

F. Urban Land Use Models

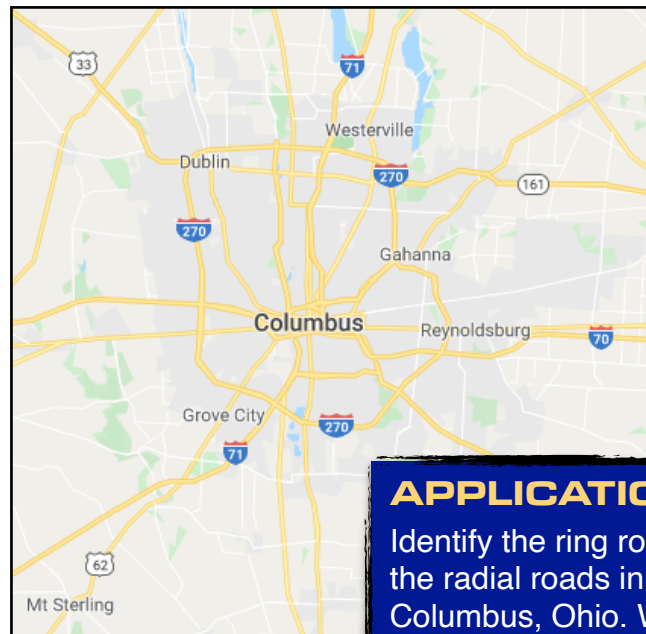
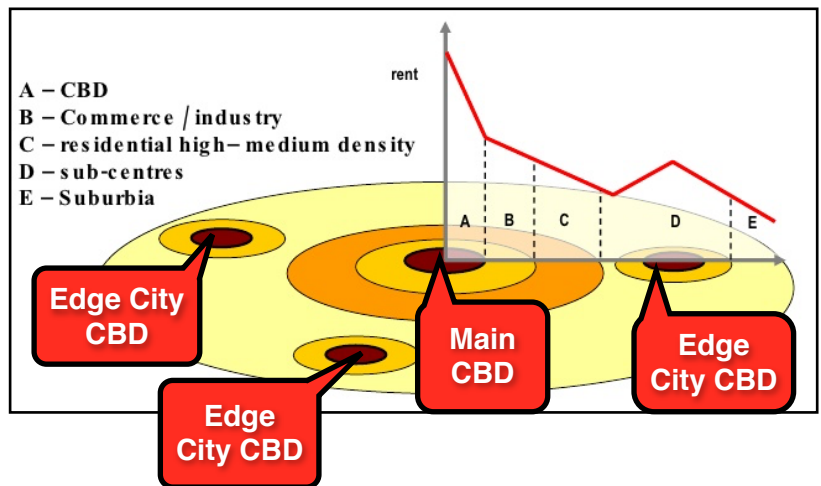
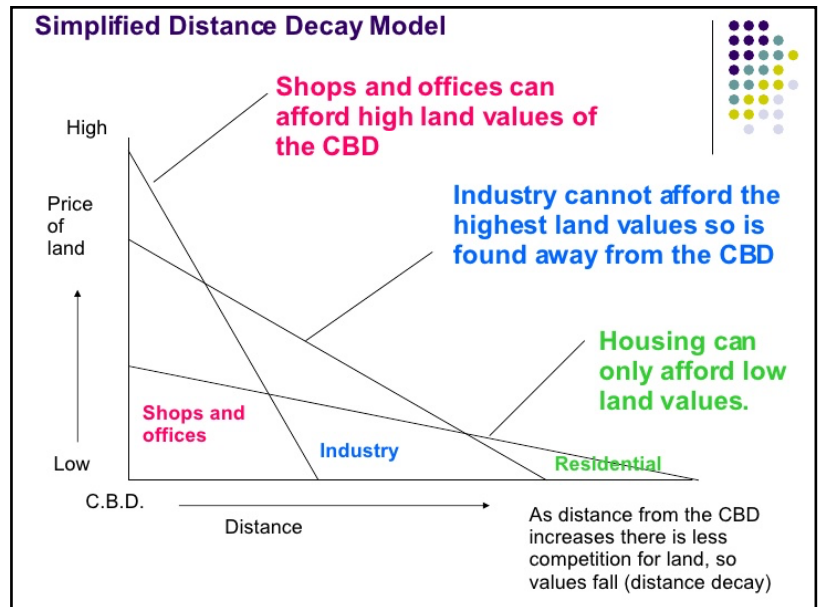
Bid Rent Theory-Urban Edition

Land value drives urban development, in particular how the land is used and the style of architecture. The closer a location is to the Central Business District (CBD), the more competition there is for the land. The higher the demand or competition is for the location, the higher the price of the land will be. Consequently, buildings in and near the CBD built vertical architecture for office space and high density residential apartments/condominiums to agglomerate as many people as possible onto a small piece of land. The further away the location is from the CBD, the more that distance decay impacts the level of competition. As the competition and demand for land decreases, the value of the land decreases as well and the architecture transitions from thin and tall towers to flat and wide industrial complexes, warehouses, retail malls, and townhouses; with low density single family homes on the outskirts.

A second strong contributor impacting land values is the *transportation infrastructure*. Because industrial complexes, warehouses, and retail stores value access to transportation, the land along the transportation corridors has an increased land value. This is especially true for train stops, highway entrance/exit ramps, and the intersections of important roads. Retail developers fight the hardest to be at locations with the highest flow of customer traffic while industrial complexes can be hidden away along access points with a lower flow of people. Many factories choose locations on the train tracks so their machinery can load and unload freight cars without any extra effort or costs.

Since American cities predominately use automobiles as transportation, it is critical to understand the layout of automotive transportation and the role intersections play in determining urban land use. Cities tend to lay out major roads in two formats: *radial roads* and *ring roads*. Radial roads start in the center and radiate outwards like rays of the sun. They follow the cardinal directions: north, northeast, east, southeast, etc. These roads allow travelers to move quickly away from the CBD. Ring roads form concentric circles, allowing travellers to move 360° around the city.

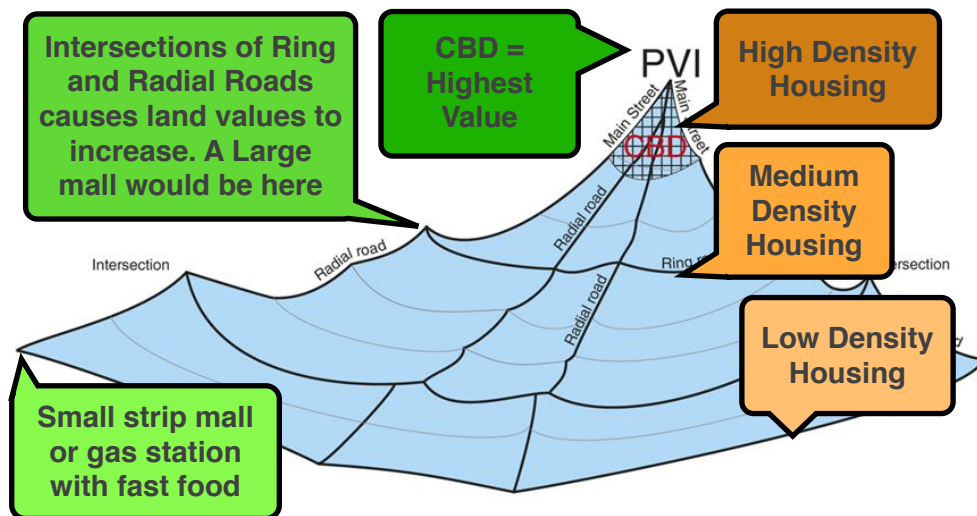
At the intersection of a major radial road and a ring road, the value of the land will increase. This increase is the result of retail businesses competing to own the land at the corner of a major intersection. Traffic flows north-south and east-west, generating maximum exposure for the business with its potential customers.



APPLICATION #1

Identify the ring roads and the radial roads in Columbus, Ohio. What is the relationship between the key suburbs & the transportation routes?

The closer the intersection is to the CBD, the higher the value. At these intersections it is common to find retail malls with higher price stores, fancy restaurants, and coffee shops. The farther away the intersection is from the CBD, the lower the customer traffic and land value. At less-ideal intersections, it is common to find gas stations and an occasional fast food restaurant. In between intersections, there is even less customer traffic with minimal competition for the land. This results in lower valued land infilled with various densities of housing and businesses/services that do not need high visibility. This includes dentists, doctors, optometrists, family lawyers, DMV offices, real estate agents, etc. These are services people purposefully seek out and which do not need high street visibility to remain viable.



The final factor in determining urban land value is *the presence of edge cities and suburbs*. In larger metropolitan areas, communities of people gather into suburban communities away from the larger CBD. At the center of the edge cities are mini-CBDs, composed of agglomerating footloose industries wanting to benefit from lower land costs and tertiary sector business (ex: Target/Walmart type retail, restaurants, dry cleaners, coffee shops, insurance agents, real estate agents, accountants, small tech firms, etc). These shopping complexes and malls are located at the most popular road intersections, with the largest agglomeration being near the highway entrance/exit ramps. Around the outskirts of the edge city's mini-CBD are suburban residences and gated communities for the middle to upper classes who have use personal transportation to circulate through their daily activities. Some of these people work in the downtown CBD while others work near the mini-CBDs. Mini-CBDs in the suburbs or edge cities cause land values to rise near those areas. The value does not come near the price value of the main CBD, but there is a noticeable price increase.

Models of American Cities

The land value, site features, transportation network, and function of an urban center serve as the driving forces behind the form or shape of an urban settlement. In the USA, there are four key models that explain the organization of American urban areas:

1 Burgess Concentric Zone Model. In 1925, Chicago was exploding in size, growing twenty times larger between 1860 and 1920 due to massive immigration from Italy, Ireland, and Eastern Europe. Ernest Burgess, a professor at the University of Chicago, established one of the first models to try and explain the explosive growth of Chicago in the hope of helping to guide other expanding urban centers.

Being capitalist minded, Burgess believed competition drove all aspects of society. As a city's prosperity increased, the CBD would rapidly expand and there would be competition for land surrounding the city. When competing for land, the most profitable competitors would use the most expensive land and use high density, vertical buildings to maximize profits. Less dominant, less wealthy activities would be pushed further away from the CBD and utilize lower density architecture. This would create a ripple effect: the rich businesses would displace the medium businesses. The medium businesses would displace the residential communities while the residential communities would be pushed further out. The outer edges of the city would keep expanding into new land, annexing those areas into the MSA.

Burgess's model predicted how a population would live in the city and how the businesses and industries would fight to occupy the CBD. The low income (migrant) workers would rent cramped living spaces in high density buildings near their employment, resulting in the creation of ethnic enclaves. The second (younger) generation families would move out of the enclaves into medium-to-low density housing like apartments, townhouses, or small single family

homes. Wealthy business owners and rags-to-riches entrepreneurs would buy single family homes away from any perceived poverty.

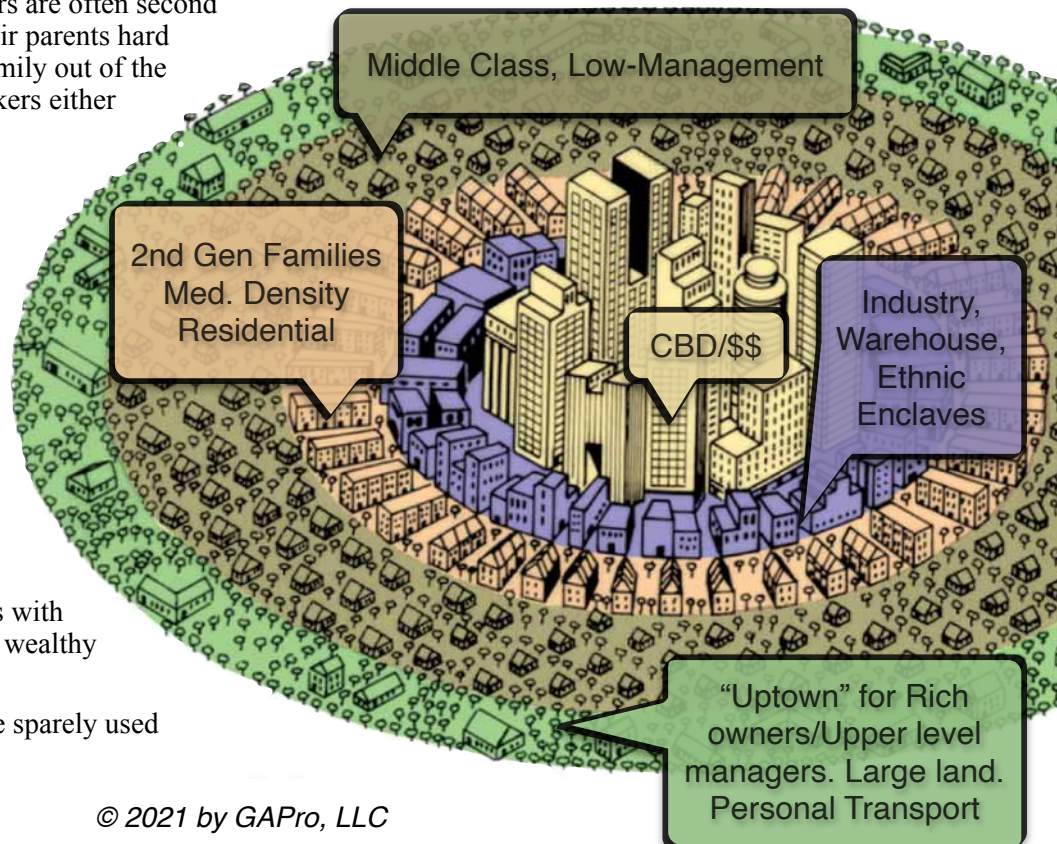
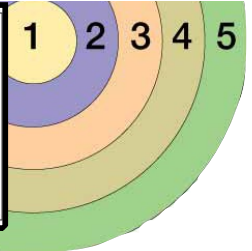
Burgess explained the city model in five circular zones:

- **Zone 1:** The CBD, home to the highest profit business, the corporate offices that could afford the highest land rent. This would include important services, government centers, financial institutions, most exclusive shopping, sports team stadiums, political offices, theaters, expensive hotels, and key commuter transportation hubs. This zone has the tallest vertical architecture, shaping the skyline and identity of the city.
- **Zone 2:** The Zone of Transition is a combination of industrial activity and low income housing. The industrial complexes and warehouses utilize the inner-area of the zone because the buildings are wider and low-density. Just outside of the warehouse areas exists the lowest-income, high density tenement/slub housing. This was inhabited by first generation immigrants or the lowest skilled, lowest paid workers of the ghettos and ethnic enclaves. The area also has a high percentage of elderly on fixed incomes, orphanages, and homeless populations. These individuals need to be within walking distance of their employment and/or cannot afford to live outside the zone. This area also has the highest criminal activity per capita.
- **Zone 3:** The Zone of Independent Worker Homes is composed of residential communities for workers who have prospered enough to move out of Zone 2 into the “respectable work housing.” However, they still need affordable housing and low transportation costs to get to work in Zones 1 and 2. These workers are often second generation citizens, who built off their parents hard work with the goal of taking their family out of the “projects” and into Zone 3. The workers either walk or use public transportation.
- **Zone 4:** Zone of Better Residence. Home to the rising middle class/manager class with a mixture of nice apartments, townhouses, and private housing. Shopping centers and malls are strategically located to meet consumer needs. The residents have personal transportation to get to/from work or can afford public transportation daily; often 3rd-4th generation residents.
- **Zone 5:** Commuter zone - 30-60 minutes away from the CBD. Exurbs with high quality single family homes for wealthy families.
- **Beyond:** Agricultural regions and the sparsely used hinterlands.

Concentric Zone Model Assumptions:

1. The land is flat and featureless.
2. Central Business District: there is only one and it is the most important economic area.
3. Competition for land near the CBD is intense, increasing costs. Only the most profitable function could maintain the space. Land costs decrease away from CBD.
4. Individuals and corporations are economically minded, trying to maximize profits.
5. Population and economic activity is expanding rapidly.
6. The population is a diverse, being culturally and economically heterogeneous.
7. Transportation access and costs are equal in all directions, but more expensive further away from the CBD.

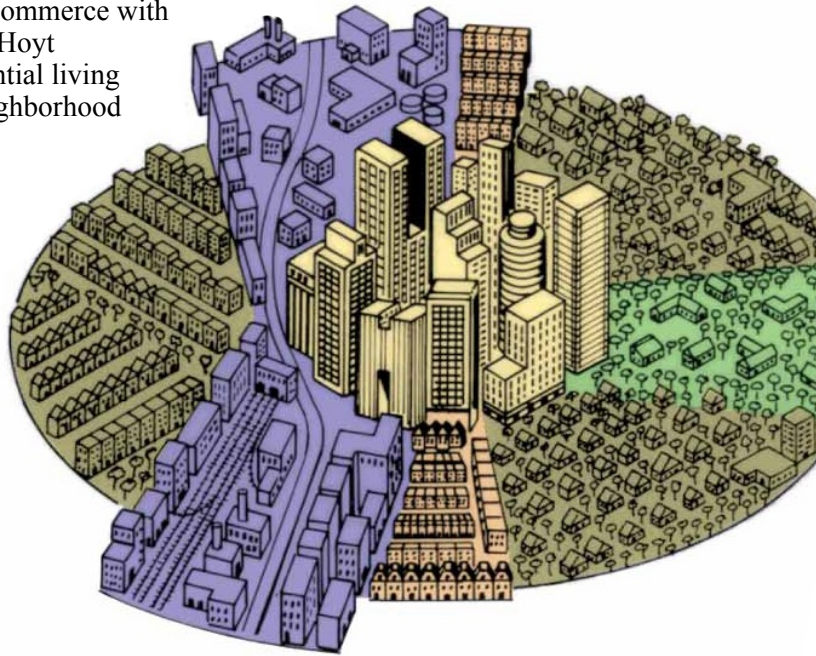
- 1 Central business district
- 2 Zone of transition
- 3 Zone of independent workers' homes
- 4 Zone of better residences
- 5 Commuter's zone



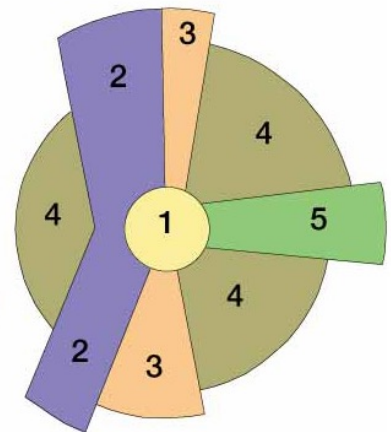
2 Hoyt's Sector Model. In 1939, the economist Homer Hoyt revised the Burgess model to correct inaccuracies or errant assumptions made in the Concentric Zone Model. Hoyt's model promoted the idea that land use is organized into long-thin sectors because of business agglomeration along railroad corridors - the primary form of transportation connecting cities. Middle to low income housing infills between the railroad tracks. As a city expands with increased business, the growth takes place linearly along the straight-lined rail corridors leading out of the city.

Hoyt organized his urban centers into five sectors:

- **Sector 1 - CBD.** Like Burgess, the CBD is the center of commerce with the most intensive, profitable, and vertical development. Hoyt promoted mixed-use zoning, blending high priced residential living with cultural and commercial institutions in the same neighborhood - even within the same building.
- **Sector 2 - Manufacturing.** Bulk gain manufacturing and warehouses have a strong need for agglomeration and transportation accessibility. Most of the "new" cities developed during this time were built inland at the intersection of multiple rail lines, as opposed to earlier cities like NYC or Boston which were seaports built along the coast. Thus, factory and warehouse buildings were positioned along the transportation corridors; sometimes even having the train line run through the middle of the factory complex. This allowed businesses to affordably get the materials from suppliers in other cities while also allowing them to bring their product affordably to market. By agglomerating with competitive and complimentary businesses, the costs of specialized business infrastructure were shared.
- **Sector 3 - Low Class Residential.** The low-class residents reside on the least desired land located close to the CBD and the manufacturing sector with easy access to walk to work. The housing is typically in the most flood prone areas, and subject to the worst conditions created by the factories: directly next to the noise pollution, immediately down wind of the air pollution, directly affected by water pollution. Similar to Burgess, this housing would be low quality, high density tenement apartments with high ethnic/immigrant concentrations, high crime rates, high homelessness, and low access to services.
- **Sector 4 - Medium Class Residential.** Similar to high-class residents, the Medium-Class residential sector is for the rising middle class/manager class. This zone consists of slightly older homes no longer desired by the rich or of new construction built to middle class needs. They are built in the nice-but-not-nicest locations with good-but-not-the-best materials, etc. The upper-middle-but-not quite wealthy houses are directly adjacent to the wealthy. The lower-just-barely-middle class townhomes and condos infill the opposite side of the tracks where they experience more of the hazards of industry.
- **Sector 5 - High Class Residential.** The wealthy choose the most pleasing sites and situations for their residences, usually in forested areas or along waterways not being utilized by industries. The houses are built on the highest ground, where there would be minimal risk of flooding. The homes are built along a transportation line mainly utilized as commuter transportation of the wealthy. The homes are situated away from the manufacturing zones so as to not experience the noise, air, water, or visual pollution the factories and warehouses. In urban areas with heavy industries creating strong air pollution, the high-class residential would be built on the west side of the city because wind tends to blow from west to east. This allows high-class houses to prosper from the factories without having to experience toxicity they create.

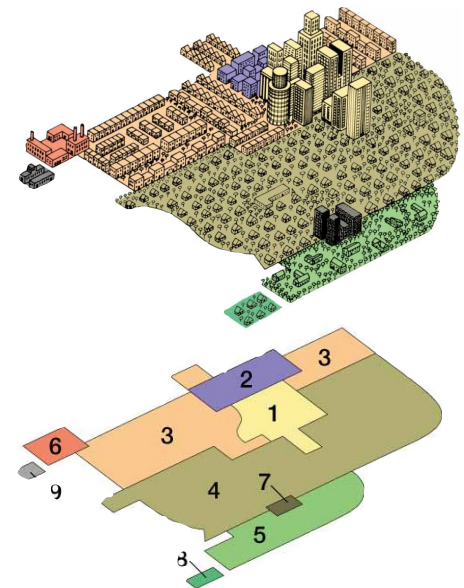


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|---|-----------------------------|
| 1 | Central business district |
| 2 | Transportation and industry |
| 3 | Low-class residential |
| 4 | Middle-class residential |
| 5 | High-class residential |



3 Ullman-Harris Multi-Nuclei Model. As American transportation technology evolved, the landscape of urban spaces continued to adapt. In 1945, Ullman and Harris agreed with many principles of Hoyt's sector model but also saw how the increased use of cars in American cities was changing the urban landscape. Roads and highways were not bound by the restrictions of railways. Individual cars, controlled by individual drivers, were able to make unique decisions for the individual's unique purpose. Thus, with the mass production of automobiles by Ford, GM and Chrysler, roads started to be built in high quantity. Roads can be built anywhere, so they were built everywhere....every...where.

This lead Ullman and Harris to conclude that urban spaces had transformed into a series of clusters or nuclei where road intersections were prized as premium locations. Because of the route flexibility of roads and highways, both the industries and the wealthy started leaving the expensive CBD for the low-cost suburbs. As a result, large urban centers no long had one massive CBD, but instead had a series of smaller CBDs in edge cities. The larger central CBD was still home to corporate headquarters and important retail or government services. The mini-CBDs became centers for tertiary services and the medium to high end residential communities. These suburban clusters attracted the family services out of the CBD like retails centers, shopping malls, schools, recreation centers, and medical services. Similarly, larger industries moved out of the CBD. Factories were either closing due to competition from overseas or relocating to the lower-cost locations on the outskirts of the city. As a result, the lower-class workers become trapped in nuclei near the CBD. All the low-skill-but-good-paying jobs left AND all the quality family services left to the suburbs/edge cities with the wealthy residents. The new low skill jobs were minimum wage and located in the suburbs where the low income residents could not easily travel to because they lacked transportation. This left the CBD with a series of problems: (1) The empty, lifeless factory buildings on prime land (2) commuter residents who took their property taxes and consumption spending outside the city limits, and (3) a large low-skill population without employment opportunities now that the factories had left.



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|---|--------------------------------|
| 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 |

4 Galaxy Model. In the 1960s, Harris built upon his Multi-Nuclei theory to develop the Galactic Model. With the hyper acceleration of car usage in American cities, paired Eisenhower's interstate highway system, cars rapidly replaced rail lines as the primary mode of transportation in metropolitan urban centers. Harris saw urban sprawl pushing the nuclei model further apart. Cities were rapidly expanding, with multiple edge cities forming further away from the main CBD. The edge cities were positioned along the main ring road, orbiting the downtown CBD like planets around the sun (#galaxyModel).



Cities were rapidly decentralizing. Thanks to cheap transportation, communication, and containerization, large industries were moving further away from the main urban space (some even out of the USA completely). Middle and upper class residents accelerated their urban-to-suburban migration. Edge cities were now home to retail shopping, entertainment, and medium-to-low density office towers (office parks) for business services that benefited from the low land cost and access to the rich suburbs. Single use zoning grouped agglomerated homes in one part of city and services in another causing further sprawl across the urban landscape and requiring personal motorized transportation to get access to jobs or to quality services. Edge cities became family focused areas with strong school systems, parks, box retail stores, and other amenities.

Meanwhile, urban centers had become home to a population of low income residents with minimal tax revenue but a high need for government service. The combination of affordable (typically publicly subsidized) housing and access to public transportation met a few of the needs of the low skilled, elderly, and new immigrant enclaves. However, with the suburbanization of the rich and middle class, businesses no longer provided tax support to downtown communities. These areas lost access to quality schools and food services, developing into food deserts due to the lack of available fresh food. They also lost access to quality doctors, dentists, banking, and retail services.

European Models

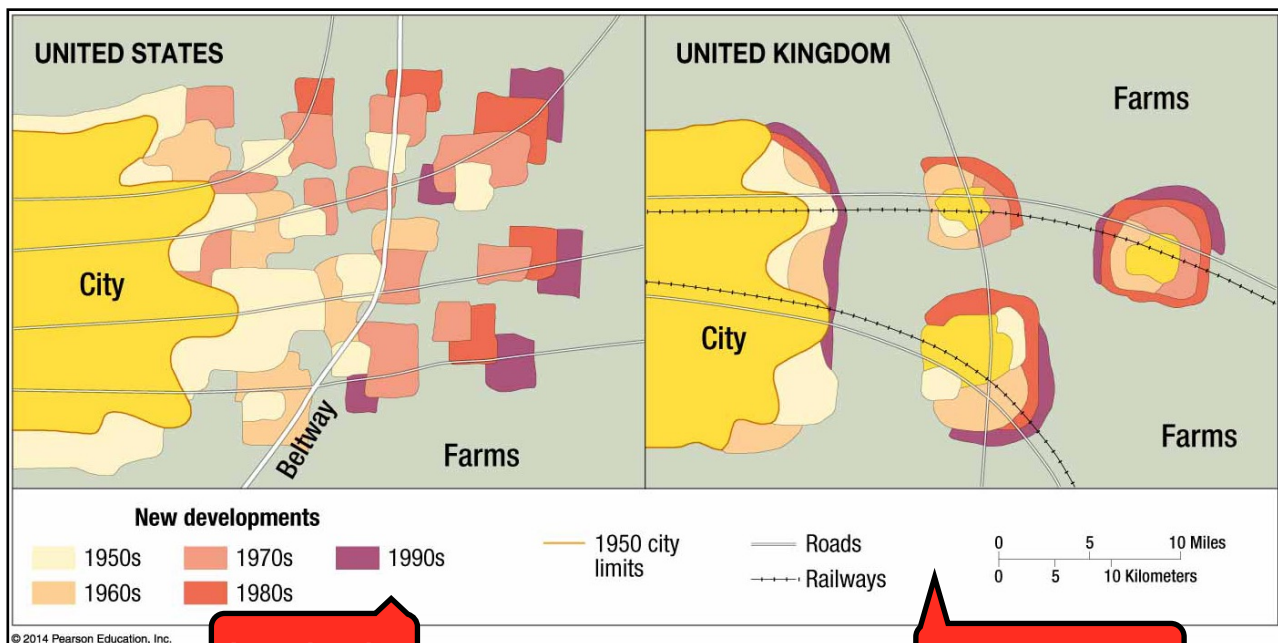
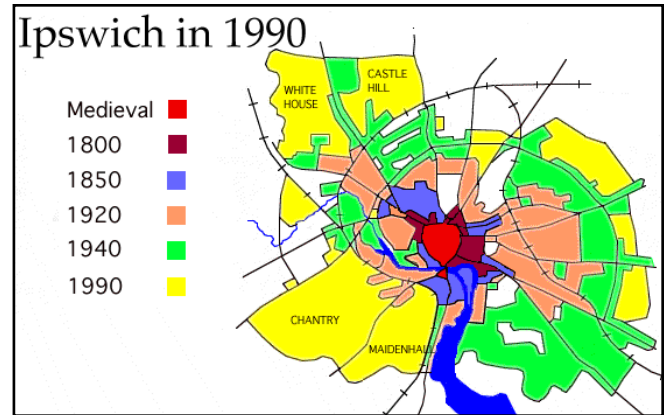
Around the world, urban centers are structured around a variety of different models and cultural values. The following sections are a brief synopsis of the urban landscapes in various regions.

Unlike American cities, European urban areas struggle with older infrastructure and urban development. Most American cities outside of the thirteen original colonies are less than 150 years old, and all major cities west of the Appalachian Mountains were developed after train technology became available to them. In contrast, Europe has urban centers more than 2,000 years old. All the land has long been owned by the families of the landed elite since the lower classes had been serfs bound to the land as labor. The CBDs were highly

developed as the playground for the wealthy, with the poor living on the outskirts. With each new form transportation technology, a new layer or level was built on the outskirts of each city. This map displays Ipswich, England, an urban center just north of London. Each color area displays growth by era around its initial medieval hearth; each era building upon the previous. Other older cities modernized through sections of the city being torn down and rebuilt. London experienced three great fires or bombing campaigns that leveled large parts of the city between 1666-1950. This gave London the opportunity to rebuild, modernize, and stay functionally relevant. Similarly, in 1850, Napoleon III destroyed large parts of Paris to rebuild it around industrial principles.

European cities differ from American cities other ways as well:

- **More people, less space.** European urban population density is significantly higher than in the USA because each state has only a small amount of available land. This impacts many of the decisions Europeans make regarding zoning choices, to maximize the urban land use, and minimize encroachment onto limited rural lands.
- **Rails over Roads.** Because of the higher density, European cities promote the use of railways over highways. It is not that Europeans do not have cars, it is that Europeans are highly discouraged from having cars. Heavy taxes and fees are placed onto cars, car parts, gasoline and parking spaces. In 2013, US gasoline prices reached their highest price in recent history at \$4.50 per gallon; in the UK gasoline regularly costs \$9.50 per gallon. This creates a financial incentive to use public transportation instead of personal vehicles encouraging urban centers to form and grow around passenger train stations. The cities only grow to the extent that the public transportation services provides access. Once people get off the trains, they will travel as far as the bus systems will take them. Otherwise, people are left to walking, and since people will only walk so far for a business or service, it limits the amount of urban sprawl, instead creating high density urban clusters.



**Low density
sprawl along
highways**

**Small, Dense
Pop Clusters
along railways**

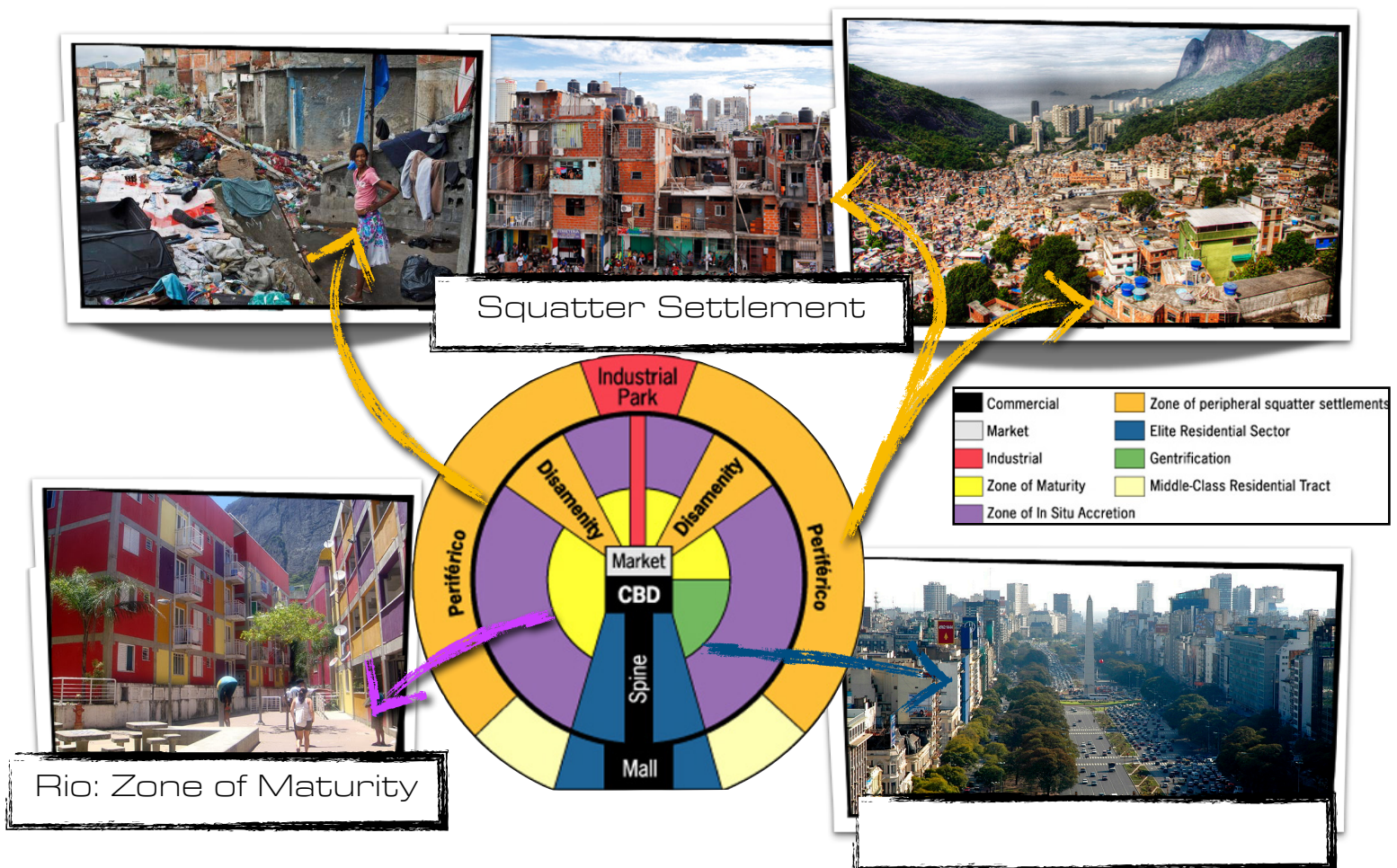


- **Mixed-Use Zoning.** Because of the high density in European cities, there is greater application of mixed-use zoning. In Paris, the government zoned the metropolitan area into *arrondissements*, or neighborhoods. Within these arrondissements every basic need can be met within a 20 minute walk of an apartment: doctor, dental, grocery, and access to mass public transportation.
- **Truly Historic Downtowns.** As discussed above, European cities have truly historic downtowns with strong cultural relevance. They keep the historical buildings in the center of the city, refusing to tear them down. Instead, the modern buildings are built in the new edge cities. For example, in Paris, downtown has the Eiffel Tower, the Arch De Triumph, the Opera House, Les Invalides, Notre Dame, the Latin Quarters.... so many sites that are treasured by Parisians and by tourists around the world. As Paris's population expanded, an edge city arose called La Defense.
- **Poverty Location.** In European cities, everyone lives in a high density housing. The HEART of the city is the location of best services, entertainment, work opportunities, and public transportation. The wealthy position themselves in the best, most centralized locations near the CBD. Meanwhile, poverty is located in the outskirts of the urban spaces where the most affordable public housing and low-cost of living options are setup. This is opposite the American system, where the edge cities and suburbs are the centers of wealth while the inner city is the center for poverty.

Latin American Model

In Latin America, the major urban centers follow the Griffin-Ford Model. Most of the established urban areas in Latin America were established when they were colonized by the Spanish and Portuguese. The cities were setup to be most convenient for the rich colonizers who were wanting to live lavish lives while exporting cheap natural resources, giving the worst spaces to the natives (see image on the following page):

- At the center is the CBD acting as the chief employment region for the city.
- The Industrial park agglomerates manufacturing for the region. This is typically bulk loss, located near the available natural resource and the low-skill, low-pay labor, on low cost land.
- The Spine is the tree-lined boulevard and the location of the hotels, hospitals, museums, stadiums, theaters, etc. Surrounding the spine is middle and high class housing. A person's housing location is a status symbol of their wealth: the closer to the CBD means wealthy, the farther away equating to poverty.
- The Zone of Maturity is composed of well established communities with nice amenities: access to public transportation, electricity, water, sewage, etc. The Zone of In Situ Accretion is an area being developed. The rate of development is subject to the health of the economy. Many of the developments are not yet connected to the public infrastructure causing the residents to have to travel for clean water or electricity.
- The Periférico and Disamenity Zones are home to illegal squatter settlements, known as *barrios* or *favelas* and are built along the worst terrain - either extremely mountainous, in a flood plain, or next to a trash heap/open sewer. The housing is poorly made, using scrap parts from trash dumps. They are disconnected from any public infrastructure or sanitation, forcing residents to travel by foot for clean water, food, or electricity.



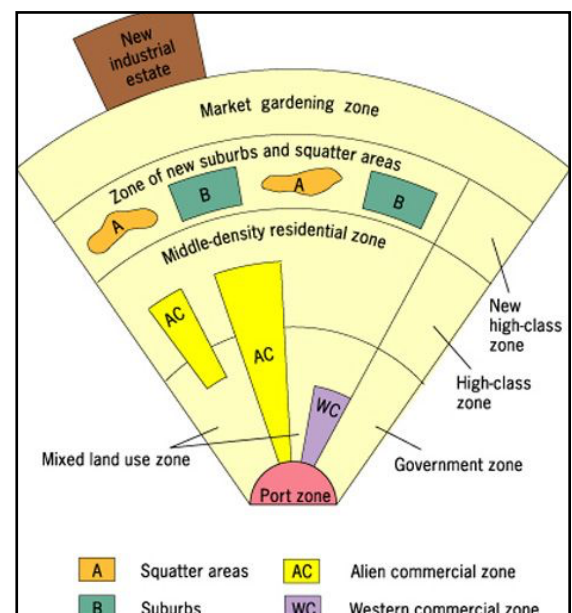
APPLICATION #2

Contrast the CBD, Zone of Maturity, and Disamenity/Squatter Settlements. What does this show about life during Colonization?

Southeast Asian Model

Many of the major Southeast Asian cities were also setup during the European colonial era and were primarily built along the coast line to serve as trading ports, bringing spices and raw materials from Asia to be manufactured at European factories or sold to European markets. Thus, the port is at the very heart of the city, serving as its economic heartbeat and connection to the broader global market.

- There are two different commercial zones: Western and Alien. The *Alien Commercial Zone* consists of ethnic Chinese that have migrated and created an ethnic enclave. Chinese make up anywhere from 10-40% of the population within a Southeast Asian port city. The *Western Commercial Zone* was setup by the Europeans with all the common Western amenities: corporate headquarters, hotels, luxury shops, convention centers, retail outlets, etc.
- The government zone is the location of the political buildings and government headquarters.
- A vast majority of land is zoned for mixed-use and consists of high density housing and urban services.



- With recent industrialism, there is a rising middle class starting to create its own middle-to-upper class housing. High class zones have luxury homes, gated communities, and the latest neighborhood amenities.
- At the edge of the city are the market gardening (#VonThunen) and squatter settlements. This is the border of agricultural activity where there are unclear property rights. In this space, the impoverished set up their illegal shantytown/squatter settlements.

Most Southeast Asian cities have earned their wealth by functioning as gateway cities and exporting fish. As a region moves from Rostow's Stage 2 to Stage 3, they are beginning to develop their own industrial zones around Fordist production of textiles, plastic toys, and electronic parts.

Cities that serve as examples of this form are: Singapore, Ho Chi Minh City, Jakarta, Manila, Bangkok, and Hanoi.



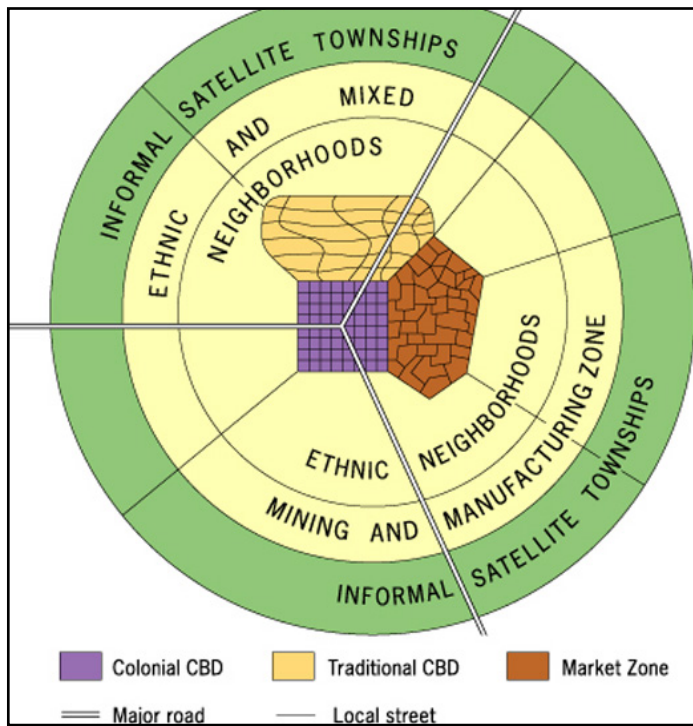
Sub-Saharan African Model

Given the diversity on the continent, there is not one African urban model, but several, merging the common generalities together.

Most major modern sub-saharan African cities were the result of European colonial rule. Many of these cities were setup as mining or resource extraction locations. In the middle of the urban center are two rather distinctive elements: the Western CBD and the Traditional and/or Market CBD. The Western or Colonial CBD contains grid streets, public infrastructure, vertical architecture, hotels, government, and financial centers. The Western CBD has everything needed to be a modern growth pole. The traditional and market CBDs house single story buildings where locals sell their products, conducting business on street curbs or in little store fronts. Financially successful urban centers have established ethnic neighborhoods with modern infrastructure installed. On the outer ring are bulk-loss industries and processing centers, located on whichever side of the city is closest to the resource being mined and processed.

Most African states have a strong mixture of nationalities living in the city and state; reflected in its urban ethnic enclaves. African cities have the highest in-migration rates in the world. People move from rural, impoverished areas hoping for a chance at a job and to build a future. They settle in sprawling shantytowns/squatter settlements on along the edge of the city in hopes of building a better life.

Examples of cities that resemble this model are: Kinshasa (Congo), Nairobi (Kenya), Harare (Zimbabwe), Dakar (Senegal), Abidjan (Ivory Coast), Luanda (Angola), Maputo (Mozambique).



Nairobi: Colonial CBD



Luanda: Colonial CBD



Harare: CBD & Industry



Kinshasa: Shanty Town & Traditional Market

Middle Eastern Model

In the Middle East, major urban centers resemble rings on a tree - each ring representing a different era of its existence. Like Europe, many of these urban areas are hundreds, if not thousands, of years old. At the heart is the most historic center, with a citadel, a major mosque, memorial architecture, and city walls. Streets are narrow and winding. Vendors still meet in open markets to sell their wares. Everything is built around walking. As technology advanced, a new “layer” of expansion was added. Outside of the Old City, there is a ring of buildings representative of the colonizers who controlled the cities during the mid-1800s to mid-1900s. After this year, the architecture progresses rapidly, showing evidence of modern development. In the modern city, everything changes. Walking is replaced by high speed trains and cars. Commerce changes from bartering markets to multinational brands and shopping malls. Housing evolves from two story houses to skyscrapers and high density housing. The environmentally determined center transitions to the possibilists’s dream - building islands in the sea and ski resorts in the desert.

Cities that serve as examples: Kuwait City (Kuwait), Dammam (Saudi Arabia), Abu Dhabi (UAE), Dubai (UAE).

