Geography Unit-3

Hydrologic Cycle

Dear Students

Warm Greetings, now we are going to learn about –

–Water on the Earth, Hydrologic Cycle, Components of Hydrologic Cycle

Water is one of the most important elements on earth. All plants and animals need water for survival. Apart from drinking, water is required for domestic, agriculture, industrial purposes etc. Water is very essential for carrying out almost all economic activities. So, water is an indispensible element without which life form on the earth is not possible.

Water on the Earth

- About 71% of the earth's surface is covered by water.
- The quantity of water present on the earth is about 326 million cubic miles.
- It is hard to visualise this massive quantity of water.
- Most of the water on the earth is saline and is found in seas and oceans.
- The salt water constitutes about 97.2% and the fresh water is only about 2.8%.
- Out of this 2.8%, about 2.2% is available as surface water and the remaining 0.6% as groundwater.
- From this 2.2% of surface water, 2.15% is available in the form of glaciers and icecaps, 0.01% in lakes and streams and the remaining 0.04% is in other forms.
- Only about 0.25% of the total ground water of 0.6% can be economically extracted with the present drilling technology.
- Water resources are useful or potentially useful to humans.
- Water in India is available in three sources.
- They are **precipitation, surface water** and **groundwater**.

Hydrologic Cycle or Water Cycle

Hydrology is the science which deals with the various aspects of water such as its occurrence, distribution, movement and properties on the planet earth. Availability of water on the earth is not uniform. Some places are very rich in water resources while some other places are poor in water resources.

Hydrologic cycle is a global sun-driven process where water is transported from oceans to atmosphere, from atmosphere to land and from land back to oceans. The water cycle can be considered as a closed system for the earth, as the quantity of water involved in the cycle is invariable, though its distribution varies over space and time.

Evaporation takes place from the surface water and transpiration from the plants. Water vapour gets condensed at higher altitudes by condensation nuclei and form clouds (resulting in droplet growth). The clouds melt and sometimes burst resulting in precipitation of different forms. A part of water from precipitation flows over the land is called runoff and the other part infiltrates into the soil which builds up the groundwater.

Hydrologic cycle is a circulation of water. It is a continuous process and takes place naturally. The three important phases of the hydrologic cycle are:

1) Evapotranspiration,
2) Precipitation and
3) Runoff

Components of Hydrologic Cycle

There are six main components in hydrologic cycle. They are:

1) Evapotranspiration,
2) Condensation,
3) Precipitation,
4) Infiltration,
5) Percolation, and
6) Runoff.

Evapotranspiration

It is defined as the total loss of water from the earth through evaporation from the surface water bodies and the transpiration from vegetation. In cropped area, it is difficult to determine the evaporation and transpiration separately. Therefore it is collectively called as evapotranspiration.

Evaporation

Evaporation refers to the process in which the liquid form of water changes into gaseous form. Water boils at 100°C (212°F) temperature but, it actually begins to evaporate at 0°C (32°F); and the process takes place very slowly. Temperature is the prime element which affects the rate of evaporation. There is a positive relationship between these two variables. Areal extent of surface water, wind and the atmospheric humidity are the other variables which affect the rate of evaporation.

The atmosphere gets nearly 90% of moisture from the oceans, seas, lakes and rivers through evaporation and the remaining 10% of the moisture from plants through transpiration.

On a global scale, the amount of water gets evaporated is about the same as the amount of water delivered to earth as precipitation. This process varies geographically, as the evaporation is more prevalent over the oceans than precipitation, while over the land, precipitation routinely exceeds evaporation. The rate of evaporation is low during the periods of calm winds than during windy times. When the air is calm, evaporated water tends to stay close to the water body. During windy, the water vapour is driven away and is replaced by dry air which facilitates additional evaporation.

Transpiration

Transpiration refers to the process by which the water content in the plants are released into the atmosphere in the form of water vapour. Much of the water taken up by plants is released through transpiration. The rate of transpiration is also affected by the temperature, wind and humidity. The rate of transpiration is also affected the by the nature of vegetation and the method of cultivation of crops

Condensation

It refers to the process in which the gaseous form of water changes into liquid form. Condensation generally occurs in the atmosphere when warm air rises, cools and loses its capacity to hold water vapour. As a result, excess water vapour condenses to form cloud droplets. Condensation is responsible for the formation of clouds. These clouds produce precipitation which is the primary route for water to return to the earth's surface in the water cycle. Condensation is the opposite of evaporation.

Forms of Condensation

Dew, Frost, Fog, Mist, and Clouds are the different forms of condensation

- **Dew:** It is a water droplet formed by the condensation of water vapour on a relatively cold surface of an object. It forms when the temperature of an object drops below the dew point temperature.
- **Frost:** The ice crystals formed by deposition of water vapour on a relatively cold surface of an object is known as frost. It forms when the temperature of an object drops below the freezing point of temperature.
- **Fog:** Fog is the suspended tiny water droplets or ice crystals in an air layer next to the earth's surface that reduces the visibility to 1,000 m or lower. For aviation purposes, the criterion for fog is 10 km or less.
- **Mist:** Mist is the tiny droplets of water hanging in the air. These droplets form when the water vapour in the air is rapidly cooled, causing it to change from invisible gas to tiny visible water droplets. Mist is less dense than fog.
- **Clouds:** Clouds consist of tiny water droplets/ice particles which are so small and light in weight. Clouds are formed by microscopic drops of water or by small ice crystals. The size of the droplets generally range from a couple of microns to 100 microns. This is the limit beyond which cloud drops become rain drops.