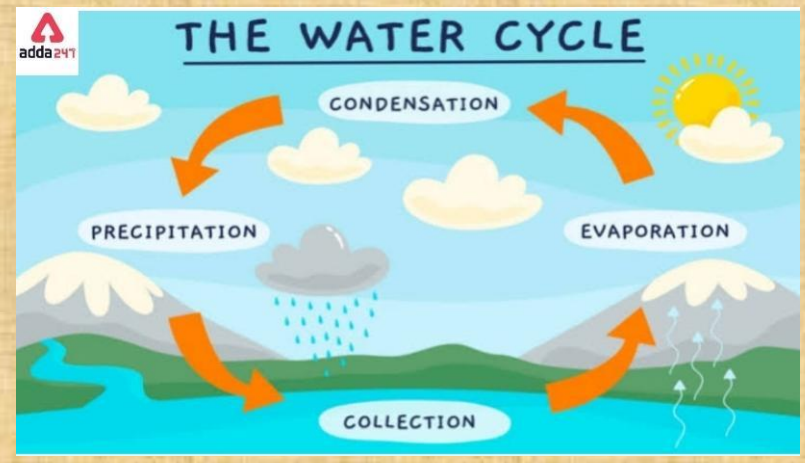
CHAPTER 03

Rain Where Does it Come From

Why Do We Care About the Water Cycle?

We care about the water cycle because water is necessary for all living things.

Wind constantly moves water around, driving a water cycle that permits life and alters landscapes all over the planet. The water cycle is the path that all water follows as it moves around Earth in different states. Liquid water is found in oceans, rivers, lakes—and even underground. Solid ice is found in glaciers, snow, and at the North and South Poles. Water vapor—a gas—is found in Earth's atmosphere.



How does water get into the atmosphere?

There are two main ways this happens:

Heat from the Sun causes water to evaporate from oceans, lakes and streams. Evaporation occurs when liquid water on Earth's surface turns into water vapor in our atmosphere.

Water from plants and trees also enters the atmosphere. This is called transpiration.

Water can be found all over Earth in the ocean, on land and in the atmosphere. The water cycle is the path that all water follows as it moves around our planet.

On Earth, you can find water in all three states of matter: solid, liquid and gas.

The cycle begins at sea. Heat from the sun evaporates water from the oceans. Water rises into the air as vapor and travels with the wind.
The air is full of water, as water vapor, even if you can't see it.

Liquid water changes into a gas when water molecules get extra energy from a heat source such as the Sun or from other water molecules running into them. These energetic molecules then escape from the liquid water in the form of gas. In the process

of changing from liquid to gas, the molecules absorb heat, which they carry with them into the atmosphere. That cools the water they leave behind.

Water Vapor Evaporates Into the Air:

The water and ice that make up clouds travels into the sky within air as water vapor, the gas form of water. Water vapor gets into air mainly by evaporation – some of the liquid water from the ocean, lakes, and rivers turns into water vapor and travels in the air. When air rises in the atmosphere it gets cooler and is under less pressure. When air cools, some of the water vapor condenses. As air pressure drops, some water vapor condenses too. The vapor becomes small water droplets and a cloud is formed.

Clouds are made of water droplets or ice crystals that are so small and light they are able to stay up in the air.

But how does the water and ice that makes up clouds get into the sky?

The air can only hold a certain amount of water vapor, depending on the temperature and weight of the air – or atmospheric pressure – in a given area. The higher the temperature or atmospheric pressure, the more water vapor the air can hold. When a certain volume of air is holding all the water vapor it can hold, it is said to be “saturated.”

What happens if a saturated volume of air cools or the atmospheric pressure drops?

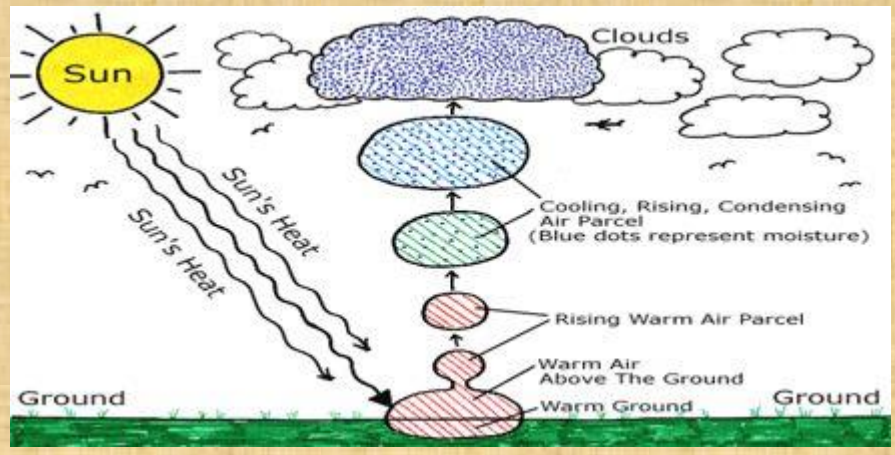
The air is no longer able to hold all that water vapor. The excess amount changes from a gas into a liquid or solid (ice). The process of water changing from a gas to a liquid is called "condensation," and when gas changes directly into a solid, it is called "deposition." These two processes are how clouds form.

Water Vapor Condenses to Form a Cloud

It’s easier for water vapor to condense into water droplets when it has a particle to condense upon. These particles, such as dust and pollen, are called condensation nuclei. Eventually, enough water vapor condenses on pieces of dust, pollen, and other condensation nuclei to form a cloud.

Condensation happens with the help of tiny particles floating around in the air, such as dust, salt crystals from sea spray, bacteria or even ash from volcanoes. Those particles provide surfaces on which water vapor can change into liquid droplets or ice crystals.

Warm water vapor rises up through Earth's atmosphere. As the water vapor rises higher and higher, the cool air of the atmosphere causes the water vapor to turn back into liquid water, creating clouds. This process is called condensation.



Clouds are made up of a bunch of cloud droplets bundled together with raindrops. Clouds are created when water vapor, an invisible gas, turns into liquid water droplets. These water droplets form on tiny particles, like dust, that are floating in the air.

Condensation is the process by which water vapor in the air is changed into liquid water. Condensation is crucial to the water cycle because it is responsible for the formation of clouds. These clouds may produce precipitation, which is the primary route for water to return to the Earth's surface within the water cycle.

Precipitation:

If the air begins to cool—such as when air warmed by the Earth's surface rises or when wind drives air up and over mountains—the air loses its ability to hold water. Clouds in the sky are volumes of air where the water has condensed and has become visible. Ultimately, the water condenses into water droplets or ice crystals that fall as rain or snow. When such clouds are near the ground, the water may condense as dew or frost instead.

Dust and other particles floating in the air provide surfaces for water vapor to turn into water drops or ice crystals. The tiny drops of water condense on the particles to form cloud droplets. A large accumulation of such droplets or ice crystals is a cloud. The big, fluffy clouds floating over your head become heavy enough with large accumulation of water droplets form rain drops to rain down onto your head. When a cloud becomes

full of liquid water, it falls from the sky as rain or snow—also known as precipitation.

Rain and snow then fill lakes and streams, and the process starts all over again.

Once on the land, the water can seep into the ground, collect into lakes and ponds, pile up as snow and ice, or run off into rivers that flow toward the ocean. Fresh water seeping into the ground nurtures plants. Lakes and rivers provide people and animals fresh water for drinking. As the water runs off along the

surface, it may erode the land. Once back in the sea, the water can begin the cycle again.

The Sun's heat causes glaciers and snow to melt into liquid water. This water goes into oceans, lakes and streams. Water from melting snow and ice also goes into the soil. There, it supplies water for plants and the groundwater that we drink.

Snow falling on a glacier during winter months usually replaces any water that melts away in the summer. However, due to Earth's overall warming, most glaciers today are losing more ice than they regain, causing them to shrink over time.