

The Importance of Hydrological Cycle on Earth

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Abstract

The other name of water is Life. The geographical name of all types of water in the world is Hydrosphere. It is spread over 15 km in the environment and 1 km in Lithosphere. The sea is the main reservoir of water. Water is no original element. It is a chemical compound whose chemical symbol is H₂O. This water travels in the hard, liquid and gaseous form. The water that we use in our day-to-day life is colourless and it has no smell. 97% of the total water of the world is deposited in the ocean and the rest 3% has surrounded the atmosphere, glacier, rivers and lakes. Why does not the water on which the plants, animals and human beings depend end? How is the balance of water being maintained? Its only answer is Hydrological Cycle that maintains balance of water. The existence and shape of water change under the influence of the sun-rays upon water, air and rocks and in that case a definite system is working like a cycle and that is called Hydrological Cycle.

[**Keywords:** Hydrological Cycle, Characters, elements, importance, interruption, implication of water, source of water]

Introduction

We first know about 'Hydrological Cycle' in Iliad written by Homer. After that, at different times in the great writings of Thales, Plato, Aristotle, Leonardo the Vinchi, we get references to the Hydrological Cycle. The great philosopher Aristotle says, 'Militas's Thales has thought that 'everything is water'. In the opinion of Thales, the primary or primitive cause of all things of the universe is water. Everything originates from water and everything ends in water. Water is the material cause of every object. Two questions arise out of this observation: (1) Why did Thales say that water is the material cause of everything? And (2) by what process water has turned into everything? Or how has the universe originated from water? Thales did not give any answer to these questions — or if answered, we do not have any scope to know it. In this context, what Aristotle has said depending solely on inference is that at the root of nutrition of all kinds there is moisture that emits heat and all living beings eke out their living with the help of water. Moreover, in all kinds of seeds, there is present some moisture, and what is damp or wet results necessarily from water. By observing this, Thales, perhaps, came to the conclusion that water in the root cause of everything. Nothing is known from Thales about how has the universe evolved out of water. In this context, Zeller says that Thales perhaps thought that element and velocity were directly connected with each other. [E.Zeller : Outlines of History of greek Philosophy, page 97]. Burnet says that the inference of Aristotle may be influenced by some matter and that was Anaximenes; the philosopher after Thales has described the air as the root cause of every object — the very air which is thought to be the inseperable part and parcel of the evaporating condition of water. In truth, air

has been regarded as the power and more transparent condition of moisture. 'Everything is water' or 'everything originates from water' — this view expressed by Thales was not so important but it was really landable that he, instead of explaining the existence of the universe by means of gods and goddesses, applied natural and scientific theory for it.

Waters of the seas or ponds evaporate and go up to the environment. Then, they come down to the land and in many forms they are delayed and return to the seas through the holes of the earth with the help of the environmental world partially. And this process is organised in a cyclic order ceaselessly and this is called Hydrological Cycle. Water is present everywhere in the world in whatever form it may be — hard, liquid or gaseous. O.E. Meander says ".....Circulation of the water from the sea, through the atmosphere to the land and thence, with numerous delays, back to the sea by over land and subterranean routes and in part by way of the atmosphere,....." R.K. Karanth says, "The circulation of the water from the oceans to the atmosphere, from the atmosphere to the lithosphere and from the lithosphere to the oceans occurring through a complex and interdependent process which is called the hydrological cycle." And R. K. I. Linsley says, "The hydrological cycle is the description term applied to the general circulation of water from the sea to the atmosphere, to the ground and back to the seas again."

The principal characteristics of Hydrological Cycle are: (1) The Hydrological Cycle is numerous and imperishable (2) Hydrological Cycle changes with the change of place, time and water in their various forms. (3) The influence of Latitude, the amount of solar energy, the capacity of the earth for holding water, geological and natural etc. on the Hydrological Cycle is manifest. (4) Evaporation and precipitation — these two natural processes are closely connected with Hydrological Cycle. (5) The Hydrological Cycle works more actively in the equatorial region than in polar region. (6) With the help of Hydrological Cycle, hydrological Budget in any country or continent is rightly known. (7) With the help of this Hydrological Cycle, many kinds of hydrological information, rains, information about climate, evaporation etc. can well be explained and analysed.

Elements of Hydrological Cycle

The elements that influence Hydrological cycle are — **(1) Evaporation:** Hydrological cycle begins with evaporation. The watery vapour is the reservoir of hydrological cycle. By the rays of the sun, the waters of the ocean, rivers, canals etc. evaporate and it is mixed with the atmosphere. The process by which water evaporates is called evaporation. The water-vapours are lighter than other elements and So, they rise above easily and speedily — and then, they get cool and condensed and create the sprays of water. At present, with the rise of heat in the atmosphere the amount of evaporation is getting increased.

(2) Condensation: The water vapour rises above and gets condensed turning ultimately into drops of water or ice. This process is known as condensation. Again the amount of the water vapour in the atmosphere and the warmth are closely related with each other. How much water vapour resides in how much warmth determines the relative moisture of the air. When the relative moisture rises upto 100% it comes

down in the form of rain that means this time floating particles of vapour get bigger and assume the form of rain and it is quite impossible for the atmosphere to carry them and they fall down on earth as rain-drops.

(3) Precipitation: When the condensed water-vapour of the atmosphere turn hard or liquid, and fall to the ground by gravitation, it is called precipitation. The water-vapour of the atmosphere, fog or frost do not belong to precipitation. The rain-water, ice-fall and hail-storm do certainly belong to precipitation.

(4) Interception : At the time of raining, the whole amount of rain does not reach the earth directly — for, the vegetable world, atmosphere and the sun-rays evaporate some amount of rain. When it rains, it is obstructed by so many things. This is called interception, by which though some amount of water gets evaporated, the rest flows over the surface of the earth and augments the volute of external water – level.

(5) Absorption : Some amount of rain-water enters underground and is absorbed and wets the soil and it is called the moisture of the each. This process sometimes fails to wet the earth completely. Very after water level under-ground rises and wets the soil and as a result beyond the monsoon, the soil is found wet in other seasons too.

(6) Evapo-transpiration : Plants suck salty mineral water from the earth through principal roots. After Carbon assimilation, when the extra-water is emitted through the pores of the leaves, it is called evapo-transpiration. This vapour adds additional vapour to the atmosphere and increases the moisture of it. So in the regions thick with trees and bushes, it rains more heavily than in other regions.

(7) Infiltration : In some regions of the World, the water flowing over the earth and the ice-born water control the deposit of water underground. The process through which meteoric water by capillary strength enters underground is regarded as infiltration. The infiltration of water underground depends on natural characteristics. As for example the entrance of water into the deeprecesses of stones, the blowing of wind underground, the amount of rain, the change of seasons and the nature of the plants etc. Directly or indirectly control the amount of water deposited on the surface of the earth.

(8) Capillary Action: The rain water enters into the ground by lezching process. The moisture of the earth and the water underground — both increase by degrees. Though the surface of the earth gets dry by the rays of the Sun, the water underground rises above through the pores of the soil and returns to the atmosphere in the form of invisible vapour. This is called capillary Action. In the Hydrological Cycle, Thus supplies water-vapours to the atmosphere and helps in the process of condensation.

(9) Ground Water: The water deposited upon the impassable layers of the rocks underground is called ground water. This ground water is formed out of the entrance of water inside the ground. Infiltration of water increases during the monsoon and the water-level on the earth's surface rises and in dry seasons, it decreases and the water level goes downwards. The number of springs or fountains and the volume of the water are controlled by the upward rise and down-ward descent

of the ground water. When the surface of the ground water remains above the surface of the river water, The supply of water happens in the riverbed and the river water increases. So during the dry seasons, the flow of ground water helps in maintaining the volume of river water. The flow of ground water happens in a very slow manner unlike river water and passing through rivers, ultimately falls into the seas. In the Hydrological Cycle, the ground water assumes a vital role.

(10) Soil-water: When the rain-water mixes with the particles of dust and the soil gets wet through Capillary Action, the water of the earth is formed. The main source of the soil water is the rains. Some amount of this rain-water is deposited in the ocean as it flows over the surface of the earth; some amount gets evaporated and the rest enters underground through percolation.

(11) Surface Water: When the rain water and other waters flow in the form of the steam of water, then we call it run-off water on the surface of the ground. Rivers, Canals, seas, oceans are the reservoirs of this surface water. Ninety seven percent of the total amount of water remains on the ground surface. And the rest three percent is present in the other elements of the world.

The importance of Hydrological Cycle

On the material level, the role of Hydrological cycle is performed in two ways : (1) Physical role and (2) Biological role. (1) **Physical Role:** In many ways the physical role is activated:

(i) The maintenance of balance in exchange of waters between the ground and the sea. Discharge and Recharge of waters: A good amount of waters through rivers and canals or through the evaporation of waters on the ground surface and through carbon synthesis is emitted. Most of waters return to the seas in the form of surface water and the tunnel water and the rest gets evaporated and driven by air returns to the ocean. This process is known as 'Discharge'. If this discharge of water had happened on one side only, The waters of canals and rivers along with the ground water would have dried up. As a result, the plant world would have been extinct and the land would have turned into a desert and the vast expanse of the land would have been inundated with the waters of the sea. But it never happens in reality. The waters of the seas evaporate and rise up and come towards the land driven by wind. Then through condensation, fall by drops to the ground. Then, the canals, tunnels and rivers become full of water and the ground water increases. This is called Recharge. If there were no chance of evaporation, the land would have been flooded gradually. But, as the ratio of discharge and the recharge is almost the same, there is hardly any possibility of inundation or the aridity of the land. Thus, the discharge and the recharge through mutual exchange of waters maintain the balance of the material world.

(ii) **Transfer of water in between places in land:** Through the amount of evaporation may be less or more in some places on the surface of the land, the water vapour is transferred by the wind. It may happen that where there is more evaporation, the precipitation is less and where there is less evaporation, the precipitation is more. But as there is no hindrance caused by mountains and hills and

no arrival of water-vapours from the Seas, it does not rain. Again because of the dry climate of the low river beds on account of their long journey, and want of sufficient rainfall, the deficit of waters is compensated by rainfall, snow-fall and ground water. Thus through the transfer of water and water-vapour, the role of Hydrological Cycle is efficiently performed.

(iii) Role of Hydrological Cycle in landscape evolution: The Hydrological cycle plays the principal role in the changes that take place in the world. Rivers are responsible for the change of the surface of the ground. The source of river water is the Hydrological Cycle. The surface of the land is influenced by ground water and the role of Hydrological Cycle is very important in this as well as in the change of the underground for if there were no recharge, there would have been no ground water.

(2) Biological Role: The biological role in the Hydrological Cycle in preserving the material world is very important. This may happen in many ways:

(i) Water-supply to the living world: The other name of water is life. Life first appeared in the water (in the seas, 350 crore years ago). For want of water physical world is affected and so life is not possible without water. The ground water (tube-wells and wells), the Sweet water of the rivers, and lakes are the source of drinking water.

(ii) Growth of Plant Kingdom: No growth or birth of plants is possible without water. The excessive amount of water creates wood-land in the moist areas. Even in dry climate, beside the river-beds or where there is the existence of ground water in the neighbourhood oasis is created. Plants are the refuge of the animal world. Plants inhale the water-vapours through carbon synthesis and add water vapour to the atmosphere and rain takes place.

(iii) Cultivation: By Hydrological process, the soil gets wet – and irrigation works flourish and as a result crops grow in plenty.

(iv) Maintaining Aquatic Eco-system: It is possible to maintain aquatic eco-system on the land on account of the supply of water in the hydrological cycle. Fishes, Snakes, Frogs, Crocodiles, and other aquatic animals and water – plants like marshes, grasses, water lotuses etc. constitute aquatic eco-system.

(v) Growth of civilisation and conservation: No animal or plant can live without water, Because of the convenience offered by water in the river – beds, the civilization of mankind centring round cultivation has become possible. In recent times, the system of cultivation has been modernised, industries and technology have developed. As long as the advantage of hydrological cycle is available, human civilization will be progressing leaps and bounds.

Interruption in the Hydrological Cycle and Advent of the ice-age

A large area of the world will be engulfed by glacier in the ice-age. Most of the rivers will be frozen. Evaporation in the seas will be reduced on account of the decrease of warmth. The water deposited in the rocky layers or in the dust will freeze — and as a result, the flow of ground water and its deposit underground will be greatly hampered. The discharge and recharge of water will be obstructed. In the materials system of the

world, there will come a momentary intermission or pause. Last ice-age appeared 80 lakh years ago and ended 18 lakh years ago. Biological order will be disturbed. Both animals and plants on land and water will be extinct, on account of excessive cold. Crops will not grow for want of water. Human civilization will be at stake for want of food. Aquatic eco-system will be interrupted. Only those vegetables, crops animals who can spend millions of years by adjusting to the situation, will be able to carry on the flow of life up to the warm age, when the Hydrological Cycle will appear again.

Implication for global water: Water is a very important natural wealth that sustains life. Pure and less salty water is commonly used.

Human use of water: Water is principally used in two cases: (1) It is used as a medium carrying (2) It is used in the system of transfer from one state of existence to another. Moreover, man uses water directly or indirectly. As for example

- (i) in domestic use, water is amply used in cooking and washing clothes etc.
- (ii) Water is used plentifully in agricultural works. Agriculture depends principally on climate. Where there is the scarcity of water, the deficit is compensated by some other artificial process.
- (iii) Water used in Industry: Industrial places need a plenty of water. The instruments and Tools used in industry need a lot of water for cooling. Moreover, the dwellings erected centring round the industry need water plentifully for their use.
- (iv) Hydel Power : The most principal use of water can be seen in its production of electricity. It is gradually increasing in most of the developing countries.
- (v) Water is used as the medium of conduction or transport.
- (vi) The recreational use of water deserves special mention. In many places in the world pleasure-trip in a boat and water-sports are rampant. Water is used as a dwelling place of fishes.
- (vii) Water as a wild life habitat : Not only man, but also for other animals need water to eke out their living. The pastures on which water is plentifully available can make wild animals drink water in plenty.

Source of water on earth

The source of water in the world can be divided into two groups. (1) The water collected from the external surface of earth. The greater amount of water in the external world remains deposited in the atmosphere, river, lake, glacier, the ice-sheet, oceans, seas and bays. Besides, a good amount of water is available in many ponds and canals. These are all the reservoirs of water on the surface of the earth.

I want to mention here a remarkable tank the name of which is Sagar Dighi. It is the biggest one in the district of Murshidabad and there is none like it all over West Bengal. It is so much important that the schools, colleges, hospitals, railway stations have been named after Sagar Dighi. The length of the tank covers one mile and the breadth half mile. A large part is absorbed on account of the lack of maintenance — but the remaining part covers about 220 bighas i.e. 92 acres.

Rumours are afoot centring round Sagar Dighi in the locality. The story which is most widespread is thus: The king Mahipal of Pal Dynasty was passing by the area

with his near and dear ones and some warriors. Two children became afraid at the sight of the king and climbed up the tree. One of them became so much terrified that it fell down and died. The king Mahipal went to a pandit for some advice with a view to redressing himself of the sin of killing a Brahmin boy. The pandit passed the verdict that he would be free from the sin of murder if he and his wife could dig a tank on the area that they would cover by walking on foot. The queen felt tired after just walking a mile. So, up to the length of that area a tank was dug. The story is engraved on a stone.

Another story was connected with the inscription again. The king dug the tank but there was no vestige of water in it. The king, morose in heart dreamt a dream: if the potter named Sagar could dig a spade-wide soil in the middle of the tank, the water would come up. When Sagar heard this, he agreed to do this. In time, no sooner had his spade struck the middle of the tank than an immense surge of water appeared and Sagar was carried away by the flood and died. The tank was named after Sagar by the king, Mahipal. Thus, there are many unknown Canals, rivers, tanks which are the reservoirs of water on the surface of the earth.

Inter water on earth

Two types of water are deposited underground : (1) Innate water : At the time of the formation of alluvial soil, O₂ and H₂ are deposited in the atoms of the soil in course of time by the process of radiation, these gases are transformed into water and this water is called innate water. (2) Ground water: The permanent or temporary layers of water that are there underground are called ground water. The soil-water, vados water belong to ground water. The source of these types of water is the Hydrological Cycle – that maintains balance of water everywhere. As a result, plants, animals and human beings are maintaining their existence and living.

The Hydrological Cycle is the main source of water. This cycle is very important in the regions where climate changes very often. This helps maintain relation between plants and animals and their adaptation too. Since the inception of the creation this Hydrological Cycle has been playing its role in a unique way. The most important connecting element of Hydrological Cycle is water vapour Lithosphere, Hydrosphere and atmosphere. The cycle is ceaselessly working in league with these spheres for the prosperity of the mankind animal world and vegetable world. So, it is our normal responsibility and duty to make the hydrological cycle more forward.

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