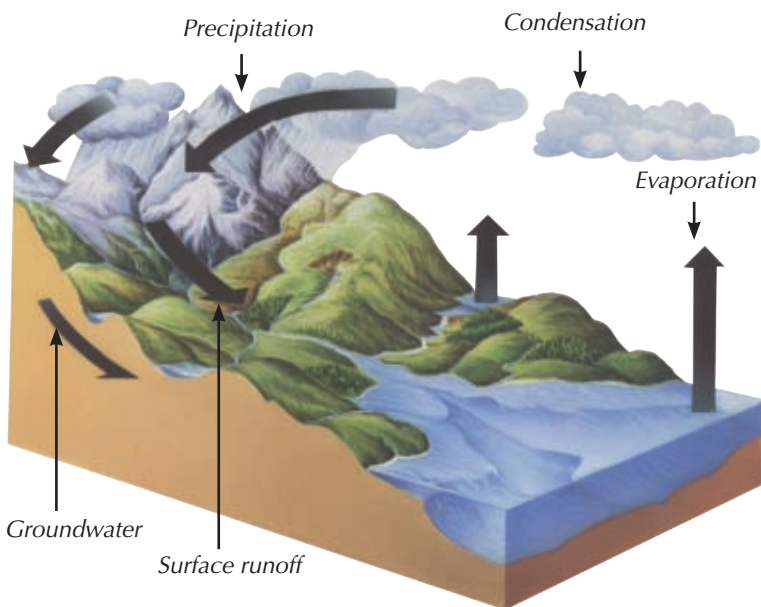


# The Earth's Water

**W**ater is needed for all life on Earth. Almost 71% of Earth's surface is covered with water. Water is found in many forms. These include groundwater, surface water, and ice. *Groundwater* is water stored underground. It is found in *aquifers*, or areas of water under the ground. *Surface water* is stored in oceans, streams, rivers, and lakes. It is also stored in man-made *reservoirs*, which are lakes or ponds created by people. Because there is so much water here, Earth is known as "the blue planet."



- **Condensation:** In the air, water vapor rises and cools and changes into liquid. The little drops of water in the air form clouds. This is called *condensation*.
- **Precipitation:** When a lot of water vapor condenses into droplets, the clouds become heavy. The air cannot hold the droplets anymore. They fall from the sky. This is called *precipitation*.
- **Collection:** When water falls to Earth, it may fall on oceans, lakes, or rivers. It may also fall on land. On land, water seeps, or soaks, into the ground and becomes *groundwater*.

## The Water Cycle

Earth has almost the same amount of water now as it had millions of years ago. The water we drink today is the same water the dinosaurs drank. Water on Earth keeps moving through its different states—solid, liquid, and gas. This movement of water on, above, and below the surface of Earth is known as the *water cycle* or *hydrologic cycle*. The water cycle is always happening. It has no starting or ending point. It is made up of several steps:

- **Evaporation:** Heat and energy from the sun warm the water of oceans, lakes, and rivers. The warm water changes from liquid into a gas called *water vapor*. This is known as *evaporation*.

## Oceans

*Oceans* are large bodies of water that cover about 71% of Earth's surface. Oceans contain about 97% of Earth's water. The five oceans on Earth are the Pacific, Atlantic, Indian, Arctic, and Southern Oceans.

### Did you know?

Earth has about 326 million cubic miles of water.



### Rivers

*Rivers* are natural waterways flowing on the Earth's surface. Rivers carry water over land from high points to lower ones. *Altitude* is the height of land above sea level. Mountains are at high altitudes. The sea is at low altitude. Rivers drain their water into the seas and oceans.

### Glaciers

*Glaciers* are thick layers of hard snow and ice that flow like slow-moving rivers. The snow in glaciers builds up over many years. Glaciers are the largest storage of freshwater on Earth. Around 69% of the world's total freshwater is in glaciers and ice caps. If these glaciers and ice caps melt, sea levels could rise by as much as 210 feet. Most glaciers are in Greenland and Antarctica.



### Aquifers

*Aquifers* are underground water storage areas. Aquifers store water between layers of rocks, sand, and gravel. Aquifer water is cleaner than surface water. Rocks and soil filter out (stop from passing through) anything that may be in the water. The water in aquifers can be pumped out by digging wells into the ground. This freshwater can be used in homes and on farms.



### Lakes and Reservoirs

*Lakes* are water bodies surrounded by land. Most lakes are a source of freshwater. However, some lakes are even saltier than the ocean. Reservoirs are man-made lakes. They form when dams are built on rivers.

# Usable Water

Usable water is water that we can use in many ways. We use water for drinking, washing, bathing, cooking, and watering plants and food crops. Earth has plenty of water, but not all the water on Earth is usable. Ocean water is salty and therefore not usable. Only 1% of the water on Earth is usable for humans. This usable water can be found in groundwater, lakes, and rivers.

## Ways We Use Water

- For agriculture (farming)
- In homes
- By industry (companies)
- To generate thermoelectric power (electricity)
- For mining

## What makes water unusable?

- Hazardous (dangerous) waste
- Wastes that have not been correctly handled
- Use of chemical pesticides and fertilizers
- Water that has become mixed with motor oil, grease, and paint



# Potable Water

Water that is safe and suitable for humans to drink is called *potable* water. Potable water does not contain salt. It is also known as drinking water. Potable water is actually *treated water*. Water from streams, rivers, springs, and lakes is treated to remove impurities. Potable water is not found in the same amounts everywhere in the world. Most of Earth's freshwater is located in North America.

## Where does potable water come from?

Potable water comes from two sources: groundwater and surface water. Both of these water sources depend on rain, snow, and other forms of precipitation. Groundwater is an important source of potable water in *arid* (dry or desert) areas. The western states of the United States get their potable water mainly from groundwater reserves.



## Who is responsible for potable water quality?

Water can contain around 80 contaminants that can cause health problems. Governments are responsible for providing safe potable water by:

- Checking for contaminants in water
- Making sure there is enough potable water
- Getting potable water to places where people need it
- Recording complaints from people who use their water
- Responding to these complaints





## Water Contaminants

*Contaminants* are impurities that pollute water. They are harmful for humans and for plants and animals. Contaminated water can cause serious diseases. Waterborne diseases are caused by drinking contaminated water. Contaminants can be natural or man-made. Natural contaminants can come from soil or from rocks. Man-made contaminants include chemicals and toxic materials from industrial, agricultural, or *domestic* (household) sources. Some common water contaminants:

- Batteries
- Cleaning solvents (chemicals)
- Disinfectants that are used to kill bacteria
- Explosives
- Grease
- Laboratory chemicals
- Oils (petroleum based)
- Paints, primers, thinners, dyes, and stains
- Photo development chemicals

## What you can do?

- Know the source of your drinking water.
- Know about the contaminants that pollute drinking water.
- Help with your community water-conservation activities.
- Always watch for chemical spills and leaks. Report these events.
- Follow the directions when using and cleaning up chemicals.

## World Water Day

Potable water is becoming scarce in many parts of the world. About 1.1 billion people do not have access clean water. The United Nations has named March 22 “World Water Day.”



## Did you know?

At any moment, the air contains about 3,100 cubic miles of water, mainly in the form of water vapor.

## Domestic Supply

*Domestic* use of water includes water used in homes every day. Water is used in the home for drinking, cooking, bathing, washing clothes and dishes, flushing toilets, and watering lawns and gardens. Domestic use of water accounts for about 8% of the total water used in a year.



## Thermoelectric Power

*Thermoelectric power* is electricity generated from water. It uses the most water in the United States. Electricity is generated with the help of steam-driven turbines. Thermoelectric power uses 70% salt water and 30% freshwater.



## Did you know?

Los Angeles still uses the same amount of water that it did in the 1970s, even though there are one million more people living there.

## Livestock

*Livestock* are animals raised on farms. Beef cattle, dairy cows, chickens, horses, pigs, sheep, and goats are examples of livestock. Livestock produces meat, poultry, eggs, and dairy products. A dairy cow needs about 42 gallons of water per day.

## Mining

*Mining* is the process of taking valuable minerals from the ground. These minerals include coal, oil, gold, silver, copper, diamonds, and other precious stones. Quarrying, milling, crushing, screening, and washing use water. Mining accounts for about 1% of the groundwater used.

## Water Use in Various Countries

In Europe, about 54% of water use is by industries. Agriculture uses only 33%. Developing countries use most of their water for agriculture. In Africa and India, agriculture alone uses nearly 90% of all water.

# Precious Water: Water Management

Large parts of Earth are covered in water. But most of Earth's water is *saline*, or salty. Salt water is not fit for humans to drink. Drinkable water is a precious commodity. Therefore, it is very important for water to be managed well. Water management aims to limit water use. This is done so that freshwater can be *conserved*, or saved for the future. Water management also helps to determine where freshwater is and how much is available.

## World Water Forum

The World Water Forum is a worldwide drive for better water management. This forum is sponsored by the World Water Council. The World Water Forum is held every third year.

The main goals of the forum:

- To highlight the importance of water
- To create awareness about water issues
- To propose possible solutions
- To get governments to act where needed





# Water Shortage: Population Growth

On October 12, 1999, there were 6 billion people living on Earth. Each year, 80 million or more people are added to the world's population. The increasing population needs more freshwater.



## Factors Affecting Water Shortage

- Population growth
- Climate change
- Food production
- Water quality
- Immigration
- Poverty (not having enough money or resources)
- Urbanization (more people living in cities)



## Immigration and Water Supply

*Immigration* is moving from the land where one was born and settling in a new country. Immigration increases the population of a country. This can create water shortages.

## Did you know?

By 2025, about 48 countries, or 35% of the global population, will face water shortage.

## Urbanization

*Urbanization* is the movement of people to towns and cities. People move to *urban*, or city, areas in search of new opportunities such as jobs. Urbanization leads to more people in a smaller area. Cities may become overpopulated. Water is scarce in these cities.

## Climate Change

*Climate change* is the change in an area's climate due to global warming. Earth is getting warmer. This causes more droughts in some areas and heavier precipitation in others. Increasing temperatures also cause glaciers to melt. All of these factors affect water availability.



## Population Growth in Asia

The population of India, China, and Pakistan will increase by about a billion people by 2050. By 2050, India is expected to add 519 million people. China will add 211 million people. And Pakistan will add nearly 200 million.

## Effects of Drought

- Soil *erosion*, or washing away of soil into rivers
- Invasion of destructive insects and other pests
- Rare animals and plants become *endangered* (at risk of dying out completely)
- Wildfires
- Dust storms
- Loss of crops and livestock
- Movement of humans, animals, and birds away from an area
- Loss of swampland, rivers, and lakes



## Hydrological Drought

*Hydrological drought* is the result of decreased rainfall and its effects on water levels. As rainfall decreases, the water levels in rivers, reservoirs, lakes, and aquifers also decrease. Usually hydrological droughts occur after meteorological droughts. They reduce hydroelectrical power production and other water uses.



## Agricultural Drought

*Agricultural drought* is the result of decreased rainfall. Dry air and less moisture in soil affect crops a great deal. Lower water levels means less water is available to irrigate crops. Wasting water is also an important reason for agricultural droughts. Usually these occur after meteorological and hydrological droughts.

## Three Types of Drought

1. *Meteorological drought* occurs due to low rainfall.
2. *Hydrological drought* occurs due to shrinking water levels.
3. *Agricultural drought* occurs due to less moisture in air and soil.

## Meteorological Drought

*Meteorological drought* occurs when rainfall decreases over a period of time. Less rainfall leads to less soil moisture. This affects vegetation. The definition of what makes a drought is very different for different places. This is because some areas are drier than others.

## Did you know?

Nine of the world's countries possess 60% of Earth's available freshwater supply. They are Brazil, Russia, China, Canada, Indonesia, the United States, India, Colombia, and the Democratic Republic of Congo.