

The Aral Sea: Central Asia's Shrinking Water Source

Introduction

In 1960, Moynaq was a fishing town in the Soviet Union. The town was nearly surrounded by the Aral Sea, a large lake in the Soviet republics of Uzbekistan and Kazakhstan. Visitors to Moynaq in 1960 saw fishing boats bobbing at its docks. At that time, Moynaq had a population of about 45,000 people. Most of these people made a living by farming, fishing, or working in the city's fish canneries.

All of that has changed. If you visited Moynaq today, you would find it surrounded by dust. Although a 20-foot welcome sign depicts a fish and a seagull, you wouldn't see the Aral Sea anywhere. The shoreline of this **inland sea** has withdrawn, and not just by a small amount. The water's edge is now nearly 90 miles from Moynaq.

Moynaq and the surrounding area suffer from **water stress**, which occurs when an area requires more water than it has. As the Aral Sea has shrunk, water stress has increased in this **region**. The area also suffers from **environmental degradation**. To *degrade* something means to damage it or wear it down. In the Aral Sea region, the environment has been degraded by misuse of the little water remaining.

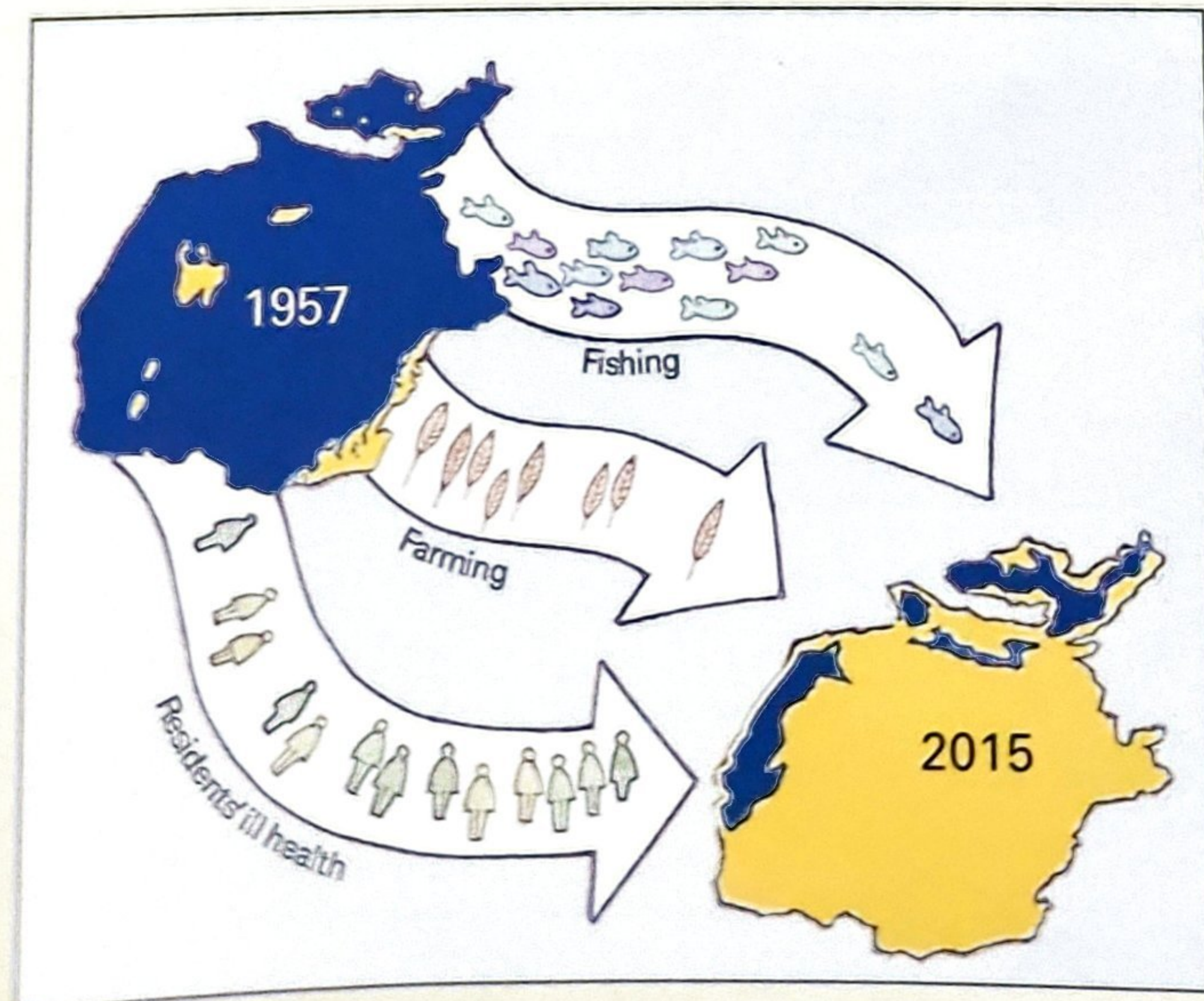
In this lesson, you will find out what caused the shrinking of the Aral Sea. You will learn about environmental degradation in the surrounding region, and you will see how damage to the environment has affected farming, fishing, and quality of life in this region.

Essential Question

How are humans affected by changes they make to their physical environment?

This illustration shows the Aral Sea at two different times. Note how much smaller it was in 2015 than in 1957. The arrows represent three aspects of life that have been affected by the shrinking of the sea. Keep this illustration in mind as you try to answer the Essential Question.

Graphic Organizer



The Aral Sea Region



A Central Asian Sea

The Aral Sea lies in two countries, Uzbekistan and Kazakhstan. The Amu and Syr rivers feed this inland sea. It was once a large, freshwater lake. Today, it is split into two parts. The larger part, in the south, is a shrunken, salty sea. The smaller part, in the north, is becoming less salty as a result of projects started in 2005 to bring fresh water back to the sea.

1. The Geographic Setting

The Aral Sea is located in Central Asia, lying in two countries, Uzbekistan and Kazakhstan. Before 1991, these two countries were part of the Soviet Union. Until the 1960s, when irrigation projects began, two rivers fed the Aral Sea: the Syr Darya from the northeast and the Amu Darya from the south. (In the Persian language, *darya* means "river.")

From Freshwater Lake to Inland Sea The Aral Sea was originally called a sea only because of its great size, not because it was salty. It was really a large lake containing fresh water.

Until the 1960s, the water in the Aral Sea was **potable**, or drinkable. Potable water can also be used for the irrigation of crops. However, even **freshwater** lakes and rivers contain a small amount of salt. This salt is washed out of the surrounding soil by the flowing water. If the amount of salt in water is very low, the water is still considered to be fresh. The term **salt water** refers only to water that is too salty to drink.

Although the Aral Sea's water used to be fresh, now it has become **saline**, or salty. *Salt* and *saline* are both derived from the Latin word *sal*, which means "salt." Today, the Aral Sea is too salty to drink and too salty for watering crops.

Salinization Affects Water and Land **Salinization**, the process by which water or land becomes salty or saltier, can affect bodies of water, such as Utah's Great Salt Lake. The process of salinization can also affect **groundwater**, which is water that lies deep underground and supplies wells and springs.

To understand salinization, think first about what happens to rainwater. Pure rain falls from the sky as fresh water. As rainwater seeps into the ground or runs off into streams, it picks up some salt from the soil. Most of that salt is carried by rivers to the ocean, which is why oceans are saline.

However, not all rivers flow directly into the ocean. Some of them end in lakes and inland seas. If water is flowing both into and out of a lake, the water that is flowing out of the lake carries some of this salt to the ocean. If no water flows out of a lake, the salt has nowhere to go. Therefore, when water evaporates from a lake, the salt is left behind. The lake grows more saline over time, eventually becoming an inland sea.

Salinization of land happens in a different way. When farmers irrigate their crops, they bring water from lakes and rivers to their fields. Often this fresh water contains some salt. When the water evaporates, it leaves the salt behind on the soil's surface. There might not be enough salt on the surface to damage plants at first. However, if people don't wash the salt away, the soil becomes saltier as the years pass. Very few plants can grow in salty soil.

The water and land in the region surrounding the Aral Sea have both been degraded by salinization. The Aral Sea used to be Earth's fourth-largest freshwater lake. Now, it's roughly ten percent of its original size and split into two parts. The larger part, in the south, is as salty as any ocean. The smaller part, in the north, is also still too salty to drink. However, recent projects are starting to bring fresh water back into this smaller part of the sea.

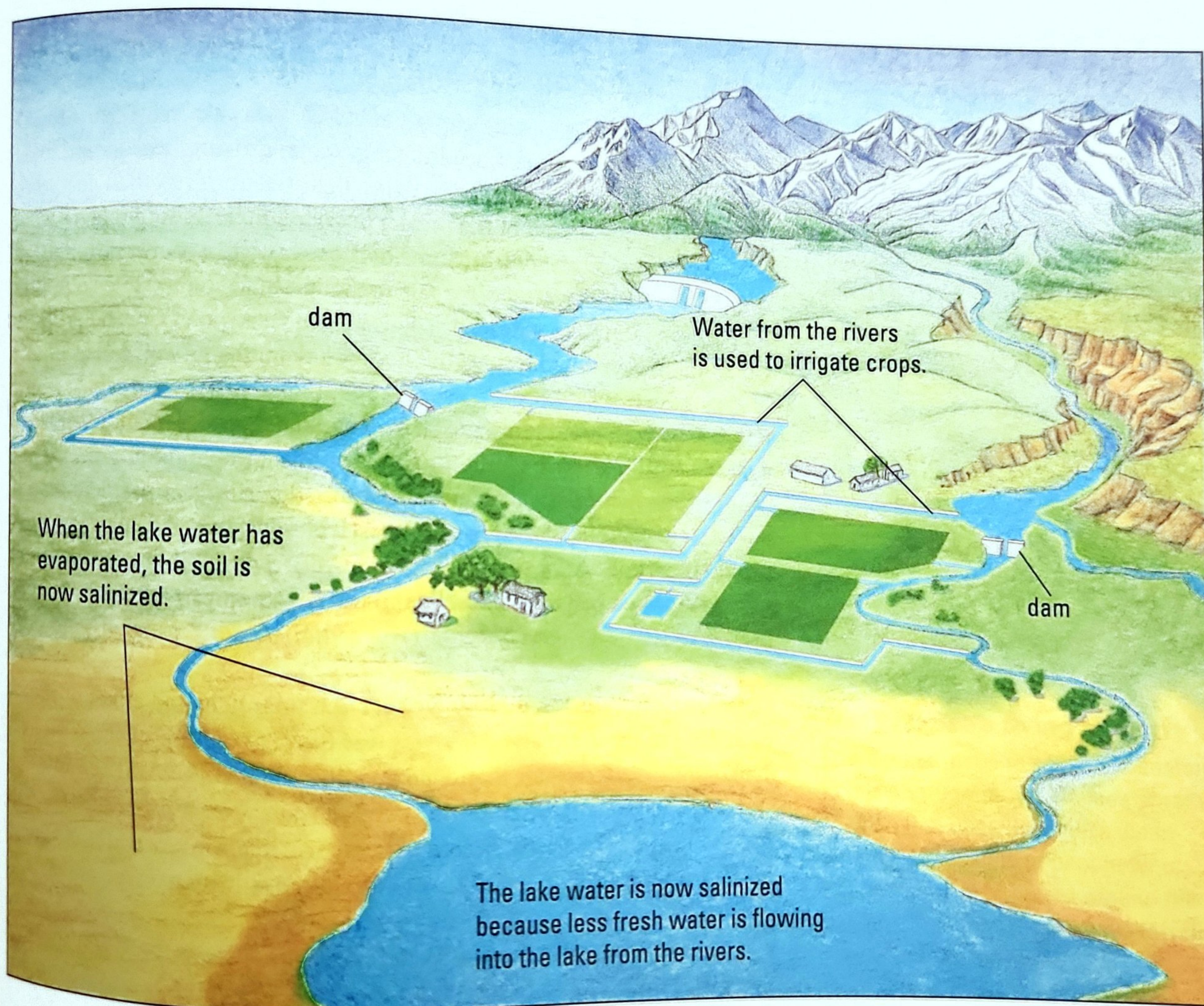
► Geoterms

environmental degradation damage to or destruction of the natural environment. When such damage occurs, habitats are destroyed, biodiversity is lost, or natural resources are used up.

groundwater water lying deep under the ground that supplies wells and springs. Over half the people in the world depend on groundwater for their drinking water.

salinization the buildup of salt in soil or water

water stress the condition that occurs when people do not have enough clean, fresh water to meet their everyday needs



Salinization of Inland Seas

A lake with no outlet to the ocean is likely to grow saltier over time. When water evaporates from a lake, any salt that was dissolved in that water is left behind. Over time, salt builds up in the lake. This process happens faster when water from rivers feeding into a lake is used for irrigation. With less water flowing in, the lake shrinks. Meanwhile, the concentration of salt in the lake water increases.



The Power of Cotton

Growing cotton in the desert produced more money for the people who lived there. The “white gold” crop became a central focus of life in desert communities. The city of Tashkent, Uzbekistan’s capital, named its soccer team the Cotton Pickers.

2. The Shrinking Sea and Farming

Cotton is sometimes called “white gold.” It’s a **cash crop** that earns farmers a good income but needs a long, warm growing season and lots of water in order to thrive.

For the government of the former Soviet Union, finding a place to grow cotton posed a problem. Some of the areas had enough rain but were too cold. Other areas were warm enough but too dry. The solution was to plant cotton in a **desert** region of Central Asia, where the crops would be irrigated with water diverted, or taken, from two rivers.

From Desert to Cotton Kingdom The Soviet government provided water to cotton farms by building dams on the Amu and Syr rivers. The water stored behind the dams was used to irrigate large areas. Large amounts of chemical fertilizers and **pesticides** were used to increase production in this new cotton kingdom. At first, irrigating a desert to grow cotton seemed to work well, and the new crop provided jobs for local people.

Salinization Creates a New Desert An unanticipated effect of the damming of the Amu and Syr rivers was the degradation of the Aral Sea. The dams diverted water that once steadily supplied the Aral Sea into canals. Roughly 50 percent of the diverted water was absorbed by the dry desert ground, and was therefore useless for irrigation. As water evaporated from the Aral, the sea began to shrink, resulting in large areas of dry seabed becoming a salty wasteland.

The shrinking of the sea affected the region’s **climate**. When the sea was full, the Aral cooled the surrounding land in summer and warmed it in winter. As the sea shrank, summers became hotter and winters became colder. The growing season decreased from the 200 days per year needed for cotton crops to only 170 days. As the climate cooled, some farmers shifted from cotton to rice because rice has a shorter growing season. Like cotton, however, rice needs a lot of water.

The use of river water for irrigation also degraded the land. Year after year, salt carried by the rivers built up on farm fields. Some areas became too salty to grow crops, and many farmers were left with nothing but salty desert.

3. The Shrinking Sea and Fishing

In 2001, a shocked Moynaq visitor described a spooky sight, reporting that rusting hulks of fishing boats lay scattered across a desert. These abandoned boats were surrounded by junk, including fiberglass, metal, rusty springs, and cigarette butts. A boat's propeller lay half-buried in the sand. The sight was so strange that the visitor almost expected to discover that space aliens had abandoned the boats there. Instead, the boats are remnants of a time when the Aral Sea was home to many productive fisheries. A **fishery** is a place where fish are caught, processed, and sold.

A Sea Once Rich in Fish Until around 1980, many of these fishing boats docked at Moynaq. Before the Aral Sea began to shrink, its water was abundant in fish. Over 80 million pounds of fish were harvested from the lake each year. The fish canneries in Moynaq produced up to 20 million cans of seafood each year, and this thriving industry employed more than 30,000 people.

The Collapse of the Aral Sea Fishing Industry The shrinking of the Aral Sea destroyed the fishing industry. As the sea began to withdraw, the fisheries were left high and dry. The town of Moynaq is now more than 90 miles from the water's edge.

The small amount of water that remains in the Aral Sea is extremely salty. Very few organisms can live in such saline conditions. In fact, most of the species of fish that were once plentiful in the sea have disappeared. Commercial fishing ended in 1982, so the fishing crews and cannery workers lost their jobs.

Most of these former fishing-industry workers have been unable to find other employment in the region, making the Aral Sea basin one of the poorest regions in Kazakhstan. Thousands of people have left the region to seek work elsewhere. Often men **migrate** alone, leaving their families behind in the dying towns. These families must survive on whatever money the men are able to send home. Of the 45,000 people who once lived in Moynaq, only a few thousand remain.



The Aral Sea's Dying Industry

Fresh water used to cover the seabed in this photograph. As the sea shrank, the fish that once lived here disappeared. Thousands of people who once worked in fisheries around the sea lost their jobs. Many have left the region to look for work.



Searching for Fresh Water

Today, water from the Aral Sea is too salty to drink. People in the region have turned to other water sources, such as rivers and groundwater. This woman relies on groundwater from her well. Unfortunately, the water may be polluted and unsafe to drink.

4. The Shrinking Sea and Quality of Life

Strong winds pick up sand that used to be at the bottom of the Aral Sea. The resulting dust storms, which the local people refer to as “black blizzards,” have become a sign of the declining quality of life in the Aral Sea region.

From Plentiful Fresh Water to Water Stress Before the 1960s, the Aral Sea provided water for nearby towns. There was enough water for household use and for irrigating crops raised on small farms.

Today, the Aral Sea region faces severe water stress. Because the water in the Aral Sea is too salty to drink, people have turned to rivers and groundwater to try to meet their water needs. However, much of that water is unfit to drink because it has been polluted by salt, **sewage**, and **toxic chemicals** used on farms—problems caused by people, not nature.

Pollution Damages the Health of Residents Many people living around the Aral Sea have become ill from drinking polluted water. Kidney and liver disease are common.

Air pollution poses another threat to health because the region’s “black blizzards” carry toxic chemicals along with dust. People who breathe in these chemicals develop health problems ranging from throat cancer to deadly lung diseases like tuberculosis.

Widespread poverty worsens these health problems. Nearly all pregnant women in the Aral Sea region suffer from anemia, a disease caused by poor nutrition. Many babies are born sick, and a significant number of them die before their first birthday.

An Uncertain Future Many scientific reports and news stories have been written about the Aral Sea region. This reporting has slowly drawn attention to the plight of the people living there. As one Moynaq resident said, “If every scientist and journalist who visited the Aral Sea brought with them a bucket of water, the sea would be filled again.”

All who study the Aral Sea region agree that repairing the environmental degradation will require expensive changes. First, they suggest that less water should be removed from the Amu and Syr rivers for irrigation. This would increase water flow into the Aral Sea.

In addition, farming practices will need to change. With less water for irrigation, farmers will have to plant less thirsty crops, such as fruit trees and grapes. They will also need to be more careful with fertilizers and pesticides.

Finally, governments will need to improve their water management. They need to construct water systems to provide safe drinking water to residents. Governments also need to build water treatment plants, which will treat sewage and **wastewater** to reduce water pollution.

Efforts to repair the environmental degradation in the Aral Sea region have made progress in recent years. In 2005, with help from the World Bank, Kazakhstan built an \$85 million dike and dam system to discharge water from the Syr River into the northern sea. Within eight months, the water level in the northern Aral rose about six feet, and salinity was reduced by about half. The sea also increased in area by 20 percent.

By 2014, the northern Aral Sea was about 140 feet above sea level, showing remarkable recovery. Native species fish have reappeared, and fishing production has expanded significantly. But efforts to repair the southern sea have been comparatively less, and it continues to shrink today.

In order to further stimulate economic recovery, countries in the Aral Sea region have utilized their natural oil reserves. For example, Kazakhstan, which borders the Aral Sea, has recently developed its oil fields to generate profits and restore quality of life in the area.

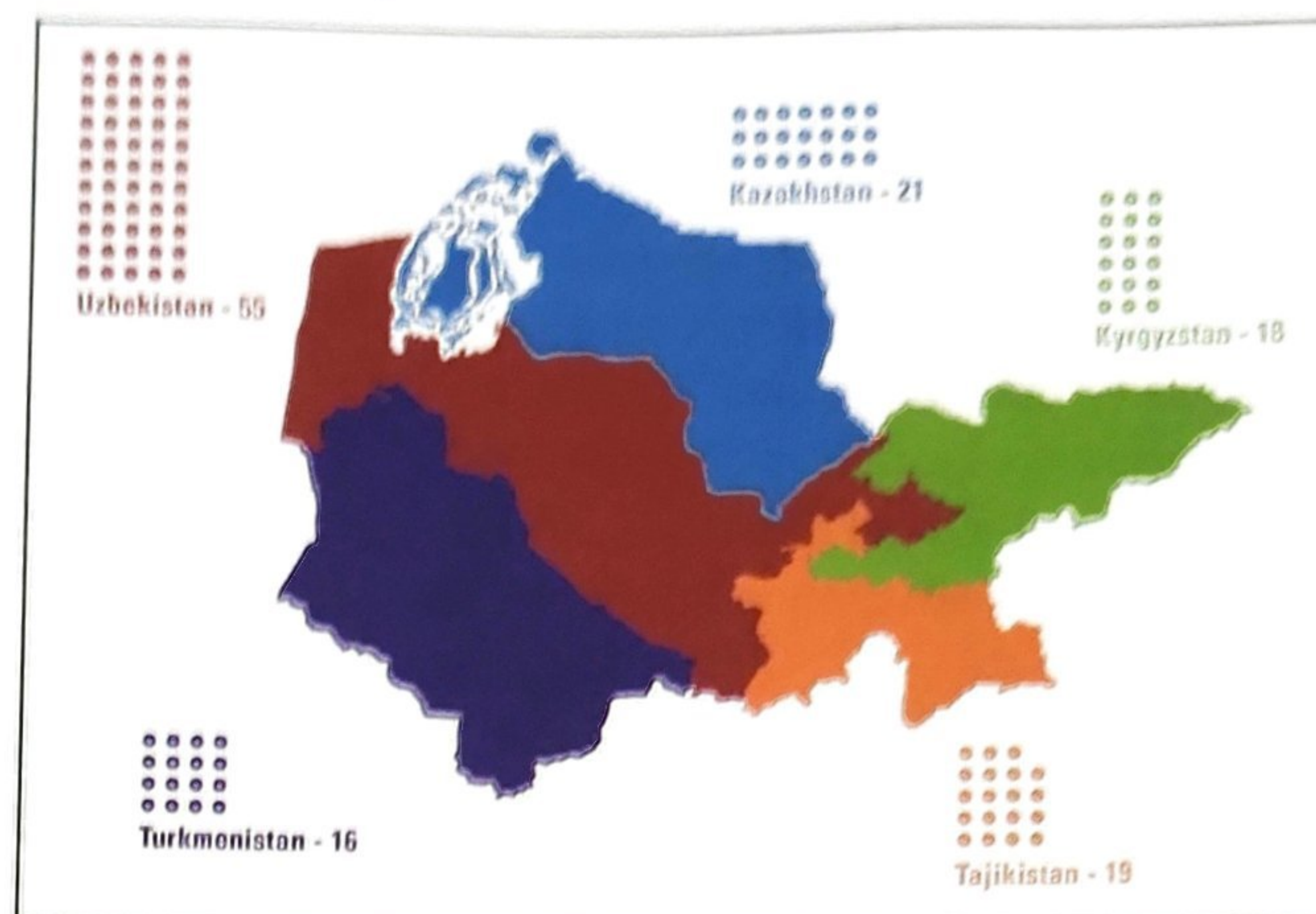
Summary

In this lesson, you learned about environmental degradation in the Aral Sea region. You discovered how dams on the Amu and Syr rivers have reduced the amount of water flowing into the Aral Sea. As a result, the sea shrank significantly, later splitting into two parts. It has also grown very salty. Increased irrigation with river water has caused widespread soil salinization, and vegetation cannot grow in soil that is too salty. Air and water pollution have increased as well. These changes have created an environmental disaster around the Aral Sea.

The Aral Sea region is not the only part of the world facing water stress. Wherever people live, they require water. When places don't receive enough rainfall to meet people's water needs, people must turn to other water sources, such as rivers and groundwater. Egypt, for example, is a desert country. For thousands of years, Egyptians have depended on the Nile River to meet their water needs. Without the Nile, life would be impossible in Egypt. To meet water requirements, some countries turn to desalinization, a costly process in which salt water is converted to fresh water.

Water stress arises when a region's need for water becomes greater than its supply. Think about this as you examine irrigation around the world in the next section.

Number of reservoirs in the Aral Sea Basin (2010)



Reservoir Resources

Facing severe water stress caused by the shrinking of the Aral Sea, inhabitants of the Aral Sea Basin rely on other sources of water for survival. Reservoirs in the region help manage river flow and provide water for irrigation. In 2010, reservoirs contributed about 30 percent of the water used to irrigate the region.

Man Sick with Tuberculosis

This man in Bangladesh suffers from a lung disease known as tuberculosis, or TB. TB used to be one of the most common causes of death in the world. Today, it is found mainly in developing countries. TB usually affects people whose health has been weakened by bad water, dirty air, or poor nutrition.

