

HOW DOES SETTLEMENT AFFECT THE ENVIRONMENT?

If you had lived 1000 years ago, what would your life have been like? You probably would have lived with a small community of people. Your settlement would have had little impact on the environment. Today, there is a global population of 7.3 billion. As every year goes by, more of us are moving to cities. Now more than 450 cities have a population over 1 million.

Our settlements now affect the environment in significant ways. Growing populations need water, food, land, and other resources, such as electricity and a system of sewage disposal. In both rural and urban areas, these needs can put stresses on the air, water, and soil, and can create different kinds of pollution.

LIGHT POLLUTION

Cities now produce so much light that it is affecting animals. **Light pollution** is the brightening of the night sky with artificial light (Figure 3.10). Light pollution can change the behaviour of insects, birds, sea turtles, fish, and mammals. The unnatural light causes disorientation. Lights in skyscrapers that are left on all night result in the deaths of nearly one billion birds every year. Birds, especially those migrating at night, strike the windows because they are attracted to the lights.

FIGURE 3.10 The city of Chicago, United States, shown here, is working to reduce the huge amounts of light pollution it creates.

I wonder how we could get people to turn off the lights in empty skyscrapers at night?



light pollution the brightening of the sky with human-made light

AIR POLLUTION

A **pollutant** is something that pollutes or contaminates, such as carbon monoxide from car exhaust. About 90 percent of city dwellers in Europe, including those in Paris, France, breathe in polluted air (Figure 3.11). When people are exposed to pollutants, their health can be harmed.

According to the World Health Organization, in 2014, air pollution in most cities was getting worse. As urban populations increase, they produce more pollution than settlements with fewer people. As well, pollutants tend to be concentrated over urban areas. The air is often cleaner in less populated areas, away from cars and factories.

Large cities produce more pollutants overall than rural areas or suburban communities. However, high-density cities sometimes produce less pollution per person than rural areas or sprawling lower-density cities. Why? In rural areas and suburban areas, families drive more. Urban families in the United States drive 11 200 fewer kilometres and use one-third less total energy than rural families. However, in sprawling cities, such as Houston, people must travel farther distances to work. They use cars and other types of transit, which can create large amounts of greenhouse gases.

pollutant something that contaminates, making air, land, and water unsafe or unusable

If pollution continues to get worse, how might this affect settlement patterns in the future?

FIGURE 3.11 In March 2014, Paris, France, was suffering from very high levels of air pollution. To reduce the pollution, the city offered free public transportation for three days.

I wonder if more people in Paris now use public transit?



WATER AND SOIL POLLUTION

As cities grow, they need to provide clean water for their populations. Cities also need to deal with the waste that their residents produce. This waste can include liquids from baths, toilets, and sinks; waste liquids from industries or manufacturers; and stormwater runoff. Wastewater needs to be treated so pollutants are removed before it is returned to any waterways. Solid waste, or garbage, also needs to be disposed of in a way that does not harm waterways or the land.

Not all cities can meet these needs. They may not have enough money. They may have poor **infrastructure**, which means they lack the services they need to function. Untreated sewage, which includes human waste, is a major source of water pollution. About 80 percent of sewage around the world is untreated and flushed into waterways. As more people migrate into cities with poor wastewater treatment, the problem will get worse. The sewage systems in many cities are already overloaded.

The more than 9 million residents of Jakarta, Indonesia, create more waste than the city can manage. As a result, much of the garbage is thrown directly into local rivers. Some factories dump toxic waste into the rivers as well. The Citarum River, which runs through Jakarta, is one of the most polluted rivers in the world (Figure 3.12). Despite the pollution, the Citarum is the only water source for millions of Indonesian people who live along the river.

Landfill sites are places where garbage is buried under the soil. The landfill sites in many cities are full, and they struggle to find new sites for storing waste safely. Many waste materials, especially electronic waste such as computers and televisions, contain toxic pollutants. As the waste breaks down, pollutants can be released into the soil and pass into waterways. This can threaten the local freshwater supply. Pollutants from landfills can eventually reach the ocean.

MALE AND ITS ISLAND OF GARBAGE

Many cities have environmental laws in place to protect the air, rivers, and soil by controlling the dumping of waste. Others have created problems by dumping their waste irresponsibly. For example, Male is the capital of the Maldives, an island nation south of India. Male is the most populated city in the Maldives. Ten thousand tourists a week visit the Maldives, creating a huge amount of garbage. There is no space in Male to store all of this waste.

In 1991, Male created an artificial island, Thilafushi, to deal with its garbage problem. Built on a coral reef, Thilafushi is used as a dump site (Figure 3.13). Now there are mountains of garbage on the island. Smoke from the burning waste pollutes the air. Hazardous waste, such as asbestos and lead, is mixed with solid waste. It seeps into the ocean, harming local ecosystems. So much garbage is brought to Thilafushi that the island expands by a square metre every day. Many people worry that “garbage island” will affect tourism in the Maldives, in addition to damaging the environment.

FIGURE 3.12 People search for recyclable plastic among the waste in the Citarum River, Indonesia.

I wonder what health risks are faced by children living near this river?

infrastructure the basic equipment and services that a city or country needs to function well, such as roads, bridges, and schools

What is the connection between overcrowded urban areas and pollution?

landfill site a place where solid waste is buried under the soil



FIGURE 3.13 This garbage has been dumped on the island of Thilafushi, in the Maldives.

I wonder how we can prevent illegal dumping of waste?

DEFORESTATION

Forests absorb and store carbon. This reduces the effects of carbon dioxide emissions, which cause global warming. However, forests near cities are often cut down to make way for new factories and housing. **Figure 3.14** shows new housing built where there were once trees near Panama City, Panama. A 2013 report stated that 2.3 million km² of forest were lost worldwide between 2000 and 2012. Only 800 000 km² of forest were added.

Is urbanization having an effect on forests everywhere? According to the UN, it is not. The rate of deforestation may decline when countries become wealthier and when more of their population lives in cities. People rely less on wood for fuel and heat. They use renewable sources instead. They may begin to protect their forests instead of cutting them down for firewood.

This is not always the case, however. For example, according to one 2014 report, Canada, a wealthy nation with a high urban population, damaged more hectares of untouched forests than any other country in the world. As well, because urban populations tend to be wealthier than rural populations, they buy and use more animal products, such as meat or dairy products. However, producing animal products requires large amounts of land. Grazing animals need space. As well, it can take 5 to 7 kg of grain to produce every kilogram of beef, and this grain also requires farmland to grow. Often forests are cut down to provide this land. For example, in South America, 70 percent of Amazon forests have been cut down to provide land for grazing.

What is the relationship between forests and wealthy countries?

FIGURE 3.14 This area on the edge of Panama City, Panama, was once a forest. Now it is the site of a new housing development. Panama City has the largest urban population in Central America.

I wonder how the wildlife that lived here was affected by the deforestation?



LOSS OF ARABLE LAND

As populations increase, there is greater stress on the soil. More people are growing crops and raising livestock. As the soil becomes over-farmed, it loses nutrients. The soil dries up and blows away. Eventually the land is no longer arable. As you learned in Chapter 2, this process of soil degradation leads to desertification. Half of the world's topsoil has been lost in the last 150 years.

Increasing desertification means that people must migrate to find new land for farming. If they cannot find arable land, farmers may move to urban areas to find other work. However, even some cities are feeling the effects of desertification. For example, Nouakchott, Mauritania, is slowly being covered by desert sand (**Figure 3.15**). Many people have moved to Nouakchott from more rural areas in the past few decades because of drought. As the land outside the city becomes desertified, fewer people can survive there.

According to the UN, urbanization is also affecting the amount of arable land. For example, when people build structures, or use land for industry, that land is no longer available for farming. As well, it makes surrounding land less fertile. To fight against the loss of arable land, some urban communities are trying to increase local food production by turning open spaces—including backyards, parks, and even rooftops—into gardens for growing vegetables.

FIGURE 3.15 Settlements near the edge of Nouakchott, Mauritania, are being covered by the sands of the Sahara Desert. Nouakchott is the largest city in the Sahara Desert.

I wonder how it feels to live in a city on the edge of a desert?



GATHER AND ORGANIZE

To investigate a geographic topic, you need to gather information. Start by identifying sources that are reliable. Then read through the sources to find data or examples that connect to the topic.

Sometimes organizing your data in a visual way can help you see patterns and make connections between ideas. Choosing the right graphic organizer can often lead you to an answer to your research question (see **Figure 3.16**).

Graphic Organizer	Best For ...
Venn diagram	comparing and contrasting two or three sets of data; finding overlap in sets of data
fishbone organizer	analyzing causes and effects
flow chart	showing steps in a process
concept map	showing connections between ideas

FIGURE 3.16 Graphic organizers can be used to present different types of information.

Read this case study, then practise gathering and organizing using what you have read.

CASE STUDY: ELEPHANT CORRIDORS

Asian elephants are highly endangered. There are fewer than 35 000 Asian elephants worldwide. Healthy elephant populations need large numbers of elephants in each herd. The herds need big territories to live in, away from humans. However, their territory is becoming smaller and more fragmented as human settlements expand.

The World Land Trust and the Wildlife Trust of India are two groups that are working to create wildlife corridors. Wildlife corridors are routes within populated areas through which animals can travel safely (**Figure 3.17**). So far, 88 elephant corridors have been identified.

FIGURE 3.17 This wildlife corridor in India connects two areas of elephant habitat. The sign warns drivers that elephants have the right of way.

The World Land Trust and the Wildlife Trust of India raise money to help move settlements that are located in these corridors. These groups help people find land where they can farm away from elephants and help to build new houses. Local people are hired to help replant forests on the farms that have been left behind.

There are challenges to building wildlife corridors, such as controlling traffic through protected areas and moving already settled populations. However, these corridors are a lifeline for the Asian elephants of India.

TRY IT

1. Create a graphic organizer to gather what you have read about elephants and wildlife corridors. Explain why you chose this graphic organizer.
2. Use the Internet to locate more information about elephant corridors. Add this information to your graphic organizer.
3. Gather information about wildlife corridors in Canada or another part of the world. Use a graphic organizer to summarize the impacts of these corridors on humans and wildlife.

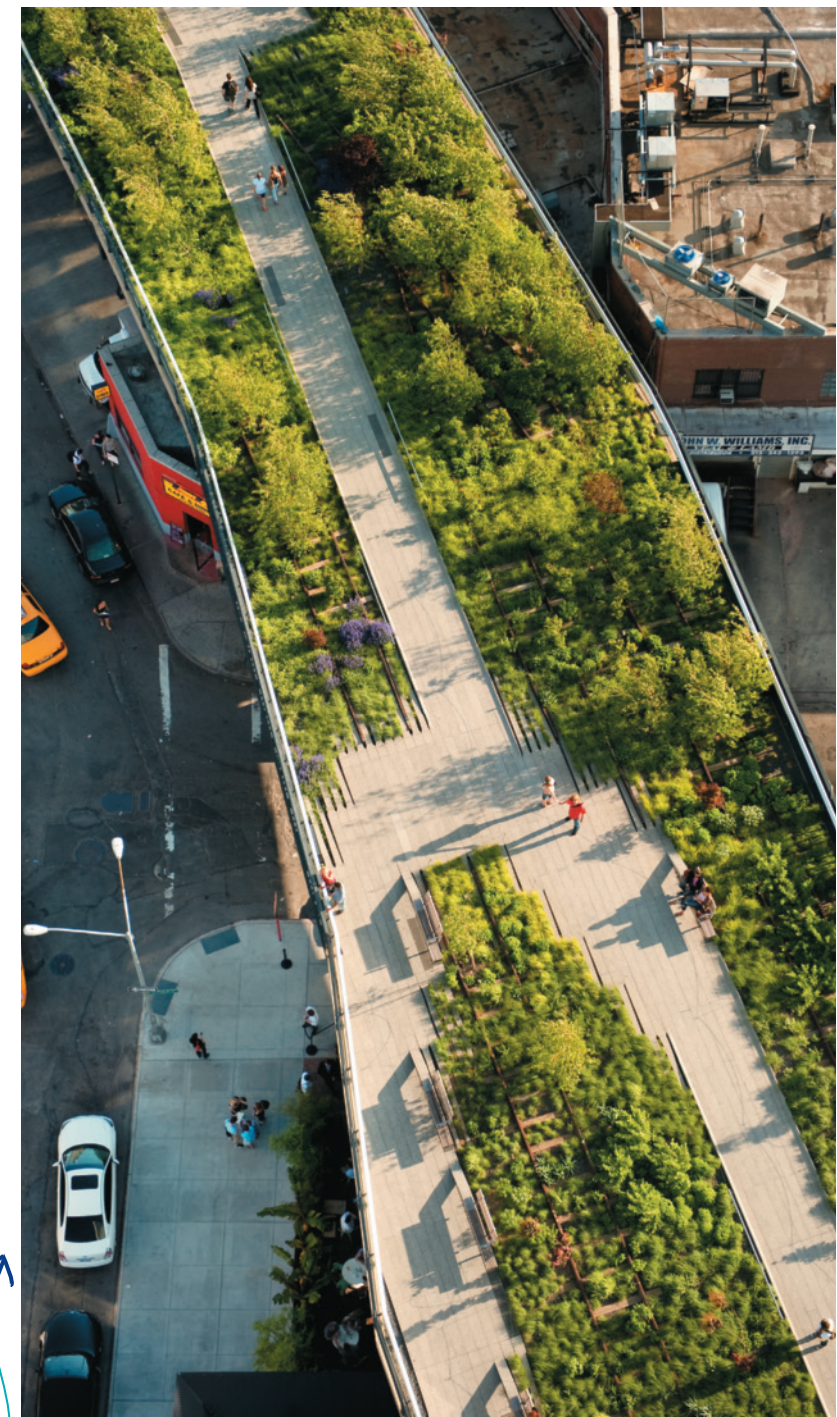


LOSS OF HABITAT

As cities grow, they can create gaps and barriers between one area of wildlife habitat and another. Animals cannot use their full territories or migrate from place to place. Urban sprawl can destroy entire forests, grasslands, and wetlands. When habitat is destroyed, animals are forced to move. Animals and plants that cannot adapt are reduced in number or die. The result is an increase in the number of species becoming extinct. For example, there are only 690 000 elephants remaining in Africa. One of the key threats to them is habitat loss.

The extinction of species threatens biodiversity, which is the variety of life on Earth. Loss of biodiversity reduces the ability of all living things to survive. As settlements grow and change, people need to consider their impact on wildlife. Urban planners in many cities have created parks to provide habitat for wildlife and a place where people can connect with the natural world (**Figure 3.18**). In the next chapter, you will learn more about ways that settlements can reduce their impacts on the environment.

FIGURE 3.18 The High Line is a public park in New York City, United States. It is built on part of an old rail line raised above the city streets.



I wonder how many different species of plants and animals live in this park?

CHECK-IN

1. **COMMUNICATE** Use a graphic organizer to summarize the impacts of settlement on the environment.
2. **EVALUATE AND DRAW CONCLUSIONS** Do you think people in wealthier, more developed countries cause more forest loss than people in other countries? What information would you need to prove your opinion? Explain.
3. **SPATIAL SIGNIFICANCE** Draw two simple maps, one showing a dense city and another showing a sprawling city, to illustrate what you know about urban sprawl and the kinds of environmental problems it can create.
4. **GEOGRAPHIC PERSPECTIVE** Describe two things that a sprawling city can do to reduce its environmental impact.