**Chapter 13: Urban Patterns**

**Key Issue 1: Why Are Downtowns Distinctive?**

**Introducing Urban Patterns** 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.

**Central City** Historically, urban settlements were very small and compact. As these settlements have rapidly increased in size, however, definitions have been created to describe 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. Virtually all countries have a local government system that recognizes cities as legal entities with defined boundaries.

**Urban Area** An **urban area** consists of a central city and its surrounding built-up suburbs. 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.

**Metropolitan Area** 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 an urbanized area with a population of at least 50,000, the county within which the city is located, and adjacent counties with a high population density and a large percentage of residents working in the central city’s county. 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 census combines MSAs and μSAs in several ways. A **core-based statistical area (CBSA)** is any one MSA or μSA. A **combined statistical area (CSA)** is two or more contiguous CBSAs tied together by commuting patterns. A **primary statistical area (PSA)** is a CSA, an MSA not included in a CSA, or a μSA not included in a CSA.

**The Central Business District** The **central business district (CBD)** is the core of the city where many services cluster. Services are attracted to the CBD because of its accessibility. The CBD is usually near the original site of settlement. The CBDs of older cities are often situated along a body of water.

**Public Services in CBDs** Public services typically located in a CBD include city hall, courts, county and state agencies, and libraries. Public services are located in the CBD to facilitate access for people living in all parts of town. Sports facilities and convention centers are found in the CBD and attract many suburbanites and out-of-towners. Cities place these facilities in the CBD because they hope to stimulate business for downtown restaurants, bars, and hotels.

**Business Services in CBDs** People in business services such as advertising, banking, journalism, and law depend on proximity for professional colleagues. Even with the diffusion of modern communications, many professionals still exchange information with colleagues primarily through face-to-face contact. A central location also helps businesses that employ workers from a variety of neighborhoods.

**Consumer Services in CBDs** Retail services were once important to the CBD but are now less so. Changing shopping habits and residential patterns have reduced the importance of retail services in the CBD.

**Retailers with High Thresholds** Retailers with a high range and threshold traditionally preferred a CBD location in order to be accessible to many people. Many large retail stores have moved to the suburbs. Changing shopping habits and residential habits have reduced the importance of retail services in the CBD.

**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. Some retailers with high ranges have located in CBDs because they are visited by tourists. Some local residents also patronize shops in the CBD as a leisure activity on evenings and weekends.

**Retailers Serving CBD Workers** Specialized retailers and those serving downtown workers still remain in the CBD. Retailers selling office supplies, computers, and clothing or offering shoe repair, rapid photocopying, or dry cleaning are actually expanding in the CBD. The number of downtown office workers has increased and downtown offices are now requiring more services. The total volume of sales in downtown areas has been stable, but the pattern of demand has changed.

**Competition for Space in CBDs** A CBD’s accessibility produces extreme competition for the limited available land. As a result, land values are very high in the CBD. 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.

**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** 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 unload and warehouses to store goods. Port facilities have moved to more modern facilities downstream. Port cities have transformed their waterfronts from industry to recreational activities. Derelict warehouses and rotting piers have been replaced with new offices, shops, parks, and museums, becoming major tourist attractions.

**Lack of Residents in the CBD** Many people used to live downtown. Many people were pulled to suburbs that offered larger homes with private yards and modern schools. They were pushed from CBDs by high rents that businesses and retail services were willing to pay and by dirt, crime, congestion, and poverty that they experienced by living downtown. Downtown living has become attractive recently to people without school-age children. People without school-age children are attracted to the entertainment, restaurants, museums, and nightlife that is clustered downtown.

**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, electric and telephone wires, and pipes for water and sewer service. Subway trains run beneath the streets of large CBS.

**Skyscrapers** Skyscrapers develop to maximize the floor space in the highest-demand areas. Downtown skyscrapers give a city one of its most distinctive images and unifying symbols. The first high-rises caused great inconvenience to neighboring structures because they blocked light and air movements. Most North American and European cities enacted zoning ordinancesearly in the twentieth century in part to control the location and height of skyscrapers.

**CBDs outside North America** Outside of North America, CBDs are less likely to be dominated by commercial services. They instead feature religious or historical structures and parks. CBDs outside of North America are also more likely to have residents. However, the 24-hour supermarket is rare outside of a North American CBD because of shopkeeper preferences, government regulations, and long-time shopping habits. Many CBDs outside of North America ban motor vehicles from busy shopping streets.

**Key Issue 2: Where Are People Distributed in Urban Areas?**

**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 levels of success. The three models describing the internal social structure of cities were developed in Chicago.

**Concentric Zone Model** The **concentric zone model**, created in 1923 by sociologist E.W. Burgess,was the first model to explain the distribution of different social groups within urban areas. According to the concentric zone model, a city grows outward from a central area in a series of concentric rings, like 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 the same order.

**Sector Model** In the **sector model**, developed in 1939 by land economist Homer Hoyt, the city develops in a series of sectors, not rings. Certain areas of the city are more attractive for various activities, originally because of an environmental or even by mere chance. Once a district with high-class housing is established, the most expensive new housing is built on the outer edge of that district, farther out from the center. The best housing is therefore found in a corridor extending from downtown to the outer edge of the city. To some extent the sector model is a refinement of the concentric zone model rather than a radical restatement.

**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. 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. Heavy industry and high-class housing 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.

**Applying the Models in North America** The three models of urban structure help us understand where people with different social characteristics tend to live within and urban area.

**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. Effective use of the models depends on the availability of data at the scale of individual neighborhoods. 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. Each decade the U.S. Bureau of the Census publishes data summarizing the characteristics of the residents and housing in each tract. Social scientists can use social area analysis to compare the distribution of characteristics and create an overall picture of where various types of people tend to live.

**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 view the models as 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.

**Applying the Models in Europe** 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. More people live downtown in cities outside of North America. 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. 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. 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.

**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. 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. The wealthy lived near the royal palace beginning in the twelfth century and the Palace of Versailles from the sixteenth century until the French Revolution in 1789.
* Multiple Nuclei. European urban areas, including Paris, have experienced a large increase in immigration from other regions of the world. In contrast to U.S. urban areas, most ethnic and racial minorities reside in the suburbs of Paris.

**Pre-modern 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.

**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.

**Beijing During the Yuan Dynasty** Kubla Khan, founder of the Yuan Dynasty, constructed a new city called Dadu beginning in 1267. The Drum Tower was constructed at the center of the city. 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.

**Beijing in 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.

**Colonial Legacy** When Europeans gained control of much of Africa, Asia, and Latin America, their colonial policies left an indelible 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. In some places, European colonial powers built a new city next to the existing one. The new city was the location for colonial services, such as administration, military command, and international trade, as well as housing for European colonists. In other cases, European colonial powers simply demolished the precolonial city.

**Applying the Models in Developing Countries** The three models of urban structure described earlier in this chapter help to explain contemporary patterns within the urban areas in developing countries. Rapid growth of population and land area has strengthened the applicability of the models in some cities but reduced their usefulness in other instances.

**Concentric Zones in Developing Countries** The concentric zone model has been used to examine cities in developing countries most frequently, most notably by geographer Harm deBlij’s model of sub-Saharan African cities. The inner rings are inhabited by higher-income people, as they have the most attractive residential areas due to proximity to businesses and consumer services. These inner rings also offer vital public services, such 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. Many residential areas in the outer rings take the form of informal settlements, also known as squatter settlements. The United Nations has identified 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 standard for legal buildings. Informal settlements have few services because neither the city nor the residents can afford them.

**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. 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.

**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. The wealthy are also attracted to the center and spine because services such as water and electricity are more 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.

**Changing Urban Structure of Mexico City** Mexico City provides an ideal example of a city in a developing country that has passed through three stages of development: pre-Europeans origin, the European colonial period, and postcolonial independence. The modern city also displays evidence of the models of urban structure.

**Precolonial Mexico City** The Aztecs founded Mexico City—which the called Tenochtitlán—on a hill known as Chapultepec (“the hill of the grasshopper”). They eventually moved their settlement to a 10-square-kilometer island in Lake Texcoco in 1325. The node of religious life was the Great Temple. Most food, merchandise, and building materials crossed from the mainland to the island by boat, and the island was laced with canals to facilitate movement. As the Aztecs conquered neighboring populations over the following two centuries, Tenochtitlán grew to a population of a half-million.

**Colonial Mexico City** The Spanish conquered Tenochtitlán in 1521, after a two-year siege. They destroyed Tenochtitlán, dispersed or killed most of the inhabitants, and constructed a new city on the site. The Spanish built Mexico City around a main square, called the Zócalo, on the site of the Aztecs’ sacred precinct in the center of the island. Streets were laid out in a grid pattern extending from the Zócalo.

**Mexico City Since Independence** At independence, Mexico City was a relatively small city. The population grew modestly during the nineteenth century, reaching around 500,000 in 1900. The population grew dramatically during the twentieth century, to 3 million in 1950 and 21 million in the urban area in 2015. Millions have migrated to the cities in search of work. In 1903, most of Lake Texcoco was drained by a gigantic canal and tunnel project, allowing the city to expand to the north and east.

**Key Issue 3: Why Do Urban Areas Expand?**

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 rose rapidly thereafter. Ten years after, one-third of Americans lived in cities, one-third in suburbs, and one-third 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.

**Annexation** The process of legally adding land area to a city is **annexation**. Normally, land can be annexed to a city only if a majority of the 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. Today, cities are less likely to annex peripheral land because residents prefer to organize their own services rather than pay the city taxes for them.

**Local Government Fragmentation** Because MSAs in the United States are composed of many independent suburbs and central cities as well as counties, local governments are fragmented and less able to deal with regional problems. 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. Two kinds of strong metropolitan-wide governments have been established in a few places in North America: consolidations of city and county governments, and federations.

**Smart Growth** Some U.S. cities have pursued **smart growth** laws to limit sprawl. Smart Growth is legislation and regulations to limit suburban growth and preserve farmland.

**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 contiguous to the existing built-up area.

**The Peripheral Model** According to the **peripheral model**,an urban area consists of an inner city surrounded by large suburban residential and business areas tied together by a beltway or ring road.

**Density Gradient** North American cities once followed a **density gradient** where density decreased consistently with increasing distance from the city center. Two changes have impacted the density gradient in recent years: fewer people living in the center, and fewer differences in density within urban areas. These two changes flatten the density gradient and reduce the extremes of density between inner and outer areas traditionally found within cities.

**Overlapping Metropolitan Areas** In the northeastern United States, large metropolitan areas are so close together that they now form one continuous urban complex, extending north of Boston to south of Washington, D.C., this region is known as **Megalopolis**. Other continuous urban complexes exist in the United States—the southern Great Lakes between Chicago and Milwaukee on the west and Pittsburgh on the east, and southern California from Los Angeles to Tijuana.

**Suburban Segregation** Many suburbs display two forms of segregation:

* Segregation of social classes. Housing in 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.
* 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. 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.

**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. 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.

**Suburban Services** Consumer and business services are also expanding in suburbs. A number of actors account for this trend.

**Suburbanization of Consumer Services** The suburbs created segregated land uses, with residential areas separate from retail and manufacturing activities, with the consequence of requiring automobile ownership for all trips. Retailing has been increasingly concentrated in planned suburban shopping malls. Corner shops have been replaced by supermarkets in small shopping centers. Generous parking lots surround stores. Malls have become centers for activities in suburban areas that lack other types of community facilities.

**Suburbanization of Business Services** Offices that do not require face-to-face contact are increasingly moving to suburbs, where rents are lower than in the CBD. For some workers suburban office locations can pose hardships. Secretaries, custodians, and other lower-status office workers may not have cars and public transportation may not serve the site. Factories and warehouses have migrated to suburbia for more space, cheaper land, and better truck access. Suburban locations facilitate truck shipments by providing good access to main highways and no central city traffic congestion.

**Legacy of Public Transport** 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. **Rush hour** is the four consecutive 15-minute periods that have the heaviest traffic. Public transit is better suited than motor vehicles to moving large numbers of people because each transit traveler takes up far less space.

**Public Transport in the United States** In the United States public transit service in minimal or nonresistant in many cities. Only 5 percent of commuting trips in the United States take place using public transport. 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. Rapid transit (subways or fixed light-rail) is increasing in some U.S. cities. Public transportation 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 reductions 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 a large subsidy.

**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. Cities with existing service have been expanding them, also.

**Reliance on Motor Vehicles** The average American travels 36 miles per day. 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 owned motor vehicles. 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 is by other means.

**Transportation Epochs** Transportation improvements have played a crucial 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)
* Iron Horse Epoch (1830-1870)
* Steel Rail Epoch (1870-1920)
* Auto-Air-Amenity Epoch (1920-1970)
* Satellite-Electronic Jet Propulsion (1970-?)

Cities have prospered or suffered during the various epochs, depending on their proximity to economically important resources and migration patterns. Parallel to this, 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 perceived cost and comfort, choice, and flexibility of motor vehicles has maintained the mode of transportation’s dominance in the United States. The U.S. government encourage the use of cars and trucks by paying 90 percent of the cost of limited-access, high-speed interstate highways, which stretch for 48,000 miles across the country. U.S. policies also keep fuel prices cheaper than those found in Europe, further supporting the use of motor vehicles. The consumption of land is one unseen costs of motor vehicle culture. An average city allocates about one-fourth of its land to roads and parking lots. Congestion is an issue not often considered by motorists as well; the average American wastes about 18 gallons of fuel and loses 42 hours per year sitting in traffic jams.

**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 a road. Still unsettled are many practical problems created by autonomous vehicles, such as liability and insurance.

**Key Issue 4: Why Do Cities Face Sustainability Challenges?**

**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 may face significant challenges, distinct from those faced by suburban inhabitants.

**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, a culture of poverty, homelessness, the presence of drugs, crime, inadequate social and consumer services, and municipal finances that cannot meet budgetary needs due to low tax revenues are some of the issues the underclass deal with in this environment.

**Physical Challenges** Large houses built by wealthy families in the nineteenth century are subdivided by absentee landlords into smaller dwellings for low-income families. This process of subdivision of houses by successive waves of lower-income people is known as **filtering**. Landlords stop maintaining houses when the rent they collect becomes less than the maintenance cost. The building will soon deteriorate and grows unfit for occupancy. The owner at this point may abandon the property because the rents that can be collected are less than the cost of taxes and upkeep. Some banks engage in **redlining**—drawing lines on a map to identify areas in which they will refuse to loan money.

**The City Renewed** The process of converting an urban neighborhood from a predominantly low-income, renter-occupied area to a predominantly middle-class, owner-occupied area is known as **gentrification**. Most cities have at least one substantially renovated inner-city neighborhood that has attracted higher-income residents. A deteriorated inner-city neighborhood is attractive for several reasons. The houses located there may be larger and more substantially constructed, containing attractive architectural details. These dwellings are also conveniently located near offices downtown, and cultural and recreational amenities.

**Removing Public Housing** Many substandard inner-city houses have been demolished and replaced with public housing. **Public housing** is government-owned housing rented to low-income individuals, with rents set at 30 percent of the tenant’s income. A housing authority, established by the local government, manages the buildings, and the federal government pays the cost of construction and maintenance, repair, and management that are not covered by rent. The U.S. government has stopped funding construction of new public housing. Because of poor conditions, high-rise public housing projects have been demolished in many U.S. cities. As a result of lower allocated funds, the supply of public housing and other government-subsidized housing in the United States decreased by roughly 1 million units between 1980 and 2010. During that same period, the number of people in need of low-rent dwellings increased by more than 2 million.

**Reviving Consumer Services** 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.

**The City Contrasted** Contemporary American cities display ever-sharper contrasts. In some places, young, white, and wealthy people are moving back into the city. In other places, cities face significant problems.

**The City Cleaned** According to the United Nations, **sustainable development** is “development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” The future sustainability of cities depends largely on how we structure our future transport. U.S. scientists working with the U.N. devised a strategy with three key elements to promote sustainable changes in future transportation.

* 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 CO2, transporting it to a storage site, and depositing it where it will not enter the atmosphere.

**The City Controlled** The future health of urban areas depends on relieving traffic congestion. Geographic tools, such as the Geographic Positioning System (GPS) and electronic mapping, are playing key 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. Demand to use congested roads is being reduced in a number of way, primarily through congestion charges, tolls, permits, and bans of vehicle from certain portions of central areas of cities.

**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. Diesel, hybrid, ethanol, full electric, plug-in hybrid, and hydrogen fuel cell technologies are all technologies being researched and developed by automotive companies to help solve this enduring problem.