SECTION 2

Urban Land Use

Objectives

- Describe the urban crisis, and explain what people are doing to deal with it.
- Explain how urban sprawl affects the environment.
- Explain how open spaces provide urban areas with environmental benefits.
- Explain the heat-island effect.
- Describe how people use the geographic information system as a tool for land-use planning.

Key Terms

urbanization
infrastructure
urban sprawl
heat island
land-use planning
geographic information system (GIS)

People live where they can find the things that they need and want, such as jobs, schools, and recreational areas. For most people today, this means living in an urban area.

Urbanization

The movement of people from rural areas to cities is known as **urbanization.** People usually leave rural areas for more plentiful and better paying jobs in towns and cities. In developed countries, urbanization slowed in the second half of the 20th century. In 1960, 70 percent of the U.S. population was classified as urban. By 1980, this percentage had increased only slightly to 75 percent. As urban populations have grown, many small towns have grown together and formed larger urban areas. The U.S. Census Bureau calls these complexes metropolitan areas. Some examples are Denver-Greeley-Boulder in Colorado and Boston-Worcester-Lawrence in Massachusetts. **Figure 5** shows the expansion of the Washington, D.C.–Baltimore metropolitan area over the years. These maps were created using data from the U.S. Census Bureau.

Urban areas that have grown slowly are often relatively pleasant places to live. Roads and public transportation in these areas have been built to handle the growth, so that traffic flows freely. Buildings, roads, and parking lots are mixed in with green spaces and recreational areas. These green spaces may provide these urban areas with much needed ecosystem services such as moderation of temperature, infiltration of rainwater runoff, and aesthetic value.

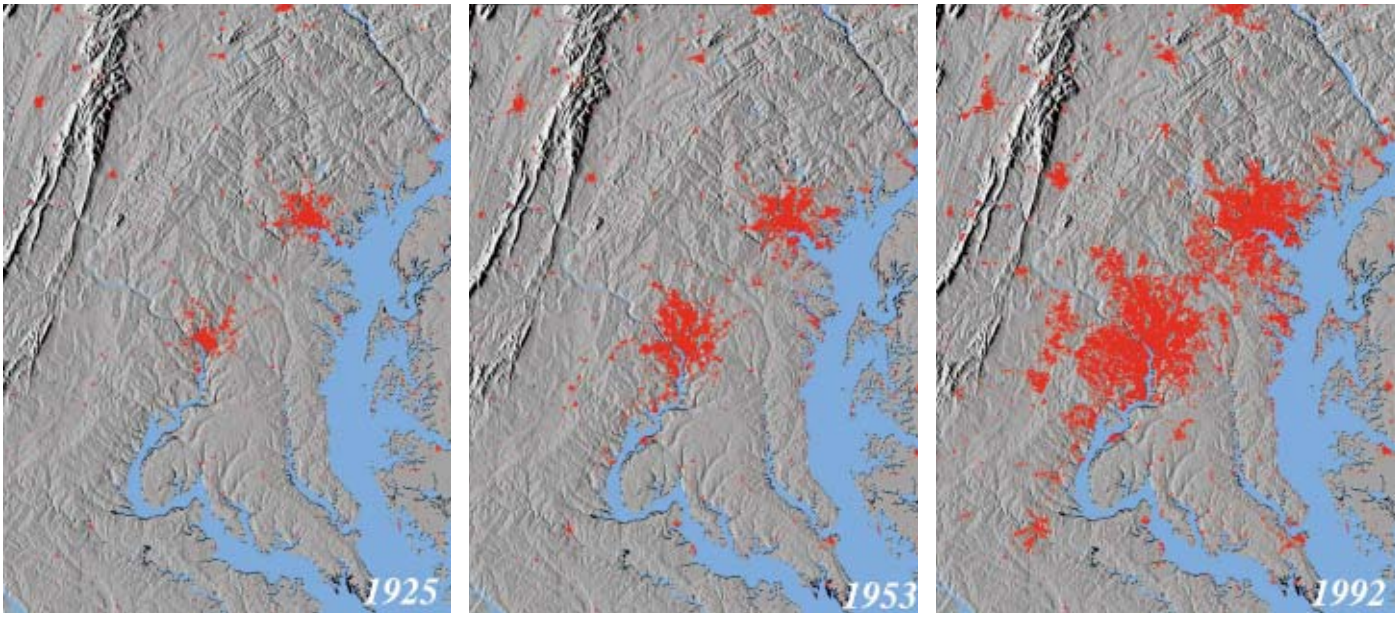


Figure 5 ▶ The Washington, D.C.–Baltimore area has grown larger and more densely populated over the years. Red areas indicate urban development.

The Urban Crisis When urban areas grow rapidly, they often run into trouble. A rapidly growing population can overwhelm the infrastructure and lead to traffic jams, substandard housing, and polluted air and water. **Infrastructure** is all of the things that a society builds for public use. Infrastructure includes roads, sewers, railroads, bridges, canals, fire and police stations, schools, libraries, hospitals, water mains, and power lines. When more people live in a city than its infrastructure can support, the living conditions deteriorate. This growth problem has become so widespread throughout the world that the term *urban crisis* was coined to describe the problem. **Figure 6** shows an example of urban crisis in Hong Kong. The hillside is covered with substandard housing in an area that lacks the necessary infrastructure for people to live in healthy conditions.

Urban Sprawl Rapid expansion of a city into the countryside around the city is called **urban sprawl.** Much of this growth results in the building of suburbs, or housing and associated commercial buildings on the boundary of a larger town. People living in the suburbs generally commute to work in the city by car. Many of these suburbs are built on land that was previously used for food production, as shown in **Figure 7.** In 2000, more Americans lived in suburbs than in cities and the countryside combined. Each year suburbs spread over another 1 million hectares (2.5 million acres) of land in the United States.

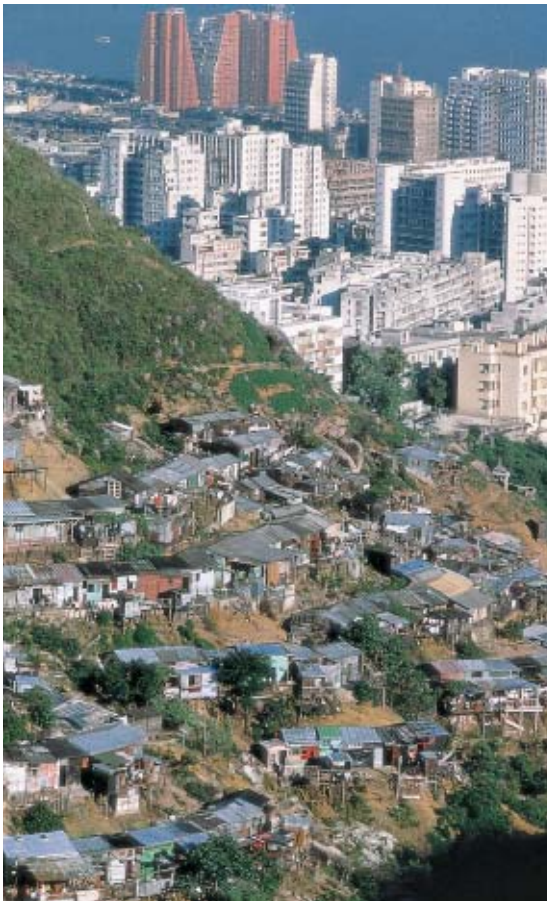


Figure 6 ▶ Rapid urban growth has led to substandard housing on the hillsides above Hong Kong.

FIELD ACTIVITY

Local Urban Sprawl On your way home from school, observe your surroundings. In your ***EcoLog,*** write down any signs of urban sprawl that you observed. What criteria did you use for making this assessment?

Figure 7 ▶ This photograph shows suburban development spreading out around Maui, Hawaii.

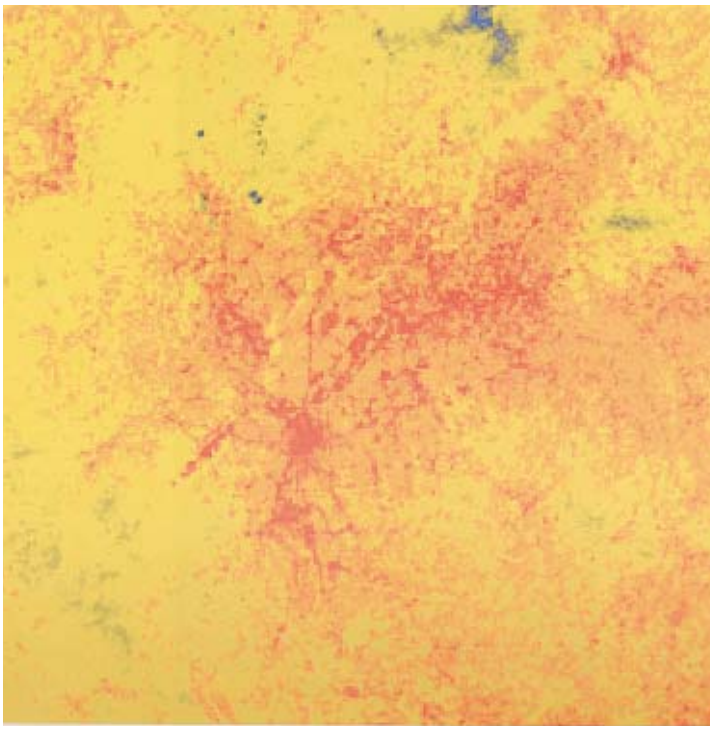
Figure 8 ▶ The search for ocean views lead people to build these homes on the California coastline, which is giving way as a result of erosion.

Connection to Geology

Flood Plains Rivers naturally flood their banks every so often. The potentially flooded area near a river is known as the flood plain. People increasingly build on flood plains, such as around the Mississippi River. Damage to buildings on flood plains often runs into the billions of dollars every year.

Development on Marginal Lands Many cities were first built where there was little room for expansion. As the cities grew, suburbs were often built on *marginal land*—land that is poorly suited for building. For example, Los Angeles and Mexico City are built in basins. These cities have expanded up into the surrounding mountains where the slopes are prone to landslides. The houses shown in **Figure 8** were built on land that is unsuited for development because of the natural processes of erosion along the coastline. Structures built on marginal land can become difficult or impossible to repair and can be expensive to insure.

Figure 9 ▶ The urban heat island over Atlanta is shown in this computer-enhanced aerial view. Areas with higher temperatures appear red.



Other Impacts of Urbanization Environmental conditions in the center of a city are different from those of the surrounding countryside. Cities both generate and trap more heat. The increased temperature in the city is called a **heat island.** Heat is generated by the infrastructure that makes a city run. Roads and buildings absorb more heat than vegetation does. They also retain heat longer. Atlanta, Georgia, is an example of a city that has a significant heat island, as shown in **Figure 9.**

Scientists are beginning to see that heat islands can affect local weather patterns. Hot air rises over a city, cooling as it rises, and eventually produces rain clouds. In Atlanta and many other cities, increased rainfall is a side effect of the heat island. The heat-island effect may be moderated by planting trees for shade and by installing rooftops that reflect rather than retain heat.

Urban Planning

Land-use planning is determining in advance how land will be used—where houses, businesses, and factories will be built, where land will be protected for recreation, and so on. Land-use planners determine the best locations for shopping malls, sewers, electrical lines, and other infrastructure.

In practice, making land-use plans is complex and often controversial. The federal government requires developers to prepare detailed reports assessing the environmental impact of many projects. And the public has a right to comment on these reports. Developers, city governments, local businesses, and citizens often disagree about land-use plans. Projects that affect large or environmentally sensitive areas are often studied carefully and even bitterly debated.

Intelligent Design Land-use planners have sophisticated methods and tools available to them today. The most important technological tools for land-use planning involve using the geographic information system.

A **geographic information system (GIS)** is a computerized system for storing, manipulating, and viewing geographic data. GIS software allows a user to enter different types of data about an area, such as the location of sewer lines, roads, and parks, and then create maps with the data. **Figure 10** shows several GIS images of Seattle, Washington. Each image corresponds to a different combination of information. The power of GIS is that it allows a user to display layers of information about an area and to overlay these layers, like overhead transparencies, on top of one another.

Connection to History

Ancient Urban Planning
People have practiced urban planning for thousands of years. The ancient Mexican city of Teotihuacan was a marvel of urban planning. The city had a grid plan oriented to 15 degrees, 25 minutes east of true north. It had two central avenues that divided the city into four quadrants. About 2,000 homes and apartment compounds lined the main avenue, which also had a channel running under it that gathered rainwater. Teotihuacan had all this—before 750 CE.

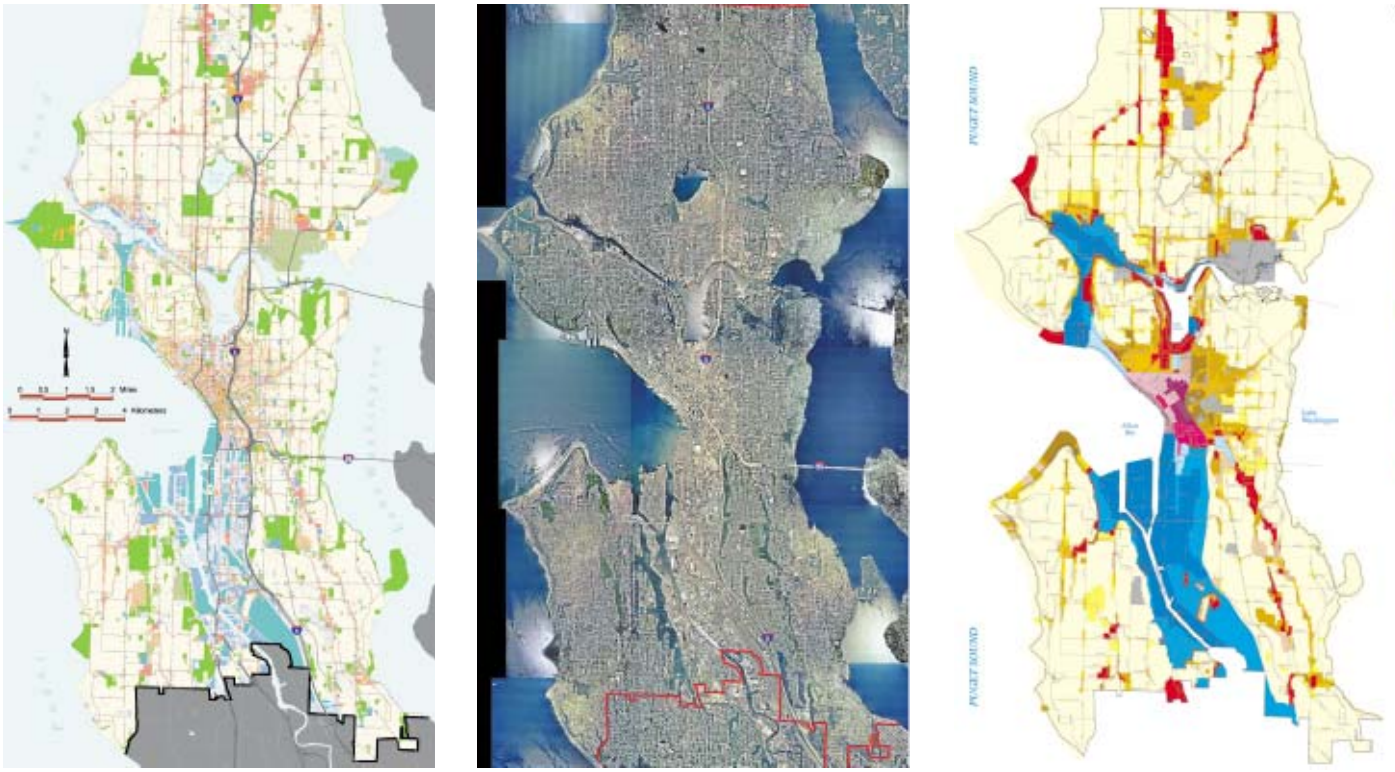


Figure 10 ▶ The images below are of Seattle, Washington. Each image represents a different GIS layer, each with specific information.

Figure 11 ▶ This mass transit system in California's San Francisco Bay Area moves thousands of people a day with much less environmental impact than if the people took individual cars instead.

Transportation Ask any urban dweller to name the main annoyance of big-city life, and the answer is likely to be "traffic." Most cities in the United States are difficult to travel in without a car. Many U.S. cities were constructed after the invention of the automobile. In addition, availability of land was not a limiting issue, so many American cities sprawl over large areas. By contrast, most cities in Europe were built before cars, have narrow roads, and are compact.

In many cities, *mass transit systems* were constructed in order to get people where they wanted to go. Mass transit systems, such as the one shown in **Figure 11**, use buses and trains to move many people at one time. Mass transit systems save energy, reduce highway congestion, reduce air pollution, and limit the loss of land to roadways and parking lots. Where the construction of mass transit systems is not reasonable, carpooling is an important alternative.

Open Space *Open space* is land within urban areas that is set aside for scenic and recreational enjoyment. Open spaces include parks, public gardens, and bicycle and hiking trails. Open spaces left in their natural condition are often called *greenbelts*. These greenbelts provide important ecological services.

Open spaces have numerous environmental benefits and provide valuable functions. The plants in open spaces absorb carbon dioxide, produce oxygen, and filter out pollutants from air and water. The plants even help keep a city cooler in the summer. Open spaces, especially those with vegetation, also reduce drainage problems by absorbing more of the rainwater runoff from building roofs, asphalt, and concrete. This ecological service results in less flooding after a heavy rain. These open spaces also provide urban dwellers with much-needed places for exercise and relaxation.

SECTION 2 Review

1. **Describe** the urban crisis, and explain how people are addressing it.
2. **Explain** how urban areas create heat islands.
3. **Explain** how open spaces provide environmental benefits to urban areas.
4. **Describe** how urban sprawl affects the environment.

CRITICAL THINKING

5. **Identifying Relationships** Write a short paragraph in which you describe the benefits of using a geographic information system for land-use planning. WRITING SKILLS
6. **Making Decisions** Describe the environmental implications of urban sprawl.