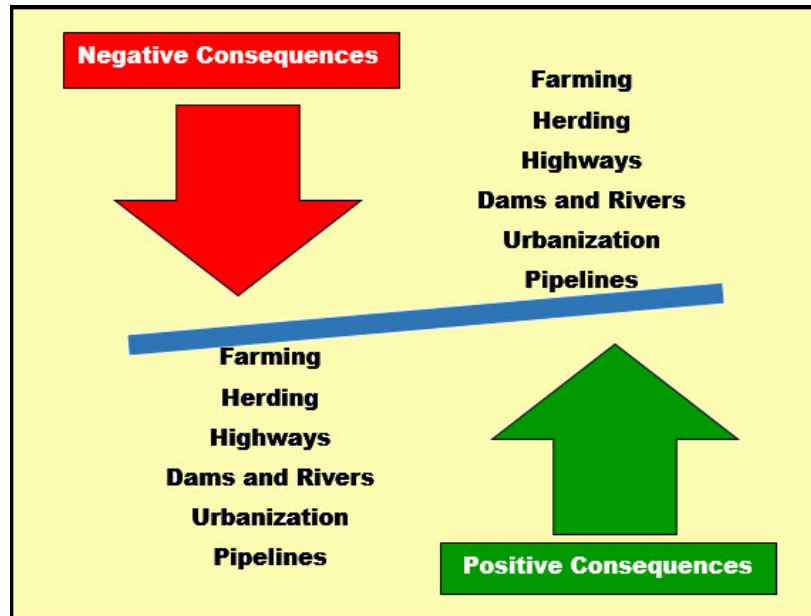


## CHANGING THE PHYSICAL ENVIRONMENT



### Unit Overview

To meet their needs and to improve their lives, the people of the Eastern Hemisphere have adapted to their physical environment in a wide variety of ways. Sometimes, however, this simply not enough to accommodate the world's growing population. As a result, people have tried to change their surroundings. As you will see in this unit, this has had both intended and unintended consequences.

### Why People Change their Physical Environment

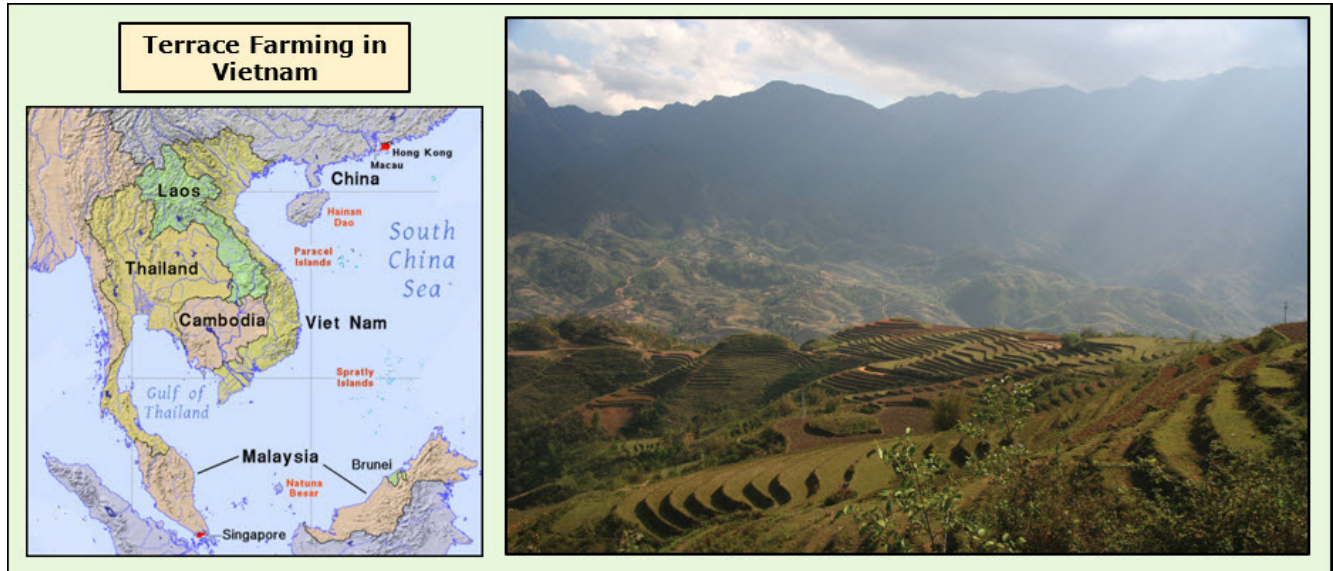
The physical environment of the Eastern Hemisphere influenced human activity. People found food, built shelters, and wore clothes based on the climate, landforms, and waterways surrounding them. At first, they simply adapted to the conditions where they lived so that they could meet their needs and make life better. As time went on, however, advancements in science and technology eventually led humans not only to adapt to their environment but to change, or **modify**, it.

Farming and herding were some of the first steps that people took to control the world around them. The construction of roads, cities, dams, and pipelines followed. The **intended consequences**, or goals, of these modifications were also to meet needs and to make life better. However, changes to the environment also have resulted in **unintended consequences**. These are effects that no one planned for or thought would happen. Farming, herding, highways, dams, urbanization, and pipelines have had both intended and unintended consequences.

### Farming

**Farming** is one of the most common ways to modify the physical environment. Across the Eastern Hemisphere, farmers plow the soil, fertilize it, and plant seeds. They often look for ways to find more land to farm. If the land is too dry, people change the paths of waterways and create irrigation systems. Sometimes more land is made available for planting by cutting steps in steep hillsides. This is called **terrace farming**. The picture below shows a terrace farm located in **Vietnam**. In

other regions, farmers clear forests and grasslands by the **slash-and-burn** method. They cut down plants and trees, burn them, and plant crops. All of these human activities change the physical environment.



Farming has both intended and unintended consequences. The goal of this human activity is to grow healthy plants and to meet the challenge of feeding an increasing world population. Although farmers often meet these goals, agriculture does have unplanned side effects. For example, clearing trees and brush for farmland has caused **deforestation** in some areas. Deforestation occurs when large numbers of trees are lost and new ones are not planted to take their place. Wild animals lose their habitats, and some become endangered. Scientists claim that deforestation contributes to global warming and climate change. A farmer often use pesticides and fertilizers to increase the size of the harvest and to prevent insects from destroying it. When rain washes these same chemicals into creeks and streams, animals, fish, and humans may be harmed unintentionally.

## Herding

In some parts of the Eastern Hemisphere, people raise animals, or **livestock**, to help meet their needs for food and transportation. They include goats, sheep, cows, horses, kangaroos, yaks, and many other animals. Many of these are important to the food supply because they provide meat and dairy products, such as milk, yogurt, butter, and cheese. Along with this intended consequence, herding has also resulted in unintended consequences. To survive, livestock eat plants and grasses. For this reason, herders remove trees and larger plants to encourage the growth of grasslands. Like farming, this practice can lead to deforestation. For example, in the early 1900s, forests covered over one-third of the land in the African nation of **Ethiopia**. Today, only a little over one-tenth of the country's area consists of forests. This is because herders have expanded the grassland to support their cattle. The lack of forests has destroyed the habitats of many animals and has put some, like the Ethiopian wolf, on the endangered list. It has also contributed to the erosion of the soil and climate change.

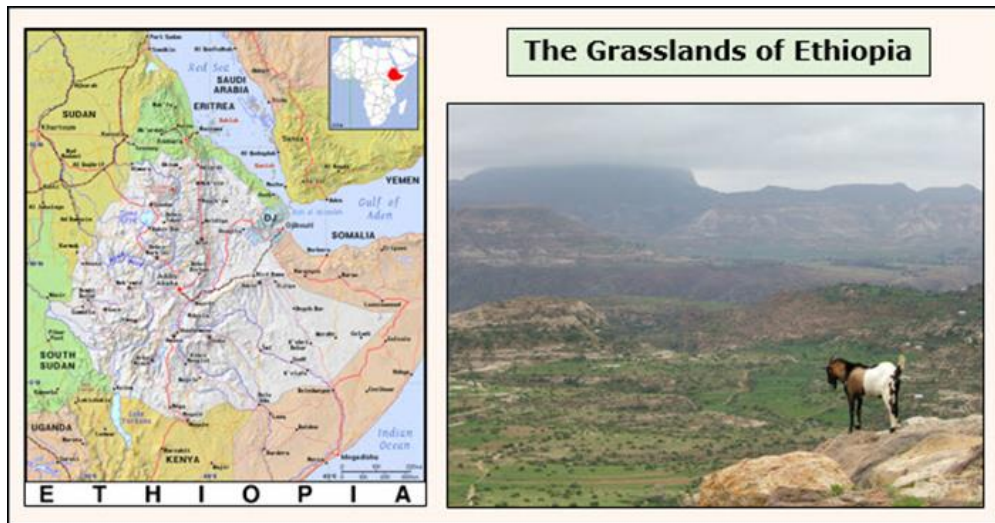


Photo Courtesy of Justin Clements: CC BY 2.0, <https://commons.wikimedia.org/w/index.php?curid=414957>

## Highways

Another way in which humans modify their physical environment to fit their needs is by building roads, highways, bridges, and tunnels. Roads and highways make it possible for the people of the Eastern Hemisphere to get from one place to another in their own cars and trucks. This is an intended consequence of highway construction. At the same time, it makes it convenient for everyone to drive more. This increases the need for bigger and more complicated road networks. A number of unintended consequences occur as a result. For example, to provide better roads, governments must find the money to pay for them. This usually means taking money from something else that is equally important or increasing taxes. More running engines mean more gases and particulates that are harmful to people and their physical environment. The ever-increasing number of cars on the road also leads to traffic jams like this one in **Beijing, China**.

### Traffic Jam in Beijing, China



In earlier times, road construction simply went around mountains and hills. Modern technology, however, has given us heavy equipment that can move millions of tons of soil and rock. Look at the two images below. A rugged mountain range, known as the **Alps**, stands along the border of Switzerland and Italy. The highway that winds through the mountains has long been an important link between the cities of Lucerne, Switzerland and Milan, Italy. It has also been called one of the most dangerous roads in the world.

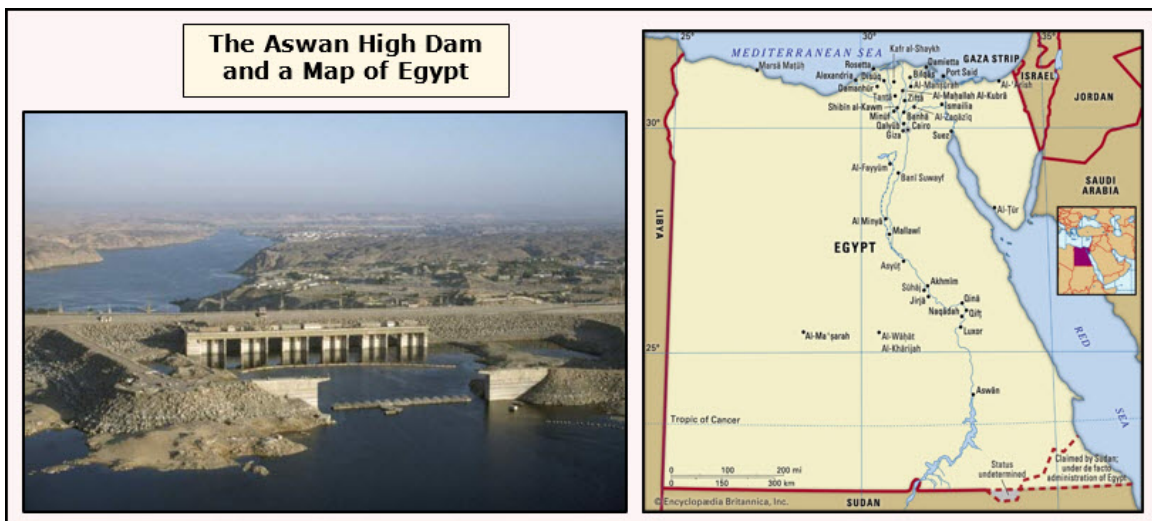


Today, a thirty-five mile railroad tunnel stretches under the mountains. Completed in 2016, the **Saint Gotthard Pass Tunnel** permits high-speed trains to carry passengers and products along a safer, faster route. It is also expected to reduce air pollution over time. This is because high-speed trains create less pollution than cars and trucks. These are the tunnel's intended consequences. The government of Switzerland also planned the project carefully to avoid negative side effects. Because this was such a large undertaking, this was not entirely possible. Surrounding communities experienced air, water, and noise pollution during and after construction.



## Dams and Rivers

The people of the Eastern Hemisphere sometimes try to fulfill their needs for food, transportation, and energy by building dams. A **dam** is a barrier that holds back water. The build-up of water behind the barrier is called the **reservoir**. Dams have several intended consequences. The right amount of water from the reservoir can be released at the right time. This helps to prevent floods and enables farmers to irrigate their crops in dry climates. Flowing water can also be used to turn turbines that create **hydroelectric power**. Hydroelectric power generates over one-fifth of the world's electricity. Egypt's **Aswan High Dam** is an example of a dam that provides hydroelectric power, irrigation, and protection from floods. You can see this dam and its reservoir, **Lake Nasser**, in the image below.



Although the Aswan High Dam has been beneficial, it has also had some negative side effects. The creation of Lake Nasser put the homes of 90,000 Egyptians under water. Relocating was a difficult process and took time. The waters of Lake Nasser also threatened to destroy one of Egypt's greatest tourist attractions, the **Temple of Abu Simbel**. Moving the temple and its sixty-five foot statues cost the Egyptian government millions of dollars. For centuries, the farmers living along the Nile River had relied on the annual floods to bring a fresh coat of top soil for their fields. After the dam was built, they had to rely on fertilizers, which were expensive and poisonous to humans and animals. The video listed below shows other examples of projects that have changed the flow of rivers. In China, this means constructing an artificial river that will carry water from the south to the drier lands in the north.

## Urbanization

Across the Eastern Hemisphere, humans have changed the natural landscape by building cities. They have constructed houses, apartment buildings, skyscrapers, sidewalks, and miles of roads. People continue to move into cities because they want to improve their lives. The movement of people to cities is called **urbanization**. Compared to the countryside, cities offer more jobs, greater access to education, and more varieties of entertainment. These are some of the intended consequences of living in cities.



**Jakarta: Street View, Map, and City Skyline**

*Photo Courtesy of Tropenmuseum, part of the National Museum of World Cultures*

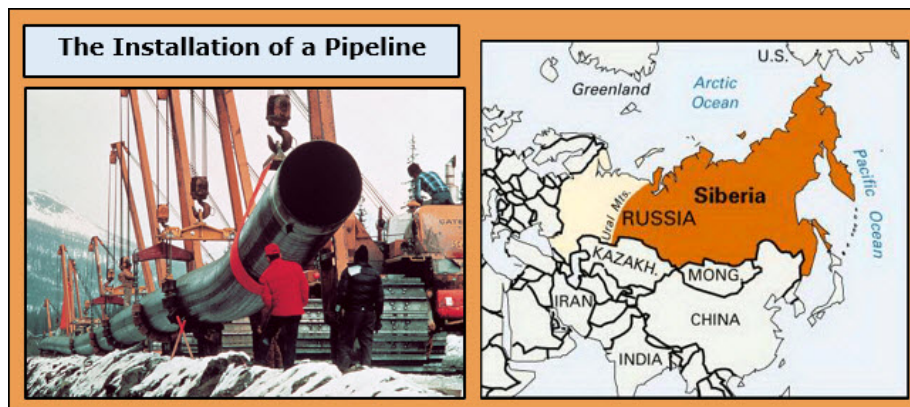
In Africa and Asia, many cities are growing at rapid rates. One example is **Jakarta**, the capital of **Indonesia**. Since 1970, this city's population has expanded from 4,000,000 to 14,000,000. The increase continues to place greater demands on the region's physical environment. This has created unintended consequences for those who live there. More people means more cars and trucks. Therefore, the city's residents struggle with traffic jams and air pollution on a daily basis. Providing drinking water for so many people is another constant challenge. At the same time, if the city is going to have adequate housing for its population, it must find more space. Clearing more land, however, is likely to further damage the region's ecosystem. The **ecosystem** is the plant and animal life that exists in the area. Each native plant and animal contributes

something significant to the ecosystem. Expanding without careful planning destroys this balance. The videos listed below explain more about what it is like to live in Jakarta.



## Pipelines

To help meet the need for energy, countries in the Eastern Hemisphere have modified the physical environment by adding pipelines. **Pipelines** consist of a series of pipes and pumps. They carry oil, natural gas, and other resources underground and underwater. Pipelines are an important part of Russia's oil and natural gas industries. **Russia** has large reserves of oil and natural gas, but there is a problem. Much of the supply is located in **Siberia**. This region of Russia experiences very cold temperatures for much of the year. It is also far from the country's industrial complexes and the areas in which most people live. Ice and snow make travel by truck difficult. For this reason, Russia transports much of its oil and natural gas through pipelines.



Although this has solved one problem, it has created unintended consequences. Pipelines have had some negative effects on the physical environment. Heavy equipment used to put the pipelines in place have destroyed forests and animal habitats. Because the climate of Siberia makes it hard to maintain these structures, leaks occur. Oil finds its way into creeks and streams. This endangers the water supply of humans and wildlife. The video listed below explains one herder concerns about the effects of Russia's oil industry on Siberia's physical environment.



## Costs and Benefits

Dams, highways, and many other projects mentioned in this unit have a very high price tag. Are they worth the cost? This is a question that each society must decide for itself. For example, China's effort to create an artificial river is called the **North-South Water Transfer Project**. Although Chinese leaders believe that this will benefit the country's economy in the long run, they have already spent 80 million dollars on its construction. The entire project is not scheduled to be finished until 2050. Will customers be able to afford the water when it arrives? Like individuals, governments must budget their money. To spend more money in one area, funds must be cut from other programs. If this is not acceptable, countries must borrow money or raise taxes. None of the options are popular.

## Time for a Quick Review

Before moving on to Unit 6, take a few minutes to review the terms found in Unit 5. Be sure that you can answer the "Can I" questions listed here with a loud "yes".

<p>Can I</p> <p>...explain the difference between an intended consequence and an unintended consequence?</p> <p>...give examples of intended consequences that have resulted from modifications of the physical environment of the Eastern Hemisphere?</p> <p>...give examples of unintended consequences that have resulted from modifications in the physical environment of the Eastern Hemisphere?</p>
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## Additional Activities and Resources

[Unit 5 Organizer](#)

[Humans and the Environment Activity](#)