



The Nile River: A Journey from Source to Mouth

19.1 Introduction

Thousands of years ago, the Nile River gave rise to one of the world's first civilizations. The ancient Egyptians built great cities, temples, and pyramids along the river. They grew crops on the river's banks. They sailed boats on its waters. They wrote songs and poems in praise of the river. The Nile gave life to ancient Egypt. Today, it is still a key part of Egyptian life.

The Nile is not just an Egyptian river. The river begins its journey in the **highlands** of East Africa far from Egypt. Along its way to the Mediterranean Sea, it crosses mountains, **plateaus**, plains, and **deserts**. The **river basin** of this great waterway covers more than 1 million square miles, or about one tenth of the African continent. A river basin is the area drained by a river and the smaller streams that flow into it. The Nile River basin includes parts of 10 African countries. Forty percent of all Africans live in these 10 countries.

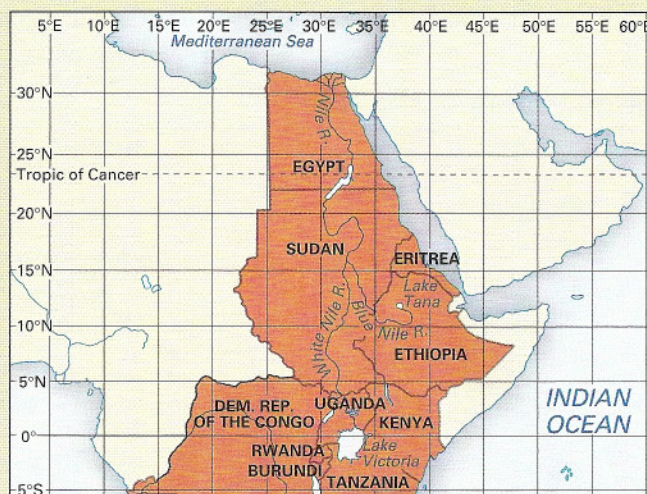
In this chapter, you will follow the course of the Nile River. You will discover how the river changes during its long journey from the highlands to the sea. You will read about the origins of the river and the explorers who traced it to its sources. You will also learn about the impact of the river on the people and environment of the Nile River basin.

Essential Question

How do rivers change as they flow across Earth's surface?

This map shows the course of the Nile River on its journey from its sources to the sea. The Nile flows through several countries. It also crosses several parallels of latitude, including the equator and the Tropic of Cancer. During its long journey, the Nile changes in many ways. Keep this map in mind as you try to answer the Essential Question.

Graphic Organizer



19.2 The Geographic Setting

Most of Egypt is a barren, sandy desert. The ancient Egyptians could not have survived without the Nile's life-giving waters. For that reason, the Greek scholar Herodotus called Egypt the "gift of the Nile." But despite the river's importance, the ancient Egyptians never knew just where it came from. In fact, the sources of the Nile remained a mystery for thousands of years.

The World's Longest River The Nile River has two main branches: the White Nile and the Blue Nile. The White Nile is the longest branch. From the White Nile's most distant **tributary** in the highlands of Burundi, the Nile runs north for about 4,160 miles. This is more than twice the distance from Chicago to Los Angeles. At this length, the Nile is the world's longest river.

Every year, the waters of the Nile rise and fall with the seasons. These changes in river level are tied to the water cycle that brings rain to the highlands of Africa. The **water cycle** is the constant movement of water from Earth's surface to the **atmosphere** and back again. After the rainy season, rising water often floods the land along the Nile's banks.

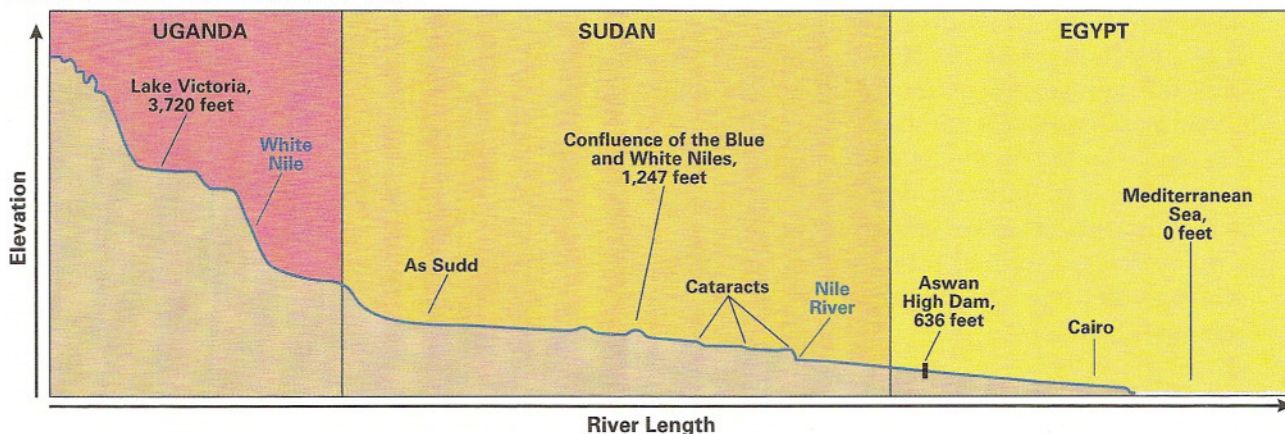
The Gifts of Water, Transportation, and Power The Nile has long been essential to the people who live along its banks. They use its water for drinking, washing, and cooking. They also use it for farming. In ancient times, the flooding of the Nile left deposits of rich **silt** on farmlands near the river. Farmers planted their crops in this fine, dark soil. They also used the floodwaters to irrigate their fields. Later on, they developed **perennial irrigation**. This is a system that distributes water to farm fields year round.

The Nile is also useful for transportation and energy. People along the Nile have long used the river as a water highway. They carry goods and people by boat from place to place. The Nile also has great **hydroelectric potential**. That means that the river can be used to generate electrical power. Cities along the Nile depend on **hydroelectric power** to meet their energy needs.

Two Views of the Nile

The satellite image above shows the path of the Nile River after the White and Blue Niles join. The diagram below shows the change in the Nile's elevation as the river flows from its source in the highlands of Burundi to the Mediterranean Sea. From its source to the sea, the Nile drops more than a mile in elevation.

Elevation Profile of the Nile



► Geoterms

hydroelectric potential the electrical power that can be generated from flowing water

perennial irrigation a system that allows for the year-round watering of crops

river basin the area drained by a river and its tributaries. These tributaries are the smaller streams that flow into the main river. Rain falling anywhere in a river basin will eventually flow into the main river.

water cycle the movement of water from the surface of Earth to the atmosphere and back again. During this cycle, water evaporates from rivers, lakes, and oceans, rises and condenses into clouds, and then falls back to Earth as rain, hail, sleet, or snow. This process is also known as the *hydrologic cycle*.

Two Branches, Ten Countries

The Nile, with its two main branches and many tributaries, travels through ten countries: Congo, Tanzania, Burundi, Rwanda, Uganda, Kenya, Ethiopia, Sudan, Eritrea, and Egypt. The Nile River basin covers around one tenth of the African continent.

The Nile River Basin



19.3 The Beginnings of the Nile

The ancient Egyptians believed that the Nile sprang forth from an underground lake in southern Egypt. The ancient Romans later tried but failed to find the Nile's source. It was only in more recent times that explorers finally discovered the origins of the Nile. Like all rivers, however, the Nile really begins with the water cycle.

From Rainwater to Rivers: The Water Cycle You have read that the water cycle recycles water from Earth's surface to the atmosphere and back again. This never-ending process moves water through the environment. Some water ends up in rivers like the Nile.

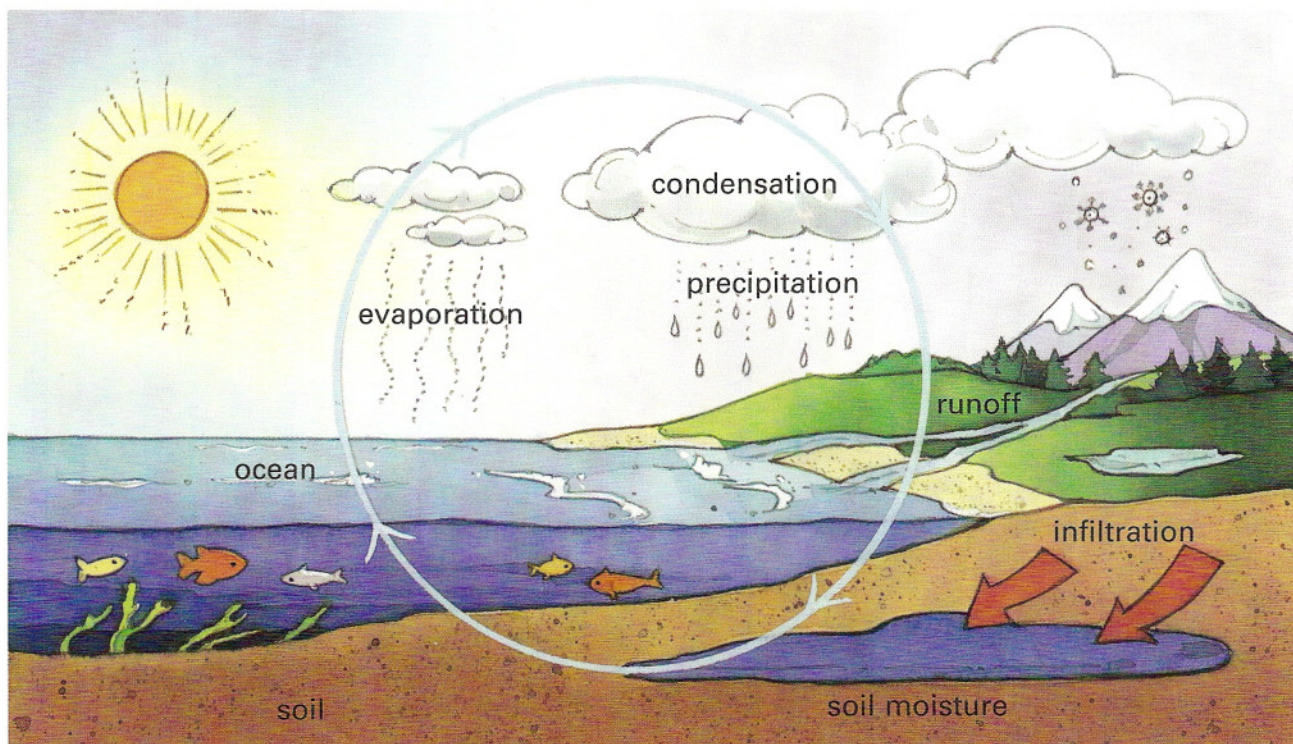
The water cycle begins with the **evaporation** of water from oceans, lakes, and rivers. This occurs when the sun heats the water. When water evaporates, it becomes **water vapor**. Steam is a form of water vapor that you can see.

As water vapor rises into the air, it cools down. The cooling causes the vapor to **condense** into tiny water droplets. The droplets then come together to form clouds. Under certain conditions, the droplets become too large and heavy to stay in the air. At that point, they fall to Earth as **precipitation**. Precipitation can take several forms, including rain, snow, sleet, and hail.

Several things can happen to precipitation after it hits the ground. Some gets stored as snow and ice in glaciers. Some soaks into the ground in a process called **infiltration**. And some runs off the ground to form streams. In areas with lots of **runoff**, streams come together to form rivers. Most rivers eventually flow into the sea. At that point, the water cycle begins again.

The Water Cycle

This diagram shows how nature recycles water. The water cycle is a "closed system." No water is ever lost. However, some water may collect unseen under the ground. This water can be tapped for human use.



Lake Tana: Source of the Blue Nile Both main branches of the Nile, the Blue and the White, are fed by rainfall and runoff in the East African highlands. In the lush, forested hills of Ethiopia, this runoff flows into Lake Tana. This lake is considered the main source of the Blue Nile. The **headwaters** of the Blue Nile, however, are found above Lake Tana. Headwaters are the stream or streams that make up the beginnings of a river.

The Blue Nile is a fast and powerful river. Fed by heavy summer rains, it roars down from Lake Tana through deep canyons to the plains below. Along the way, it picks up lots of dark soil. Most of the silt that ends up on flooded farmlands downstream comes from the Blue Nile.

The source of the Blue Nile remained a mystery to outsiders until the 1600s. Around 1615, a Spanish priest named Pedro Paéz made his way to Lake Tana. There he found the outlet where the river leaves the lake. In the late 1700s, the Scottish explorer James Bruce also reached the source. He later published a book about his travels and took credit for the discovery.

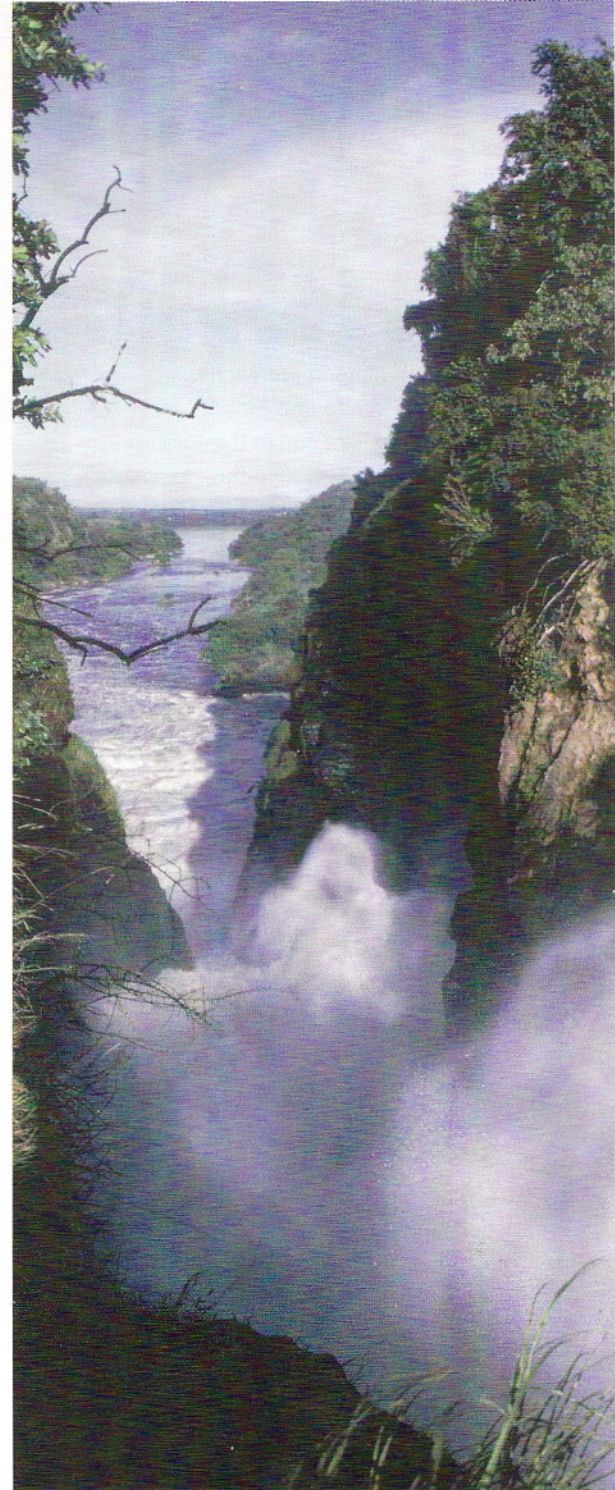
Lake Victoria: Source of the White Nile The other main branch of the Nile starts farther to the south. As you may recall, the White Nile's headwaters consist of a stream flowing out of the mountains of Burundi. But the river's main source is Lake Victoria, which is a large, shallow lake in Uganda.

For years, however, the origins of the White Nile remained as mysterious as those of the Blue Nile. Various explorers tried to follow the river from Egypt to its source. But they lost their way in swamps or were turned back by river rapids.

Then, in the 1850s, the English explorer John Hanning Speke reached Lake Victoria. Convinced that this was the White Nile's source, he returned a few years later. In 1862, he found a river flowing out of the north side of the lake. He followed the river for a distance. Then he returned to England to announce that he had discovered the source of the White Nile.

At first, many scholars doubted Speke's claim. They thought he hadn't explored the area well enough. But later expeditions confirmed that Lake Victoria was the main source of the White Nile. In 1937, a German explorer named Bruckhart Waldekker traced the river's headwaters farther south into Burundi.

Like the Blue Nile, the White Nile flows out of Lake Victoria as a rushing torrent. It passes through two more lakes and over a large waterfall before reaching the flat plains of Sudan. There it slows down. Along the way, the river takes on a muddy gray color. This gray color gives the White Nile its name.



Murchison Falls

North of Lake Victoria, the White Nile thunders over Murchison Falls. This is one of the most dramatic spots on the Nile's long journey to the sea. Today, these falls are part of a national park in Uganda. Park wildlife includes elephants and giraffes. Hippos and crocodiles are often found in these waters.

Watered by Two Niles

Al Jazirah, a state in Sudan, lies between the White and Blue Niles. Irrigation canals begun in the 1920s turned this state into a cotton-growing center. Today wheat is Al Jazirah's most important crop.



19.4 Two Niles Meet: Confluence and Cataracts

After leaving the highlands, the White Nile crosses the plains of Sudan. Along the way, it passes through a huge swamp called the As Sudd. Here the river spreads out into many small channels. These channels are clogged with **vegetation** and are hard to navigate. In the first century C.E., a Roman expedition sent out to find the source of the Nile got lost in this swamp.

The White and Blue Niles Meet at Khartoum Beyond the As Sudd, the White Nile continues its sluggish journey north. Just to the east, the Blue Nile also flows northward from the Ethiopian highlands. In north-central Sudan, the two branches of the Nile finally meet. This **confluence**, or coming together, takes place at the city of Khartoum, the capital of Sudan.

At this point, the Nile becomes a much larger river. This is especially true during the summer rainy season. Although the flow of the White Nile remains much the same throughout the year, the Blue Nile grows much larger as a result of summer rains. It is this rise of the Blue Nile that causes most of the flooding downstream.

At first, the waters of the two rivers don't mix. The gray flow of the White Nile runs alongside the darker waters of the Blue Nile. After a few miles, though, the rivers blend. Finally, the Nile truly becomes one river.

Rough Waters Slow River Travel North of Khartoum, the Nile rolls on for another 800 miles before reaching the southern border of Egypt. The river makes a wide turn to the south and west during this stage of the journey. This turn is called the "great bend." The Nile also passes over six **cataracts**. These are rapids or low waterfalls where the river drops over rock outcroppings.

The Nile cataracts have been famous throughout history as a barrier to river travel and trade. Boats can sail on stretches of water between the cataracts. But the rapids are far too dangerous for river travel. In ancient times, river traders had to unload their boats and move their goods by land around these rough waters.

19.5 Through the Desert: Wadis and Dams

North of Khartoum, the Nile flows through one of the harshest landscapes in the world. Rain rarely falls here. But when it does, it can cause a flash flood. During a storm, rainwater suddenly fills normally dry riverbeds, called **wadis**. If you're in a wadi when a storm hits, you'd better move fast. Otherwise you might be swept away by a wall of water.

An Arid Landscape In northern Sudan, the Nile enters a vast desert that continues northward through Egypt. Here, the land on both sides of the river is sunbaked and desolate. To the west lies the Sahara, the world's largest desert. It stretches for thousands of miles across northern Africa. To the east, between the Nile and the Red Sea, lies the Nubian Desert. This is a land of rocky hills, sand dunes, and wadis. Few people live here.

The Nile provides relief from this **arid** landscape. Here and there, trees grow up along its banks. In some places, people have settled down and irrigated small plots of land for farming. Farther north, in Egypt, farming and settlement increase along the Nile. Here, the land along the river looks like a ribbon of green stretched across the red-brown sands of the desert.

Controlling the Nile: The Aswan High Dam After winding for hundreds of miles through Sudan, the Nile finally reaches Lake Nasser. This lake straddles the border between Sudan and Egypt. It is not a natural lake, however, but a **reservoir**. In fact, it is one of the largest reservoirs in the world. It was formed in 1970 by the construction of the Aswan High Dam, in Egypt.

The dam was built for two main reasons. One was to develop the Nile's hydroelectric potential. The power plant at the dam generates an enormous amount of electricity. This power has helped Egypt and Sudan develop their cities and new industry.

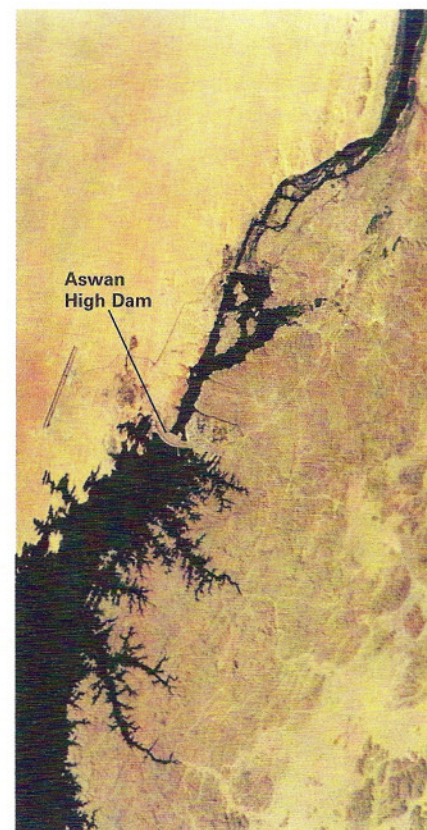
The second reason was to control the river's flow. As you know, in the past the Nile flooded nearly every year. Those floods brought benefits to Egypt, but they also destroyed villages along the river. Some years, rainfall in the mountains was light and the floods didn't occur. In those years, Egypt lacked water.

The Aswan High Dam holds back the floodwaters that used to cause problems. Instead, water is released in a more steady flow from Lake Nasser. In this way, the dam provides a reliable, year-round supply of water for Egyptian farms and cities.

Along with its benefits, the Aswan High Dam has also had some negative effects. When Lake Nasser was formed, thousands of people had to move because their homes were covered by water. Also, the dam traps most of the rich silt that used to flow down to Egyptian farmlands. That silt now sits at the bottom of the lake. As a result, farmlands downstream are less fertile. Farmers must now buy artificial fertilizers to enrich the soil.

The Aswan High Dam

This photograph, taken from the space shuttle, shows the Aswan High Dam and its reservoir, Lake Nasser. The dam is enormous. Enough rock was used in its construction to build 17 pyramids the size of the Great Pyramid at Giza, Egypt. The lake is huge, too. It stretches for 300 miles from Egypt into Sudan.



19.6 Across Egypt: Floodplains and Delta

For most of its journey through Egypt, the Nile flows through a narrow valley. In this Nile River valley, **floodplains** lie between the banks of the river and low cliffs on either side. Near the river's end, the Nile fans out to form a large **delta**. Together, the floodplains and delta make up just 3 percent of Egypt's land area. But they are home to most of its people. Approximately 95 percent of all Egyptians live along the Nile.

A Narrow Strip of Farmland Lines the River The floodplains of the Nile River valley have served as farmland for thousands of years. In most places, the floodplains are just a few miles wide. But the ancient Egyptians used them to produce bountiful harvests of wheat, barley, and other crops. These harvests made it possible for Egyptians to create one of the greatest early civilizations.

Until recent times, farmers along the Nile depended on annual floods to water and add fertile soil to their fields. They also used traditional irrigation techniques to bring water from the river. They built canals and moved water with simple machines like the *shaduf*. This is a pole with a bucket at one end and a weight at the other. The pole is attached to a brace so it can move up and down. The farmer dips the bucket into the water and lets the weight pull it out again.

The construction of the Aswan High Dam brought major changes to farming along the Nile. Lake Nasser now supplies water for a large system of perennial irrigation. With this water, farmers have been able to increase the amount of land under cultivation. As a result, Egyptian harvests have grown. Cotton, in particular, is a major export crop.

Old and New Irrigation

As in ancient times, some Egyptian farmers still rely on oxen to draw water from the Nile for their crops. Today, many farmers use electric pumps to irrigate their fields. With a steady water supply, Egypt has increased its farmland by almost 50 percent.

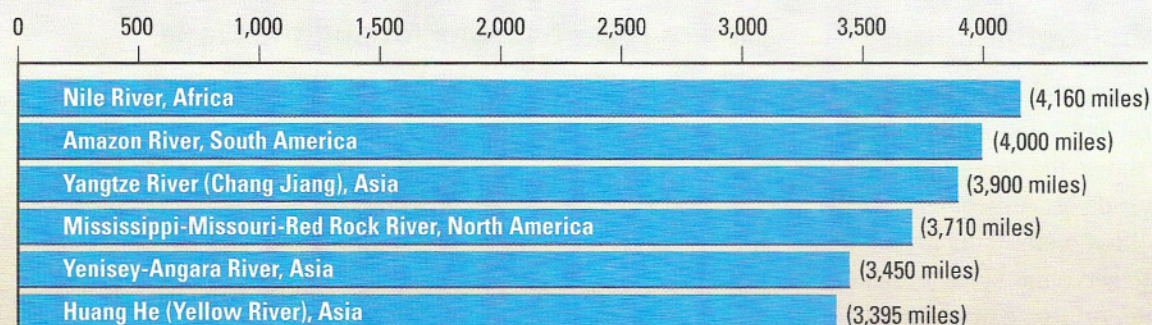
Water for Rapidly Growing Cairo About 600 miles from the Aswan High Dam, the Nile reaches Cairo, the capital of Egypt. The river flows through the center of the city. Broad, tree-lined avenues and modern skyscrapers line its banks. In the evening, people stroll

along the Nile or sit in cafes overlooking the water.

With more than 10 million people, Cairo is one of the largest cities in the world. Like the rest of Egypt, Cairo gets most of its water from the Nile. This has worked well in the past. But the city is growing rapidly. Therefore, water needs are growing as well. At the same time, Cairo is pouring **sewage** and industrial waste into the river. These two factors—population growth and pollution—are putting pressure on the water supply. Cairo will have to plan carefully to avoid water problems in the future.



The Six Longest Rivers in the World



The River's Final Gift: The Nile Delta North of Cairo, the Nile travels another 100 miles before emptying into the sea. Here the floodplains of the Nile spread out in a broad, triangular delta. At its widest point, on the coast, this fan-shaped delta measures 155 miles across. This fertile area produces much of Egypt's food.

The Nile Delta began forming many thousands of years ago. When the river reached the coastal plain, it slowed down and divided into several branches. As the Nile slowed, it dropped the remainder of the load of silt it brought down from the highlands. Over time, this silt built up into a thick layer of soil. The Nile Delta became the richest farmland in Africa, and some of the richest in the world.

In ancient times, the Nile split into seven channels while crossing the delta. Over time, silt has filled some of those channels. Today, only two remain. At the end of its long journey, the Nile pours from two mouths into the Mediterranean Sea.

From Tributary to Mouth

The length of each of these six rivers is measured from its most distant tributary. It's hard to measure rivers, though, and experts some times disagree. For example, some geographers believe that the Amazon is longer than the Nile.

19.7 Beginning to Think Globally

In this chapter, you have read about the journey of the Nile River from its sources to the sea. You read about the water cycle and how it gives rise to rivers like the Nile. You learned where the Nile River basin is located and how the river changes as it flows downstream. You also learned about some of the benefits the Nile brings to people who live along its banks. These include hydroelectric potential and water for perennial irrigation.

The Nile is one of many great rivers in the world. The Amazon River is another. It drains a larger area than even the Nile. The Amazon starts in the snowy Andes Mountains of South America. It flows east through the world's largest **tropical rainforest** to the Atlantic Ocean. The Ohio, Missouri, and Mississippi rivers also form a mighty river system. This system stretches from the Appalachians west to the Rocky Mountains. It drains a large part of the North American continent into the Gulf of Mexico.

All rivers change as they flow across the surface of Earth. Some changes are natural. Others are the result of human activity. Think about this as you look at how hydroelectric dams affect rivers around the world.

19.8 Global Connections

This map shows major rivers and hydroelectric dams around the world. The graph shows the energy produced by the largest dams. A megawatt (MW) equals 1 million watts. This is enough electricity to serve the needs of about 1,000 people. A large dam can produce 1,000 MW of energy. The diagram shows how a hydroelectric dam works to produce all of this power.

What are the main benefits of building hydroelectric dams?

Hydroelectric dams produce clean energy. They don't pollute the air the way power plants that burn **fossil fuels** do. They don't produce radioactive waste products the way nuclear power plants do. They control flooding and provide water for farms and cities. Dams also create lakes that are used for recreation.

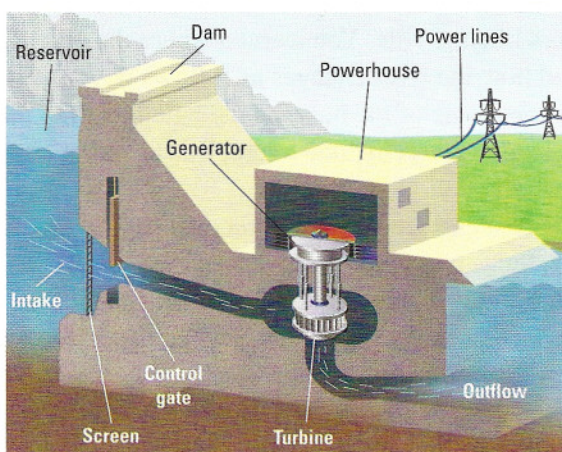
What are the main costs of building hydroelectric dams?

Giant dams cost billions of dollars to build. They have environmental costs as well. The lakes that form behind dams flood large areas. Towns, farms, and forests may be submerged by rising water. Many people may be forced to move. Wildlife may suffer as well from loss of **habitat**.

Do the benefits of damming rivers outweigh the costs?

Hydroelectric dams have clear benefits. But these benefits must be weighed against the costs. All rivers change as they flow across the surface of Earth. But large dams change rivers in ways that can have a major impact on people and the environment.

Major River Systems Around the World



The Power of Water

A hydroelectric dam turns waterpower into electric power. Water flowing through the dam turns the blades of a turbine. The spinning turbine creates an electric current inside a generator. This current travels over power lines to distant towns and cities.



Ten Major Power-Generating Hydroelectric Dams

