Brandon Valley School District

District Learning Plan

March 16-19, 2020

Grade 6 Science

Brandon Valley School District Distance Learning Plan

LESSON/UNIT: Hydrosphere **SUBJECT/GRADE: 6th Science** **DATES: March 16 - 19, 2020**

What do students need to do?	For Science this week, you will read four NEWSELA articles and answer the questions. Monday (3/16): Read Newsela article Bodies Of Water: Oceans and answer four questions. Tuesday (3/17): Read Newsela article The Water Cycle and answer four questions. Wednesday (3/18): Read Newsela article The Ocean's Conveyor Belt Mixes Global Waters and answer four questions. Thursday (3/19): Read Newsela article Hydropower Explained and answer four questions.
What do students need to bring back when school resumesl?	-Article question answers
What standards do the lessons cover?	MS-ESS2-1 Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process. MS-ESS2-4 Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity. MS-ESS2-6 Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates. MS-ESS3-1 Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes. MS-ESS3-3 Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment. MS-ESS3-4 Construct an argument supported by evidence for how increases in human population and per capita consumption of natural resources impact Earth's systems. MS-ESS3-5 Ask questions to clarify evidence of the factors that may have caused a change in global temperatures over the past century.
What materials do students need? What extra resources can students use?	- NEWSELA articles- Pdf or online (Student Accounts) - Paper and pencil - https://my.mheducation.com/login (Student Text Book- Chapter 16)

What can students do if they finish early?	- https://games.noaa.gov/ (Interactive Games- National Oceanic and Atmospheric Administration) - https://kids.nationalgeographic.com/explore/ocean-portal/ (Interactive website) - Independent Reading
Who can we contact if we have questions?	Mr. Putnam- Mike.Putnam@k12.sd.us Ms. Grieve- Tami.Grieve@k12.sd.us Ms. Schindling- Kayla.Schindling@k12.sd.us Mr. VanHeel- Jeremy.VanHeel@k12.sd.us Ms. Sports- Wendy.Sports@k12.sd.us Ms. Manitz- Christine.Manitz@k12.sd.us Ms. Murtha- Christine.Murtha@k12.sd.us
Notes: **Feel free to reach out if you have any questions.**	

Bodies Of Water: Oceans

By Encyclopaedia Britannica, adapted by Newsela staff on 10.02.17
Word Count **747**
Level **MAX**

A child plays in the waves of the Atlantic Ocean in Porto Corvo on the coast of Portugal. Photo from: Wikimedia Commons

An ocean is a massive body of salt water. Oceans cover nearly 71 percent of Earth's surface and contain almost 98 percent of all the water on Earth.

There is one world ocean, but it is divided into five main areas: the Pacific, the Atlantic, the Indian, the Arctic and the Southern, or Antarctic. Together, they can be seen as one world ocean because they have no real borders, and water flows freely among them. Smaller parts of these oceans are called seas, gulfs and bays.

Ocean Water

Ocean water is salty. The saltiness comes from a chemical substance called sodium chloride, which is dissolved in the water. (The salt that people eat is sodium chloride in the form of crystals.)

Winds and other forces cause ocean water to be constantly in motion. Large amounts of ocean water move around Earth in patterns called currents. Ocean currents may be warm or cold. Warm currents tend to bring warm weather and rain to nearby land, while cold currents tend to cause a

dry climate. The Gulf Stream is a warm current that runs north along the eastern coast of the United States.

Winds also cause ocean water to move in waves. Steady, powerful winds cause big waves and gentle breezes create ripples. Large swells in ocean water usually come from stormy weather.

Tides, the rise and fall of ocean levels, are another way that ocean water moves. Tides happen throughout the day. On a beach, for example, the ocean covers more sand at high tide than at low tide. The pull of a force called gravity among the Earth, the moon and the sun causes tides.

Ocean Floor

The ocean floor has many levels. The shallowest part of the oceans, called the continental shelf, lies along the edges of the continents. The edges of the continental shelf slope down toward the deep parts of the oceans, called the basins. At the bottom of the basins are large, flat plains.

In some places, deep cracks called trenches cut into the ocean floor. In other places, underwater mountain chains, called oceanic ridges, rise up from the floor. Earthquakes sometimes occur along the trenches and ridges, and parts of the ridges even contain active volcanoes.

Ocean Life

Living things inhabit all levels of Earth's oceans. Ocean plants grow fairly close to the water's surface because they need sunlight to stay alive. Sunlight penetrates the water to only about 656 feet. The most numerous ocean plants, called phytoplankton, are tiny, one-celled plants that drift with the ocean currents. Various kinds of sea grass and other plants also grow in the world's oceans, and seaweeds, which are plantlike forms of algae, are plentiful as well.

Like ocean plants, most ocean animals live in shallower water. This is because there are more plants and animals to eat near the water's surface. But animals also can be found in deep water, including within the oceans' deepest, darkest trenches.

The largest ocean animal is the blue whale. No larger animal has ever lived on Earth. The tiniest animals are a form of plankton called zooplankton. Hundreds of thousands of other types of animal also live in the ocean, including clams, crabs, squid, dolphins and many different kinds of fish. Corals and sea anemones look like plants, but they are animals, too.

Importance Of The Oceans

The world's oceans are important to life on Earth. Oceans are a great source of food for people around the world and also provide minerals, oil and natural gas. Phytoplankton and algae create much of the world's oxygen. Oceans also help to keep climates stable by storing heat from the sun.

Today, many dangers threaten the health of the oceans. People pollute oceans by dumping poisonous waste and garbage into them. Ocean pollution reduces oxygen in the water and harms ocean life. Overfishing and oil spills harm ocean life as well.

People called oceanographers study the oceans to try to keep them healthy. Some examine the quality of the water and the way the water moves. Others look at the structures of the seafloors and basins. Another group of oceanographers is interested in the plants and animals that live in oceans.

Quiz

1 Which sentence from the article BEST supports the idea that oceans are important for life on Earth to thrive?

(A) Oceans are a great source of food for people around the world and also provide minerals, oil and natural gas.

(B) Ocean pollution reduces oxygen in the water and harms ocean life.

(C) People called oceanographers study the oceans to try to keep them healthy.

(D) Another group of oceanographers is interested in the plants and animals that live in oceans.

2 Read the section "Ocean Water."

Select the paragraph from the section that suggests that the people who live close to the ocean can feel the effect it has on the temperature in the area.

3 Which sentence would be BEST to include in a summary of the article?

(A) The ocean is divided into smaller parts called seas, gulfs and bays.

(B) The ocean gets its saltiness from a substance called sodium chloride.

(C) The ocean is known to have earthquakes and active volcanoes.

(D) The ocean is home to many diverse forms of plant and animal life.

4 Read the following detail from the article.

> *Oceans cover nearly 71 percent of Earth's surface and contain almost 98 percent of all the water on Earth.*

How does this detail develop the CENTRAL idea of the article?

(A) It shows readers why oceans are necessary for life on Earth.

(B) It explains why the ocean has many different plants and animals.

(C) It shows that a large portion of the Earth is covered by oceans.

(D) It suggests that it is very important to keep oceans healthy.

The water cycle

By National Geographic Society on 03.27.19
Word Count **1,271**
Level **MAX**

Image 1. A blueish glacier is seen in an ocean in Antarctica in February 2019. Most of the freshwater on Earth exists in the form of glaciers. Photo by: Ozge Elif Kizil/Anadolu Agency/Getty Images

The water cycle describes how water is exchanged or cycled through Earth's land, ocean and atmosphere. Water always exists in all three places, and in many forms — as lakes and rivers, glaciers and ice sheets, oceans and seas, underground aquifers, and vapor in the air and clouds.

Evaporation, Condensation And Precipitation

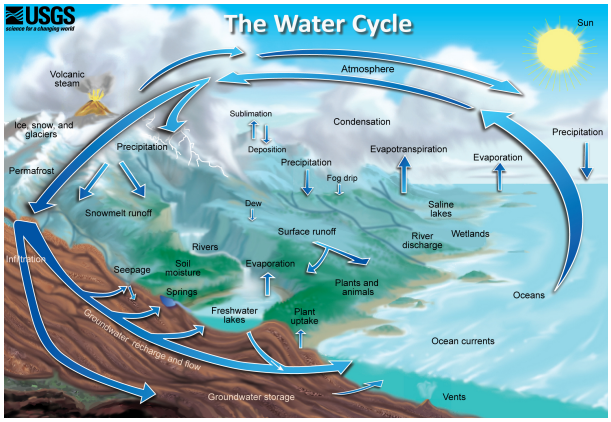
The water cycle is made up of three major parts: evaporation, condensation and precipitation.

Evaporation

Evaporation is the process of a liquid's surface changing to a gas. In the water cycle, liquid water (in the ocean, lakes or rivers) evaporates and becomes water vapor.

Water vapor surrounds us, as an important part of the air we breathe. Water vapor is also an important greenhouse gas. Greenhouse gases such as water vapor and carbon dioxide insulate the Earth and keep the planet warm enough to maintain life as we know it.

The water cycle's evaporation process is driven by the sun. As the sun interacts with liquid water on the surface of the ocean, the water becomes an invisible gas (water vapor). Evaporation is also influenced by wind, temperature and the density of the body of water.



Condensation

Condensation is the process of a gas changing to a liquid. In the water cycle, water vapor in the atmosphere condenses and becomes liquid.

Condensation can happen high in the atmosphere or at ground level. Clouds form as water vapor condenses, or becomes more concentrated (dense). Water vapor condenses around tiny particles called cloud condensation nuclei (CCN). CCN can be specks of dust, salt or pollutants. Clouds at ground level are called fog or mist.

Like evaporation, condensation is also influenced by the sun. As water vapor cools, it reaches its saturation limit or dew point. Air pressure is also an important influence on the dew point of an area.

Precipitation

Unlike evaporation and condensation, precipitation is not a process. Precipitation describes any liquid or solid water that falls to Earth as a result of condensation in the atmosphere. Precipitation includes rain, snow and hail.

Fog is not precipitation. The water in fog does not condense sufficiently to precipitate, or liquefy, and fall to Earth. Fog and mist are a part of the water cycle called suspensions: they are liquid water suspended in the atmosphere.

Precipitation is one of many ways water is cycled from the atmosphere to the Earth or ocean.

Other Processes

Evaporation, condensation and precipitation are important parts of the water cycle. However, they are not the only ones.

Runoff, for instance, describes a variety of ways liquid water moves across land. Snowmelt, for example, is an important type of runoff produced as snow or glaciers melt and form streams or pools.

Transpiration is another important part of the water cycle. Transpiration is the process of water vapor being released from plants and soil. Plants release water vapor through microscopic pores called stomata. The opening of stomata is strongly influenced by light, and so is often associated with the sun and the process of evaporation. Evapotranspiration is the combined components of evaporation and transpiration and is sometimes used to evaluate the movement of water in the atmosphere.

States Of Water

Through the water cycle, water continually circulates through three states: solid, liquid and vapor.

Ice is solid water. Most of Earth's freshwater is ice, locked in massive glaciers, ice sheets and ice caps.

As ice melts, it turns to liquid. The ocean, lakes, rivers and underground aquifers all hold liquid water.

Water vapor is an invisible gas. Water vapor is not evenly distributed across the atmosphere. Above the ocean, water vapor is much more abundant, making up as much as 4 percent of the air. Above isolated deserts, it can be less than 1 percent.

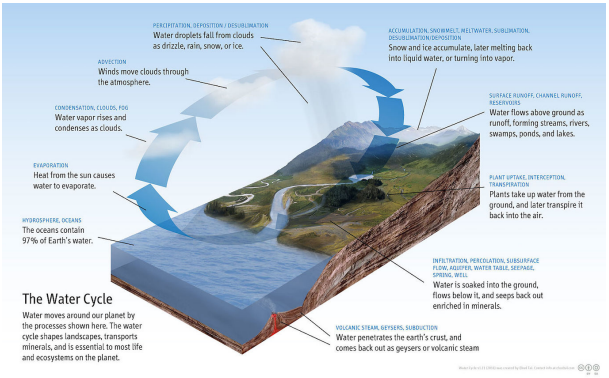
The Water Cycle And Climate

The water cycle has a dramatic influence on Earth's climate and ecosystems.

Climate is all the weather conditions of an area, evaluated over a period of time. Two weather conditions that contribute to climate include humidity and temperature. These weather conditions are influenced by the water cycle.

Humidity is simply the amount of water vapor in the air. As water vapor is not evenly distributed by the water cycle, some regions experience higher humidity than others. This contributes to radically different climates. Islands or coastal regions, where water vapor makes up more of the atmosphere, are usually much more humid than inland regions, where water vapor is scarcer.

A region's temperature also relies on the water cycle. Through the water cycle, heat is exchanged and temperatures fluctuate. As water evaporates, for example, it absorbs energy and cools the local environment. As water condenses, it releases energy and warms the local environment.



The Water Cycle And The Landscape

The water cycle also influences the physical geography of the Earth. Glacial melt and erosion caused by water are two of the ways the water cycle helps create Earth's physical features.

As glaciers slowly expand across a landscape, they can carve away entire valleys, create mountain peaks and leave behind rubble as big as boulders. Yosemite Valley, part of Yosemite National Park in the U.S. state of California, is a glacial valley.

Glacial melt can also create landforms. The Great Lakes, for example, are part of the landscape of the Midwest of the United States and Canada. The Great Lakes were created as an enormous ice sheet melted and retreated, leaving liquid pools.

The process of erosion and the movement of runoff also create varied landscapes across the Earth's surface. Erosion is the process by which earth is worn away by liquid water, wind or ice.

Erosion can include the movement of runoff. The flow of water can help carve enormous canyons, for example. These canyons can be carved by rivers on high plateaus. A famous canyon is the

Grand Canyon. It is on the Colorado Plateau in the U.S. state of Arizona. They can also be carved by currents deep in the ocean such as the Monterey Canyon in California.

Reservoirs And Residence Time

Reservoirs are simply where water exists at any point in the water cycle. An underground aquifer can store liquid water, for example. The ocean is a reservoir. Ice sheets are reservoirs. The atmosphere itself is a reservoir of water vapor.

Residence time is the amount of time a water molecule spends in one reservoir. For instance, the residence time of "fossil water," ancient groundwater reservoirs, can be thousands of years.

Residence time for water in the Antarctic ice sheet is about 17,000 years. That means that a molecule of water will stay as ice for about that amount of time.

The residence time for water in the ocean is much shorter — about 3,200 years.

The residence time of water in the atmosphere is the shortest of all — about nine days.

Calculating residence time can be an important tool for developers and engineers. Engineers may consult a reservoir's residence time when evaluating how quickly a pollutant will spread through the reservoir, for instance. Residence time may also influence how communities use an aquifer.

Fast Facts:

Breaking The Cycle

The water cycle can change. Glacial retreat is the process in which glaciers melt faster than their ice can be replaced by precipitation. Glacial retreat limits the amount of fresh water available on Earth. We are experiencing the fastest rate of glacial retreat in recorded history.

Quiz

1 Which sentence from the section "The Water Cycle And Climate" BEST supports the conclusion that the water cycle has a significant effect on weather?

(A) Climate is all the weather conditions of an area, evaluated over a period of time.

(B) Two weather conditions that contribute to climate include humidity and temperature.

(C) Humidity is simply the amount of water vapor in the air.

(D) As water condenses, it releases energy and warms the local environment.

2 Which sentence from the article shows a MAIN problem facing Earth's water supply?

(A) Most of Earth's freshwater is ice, locked in massive glaciers, ice sheets and ice caps.

(B) Water vapor is not evenly distributed across the atmosphere.

(C) Residence time for water in the Antarctic ice sheet is about 17,000 years.

(D) We are experiencing the fastest rate of glacial retreat in recorded history.

3 What is the MOST likely reason the author included the information about reservoirs and residence time?

(A) to show why it is important to protect ancient groundwater aquifers

(B) to show why it is important to understand how Earth stores water

(C) to explain how pollution can affect the quality of different water sources

(D) to explain how a warm climate can affect how much fresh water there is

4 Based on the article, what effect does pollution have on condensation?

(A) There are more particles in the air for water vapor to cluster around.

(B) Areas with more pollution have more clouds and rain.

(C) Pollution creates more ground level clouds.

(D) It is harder for the sun to warm up the water vapor.

The ocean's conveyor belt mixes global waters

By National Geographic Society, adapted by Newsela staff on 04.19.19
Word Count **1,084**
Level **940L**

The Antarctic Circumpolar Current and overturning make the waters around Antarctica an ideal habitat for many marine mammals. Many types of whales, for instance, migrate to the waters around Antarctica every year to feed on phytoplankton and other tiny sea creatures churned up by overturning waters. Here is a humpback whale in Antartica. They dive deep for food. Photo from Getty Images.

The ocean is in constant motion. You can see this for yourself when you watch waves crash onto shore. If you go swimming, you may even feel an ocean current pulling you along. Surface currents, such as the Gulf Stream, move water across the globe. They are powered by the Earth's various wind patterns. The ocean also has deep underwater currents. These are bigger than surface currents, but more slow-moving. Underwater currents mix the ocean's waters on a global scale. They are driven by a process known as thermohaline circulation.

Global Oceanic Circulation

Thermohaline circulation moves a huge current of water around the globe, from northern oceans to southern oceans, and back again. Currents slowly turn over water in the entire ocean, from top to bottom. Warm surface waters move downward and cold, nutrient-rich waters are forced

upward. The whole process is something like a giant conveyor belt. A conveyor belt is a continuously moving band of material that moves objects from one place to another, and then circles back on itself. You may have seen conveyor belts at airports, where they are used to move passenger luggage.

The term thermohaline combines the words thermo (heat) and haline (salt). Both heat and salt are factors that influence the density of seawater. Density is the amount of matter in a specific volume of material. The more matter something has, the more it weighs. The ocean is constantly shifting and moving in reaction to changes in water density. To best understand ocean water dynamics, or how water moves, there are a few simple principles to keep in mind:

• Water always flows down toward the lowest point.

• Water's density is determined by the water's temperature and salinity (amount of salt).

• Cold water is denser than warm water.

• Water with high salinity is denser than water with low salinity.

• Ocean water always moves toward an equilibrium, or balance. For example, if surface water cools and becomes denser, it will sink. The warmer water below will rise to balance out the missing surface water.

Top Layer, Thermocline And Deep Ocean

The ocean can be divided into several layers. The top layer collects the warmth and energy of sunlight, while the bottom layers collect the rich, nutrient-filled sediment of decayed plant and animal matter.

The top ocean layer is about 330 feet deep. Enough sunlight reaches that depth for phytoplankton to carry out photosynthesis. Phytoplankton are microscopic plants. They make up the first part of the marine food chain and are essential to all ocean life.

The middle layer is called the thermocline. The ocean's temperature and density change very quickly at this layer. The thermocline is about 1,600 to 3,300 feet deep.

Below the thermocline is the bottom layer, or deep ocean, which averages about 2 miles in depth.

Movement In The Depths

As phytoplankton die, they sink and collect on the ocean floor. Thus, nutrients continuously move from the ocean's surface to its depths. However, this process is not one-way. In certain regions of the ocean, deep water upwells, or rises to the surface. As it rises, it brings nutrients back up to the surface.

The ocean slowly turns over from top to bottom in a continual global loop. Like a conveyor belt, thermohaline circulation moves nutrients from one part of the ocean to another.

Let's start in the northern Atlantic Ocean and follow the conveyor belt as it moves water around the Earth.

In the seas near Greenland and Norway, the water is cold. Some of it freezes, leaving salt behind. The cold, salty water becomes dense and sinks to the ocean floor. This water is known as the North

Atlantic Deep Water, and it is one of the primary driving forces of the conveyor belt.

The force of the sinking cold water pushes the existing North Atlantic Deep Water south, toward Antarctica, in a slow-moving underwater current. When it reaches Antarctica, the water flows east with the Antarctic Circumpolar Current. This huge and powerful current circles the continent.

Parts of the Antarctic Circumpolar Current flow northward and move into the Indian and Pacific Oceans. As the deep, cold water travels through the oceans, it mixes with warmer water. The water eventually becomes warm enough to rise. This creates a slow upwelling that brings nutrients to the surface.

In the Pacific, the surface water flows into the Indian Ocean. It then travels around southern Africa, and back into the Atlantic. The warm waters eventually travel back to the North Atlantic Deep Water, completing the global loop.

It takes about 500 years for the conveyor belt to turn over the ocean's waters and make one complete trip around the Earth.

The deep water in the Greenland Sea flows along toward the lowest point on the floor of the North Atlantic Ocean. The water collects in a basin, the same way river water flows into a lake or pond. That basin is the North Atlantic Deep Water.

Other seas also feed their waters into the North Atlantic Deep Water. Among them are the Mediterranean Sea, which enters the Atlantic Ocean through the Strait of Gibraltar.

Overturning Near Antarctica

Once the conveyor belt reaches the southern part of the globe it is driven back north by the Antarctic Circumpolar Current.

Western winds are very strong in the Antarctic. They help create the intensely powerful Antarctic Circumpolar Current, which moves a huge amount of water very quickly around the continent of Antarctica.

Overturning occurs in the waters around Antarctica. It happens when the extremely cold Antarctic surface water sinks, causing nutrient-rich deep water to rise. Overturning continually moves huge amounts of water from the ocean bottom to the surface.

The Antarctic Circumpolar Current and overturning make the waters around Antarctica an ideal habitat for many marine mammals. Many types of whales, for instance, migrate to the waters around Antarctica every year. They feed on phytoplankton and other tiny sea creatures churned up by overturning waters.

Threat To The System

Ocean temperature plays a key role in the conveyor belt. Thus, climate change caused by human activities could threaten the system. If one part of the conveyor belt were to break down, nutrients would not be distributed to start the food chain. Organisms such as phytoplankton need those nutrients to thrive. Severe climate change slows phytoplankton from forming the first link in the marine food chain. If the first link is threatened, all life in the oceans is threatened.

URL: https://www.nationalgeographic.org/encyclopedia/ocean-conveyor-belt/

Quiz

1 How does the author build understanding of thermohaline circulation?

(A) by explaining how ocean water is continuously overturned and pushed downward

(B) by describing a geographic pattern that originates in the north and moves southward

(C) by showing how changes in water density drive ocean currents in a continuous cycle

(D) by pointing out how the ocean layers interact and force currents around the globe

2 Read the following paragraph from the section "Threat To The System."

Ocean temperature plays a key role in the conveyor belt. Thus, climate change caused by human activities could threaten the system. If one part of the conveyor belt were to break down, nutrients would not be distributed to start the food chain. Organisms such as phytoplankton need those nutrients to thrive. Severe climate change slows phytoplankton from forming the first link in the marine food chain. If the first link is threatened, all life in the oceans is threatened.

What does the author MOST LIKELY want the reader to think about climate change based on this selection?

(A) If ocean temperatures keep rising, climate change will be a problem for humans.

(B) Because humans are responsible for climate change, marine life will disappear.

(C) Since climate change is just getting started, the marine food chain has not yet been affected.

(D) Unless humans put the brakes on climate change, life in the ocean is at risk.

3 Read the following selection from the section “Overturning Near Antarctica,” then fill in the blank.

Many types of whales, for instance, migrate to the waters around Antarctica every year. They feed on phytoplankton and other tiny sea creatures churned up by overturning waters.

The phrase "churned up" in the sentence above tells the reader that ____.

(A) the sea life is plentiful

(B) the winds are steady

(C) the water is agitated

(D) the current is strong

4 What is the definition of “conveyor belt" as used in the following selection?

Let's start in the northern Atlantic Ocean and follow the conveyor belt as it moves water around the Earth.

(A) a device that moves in a loop

(B) a constantly moving system

(C) a method of moving objects

(D) a slowly moving pressure

Hydropower explained

By U.S. Energy Administration, adapted by Newsela staff on 10.22.19
Word Count **677**
Level **930L**

Image 1. The Chief Joseph Dam on the Columbia River, Washington. Dams harness the power of water to produce electricity. Photo by: Earl Roberge/Science Source

People have a long history of using the force of flowing water to produce mechanical energy. Energy created using the flow of water in streams or rivers is called hydropower. Hydropower was one of the first sources of energy used for electricity generation. In the United States, it is the largest single renewable energy source for electricity generation. A renewable energy source is a source that is naturally replenished, like sunlight, wind and flowing water.

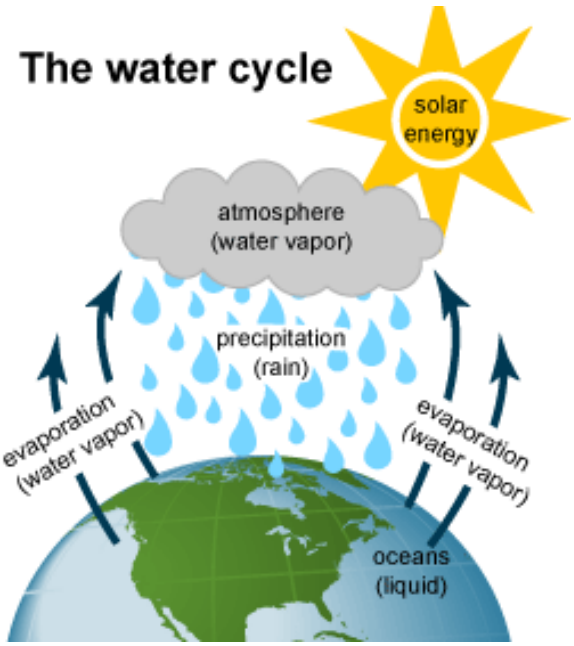
Hydroelectricity is the electricity produced from hydropower. In 2018, hydroelectricity accounted for about 7 percent of the total U.S. large-scale electricity generation. It accounted for around 40 percent of total large-scale electricity generation from renewable energy sources. Hydroelectricity's share of total U.S. electricity generation has decreased over time. This is due to increased electricity generation from other sources.

Hydropower Relies On The Water Cycle

Understanding the water cycle is important to understanding hydropower. The water cycle has three steps. First, solar energy heats water on the surface of rivers, lakes and oceans. Heating

water causes some of it to evaporate. Next, water vapor condenses into clouds and falls as rain or snow. Lastly, rain and snow collect in streams and rivers. Streams and rivers empty into oceans and lakes. There, the water can evaporate and the cycle begins again.

The amount of rain and snow that drains into rivers and streams in a place determines the amount of water available for producing hydropower. Amounts of rain and snow can change with the seasons. They can also change because of longer-term weather patterns, such as droughts. These changes have a large effect on hydropower production.



Hydroelectric Power Is Produced With Moving Water

Water is the source of hydroelectric power. This is why hydroelectric power plants are usually located on or near a water source. Two primary factors determine the amount of available energy in moving water. One factor is the volume of the water flow. Swiftly flowing water in a big river carries a great deal of energy in its flow. For example, the Columbia River is a large river that forms the border between Oregon and Washington. It carries a large amount of energy in its flow.

The other factor that determines the amount of energy in moving water is the change in elevation, or fall, as the water moves from one point to another. Water descending quickly from a high point also has a large amount of energy in its flow. The water flowing over Niagara Falls in New York is an example of water falling quickly from a high point.

At both Niagara Falls and the Columbia River, water flows through a pipe. The pipe is also known as a penstock. The force of the water pushes and turns blades in a turbine. The turbine blades spin a generator. A generator is a machine the converts energy into electricity.

There are other types of hydropower systems. In a run-of-the-river system, the force of the current applies pressure on a turbine. In a storage system, dams are used to create reservoirs for the water. Water gathers in these reservoirs before reaching the turbine and is released as needed to generate electricity.

History Of Hydropower

Hydropower is one of the oldest sources of energy for producing mechanical and electrical energy. Hydropower was used thousands of years ago to turn paddle wheels to help grind grain. Before steam power and electricity were available in the United States, grain and lumber mills were powered directly with hydropower.

The first industrial use of hydropower to generate electricity in the United States occurred in 1880. Sixteen of the first electric lamps were powered using a water turbine at the Wolverine Chair Factory in Grand Rapids, Michigan. The first U.S. hydroelectric power plant opened on the Fox River near Appleton, Wisconsin, in 1882. Most U.S. hydroelectricity is now produced at large dams on major rivers. Most of these hydroelectric dams were built before the mid-1970s.

Quiz

1 Which sentence from the introduction [paragraphs 1-2] BEST supports the conclusion that hydropower is less popular than other ways of creating energy?

(A) A renewable energy source is a source that is naturally replenished, like sunlight, wind and flowing water.

(B) It accounted for around 40 percent of total large-scale electricity generation from renewable energy sources.

(C) Hydroelectricity's share of total U.S. electricity generation has decreased over time.

(D) This is due to increased electricity generation from other sources.

2 How does hydropower work? How do you know?

(A) Vapor from the water cycle is harnessed to create energy. "There, the water can evaporate and the cycle begins again."

(B) Vapor from the water cycle is harnessed to create energy. "Next, water vapor condenses into clouds and falls as rain or snow."

(C) The movement of water is turned into another form of energy. "People have a long history of using the force of flowing water to produce mechanical energy."

(D) The movement of water is turned into another form of energy. "In the United States, it is the largest single renewable energy source for electricity generation."

3 What is MOST likely the reason the author included information about renewable energy?

(A) because renewable energy causes less pollution than hydropower

(B) because hydropower will eventually be replaced by renewable energy

(C) because renewable energy is important for stopping climate change

(D) because hydropower is a major source of renewable energy

4 Read the selection below.

> *The amount of rain and snow that drains into rivers and streams in a place determines the amount of water available for producing hydropower. Amounts of rain and snow can change with the seasons. They can also change because of longer-term weather patterns, such as droughts. These changes have a large effect on hydropower production.*

Why did the author include this information?

(A) to show that hydropower production is sensitive to unpredictable changes in the environment

(B) to show that hydropower can cause unpredictable changes in the environment

(C) to show that the water cycle is unpredictable, which makes hydropower unreliable

(D) to show that the water cycle is unpredictably changing due to global warming