Chapter 26 – The Aral Sea: Central Asia's Shrinking Water Source – SSWG 5b

1. 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 40,000 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 The shoreline of this **inland sea** has withdrawn, and not just a small amount.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 what little water there is.

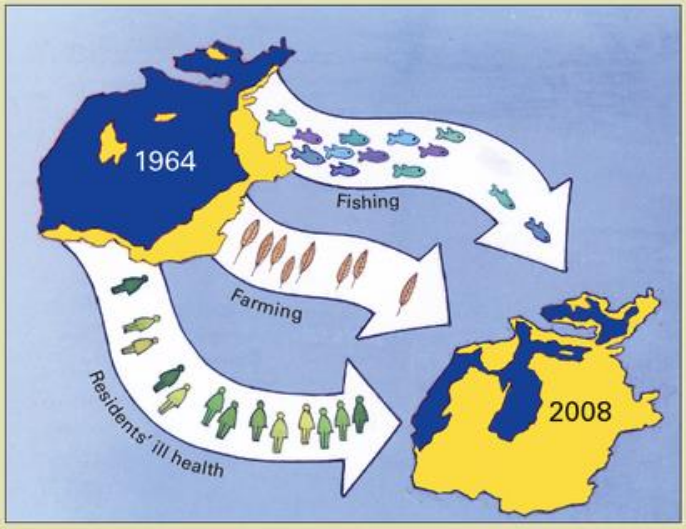
In this chapter, you will find out what caused the shrinking of the Aral Sea. You will learn about environmental degradation in the surrounding region, and you will see how damage to the environment has affected farming, fishing, and quality of life in this region.

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 2008 than in 1964. 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



2. 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 first 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**, which means it was 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**, which means 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.

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.

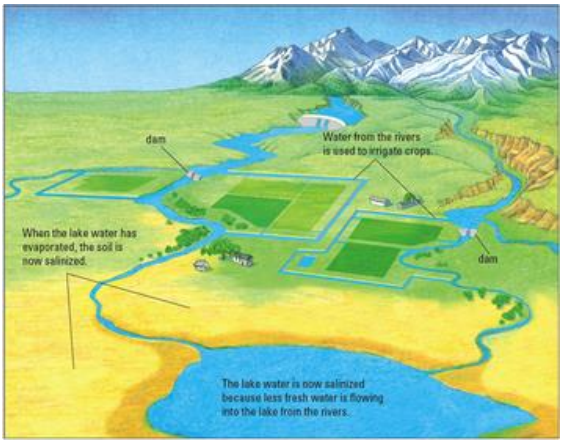
salinization the buildup of salt in soil or water

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

Salinization Affects Water and Land **Salinization**, the process in which water or land becomes salty or saltier, can affect a body of water, such as the Great Salt Lake in the state of Utah. 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 and 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 a little salt. When the water evaporates, it leaves the salt behind on the surface of the soil. There might not be enough salt on the surface to damage plants, at least 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 about 10 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, but recent projects are starting to bring fresh water back into this part of the sea.

3. The Shrinking Sea and Farming

Cotton is sometimes called “white gold.” It's a **cash crop** that earns farmers a good income, but cotton 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 unplanned effect of the damming of the Amu and Syr rivers was the degradation of the Aral Sea. Approximately 90 percent of the rivers' water was stored behind the dams,

and therefore only 10 percent of the water reached the Aral Sea. 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 had 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 turned 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 by 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.

4. The Shrinking Sea and Fishing

A shocked visitor to Moynaq in 2001 described a spooky sight. Rusting hulks of fishing boats lay scattered across a desert. These abandoned boats were surrounded by junk, with fiberglass, metal, rusty springs, and cigarette butts littering the ground. 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 reminders 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 about 1980, many of these fishing boats had docked at Moynaq.Before the Aral Sea began to shrink, its water was abundant in fish. About 95 million pounds of fish were harvested from the lake each year. The fish canneries in Moynaq produced 20 million cans of seafood a year, and this thriving industry supported about 35,000 workers.

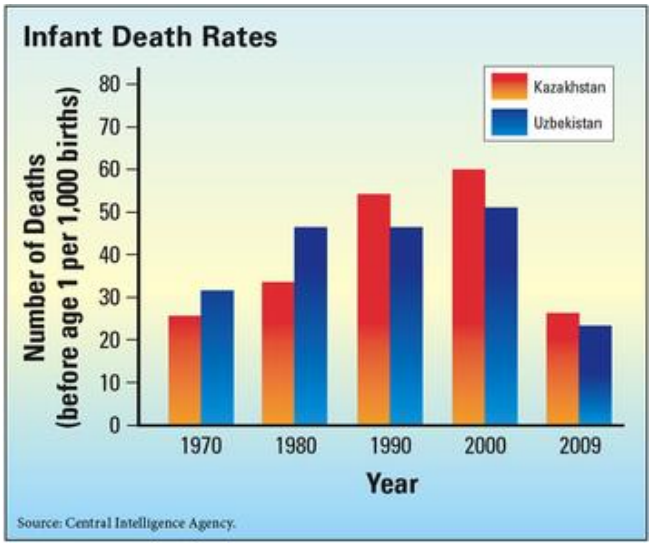
The Collapse of the Aral Sea Fishing Industry The shrinking of the Aral Sea destroyed the fishing industry. As the sea began to withdraw, the fisheries were left high and dry. Today the town of Moynaq is more than 90 miles from the water's edge.
The small amount of water that remains in the Aral Sea is extremely salty. Very few organisms can live in such saline conditions. In fact, most of the 100 species of fish that were once plentiful in the sea have disappeared. Commercial fishing ended in 1982, and as a result the fishing crews and cannery workers lost their jobs.
Most of these former fishing-industry workers have been unable to find other employment nearby. The highest level of joblessness in Kazakhstan is in the Aral Sea region. Thousands of people have left the region to seek work elsewhere. Often men **migrate** alone, leaving their families behind in the dying towns. The women and children must then survive on whatever money the men are able to send home. Of the 40,000 people who once lived in Moynaq, only a scant 3,000 remain.

5. 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 to irrigate the 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. Stomach problems 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 only makes these health problems worse. 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 begun to help the people who live 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, less water should be removed from the Amu and Syr rivers for irrigation. This would allow for increased 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.

These changes will cost billions of dollars. This is a far greater expense than any country in the region can afford—but there is hope. In 2005, Kazakhstan, with help from the World Bank, built an $85 million dike and dam system to discharge water from the Syr River into the northern sea. The water level of this part of the Aral rose about 6 feet and saltiness was reduced by about half in only 8 months. The sea also increased in area by 20 percent. Also, this part of Central Asia has large oil reserves. In the future, the countries around the Aral Sea may be able to use money earned by selling oil to improve the quality of life in this region.

Summary - Beginning to Think Globally

In this chapter, 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 has shrunk significantly and split 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 their water requirements, some countries turn to desalinization, a costly process in which salt water is converted to fresh water.

Water stress results 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.

Global Connections

This map shows regions of the world that rely on irrigation to grow crops. The colors indicate the percentage of land in each area that is irrigated. Symbols for four crops that are heavy water users are shown in the countries where the majority of the total world production of each crop is grown.

What factors might affect how much water a region uses for irrigating crops? One factor affecting how much water a region uses for irrigation is population density. The more people who live in a particular region, the more food local farmers must grow to feed those people. Another factor affecting water use is climate. Areas with relatively high year-round rainfall need little irrigation. In contrast, areas with little precipitation depend on irrigation. A third factor is the type of crop being grown, as some crops are significantly thirstier than others.

What areas are most likely to experience water stress? Areas with dry climates and high population densities are most likely to face water

stress. Most of California, for example, is arid. Farmers there must rely on irrigation to grow large amounts of cotton, fruits, and vegetables. As California's urban population continues to increase, farmers have to compete with cities for limited water supplies.

What choices can people make to reduce water stress? The best way to reduce water stress is to reduce water needs. For farmers in arid regions, this means growing less thirsty crops. Switching from cotton to wheat, for example, can cut water use by more than half. For families, this means using less water for daily living. For example, repairing one dripping faucet can save 3,000 gallons of water per year.

Crop	Symbol	Water Needed to Grow 1 Pound of Crop	Major World Producers
Cotton		840–3,500 gallons	China, India, United States
Rice		360–600 gallons	China, India, Indonesia
Sugarcane		180–360 gallons	Brazil, India, Thailand, China
Wheat		110 gallons	China, India, United States, Russia