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TOPIC: **Different states of water, Precipitation, Soil Water and Water Table**
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Water is essential for existence of life on earth. Water being continuously used its conservation is the major concern in the present scenario. The water cycle has helped in maintaining water on the surface of the earth for millions of years. The water circulated in water cycle takes three different forms – **solid, liquid and gaseous.** The solid form of water – ice, is found at the poles of the earth, the snow covered mountains and the glaciers. The liquid form is present in the rivers, lakes, seas, and oceans. The gaseous form of water, water vapour is present all around us.

Water present in the oceans and seas evaporate due to the sun's heat and get converted into water vapour. Ice caps and snow can directly sublimate into water vapour. The atmosphere has lower temperatures in some parts of the world which causes water vapour to condense into tiny droplets. These tiny droplets are heavier than air and therefore may fall if not supported by any uplift. A huge concentration of these tiny droplets results in the formation of visible clouds. The cloud particles collide with dust particles and precipitation occurs.

Precipitation is one of the three main processes (evaporation, condensation, and precipitation) that constitute the hydrologic cycle, the continual exchange of water between the atmosphere and Earth's surface. **Precipitation** occurs in the form of rain or snow. Rainwater falls on earth and flows to the rivers and lakes and some of the rainwater is absorbed by the earth's surface. The groundwater gets replenished by rains. This cycle continues in order to maintain the water balance on the surface of the earth.

Types of precipitation:

Drizzle

Liquid precipitation in the form of very small drops, with diameters between 0.2 and 0.5 mm (0.008 and 0.02 inch) and terminal velocities between 70 and 200 cm per second (28 and 79 inches per second), is defined as drizzle.

Rain and freezing rain

Waterdrops with diameters greater than those of drizzle **constitute** rain. **Raindrops** rarely exceed 6 mm (0.2 inch) in diameter because they become unstable when larger than this and break up during their **fall**.

When raindrops fall through a cold layer of air (colder than 0 °C, or 32 °F) and become supercooled, **freezing rain** occurs. The drops may freeze on impact with the ground to form a very slippery and dangerous "glazed" ice that is difficult to see because it is almost transparent.

Snow

Snow in the atmosphere can be subdivided into ice crystals and snowflakes. Ice crystals generally form on ice nuclei at temperatures appreciably below the freezing point.

Snowflakes are aggregates of ice crystals that appear in an infinite variety of shapes, mainly at temperatures near the freezing point of water.

Hail

Solid precipitation in the form of hard pellets of ice that fall from cumulonimbus clouds is called hail.

Soil Water:

Soils can process and contain considerable amounts of water. They can take in water, and will keep doing so until they are full, or until the rate at which they can transmit water into and through the pores is exceeded. Some of this water will steadily drain through the soil and end up in the waterways and streams, but much of it will be retained, away from the influence of gravity, for use of plants and other organisms to contribute to land productivity and soil health.

Soil water is the term for water found in naturally occurring soil. Soil water is also called **rhizic water**. There are three main types of soil water - **gravitational water**, **capillary water**, and **hygroscopic water.**

Gravitational Water:

Gravitational water is free water moving through soil by the force of gravity. It is largely found in the macropores of soil and very little gravitational water is available to plants as it drains rapidly down the water table in all except the most compact of soils.

Capillary Water:

Capillary water is water held in the micropores of the soil, and is the water that composes the soil solution. Capillary water is held in the soil because the surface tension properties (cohesion and adhesion) of the soil micropores are stronger than the force of gravity. However, as the soil dries out, the pore size increases and gravity starts to turn capillary water into gravitational water and it moves down.

Capillary water is the main water that is available to plants as it is trapped in the soil solution right next to the roots if the plant.

Hygroscopic Water:

Hygroscopic water forms as a very thin film surrounding soil particles and is generally not available to the plant. This type of soil water is bound so tightly to the soil by adhesion properties that very little of it can be taken up by plant roots. Since hygroscopic water is found on the soil particles and not in the pores, certain types of soils with few pores (clays for example) will contain a higher percentage of it.

Water Table:

Water table, also called **groundwater table**, upper level of an underground surface in which the soil or rocks are permanently saturated with water. The water table separates the groundwater zone that lies below it from the capillary fringe, or zone of aeration, that lies above it. The water table fluctuates both with the seasons and from year to year because it is affected by climatic variations and by the amount of precipitation used by vegetation. It also is affected by withdrawing excessive amounts of water from wells or by recharging them artificially.

The water table is an underground boundary between the soil surface and the area where groundwater saturates spaces between sediments and cracks in rock. Water pressure and atmospheric pressure are equal at this boundary.

The soil surface above the water table is called the unsaturated zone , which is also called the zone of aeration due to the presence of oxygen in the soil. Underneath the water table is the saturated zone, where water fills all spaces between sediments. The saturated zone is bounded at the bottom by impenetrable rock.

The shape and height of the water table is influenced by the land surface that lies above it; it curves up under hills and drops under valleys. The groundwater found below the water table comes from precipitation that has seeped through surface soil. Springs are formed where the water table naturally meets the land surface, causing groundwater to flow from the surface and eventually into a stream, river, or lake.

The water table level can vary in different areas and even within the same area. Fluctuations in the water table level are caused by changes in precipitation between seasons and years. During late winter and spring, when snow melts and precipitation is high, the water table rises. There is a lag, however, between when precipitation infiltrates the saturated zone and when the water table rises. This is because it takes time for water to trickle through spaces between sediments to reach the saturated zone, although the process is helped by gravity. Irrigation of crops can also cause the water table to rise as excess water seeps into the ground.

During the summer months, the water table tends to fall, due in part to plants taking up water from the soil surface before it can reach the water table. The water table level is also influenced by human extraction of groundwater using wells; groundwater is pumped out for drinking water and to irrigate farmland. The depth of the water table can be measured in existing wells to determine the effects of season, climate, or human impact on groundwater. The water table can actually be mapped across regions using measurements taken from wells.

If water is not extracted through a well in a sustainable manner, the water table may drop permanently. This is starting to be the case around the world. Some of the largest sources of groundwater are being depleted in India, China, and the United States to the point where they cannot be replenished. Groundwater depletion occurs when the rate of groundwater extraction through wells is higher than the rate of replenishment from precipitation.