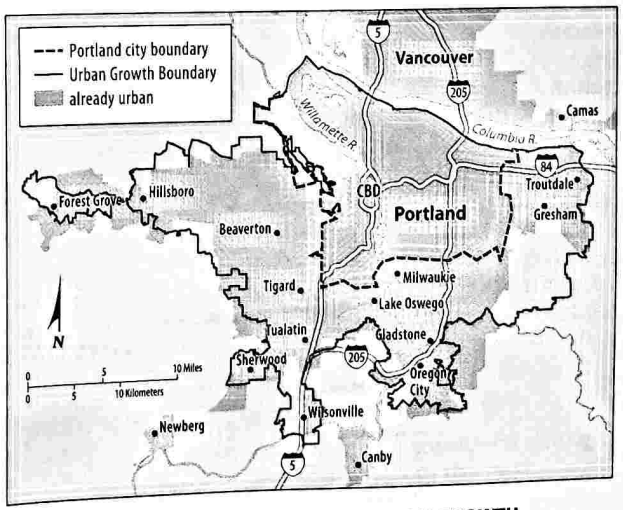
- **Consolidations of city and county governments.** Examples of consolidations of city and county governments include Indianapolis and Miami. The boundaries of Indianapolis were changed to match those of Marion County, Indiana. Government functions that were handled separately by the city and the county now are combined into a joint operation in the same office building. In Florida, the city of Miami and surrounding Dade County have combined some services, but the city boundaries have not been changed to match those of the county.
- **Federations.** Examples of federations include Toronto and other large Canadian cities. Toronto's metropolitan government was created in 1954, through a federation of 13 municipalities. A two-tier system of government existed until 1998, when the municipalities were amalgamated into a single municipality.

SMART GROWTH

Several U.S. states have taken steps to curb suburban growth. The goal is to produce a pattern of compact and contiguous development and protect rural land for agriculture, recreation, and wildlife. Legislation and regulations to limit suburban growth and preserve farmland has been called **smart growth**. Oregon and Tennessee have defined growth boundaries within which new development must occur (Figure 13-44). Cities can annex only lands that have been included in the urban growth areas. New Jersey, Rhode Island, and Washington were also early leaders in enacting strong state-level smart-growth initiatives. Maryland's smart-growth law discourages the state from funding new highways and other projects that would extend suburban sprawl and destroy farmland. State development money must be allocated to "fill in" already urbanized areas.

PAUSE & REFLECT 13.3.1

How might urban growth boundaries help to slow suburban growth?



▲ FIGURE 13-44 PORTLAND, OREGON, URBAN GROWTH BOUNDARY New developments must take place inside the boundary.

Suburban Sprawl

LEARNING OUTCOME 13.3.2

Describe suburban sprawl.

Sprawl is the development of suburbs at relatively low density and at locations that are not contiguous to the existing built-up area. When private developers select new housing sites, they seek cheap land that can easily be prepared for construction --land often not contiguous to the existing built-up area. Sprawl is also fostered by the desire of many families to own large tracts of land.

PERIPHERAL MODEL

Chauncey Harris created the peripheral model as a modification of the multiple nuclei model (which he co-authored). According to the **peripheral model**, an urban area consists of an inner city surrounded by large suburban residential and service nodes or nuclei tied together by a beltway or ring road (Figure 13-45).

DENSITY GRADIENT

As you travel outward from the center of a city, you can watch the decline in the density at which people live (Figure 13-46). Inner-city apartments or row houses may pack as many as 250 dwellings on a hectare of land (100 dwellings per acre). Older suburbs have larger row houses, semidetached houses, and individual houses on small lots, at a density of about 10 houses per hectare (4 houses per acre). A detached house typically sits on a lot of 0.25 to 0.5 hectares (0.6 to 1.2 acres) in new suburbs and a lot of 1 hectare or greater (2.5 acres) on the fringe of the built-up area.

This density change in an urban area is called the density gradient. According to the **density gradient**, the number of houses per unit of land diminishes as distance from the center city increases. Two changes have affected the density gradient in recent years:

- **Fewer people living in the center.** The density gradient thus has a gap in the center, where few live.
- **Fewer differences in density within urban areas.** The number of people living on a hectare of land has decreased in the central residential areas through population decline and abandonment of old housing. At the same time, density has increased on the periphery through construction of apartment and town-house projects and diffusion of suburbs across a larger area.

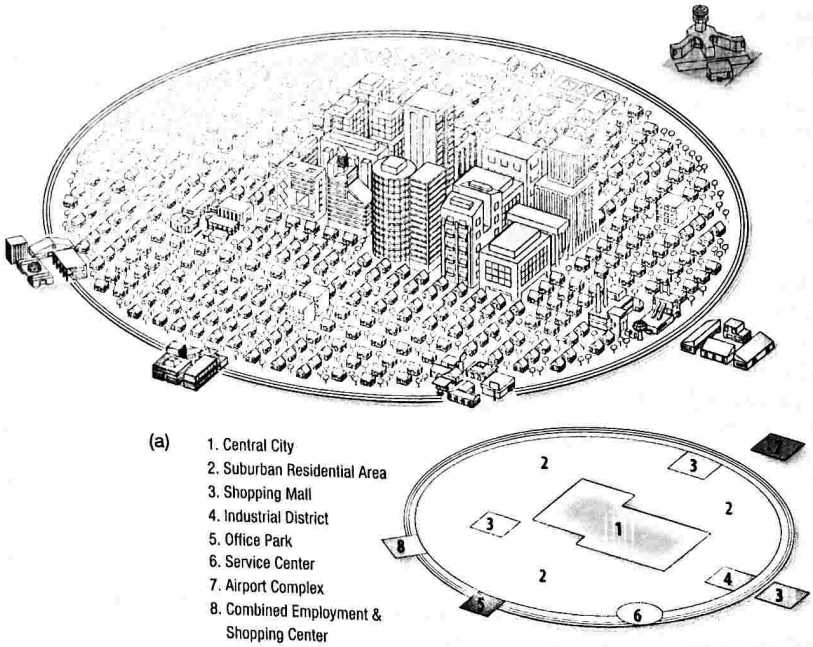
These two changes flatten the density gradient and reduce the extremes of density between inner and outer areas traditionally found within cities.

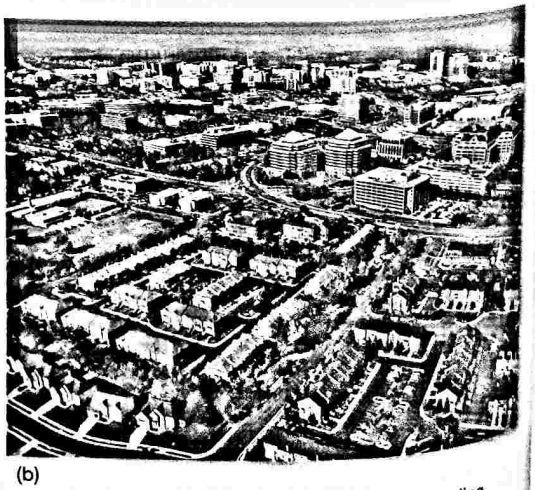
A flattening of the density gradient for a metropolitan area means that its people and services are spread out over a larger area. U.S. suburbs are characterized by sprawl and segregation.

As long as demand for single-family detached houses remains high, land on the fringe of urban areas will be converted from open space to residential land use. Land is not transformed immediately from farms to housing developments. Instead, developers buy farms for future construction of houses by individual builders. The peripheries of U.S. cities look like Swiss cheese, with pockets of development and gaps of open space.

Sprawl incurs costs:

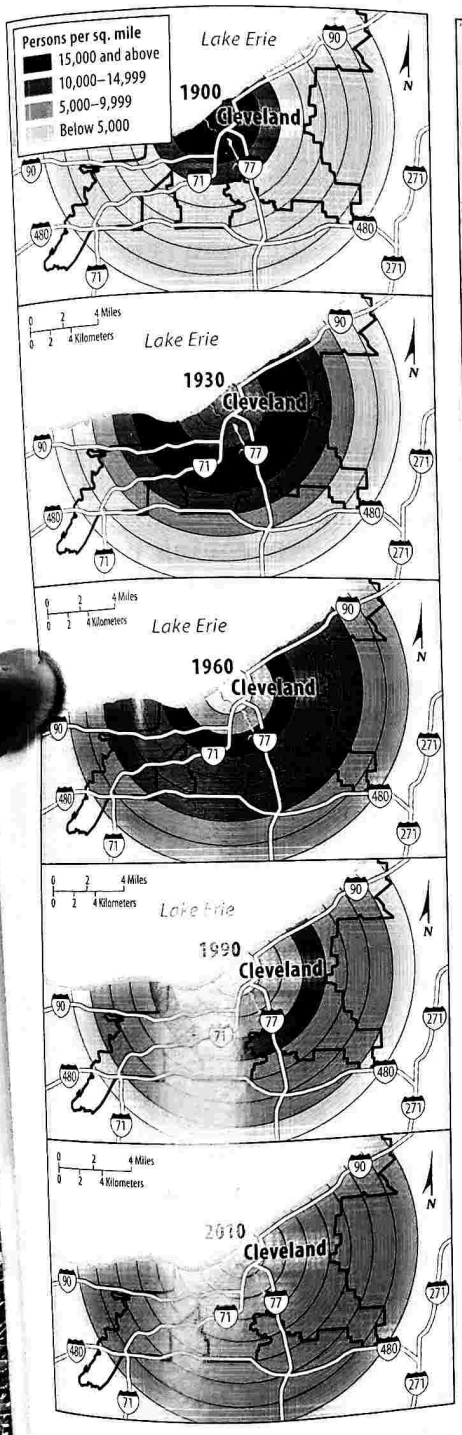
- Local authorities must spend more money extending roads and utilities to connect developments not contiguous to existing built-up areas.



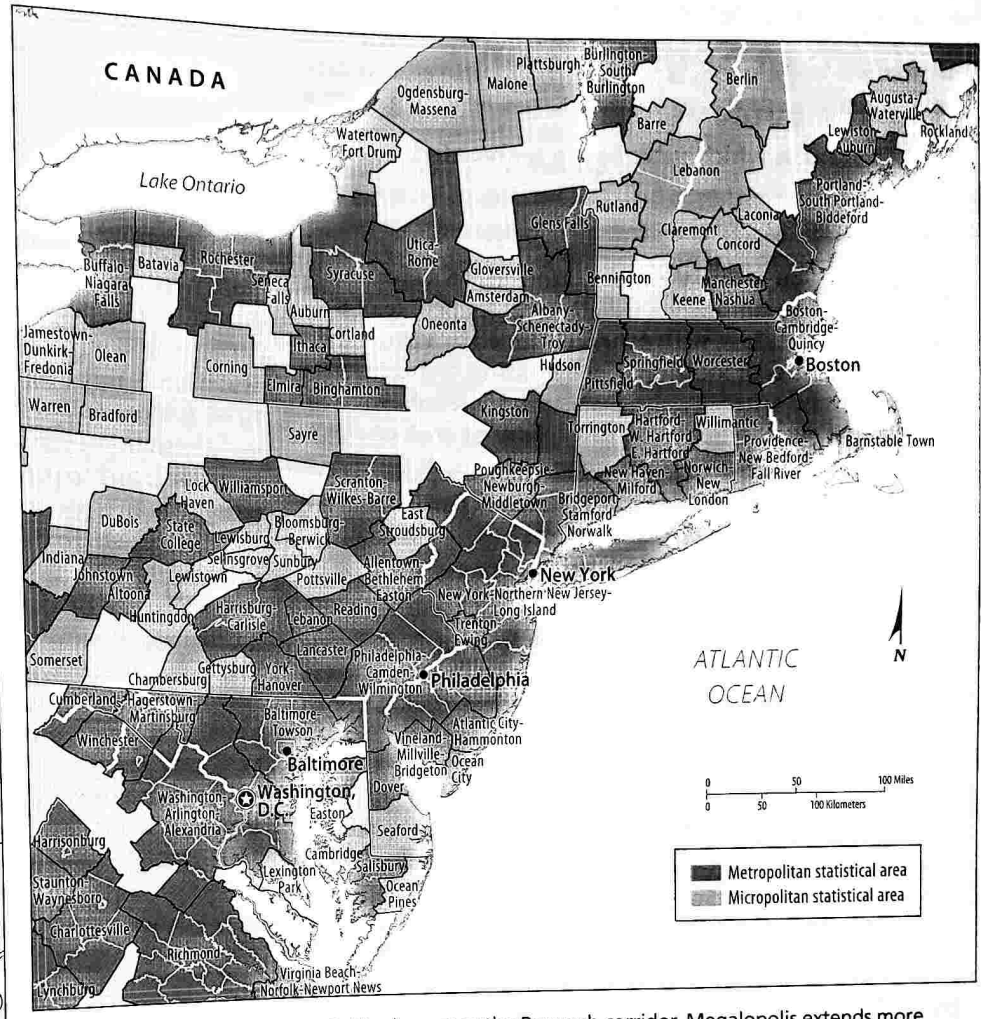


(b)

▲ **FIGURE 13-45 PERIPHERAL MODEL** **(a)** According to this model, the central city is surrounded by a beltway or ring road. Around the beltway are suburban residential areas and nodes, or edge cities, where consumer and business services cluster. **(b)** Tysons Corner, Virginia, is an edge city outside Washington, D.C.



◀ **FIGURE 13-46 DENSITY GRADIENT IN CLEVELAND**, 1900-2010.



▲ **FIGURE 13-47 MEGALOPOLIS** Also known as the Boswash corridor, Megalopolis extends more than 700 kilometers (440 miles) between north of Boston to south of Washington. Megalopolis contains one-fourth of the U.S. population on only 2 percent of the country's total land area.

- More agricultural land is lost through construction of isolated housing developments.
- More energy is expended because trips to work and services must cover longer distances.

MEGALOPOLIS

MSAs in the northeastern United States form one continuous urban complex, extending from north of Boston to south of Washington, D.C. Geographer Jean Gottmann named this region **Megalopolis**, a Greek word meaning "great city" (Figure 13-47). Other U.S. urban complexes include the southern Great Lakes between Milwaukee and Pittsburgh and southern California between Los Angeles and Tijuana. Among examples in other developed regions are the German Ruhr (including the cities of Dortmund, Düsseldorf, and Essen), Randstad in the Netherlands (including the cities of Amsterdam, The Hague, and Rotterdam), and Japan's Tokaido (including the cities of Tokyo and Yokohama).

Within Megalopolis, central cities such as Baltimore, New York, and Philadelphia retain distinctive identities, and the urban areas are visibly separated from each other by parks, military bases, and farms. But at the periphery of the urban areas, the boundaries overlap.

PAUSE & REFLECT 13.3.2

Name a city in Megalopolis that you consider a strong candidate to become part of an MSA in the near future? Why that city?

Suburban Segregation

LEARNING OUTCOME 13.3.3

Explain ways in which suburbs are segregated.

Many suburbs display two forms of segregation:

- **Segregation of social classes.** Housing in a given suburban community is usually built for people of a single social class, with others excluded by virtue of the cost, size, or location of the housing. Segregation by race and ethnicity also persists in some suburbs (see Chapter 7).
- **Segregation of land uses.** Residents are separated from commercial and manufacturing activities that are confined to compact, distinct areas.

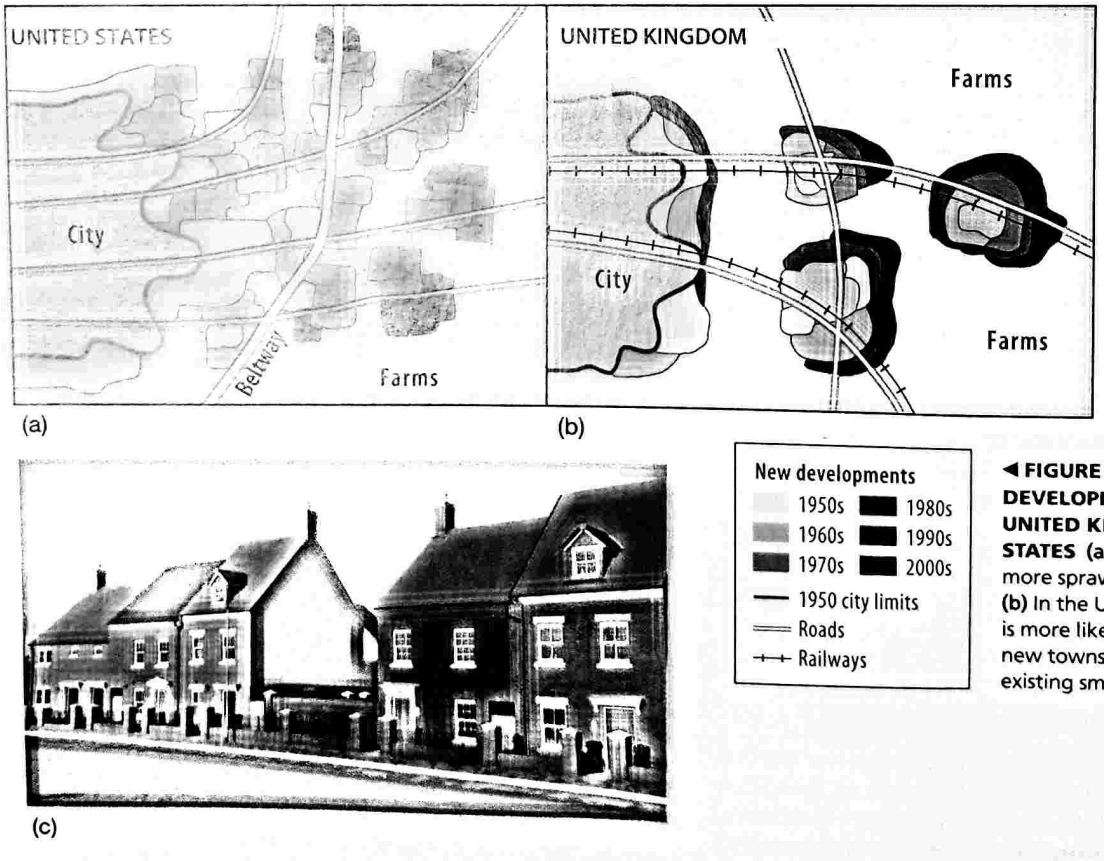
U.S. AND U.K. SUBURBS

The supply of land for the construction of new housing is more severely restricted in European urban areas than in the United States (Figure 13-48). Officials try to limit sprawl by designating areas of mandatory open space. Several British cities are surrounded by greenbelts, or rings of open space. New housing is built either in older suburbs inside the greenbelts or in planned extensions to small towns and new towns beyond the greenbelts. On the other hand, restriction of the supply of land on the urban periphery has driven up house prices in Europe.

RESIDENTIAL SEGREGATION

Low-income people and minorities are unable to live in many U.S. suburbs because of the high cost of the housing and unwelcoming attitudes of established residents. Suburban communities discourage the entry of those with lower incomes and minorities because of fear that property values will decline if the high-status composition of the neighborhood is altered. Extensive areas of suburbs have been developed with houses of similar interior dimension, lot size, and cost, appealing to people with similar incomes and lifestyles.

The homogeneity in suburban communities is legally protected through zoning ordinances. A **zoning ordinance** is a law that limits the permitted uses of land and maximum density of development in a community. Zoning ordinances typically identify districts designed only for single-family houses, apartments, industry, or commerce. Low-income families may have difficulty finding affordable housing through provisions such as requiring each house to sit on a large lot and prohibiting apartments. Fences are built around some suburban housing districts, and visitors must check in at a gate house to enter (Figure 13-49).



◀ FIGURE 13-48 SUBURBAN DEVELOPMENT PATTERNS IN THE UNITED KINGDOM AND THE UNITED STATES **(a)** The United States has much more sprawl than the United Kingdom. **(b)** In the United Kingdom, new housing is more likely to be concentrated in new towns or **(c)** planned extensions of existing small towns.

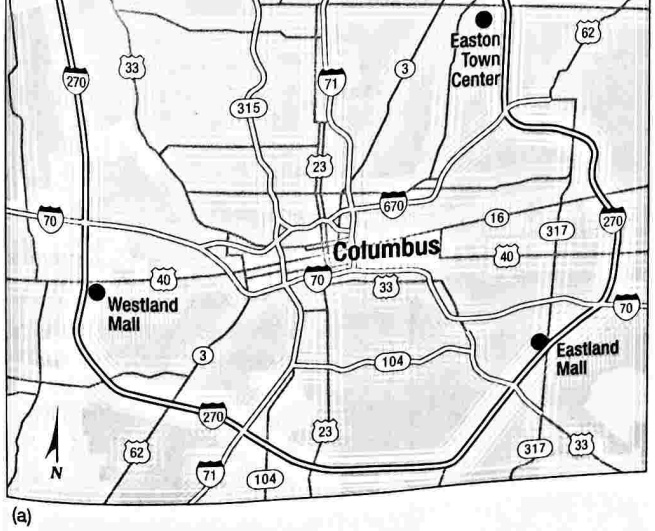
▲ **FIGURE 13-49 GATED COMMUNITY** Orlando, Florida.

SUBURBAN SERVICES

Consumer and business services are also expanding in suburbs. A number of factors account for this trend.

SUBURBANIZATION OF CONSUMER SERVICES. Consumer services have expanded in the suburbs because most of their customers live there (Figure 13-50). Historically, urban residents bought food and other daily necessities at small neighborhood shops in the midst of housing areas and shopped in the CBD for other products. But since the end of World War II, downtown sales have stagnated, whereas suburban sales have risen at an annual rate of 5 percent.

Suburban retailing is concentrated in shopping malls of varying sizes. Larger malls contain department stores and



(a)

specialty shops once located only in the CBD. Gener parking lots surround the stores. A shopping mall is built a developer, who buys the land, builds the structures, a leases space to individual merchants.

Suburban residents no longer wish to make the lo journey to shop in the CBD, and corner shops have been placed by supermarkets in shopping malls. The low dens of residential construction discourages people from wa ing to stores, and restrictive zoning practices often exclu shops from residential areas.

PAUSE & REFLECT 13.3.3

Are you able to walk from your home to consumer services? Would you want to live near shops? Why or why not?

SUBURBANIZATION OF BUSINESS SERVICES. Offic that do not require face-to-face contact are increasing moving to suburbs, where rents are lower than in the CB Executives can drive more easily to their offices and pa their cars without charge. Factories and warehouses also i creasingly locate in suburbs for more space, cheaper lan and better truck access.

Suburban locations have posed hardships for some em ployees, especially lower-status workers, such as secretari and custodians. These employees may live in neighbo hoods that are not convenient to where they work. The may not own reliable cars, but public transportation ma not serve their place of employment. Some workers miss th stimulation and animation of a central location, particu larly at lunchtime.

◀ **FIGURE 13-50 SUBURBAN SHOPPING MALLS, COLUMBUS, OHIO** **(a)** The malls surround the city near the beltway. **(b)** Easton Town Center is a suburban shopping mall designed to look like a CBD.

(b)

Legacy of Public Transport

LEARNING OUTCOME 13.3.4

Describe the benefits and drawbacks of public transport.

Because few people live within walking distance of their place of employment, urban areas are characterized by extensive commuting. The heaviest flow of commuters is into the CBD in the morning and out of it in the evening. **Rush hour,** or peak hour, is the four consecutive 15-minute periods that have the heaviest traffic.

The intense concentration of people in the CBD during working hours strains transportation systems because a large number of people must reach a small area of land at the same time in the morning and disperse at the same time in the afternoon. As much as 40 percent of all trips made into or out of a CBD occur during four hours of the day—two in the morning and two in the afternoon.

PUBLIC TRANSPORT IN THE UNITED STATES

Public transport in the United States is used primarily for commuting by workers into and out of the CBD. Despite its advantages in getting in and out of the CBD, public transport is used for only 5 percent of commuting trips in the United States. One-half of trips to work are by public transport in New York; one-third in Boston, San Francisco, and Washington; and one-fourth in Chicago and Philadelphia (Figure 13-51). But in most other cities, public transport service is minimal or nonexistent. Motorists driving alone account for 76 percent of commuters and carpooling for another 10 percent.

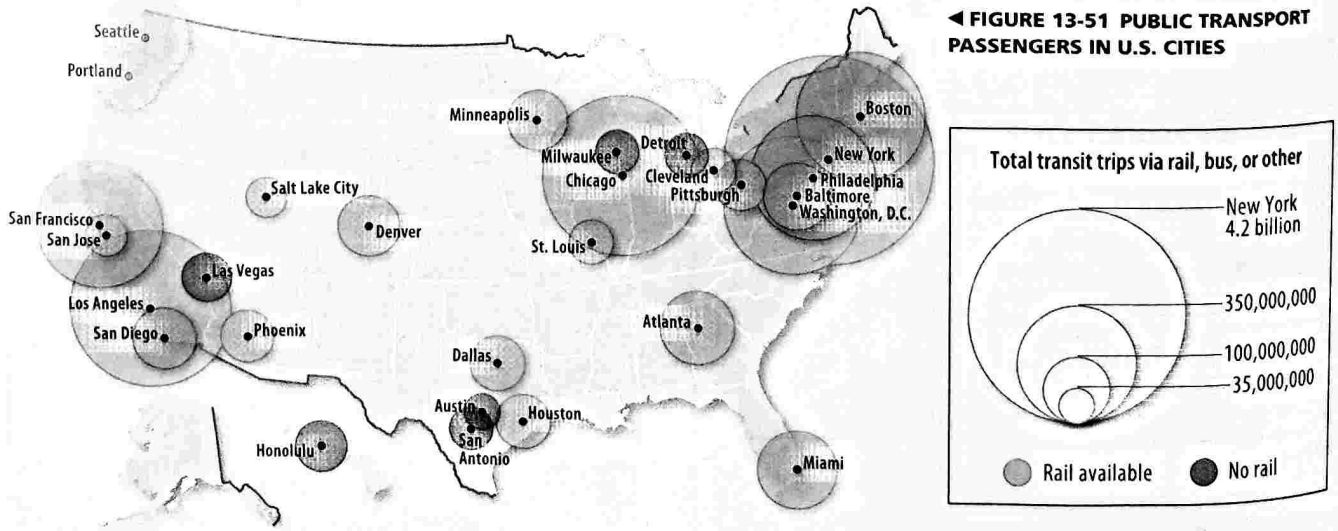
Historically, the growth of suburbs was constrained by poor transportation. People lived in crowded cities because they had to be within walking distance of shops and places of employment. The invention of the railroad in the nineteenth century enabled people to live in suburbs and work in the central city. Many so-called streetcar suburbs built in the nineteenth century still exist and retain unique visual identities. They consist of houses and shops clustered near a station or former streetcar stop at a much higher density than is found in newer suburbs. To accommodate commuters, cities built railroads at street level (called trolleys, streetcars, or trams), above ground (Els), and underground (subways).

The suburban explosion in the twentieth century relied on motor vehicles rather than railroads, especially in the United States. Rail lines restricted nineteenth-century suburban development to narrow ribbons within walking distance of the stations. Cars and trucks permitted large-scale development of suburbs at greater distances from the center, in the gaps between the rail lines. Motor vehicle drivers have much greater flexibility in their choice of residence than was ever before possible.

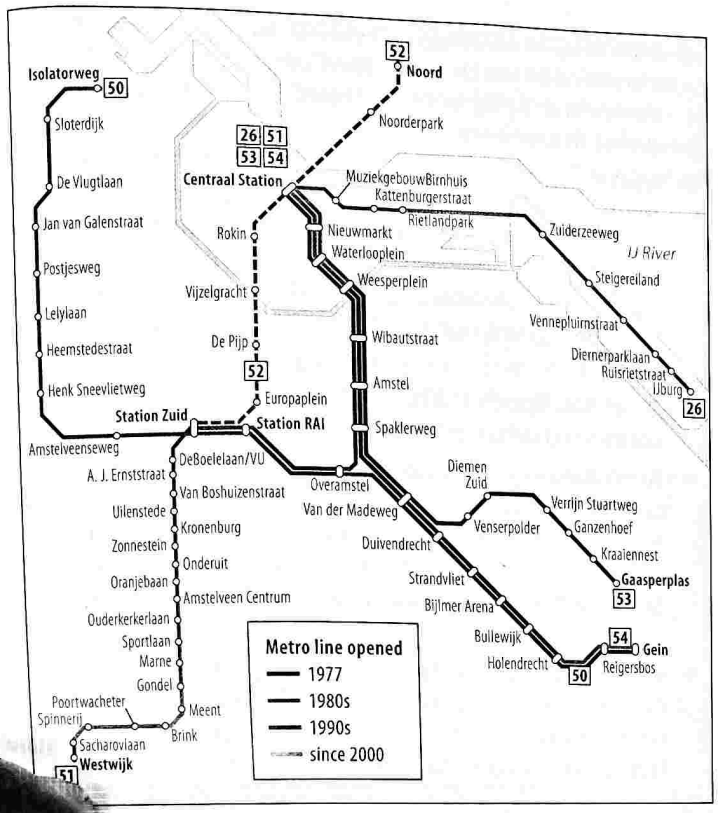
Public transport reached its peak in the United States in the 1940s, when it carried 23 billion passengers per year. Ridership in the United States declined to a low of around 6 billion in 1970. However, public transport ridership increased from less than 8 billion in 1994 to nearly 11 billion in 2014.

The trolley—now known by the more elegant term fixed light-rail transit—was once relegated almost exclusively to tourist attractions in New Orleans and San Francisco but is making a comeback in North America. Since 1975, 21 new light-rail systems have been opened in the United States. Dallas and Los Angeles—long dependent entirely on motor vehicles—opened light-rail lines during the 1990s and now have the two largest U.S. systems, more than 100 kilometers (60 miles) each. Ten other U.S. cities and two Canadian cities have new systems between 50 and 100 kilometers (30 and 60 miles).

Entirely new subway systems were opened between 1972 and 1993 in six U.S. cities: Atlanta, Baltimore, Los Angeles, Miami, San Francisco, and Washington. Cities with century-old systems such as Boston and Chicago have attracted new passengers through construction of new lines and modernization of existing ones. Chicago has pioneered construction of heavy-rail rapid transit lines in the median strips of expressways. The federal government has permitted Boston, New York, and other cities to use funds



◀ FIGURE 13-51 PUBLIC TRANSPORT PASSENGERS IN U.S. CITIES



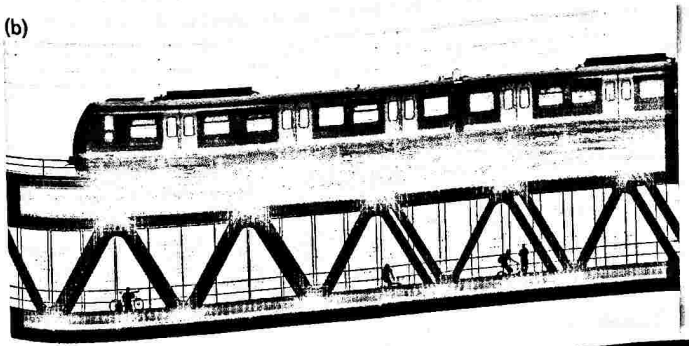
URE 13-52 AMSTERDAM METRO

originally allocated for interstate highways to modernize rapid transit service instead. New York's subway cars, once covered with graffiti spray-painted by gang members, have been cleaned so that passengers can ride in a more hospitable environment.

▼ FIGURE 13-53 PUBLIC TRANSPORT IN MUNICH, GERMANY
(a) U-Bahn (underground heavy rail), **(b)** S-Bahn (elevated heavy rail), **(c)** tram.

(a)

(b)



(c)

Despite modest recent successes, public transit in the United States is caught in a vicious circle because fares do not cover operating costs. As patronage declines and expenses rise, the fares are increased, which drives away passengers and leads to service reduction and still higher fares. Public expenditures to subsidize construction and operating costs have increased, but the United States does not fully recognize that public transportation is a vital utility deserving of subsidy to the degree long assumed by governments in other developed countries, as well as developing countries.

The minimal level of public transit service in most U.S. cities means that low-income people may not be able to reach places of employment. Low-income people tend to live in inner-city neighborhoods, but the job opportunities, especially those requiring minimal training and skill in personal services, are in suburban areas not well served by public transportation. Inner-city neighborhoods have high unemployment rates at the same time that suburban firms have difficulty attracting workers. In some cities, governments and employers subsidize vans to carry low-income inner-city residents to suburban jobs.

PUBLIC TRANSIT IN OTHER COUNTRIES

In hundreds of cities around the world, extensive networks of bus, tram, and subway lines have been maintained, and funds for new construction have been provided in recent years. Wikipedia lists 148 cities with underground heavy-rail systems and 371 cities with light-rail systems in operation as of 2014. Another 36 heavy-rail systems were scheduled to open between 2015 and 2020, including 16 in China. And cities with existing service have been expanding them (Figure 13-52).

The greater importance placed on public transport outside the United States can be seen by comparing Indianapolis, Indiana, with Munich, Germany. Both urban areas have around 1.4 million inhabitants, and both have around 500 kilometers of bus lines. But Indianapolis has no rail service, whereas Munich has 95 kilometers of U-Bahn (underground heavy rail), 442 kilometers of S-Bahn (elevated heavy rail), and 71 kilometers of trams (Figure 13-53).

PAUSE & REFLECT 13.3.4

Do you regularly utilize public transport? Why or why not?

Reliance on Motor Vehicles

LEARNING OUTCOME 13.3.5

Describe the strategies to reduce the impact of motor vehicles in urban areas.

The average American travels 58 kilometers (36 miles) per day. People do not travel aimlessly; their trips have a precise point of origin, destination, and purpose. In the United States, 19 percent of trips are for work, 10 percent for school or church, 28 percent for social and recreational activities, and 43 percent for other personal activities (such as shopping and medical care).

In urban areas, public transport is better suited than motor vehicles to moving large numbers of people because each transit traveler takes up far less space. Public transport is cheaper, less polluting, and more energy efficient than privately operated motor vehicles. It also is particularly suited to rapidly bringing a large number of people into a small area. A bus can accommodate 30 people in the amount of space occupied by one car, whereas a double-track rapid transit line can transport the same number of people as 16 lanes of urban freeway.

Nonetheless, 83 percent of trips in the United States are by car or truck, 12 percent are by walking or biking, 2 percent each are by public transport or school bus, and 1 percent are by other means. Despite the small number of trips by public transport, the mode of travel is an important component of transportation systems in large cities.

TRANSPORTATION EPOCHS

Transportation improvements have played a key role in the changing structure of urban areas. Geographer John Borchert identified five eras of U.S. urban areas resulting from changing transportation systems:

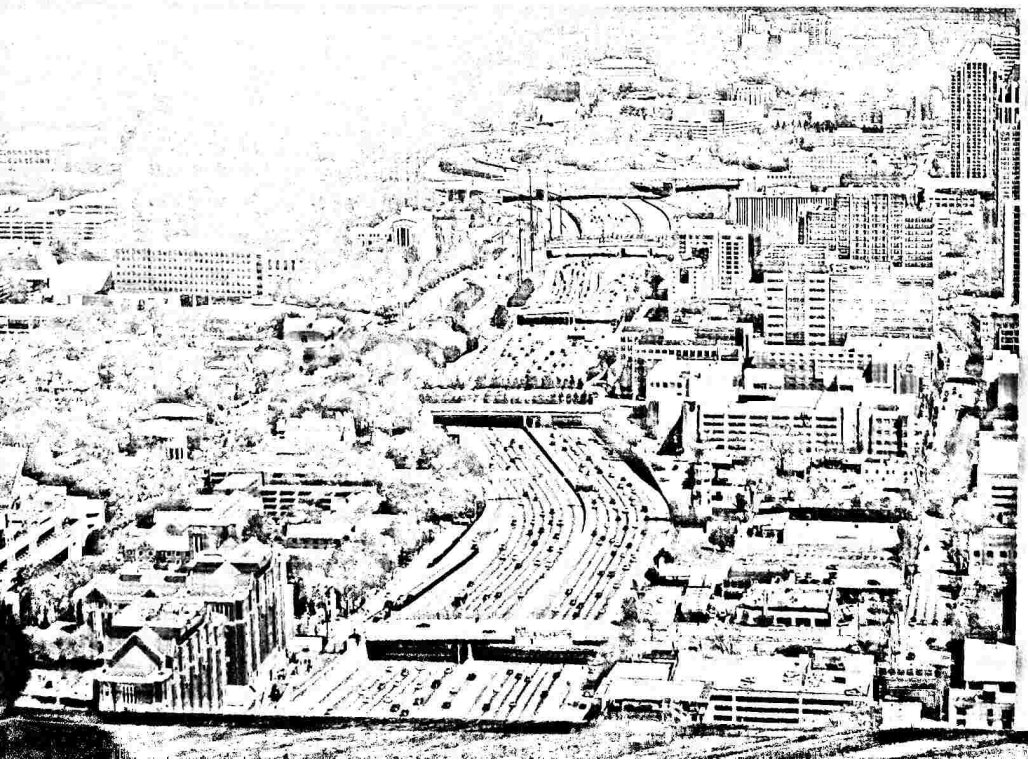
- **Sail-Wagon Epoch (1790–1830).** Urban areas were clustered along the Atlantic Coast. Communication was primarily by wind-powered ships plying up and down the Atlantic Coast.
- **Iron Horse Epoch (1830–1870).** The steam engine made it possible for ships to travel much faster and to reach inland locations. Canals connected newly founded inland cities with the established ones on the East Coast. Steam-powered railroads provided transport from outlying areas into the existing urban centers.
- **Steel Rail Epoch (1870–1920).** Long-haul rail lines connected urban areas around the country.
- **Auto-Air-Amenity Epoch (1920–1970).** The internal combustion engine made it possible for motor vehicles to become the dominant mode of transport within and between urban areas. Gasoline-powered airplanes facilitated long-distance travel between distant urban centers.
- **Satellite-Electronic-Jet Propulsion (1970–?).** The current era is characterized by the ability to communicate electronically, as well as to control transport systems electronically.

Cities have prospered or suffered during the various epochs, depending on their proximity to economically important resources and migration patterns. At the same time, cities retain physical features from the earlier eras that may be assets or liabilities in subsequent eras.

BENEFITS AND COSTS OF MOTOR VEHICLES

There are around 1.2 billion motor vehicles in the world, including 255 million in the United States. The United States actually has more registered motor vehicles than licensed drivers. Motor vehicle ownership is nearly universal among American households, with the exception of some poor families, older individuals, and people living in the centers of large cities such as New York. Motor vehicles offer two principal benefits:

- **Comfort, choice, and flexibility.** Motorists can live wherever they wish and travel whenever they wish. They are not constrained by the timetable of public transport service. A motor vehicle offers comfortable seats, choice of music, and isolation from unpleasant people on a bus or subway.
- **Perceived cost.** Motorists perceive that the cost of using vehicles is less than the cost of using public transport.



◀ **FIGURE 13-54 URBAN FREEWAY** I-75 carves a wide path through downtown Atlanta.

Each time public transport is used a fare must be paid, and the fare is higher than the cost of fuel, at least in the United States. Most of the costs associated with motor vehicles, such as insurance and license, are paid on an annual basis, regardless of the amount of driving that is actually done.

The U.S. government encourages the use of cars and trucks by paying 90 percent of the cost of limited-access, high-speed interstate highways, which stretch for 77,000 kilometers (48,000 miles) across the country. The use of motor vehicles is also supported by policies that keep the price of fuel below the level found in Europe.

Motor vehicles have costs beyond their purchase and operation. These costs are not noticed by most motorists:

- **Consumption of land.** The motor vehicle is an important user of land in the city (Figure 13-54). An average city allocates about one-fourth of its land to roads and parking lots. Multilane freeways cut a 23-meter (75-foot) path through the heart of a city, and elaborate interchanges consume even more space. Valuable land in the central city is devoted to parking cars and trucks, although expensive underground and multistory parking structures can reduce the amount of ground-level space needed. European and Japanese cities have been especially disrupted by attempts to insert new roads and parking areas in or near the medieval central areas.

Congestion. The average American wastes 18 gallons of gasoline and loses 42 hours per year sitting in traffic jams, according to the Urban Mobility Report prepared by the Texas Transportation Institute. In the United States, the total cost of congestion is valued at $160 billion per year. But most Americans still prefer to commute by vehicle. Most people overlook these costs because they place higher value on the privacy and flexibility of schedule offered by a car.

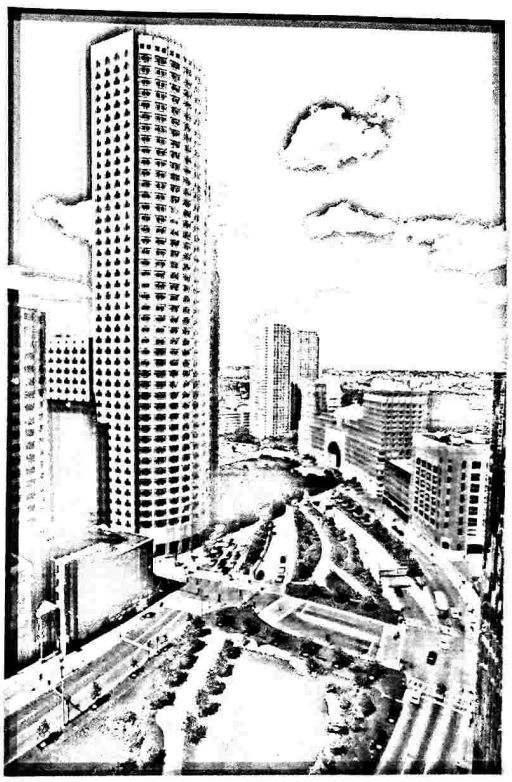
Freeways that once sliced through CBDs have been demolished in a number of cities, including Boston, San Francisco, and Seoul. For example, Boston's Central Artery has been replaced by a park (Figure 13-55).

AUTONOMOUS DRIVING VEHICLES

Future transportation systems are likely to include various forms of autonomous vehicles. Vehicles currently possess technological capabilities supportive of hands-free driving such as sensors and GPS, and they can perform hands-free functions such as automatic braking, parallel parking, and prevention of unsafe lane changes.

Autonomous vehicles are likely to result in fewer accidents caused by human error, provide mobility for people who are too young to drive or have a disability, and decrease the safe distance between vehicles and therefore increase the number of vehicles that can fit on the road.

Still unsettled are many practical problems created by autonomous vehicles, such as liability and insurance. The most significant obstacle to autonomous vehicles may be consumer acceptance. Do you want to give up some or all control of the vehicle? What do your parents and grandparents think? autonomous vehicles excite them or frighten them?



▲ **FIGURE 13-55 FREEWAY DEMOLITION** Boston's Central Artery freeway was demolished and replaced with the Rose Kennedy Greenway.

PAUSE & REFLECT 13.3.5

What are some benefits and costs of removing ur freeways, such as in Boston?

CHECK-IN KEY ISSUE 3

Why Do Urban Areas Expand?

- ✔ **U.S. cities once expanded by annexing surrounding land, but that practice is now less common.**
- ✔ **Cities are typically surrounded by sprawling independent suburban jurisdictions.**
- ✔ **Suburban sprawl consumes a lot of land and requires investment in a lot of new roads and utilities.**
- ✔ **Suburbs are often segregated by social class an by land use activities.**
- ✔ **Suburban residents are dependent on motor vehicles to get to other places, whereas most cities offer forms of public transit.**

KEY ISSUE 4

Why Do Cities Face Sustainability Challenges?

- ▸ **The City Challenged**
- ▸ **The City Renewed**
- ▸ **The City Contrasted**
- ▸ **The City Cleaned**
- ▸ **The City Controlled**

LEARNING OUTCOME 13.4.1
Understand challenges faced by cities.

The final key issue of the book returns to the themes introduced in the first key issue. The first key issue introduced five basic concepts used by geographers to explain why every place on Earth is in some ways unique and in other ways related to other locations—place, region, scale, space, and connections. These five themes are especially useful in understanding cities.

Place and region help to explain why every city is unique:

- A place is a specific point on Earth, distinguished by a particular characteristic. Every city occupies a unique location on Earth's surface. Furthermore, a city itself contains a collection of unique places, such as the CBD and residential areas occupied by people with distinctive cultural and economic characteristics.
- A region is an area of Earth defined by one or more distinctive characteristics. Urban areas have grown so large that they now constitute regions with widely varying features.

Scale, space, and connections help to explain why different cities are interrelated:

- Scale is the relationship between the portion of Earth being studied and Earth as a whole. Cities reflect the importance of the variety of scales, from local to global. At the local scale, cities are centers of diversity. Living in a city puts you in close proximity to people with different cultural characteristics and economic conditions. At the same time, the economic well-being and cultural vibrancy of a city depends on global economic and cultural patterns and processes.
- Space refers to the physical gap or interval between two objects. People and activities are arranged within a city according to properties of distribution. Density declines with increasing distance from the city (though less than in the past), distinctive groups of people and activities are concentrated in various areas of the city, and the physical structure of the city such as the layout of streets follows a regular pattern.
- Connection refers to relationships among people and objects across the barrier of space. Cities are nodes of connections. They are the centers for the transportation networks that tie together cities, as well as areas within cities.

The City Challenged

One hundred years ago, low-income inner-city neighborhoods in the United States teemed with throngs of recent immigrants from Europe. Such neighborhoods that housed perhaps 100,000 a century ago may contain fewer than 5,000 inhabitants today. Those remaining in these neighborhoods face a variety of distinctive social and physical challenges that are very different from those faced by suburban residents.

SOCIAL CHALLENGES

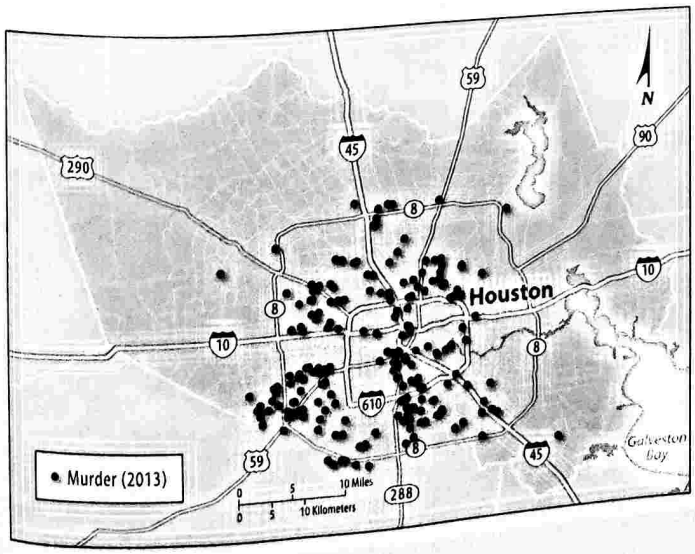
The **underclass** is a group in society prevented from participating in the material benefits of a more developed society because of a variety of social and economic hardships. A disproportionately large share of the underclass live in inner-city neighborhoods, where they are trapped in an unending cycle of hardships:

- **Inadequate job skills.** Inner-city residents are increasingly unable to compete for jobs. They lack technical skills needed for most jobs because fewer than half complete high school. Despite the importance of education in obtaining employment, many in the underclass live in an atmosphere that ignores good learning habits, such as regular school attendance and completion of homework. In the past, people with limited education could become factory workers or filing clerks, but today these jobs require skills in computing and handling electronics. Inner-city residents do not even have access to the remaining low-skilled jobs, such as custodial and fast-food service jobs because these jobs are increasingly in the distant suburbs and poorly served by public transport.
- **Culture of poverty.** Unwed mothers give birth to two-thirds of the babies in U.S. inner-city neighborhoods, and 80 percent of children in the inner city live with only one parent. Because of inadequate child-care services, single mothers may be forced to choose between working to generate income and staying at home to take care of the children. In principle, government officials would like to see more fathers living with their wives and children, but they provide little incentive for them to do so. Only a small percentage of "deadbeat dads" are tracked down for failing to provide child-care support. If the husband moves back home,

▲ **FIGURE 13-56 HOMELESS PERSON** New York City.

his wife may lose welfare benefits, leaving the couple financially worse off together than apart.

- **Homelessness.** Several million people are homeless in the United States. Most people are homeless because they cannot afford housing and have no regular income. Affordable housing is increasingly difficult to find in cities. Homelessness may have been sparked by family problems or job loss (Figure 13-56). One-fourth of homeless people are children, according to government surveys.
- **Drugs.** Trapped in a hopeless environment, some inner-city residents turn to drugs. Although drug use is a problem in suburbs as well, rates of use have increased most rapidly in inner cities. Some drug users obtain money through criminal activities. Gangs may form in inner-city neighborhoods to control lucrative drug distribution.



◀ **FIGURE 13-57 MURDERS IN HOUSTON** Compare the distribution of murders with Houston's social areas in Figures 13-15, 13-16, and 13-17.

- **Crime.** Inner-city neighborhoods have a relatively high share of a metropolitan area's serious crimes, such as murder (Figure 13-57). A relatively high percentage of victims, as well as those arrested for murder, in cities are minorities. Violence may erupt when two gangs fight over the boundaries between their drug distribution areas.
- **Inadequate services.** Inner-city neighborhoods lack adequate police and fire protection, shops, hospitals, clinics, and other health-care facilities. Food deserts are especially common in low-income inner-city areas.
- **Municipal finances.** Low-income residents in inner-city neighborhoods require public services, but they can pay very little of the taxes to support the services. Central cities face a growing gap between the cost of needed services in inner-city neighborhoods and the availability of funds to pay for them.

PAUSE & REFLECT 13.4.1

How might additional investment in education address some of these features of the underclass?

PHYSICAL CHALLENGES

Thousands of vacant houses stand in the inner areas of U.S. cities because the landlords have abandoned them (see Debate It feature). Schools and shops close because they are no longer needed in inner-city neighborhoods with rapidly declining populations.

Filtering is the process of change in the use of a house, from single-family owner-occupancy to rented apartments and ultimately to abandonment. Many inner-city houses built by wealthy families in the nineteenth century have been subdivided by absentee landlords into smaller dwellings for low-income families. Landlords stop maintaining houses when the rent they collect becomes less than the costs of maintenance and taxes. In such a case, the building soon deteriorates and grows unfit for occupancy.

Some financial institutions hastened the abandonment of inner-city housing through redlining. **Redlining** is a process by which financial institutions draw red-colored lines on a map and refuse to lend money for people to purchase or improve property within the lines. As a result of redlining, families who try to fix up houses in the area have difficulty borrowing money. Although redlining is illegal, enforcement of laws against it is frequently difficult. The Community Reinvestment Act requires U.S. banks to document by census tract where they make loans. A bank must demonstrate that inner-city neighborhoods within its service area receive a fair share of its loans.

The City Renewed

LEARNING OUTCOME 13.4.2

Describe the process of gentrification.

Gentrification is the process of converting an urban neighborhood from a predominantly low-income, renter-occupied area to a predominantly middle-class, owner-occupied area. Most cities have at least one substantially renovated inner-city neighborhood that has attracted higher-income residents, especially single people and couples without children who are not concerned with the quality of inner-city schools.

A deteriorated inner-city neighborhood is attractive for several reasons:

- The houses may be larger and more substantially constructed yet less expensive than houses in the suburbs.
- Houses may possess attractive architectural details, such as ornate fireplaces, cornices, high ceilings, and wood trim.
- For people who work downtown, inner-city living eliminates the strain of commuting on crowded freeways or public transport.
- The neighborhoods are near theaters, bars, restaurants, stadiums, and other cultural and recreational facilities.

Because renovating an old inner-city house can be even more expensive than buying a new one in the suburbs, cities encourage the process by providing low-cost loans and tax breaks. Public expenditures for renovation have been criticized as subsidies for the middle class at the expense of people with lower incomes, who are sometimes forced to move out of the gentrified neighborhoods because the rents in the area suddenly become too high for them (Figure 13-58).

REMOVING PUBLIC HOUSING

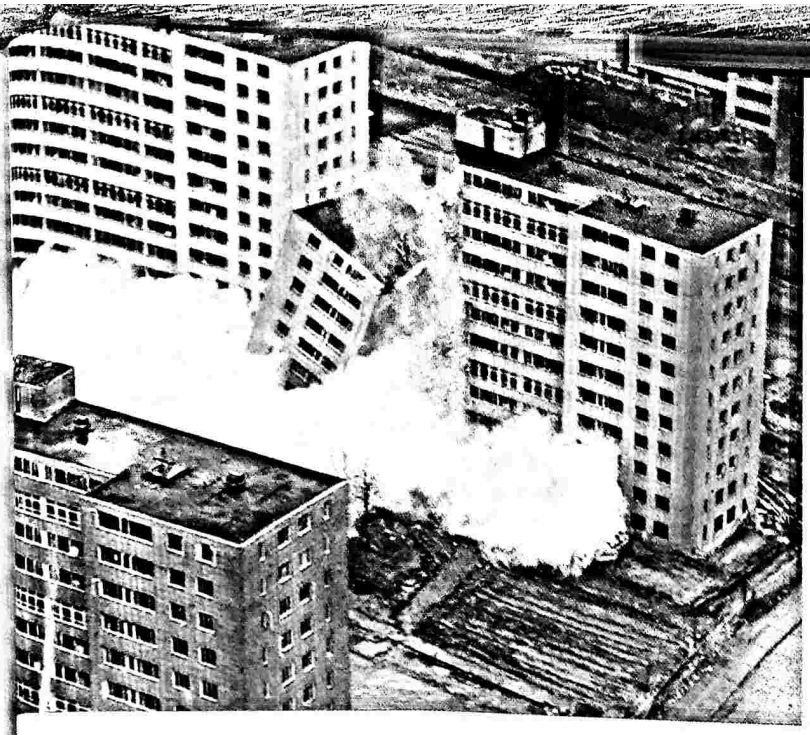
Given the high cost of housing in cities, governments sometimes step in to actually own or support the management of housing for low-income households. In the United States, **public housing** is government-owned housing rented to low-income individuals, with rents set at 30 percent of the tenant's income. In other countries, local governments or nonprofit organization such as charitable groups build and own much of the housing, aided by subsidies from the national government.

During the mid-twentieth century, many substandard inner-city houses were demolished and replaced with public housing. Several decades later, many of these public housing projects were themselves considered unsatisfactory living environments and in turn have also been demolished (Figure 13-59). Especially unsatisfactory were high-rise public housing projects. The elevators were frequently broken, juveniles terrorized other people in the hallways, and drug use and crime rates were high. Some observers claimed that the high-rise buildings were responsible for the problem because too many low-income families were concentrated into a high-density environment.

With the overall level of funding much lower, the supply of public housing and other government-subsidized housing in the United States diminished by approximately 1 million units between 1980 and 2010. But during the same period, the number of households that needed low-rent dwellings increased by more than 2 million. In Britain, the supply of public housing, known as social housing (formerly council estates), also declined because the government forced local authorities to sell some of the dwellings to the residents. The British also expanded subsidies to nonprofit housing associations that build housing for groups with special needs, including single mothers, immigrants, disabled people, and elderly people, as well as the poor.

(a) (b)

▲ **FIGURE 13-58 GENTRIFICATION IN CINCINNATI** **(a)** Into the twenty-first century, the inner-city neighborhood of Over-the-Rhine had many abandoned residences and shops. **(b)** Many of these buildings have been renovated with attractive shops and higher-cost housing.



▲ **FIGURE 13-59 DEMOLISHED PUBLIC HOUSING** One of the most notorious high-rise public housing projects, Pruitt-Igoe in St. Louis, was constructed during the 1950s and demolished during the 1970s.

Cities try to reduce the hardship on poor families forced to move. U.S. law requires that they be reimbursed both for moving expenses and for rent increases over a four-year period. Western European countries have similar laws. Cities are also renovating old houses specifically for lower-income families through public housing or other programs. By renting renovated houses, a city also helps to disperse low-income families throughout the city instead of concentrating them in large inner-city public housing projects. However, some public housing projects were located in neighborhoods that are now gentrifying, so the new housing that is replacing the demolished high rises may be too expensive for the former public housing residents (Figure 13-60).

REVIVING CONSUMER SERVICES

Most consumer services have located in suburbs to be near suburban residents. However, some consumer services are returning to the inner city, in part to meet day-to-day needs of residents of gentrified neighborhoods. Inner-city consumer services are also attracting people looking for leisure activities, such as unusual shops in a dramatic downtown setting or view of a harbor. Several North American CBDs have combined new retail services with leisure services. For example:

- Boston's Faneuil Hall Marketplace is located in renovated eighteenth-century buildings.
- Baltimore's Harbor Place is built in the Inner Harbor, adjacent to waterfront museums, tourist attractions, hotels, and cultural facilities.
- Chicago's Navy Pier, a former cargo dock, has been converted to shops and attractions.
- New York's South Street Seaport integrates the old fish market with retailing and recreational activities.
- Philadelphia's nineteenth-century Reading Terminal Market, which barely survived during the twentieth-century suburbanization movement, has been renovated into a thriving marketplace with individual stalls operated by different merchants.
- San Francisco's Ferry Building, where San Francisco Bay ferries dock, is a gourmet food center (Figure 13-61).

PAUSE & REFLECT 13.4.2

What might be the attractions and the challenges of buying groceries in places like the Reading Terminal or Ferry Building?

▲ **FIGURE 13-60 PUBLIC HOUSING AND GENTRIFICATION** A notorious high-rise public housing project in Chicago called Cabrini Green was located in a gentrifying neighborhood. The project has been demolished and replaced with new housing for middle-class families. This image from 2003 shows two Cabrini Green towers awaiting demolition next to new housing.

▲ **FIGURE 13-61 SAN FRANCISCO'S FERRY BUILDING** The ferry terminal in downtown San Francisco has been renovated into a retail center.

The City Cleaned

LEARNING OUTCOME 13.4.4

Strategies for improving city air.

Where will you be living 10 or 20 years from now? Chances are it will be in an urban area. More than half of the world's inhabitants now live in cities, and the percentage will continue to increase in the years ahead.

What will the city of the future be like? In some respects, it may look familiar. It will probably have commercial areas and residential neighborhoods. People of similar interests and backgrounds are likely to continue to cluster in rings, sectors, and nodes.

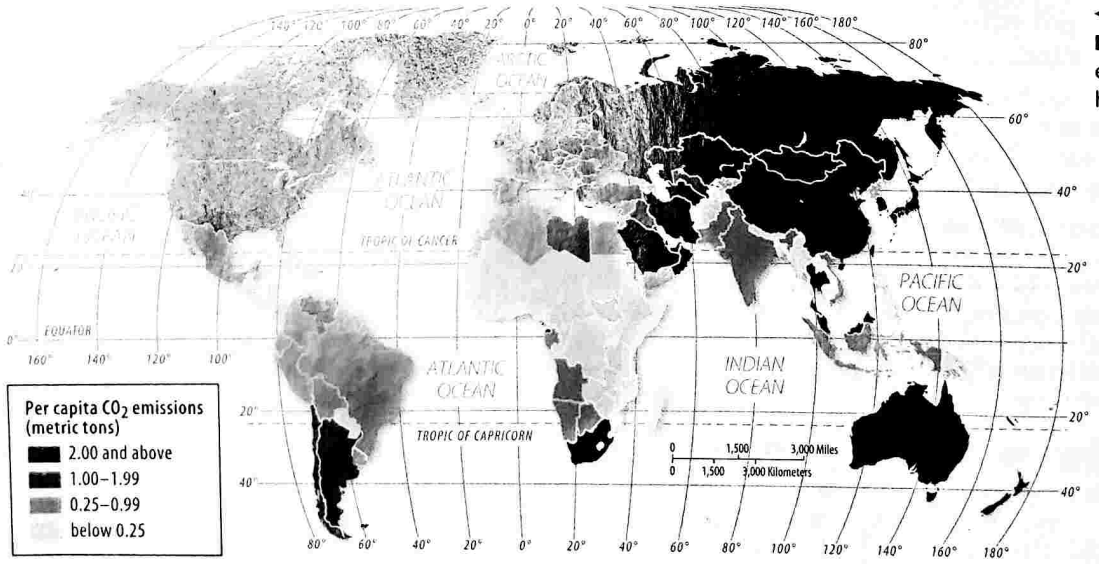
Will the city of the future be sustainable? **Sustainable development** is "development that meets the needs of the present without compromising the ability of future generations to meet their own needs," according to the United Nations. The future sustainability of cities—and therefore of Earth—depends largely on how we structure our future transport.

The average American spends more than 600 hours per year driving. That's nearly one month of the year. Our future transport will definitely be more energy-efficient and less polluting. As we conclude our study of human geography, we focus on two key changes in our future transport: the source of power and the control of the vehicle.

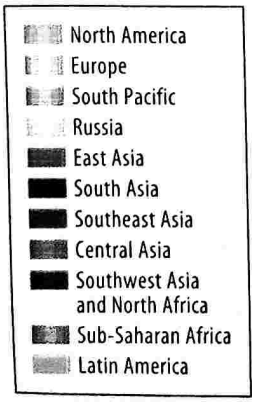
What will it take for the world to reduce pollution and fossil fuel dependency in the years ahead (Figure 13-65)? According to the United Nations, strategies will vary among countries (Figure 13-66). The U.S. scientists working with the U.N. offered a strategy with three key elements (Figure 13-67):

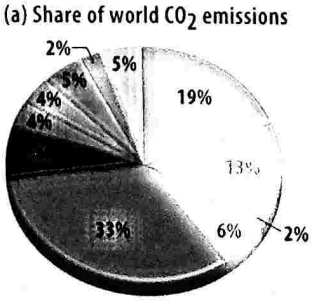
- Sharp decrease in the use of the three fossil fuels.
- Increase in the use of renewable energy.
- Use of **carbon capture and storage (CCS),** which involves capturing waste CO_2, transporting it to a storage site, and depositing it where it will not enter the atmosphere, normally underground.

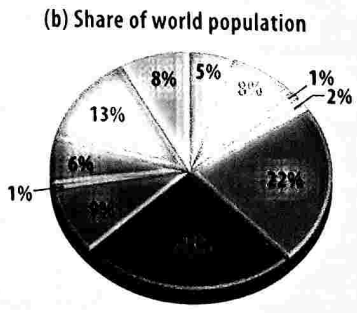
The principal impact on the average American would be reliance on electricity for nearly all household activities and transportation. This electricity would be generated almost exclusively through sources other than the three fossil fuels. As hard as it will be for the United States to reduce its carbon footprint, the challenge is even greater for developing countries, especially China, which



◀ **FIGURE 13-65 PER CAPITA CO_2 EMISSIONS** Developed countries, especially in North America, have high per capita CO_2 emissions.







◀ **FIGURE 13-66 SHARE OF EMISSIONS AND POPULATION (a)** East Asia, especially China, is responsible for the largest share of the world's CO_2 emissions. **(b)** East Asia and North America generate higher percentages of CO_2 emissions than their share of the world's population.

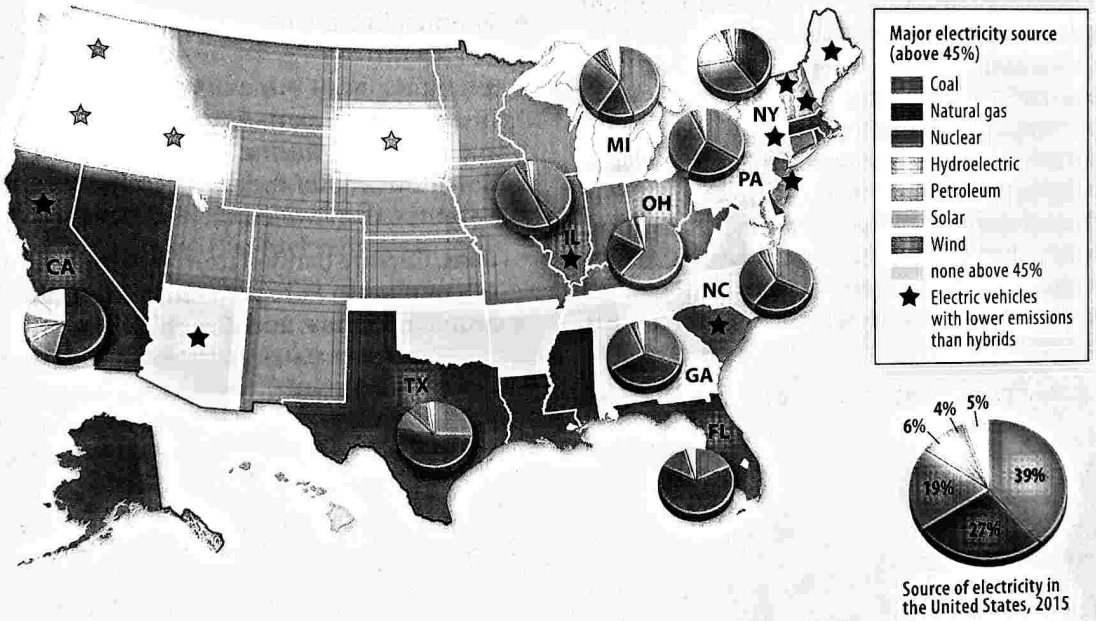
SUSTAINABILITY & OUR ENVIRONMENT

Regional Variations in Electricity

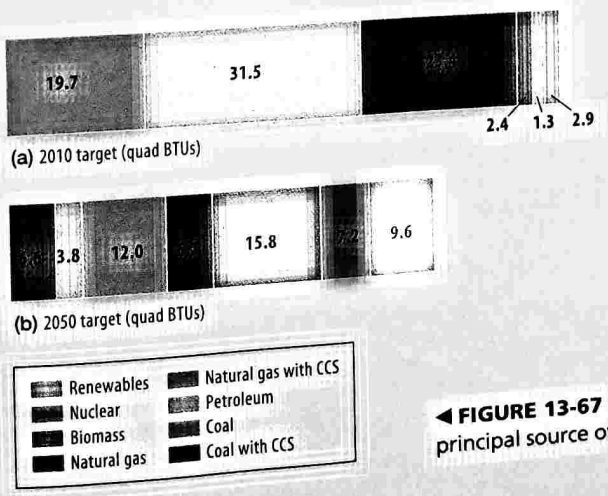
Electric-powered vehicles require recharging by being plugged into a source of electricity such as an outlet in the garage. The source of that electricity may or may not be sustainable. Though fossil fuel is not being pumped directly into the tank of the electric-powered vehicle, fossil fuel may be consumed to generate the electricity at the power plant. In fact, the United States as a whole generates around 39 percent of its electricity from coal-burning power plants and around 27 percent from natural gas.

An electric vehicle does reduce consumption of an increasingly scarce and expensive resource—petroleum. But if the electricity is generated by natural gas, then plugging a vehicle into the electric grid may conserve petroleum at the expense of more rapid depletion of natural gas. If electricity is generated by coal, a plug-in may cause more air pollution.

Electricity is generated differently across the 50 U.S. states. In the Pacific Northwest, where hydroelectric is the leading source of electricity, recharging electric vehicles will have much less impact on air quality than will be the case in the Midwest (Figure 13-68). States that depend on farm production may benefit from increased use of ethanol. Thus, the "greenest" alternative varies by location.



▲ **FIGURE 13-68 ELECTRICITY BY U.S. STATE** The mix of fuels running power plants varies widely among the 50 states. Electric cars generate lower CO_2 emissions than hybrids in some states and higher emissions in others, depending on the source of electricity.



◀ **FIGURE 13-67 U.N. TARGET FOR CO_2 EMISSIONS REDUCTION IN THE UNITED STATES** The principal source of reduction would be through lower use of fossil fuels.

is now the world's leading manufacturing country. International cooperation and coordination will be required to reduce global pollution.

PAUSE & REFLECT 13.4.4

What is happening in or near your community to reduce generation of electricity through fossil fuels?

The City Controlled

LEARNING OUTCOME 13.4.5

Consider alternative future vehicles for the city.

The future health of urban areas depends on relieving traffic congestion. The average American spends around 42 hours a year stuck in traffic jams (but 80 hours in Los Angeles). Geographic tools, including the Global Positioning System (GPS) and electronic mapping, are playing central roles in the design of intelligent transportation systems, either through increasing road capacity or through reducing demand.

CONTROLLING VEHICLES

The current generation of innovative techniques to increase road capacity is aimed at providing drivers with information so that they can make intelligent decisions about avoiding congestion. Information about traffic congestion is transmitted through computers, handheld devices, and vehicle monitors. Traffic hot spots are displayed on electronic maps and images, using information collected through sensors in the roadbeds and cameras placed at strategic locations. An individual wishing to know about a particular route can program an electronic device to receive a congestion alert and to suggest alternatives. Radio stations in urban areas broadcast reports to advise motorists of accidents or especially congested highways.

Demand to use congested roads is being reduced in a number of ways:

- **Congestion charges.** In London, motorists must pay a congestion charge of up to £12 ($18) to drive into the central area between 7 a.m. and 6 p.m. Monday through Friday (Figure 13-69). A similar system exists in Stockholm, where the charge varies depending on the time of day.
- **Tolls.** In Toronto and several California cities, motorists are charged higher tolls to drive on freeways during congested times than at other times. A transponder attached to a vehicle records the time of day it is on the highway. A monthly bill sent to the vehicle's owner reflects the differential tolls.
- **Permits.** In Singapore, to be permitted to drive downtown during the busiest times of the day, a motorist must buy a license and demonstrate ownership of a parking space. The government limits the number of licenses and charges high tolls to drive downtown. Several cities in China intend to require permits to drive in congested areas.
- **Bans.** Cars are banned from portions of the central areas of a number of European cities, including Copenhagen, Munich, Vienna, and Zurich (Figure 13-70).

▼ FIGURE 13-69 **CONGESTION CHARGE** Central London.

▲ **FIGURE 13-70 NO-CAR ZONE** Strøget, a main shopping street in Copenhagen, prohibits vehicles and is limited to pedestrians.

ALTERNATIVE FUEL VEHICLES

Consumers in developed countries are reluctant to give up their motor vehicles, and demand for vehicles is soaring in developing countries. One of the greatest challenges to reducing pollution and conserving nonrenewable resources is reliance on petroleum as automotive fuel, so carmakers are scrambling to bring alternative-fuel vehicles to the market. Here are some alternative technologies:

- **Diesel.** Diesel engines burn fuel more efficiently, with greater compression, and at a higher temperature than conventional gas engines. Most new vehicles in Europe are diesel powered, where they are valued for zippy acceleration on crowded roads, as well as for high fuel efficiency. However, diesels have been found to generate high levels of nitrogen oxides. Diesels have made limited inroads in the United States, where they were identified with ponderous heavy trucks, poorly performing versions in the 1980s, and generation of more pollutants. Biodiesel fuel mixes petroleum diesel with biodiesel (typically 5 percent), which is produced from vegetable oils or recycled restaurant grease.
- **Hybrid.** Sales of hybrids increased rapidly during the first decade of the twenty-first century, led by Toyota's success with the hybrid Prius. A gasoline engine powers the vehicle at high speeds, and at low speeds, when the gas engine is at its least efficient, an electric motor takes over. Energy that would otherwise be wasted in coasting and braking is also captured as electricity and stored until needed.
- **Ethanol.** Ethanol is fuel made by distilling crops such as sugarcane, corn, and soybeans. Sugarcane is distilled for fuel in Brazil, where most vehicles run on ethanol. In the United States, corn has been the principal crop for ethanol, but this has proved controversial because the amount of fossil fuels needed to grow and distill the corn is comparable to—and possibly greater than—the amount saved in vehicle fuels. Furthermore, growing corn for ethanol diverts corn from the food chain, thereby allegedly causing higher food prices in the United States and globally. More promising is ethanol distilled from cellulosic biomass, such as trees, grasses, and algae.
- **Full electric.** A full electric vehicle has no gas engine. When the battery is discharged, the vehicle will not run until the battery is recharged by plugging it into an outlet. Motorists can make trips in a local area and recharge the battery at night. Out-of-town trips are difficult because recharging opportunities are scarce. In large cities, a number of downtown garages and shopping malls have recharging stations, but few exist in rural areas.
- **Plug-in hybrid.** In a plug-in hybrid, the battery supplies the power at all speeds. It can be recharged in one of two ways: While the car is moving, the battery can be recharged by a gas engine or, when it is parked, the car can be recharged by plugging into an electrical outlet. The principal limitation of a full electric vehicle has been the short range of the battery before it needs recharging. Using a gas engine to recharge the battery extends the range of the plug-in hybrid to that of a conventional gas engine.
- **Hydrogen fuel cell.** Hydrogen forced through a PEM (polymer electrolyte membrane or proton exchange membrane) can be combined with oxygen from the air to produce an electric charge. The electricity can then be used to power an electric motor. Fuel cells are now widely used in small vehicles such as forklifts. Fuel cell vehicles are being used in a handful of large East Coast and West Coast cities, where hydrogen fueling stations have been constructed.

PAUSE & REFLECT 13.4.5

What strategies are being used at your university or in your school district to promote alternatives to cars and trucks?

CHECK-IN KEY ISSUE 4

Why do cities face sustainability challenges?

- ✔ **Cities have large numbers of underclass people who live in a culture of poverty.**
- ✔ **Many cities have areas of gentrification and regeneration.**
- ✔ **Future cities are likely to be dependent on alternative forms of transport.**

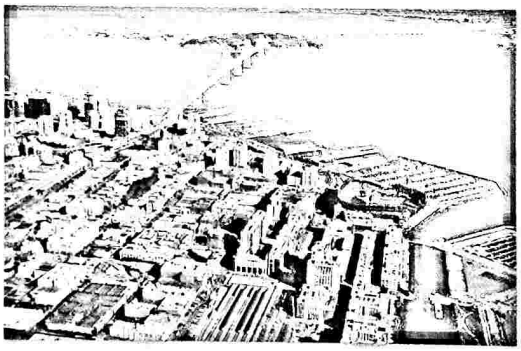
Summary & Review

KEY ISSUE 1

Why are downtown districts distinctive?

An urban area consists of a central city and its surrounding built-up suburbs. The CBD contains a large percentage of an urban area's public and business services. Some consumer services, especially leisure, are also in the CBD.

THINKING GEOGRAPHICALLY



1. Some professional sports arenas and stadiums are located in the CBD, and some are located in suburbs. What are the advantages and drawbacks for the fans of each location?

▲ **FIGURE 13-71 DOWNTOWN STADIUM** The San Francisco Giants play in AT&T Park, adjacent to downtown San Francisco.

KEY ISSUE 2

Where do different groups live in urban areas?

Three models help to explain where different groups of people live in urban areas. According to the concentric zone model, a city grows outward in rings. According to the sector model, a city grows along transportation corridors. According to the multiple nuclei model, a city grows around several nodes. The models can be used to describe where people of varying characteristics tend to cluster in an urban area.

THINKING GEOGRAPHICALLY

2. Identify the ring, sector, and node in which you (or a friend or relation) live within an urban area. Do conditions in your place fit the overall patterns expected of the three models? Why or why not?

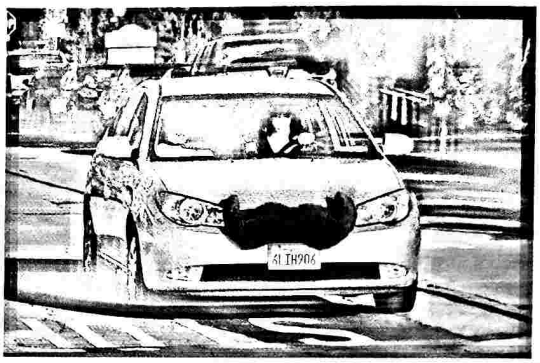
▲ **FIGURE 13-72 SUN CITY, ARIZONA** The city's street pattern consists of a series of concentric circles.

KEY ISSUE 3

Why do urban areas expand?

Urban growth has been primarily focused on suburbs that surround older cities. In the past, cities expanded their land area to encompass outlying areas, but now they are surrounded by independent suburban jurisdictions. Public transport, such as subways and buses, are more suited than private cars to moving large numbers of people into and out of the CBD, but private motor vehicles dominate urban transportation, especially in the United States.

THINKING GEOGRAPHICALLY



3. What impact might a car-sharing service such as Uber or Lyft have on patterns of urban transport?

▲ **FIGURE 13-73 LYFT CAR-SHARING SERVICE** Lyft drivers identify their cars by attaching a jumbo pink mustache to the front.

KEY ISSUE 4

Why do cities face sustainability challenges?

Cities face physical, social, and economic difficulties, but some improvements have also occurred. The older housing in the inner city can deteriorate through processes of filtering and redlining. Some cities have experienced gentrification, in which higher-income people move in and renovate previously deteriorated neighborhoods.

THINKING GEOGRAPHICALLY

4. What are the impacts of gentrification on low-income inner-city residents? What are some of the benefits and challenges of providing housing for low-income residents in a gentrifying neighborhood?

▲ **FIGURE 13-74 GENTRIFICATION AND AFFORDABLE HOUSING** This building, located in a gentrifying neighborhood of Cincinnati, houses low-income people who were once homeless.

KEY TERMS

Annexation *(p. 478)* Legally adding land area to a city in the United States.

Carbon capture and storage (CCS) *(p. 494)* The process of capturing waste CO_2, transporting it to a storage site, and depositing it where it will not enter the atmosphere, normally underground.

Census tract *(p. 468)* An area delineated by the U.S. Bureau of the Census for which statistics are published; in urban areas, census tracts correspond roughly to neighborhoods.

Central business district (CBD) *(p. 462)* The area of a city where retail and office activities are clustered.

Central city (city) *(p. 460)* An urban settlement that has been legally incorporated into an independent, self-governing unit known as a municipality.

Combined statistical area (CSA) *(p. 461)* In the United States, two or more contiguous CBSAs tied together by commuting patterns.

Concentric zone model *(p. 466)* A model of the internal structure of cities in which social groups are spatially arranged in a series of rings.

Core-based statistical area (CBSA) *(p. 461)* In the United States, any MSA or μSA.

Density gradient *(p. 480)* The change in density in an urban area from the center to the periphery.

Edge city (p. 467) A large node of office and retail activities on the edge of an urban area.

Filtering *(p. 489)* A process of change in the use of a house, from single-family owner occupancy to abandonment.

Gentrification *(p. 490)* A process of converting an urban neighborhood from a predominantly low-income, renter-occupied area to a predominantly middle-class, owner-occupied area.

Informal settlement *(p. 474)* An area within a city in a less developed country in which people illegally establish residences on land they do not own or rent and erect homemade structures.

Megalopolis *(p. 481)* A continuous urban complex in the northeastern United States.

Metropolitan statistical area (MSA) *(p. 460)* In the United States, an urbanized area of at least 50,000 population, the county within which the city is located, and adjacent counties meeting one of several tests indicating a functional connection to the central city.

Micropolitan statistical area (μSA) *(p. 461)* An urbanized area of between 10,000 and 50,000 inhabitants, the county in which it is located, and adjacent counties tied to the city.

Multiple nuclei model *(p. 467)* A model of the internal structure of cities in which social groups are arranged around a collection of nodes of activities.

Peripheral model *(p. 480)* A model of North American urban areas consisting of an inner city surrounded by large suburban residential and business areas tied together by a beltway or ring road.

Primary census area (PSA) *(p. 461)* In the United States, any CSA, any MSA not included in a CSA, or any μSA not included in a CSA.

Public housing *(p. 490)* Government-owned housing rented to low-income individual, with rents set at 30 percent of the tenant's income.

Redlining *(p. 489)* A process by which financial institutions draw red-colored lines on a map and refuse to lend money for people to purchase or improve property within the lines.

Rush hour *(p. 484)* The four consecutive 15-minute periods in the morning and evening with the heaviest volumes of traffic.

Sector model *(p. 466)* A model of the internal structure of cities in which social groups are arranged around a series of sectors, or wedges, radiating out from the central business district.

Smart growth *(p. 479)* Legislation and regulations to limit suburban sprawl and preserve farmland.

Social area analysis *(p. 468)* Statistical analysis used to identify where people of similar living standards, ethnic background, and lifestyle live within an urban area.

Sprawl *(p. 480)* Development of new housing sites at relatively low density and at locations that are not contiguous to the existing built-up area.

Suburb *(p. 478)* A residential or commercial area situated within an urban area but outside the central city.

Sustainable development *(p. 494)* Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

Underclass *(p. 488)* A group in society prevented from participating in the material benefits of a more developed society because of a variety of social and economic characteristics.

Urban area *(p. 460)* A central city and its surrounding built-up suburbs.

Urban cluster *(p. 460)* In the United States, an urban area with between 2,500 and 50,000 inhabitants.

Urbanized area *(p. 460)* In the United States, an urban area with at least 50,000 inhabitants.

Zoning ordinance *(p. 482)* A law that limits the permitted uses of land and maximum density of development in a community.

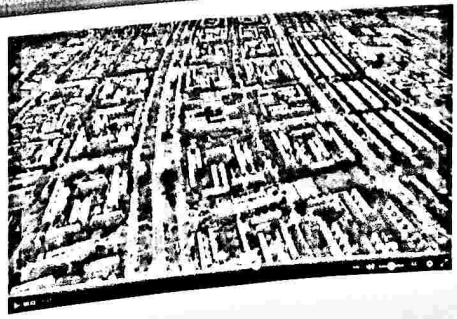
GeoVideo

Log in to the MasteringGeography Study Area to view this video.

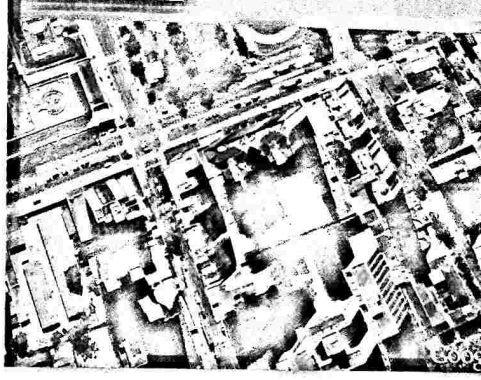
Brasília

A planned city completed in 1960, Brazil's capital, Brasília, provides an opportunity to compare a utopian dream with present-day social reality.

1. What values and aspirations motivated the creation of Brasília and shaped its design?
2. How does the form of Brasília reflect the different functions of a city and national capital?
3. Does Brasília today realize its founders' vision of society? Give examples from the video to support your answer.



EXPLORE



Curitiba's transport and housing

Use Google Earth to explore transport and housing in Curitiba, Brazil.

Fly to *Praca GK Gilbran, Curitiba, Brazil.*

Select *Bus* in the *Transportation* menu.

Select *More* then click on the triangle and the box next to *Transportation* and select *Bus.*

Drag to enter *Street View* to the bus stop on the southeast side of the triangle formed by the praca (park).

1. What is unusual about the bus stops, compared to those in other cities?
2. What type of housing structures surround the praca?

Fly to *240 Rua Brasilio Bontorim, Curitiba, Brazil.*

3. Describe differences in the appearance of this suburb compared to a typical one in the United States.

MasteringGeography™

Looking for additional review and test prep materials?

Visit the Study Area in **MasteringGeography™** to enhance your geographic literacy, spatial reasoning skills, and understanding of this chapter's content by accessing a variety of resources, including MapMaster interactive maps, videos, *In the News* RSS feeds, flashcards, web links, self-study quizzes, and an eText version of *The Cultural Landscape.*

www.masteringgeography.com