Iqra National University

Department of Civil Engineering

Assignment

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Q1. What is "Hydrological Cycle"? Now a days there is general discussion that Hydrological cycle has been disturbed. Is this a myth or reality? Briefly explain.

Answer.

Hydrological cycle is also known as Water cycle. It contain 2-phases.

Atmospheric Phase of Hydrologic Cycle

Atmospheric phase of hydrologic cycle starts with the formation of clouds after vaporization from water bodies and ends after the occurrence of precipitation.

Land Phase of Hydrologic Cycle

Starts with precipitation Infiltration and Interception, Depression storage in depressions on the surface Detention Storage Surface Runoff Base flow Total Runoff.

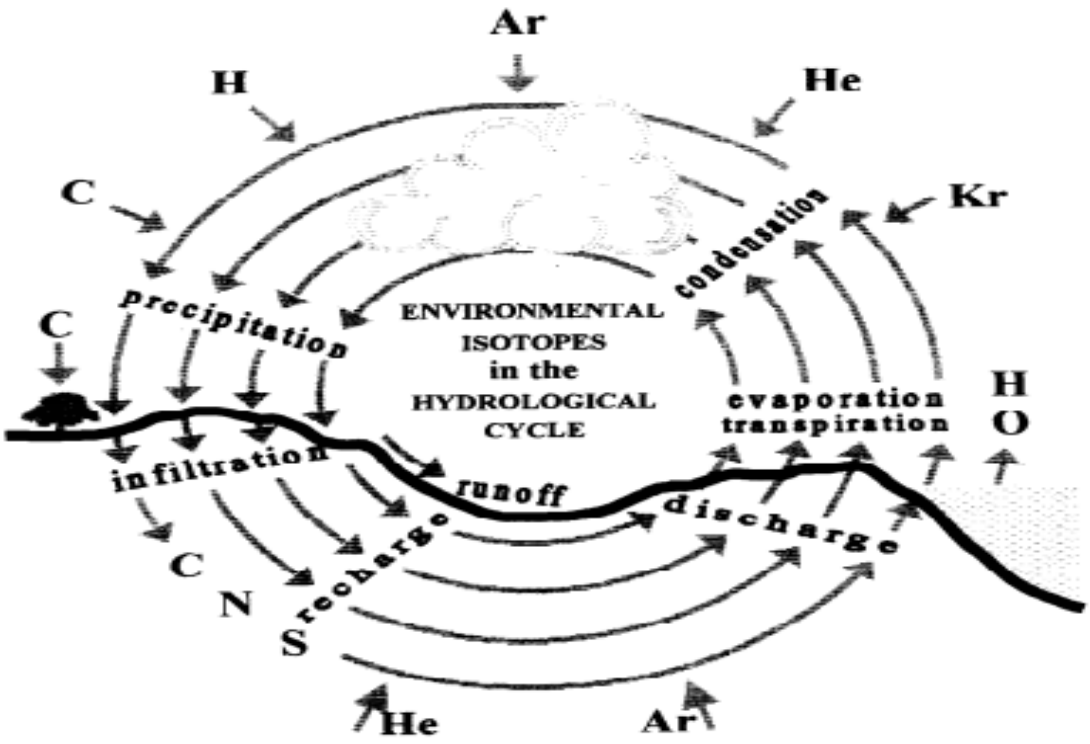

Fig: Hydrological Cycle

The cycle includes the following processes,

Evaporation:

In this process the water moves from liquid state into the gaseous state as atmospheric water vapor.

Condensation:

In this process atmospheric water vapor changes into water due to cooling of air.

Precipitation:

When water falls from atmosphere in the form of rain, snow, hail and sleet to the ground and water bodies.

Interception:

In this process some part of rain does not reach the streams but is instead intercepted by the leaves, branches of plants, other greenery on the land etc.

Infiltration:

This process involves movement of water through the boundary area where atmosphere interfaces with the soil. Infiltrated water and water stored in the soil, can become subsurface runoff.

Transpiration:

In this process the leaves of plants lose water in the atmosphere.

Runoff:

It is the flow from a drainage basin/catchment are in surface streams, unaffected by artificial diversions or storages.

Storage:

It may be in atmosphere, on earth surface and in the ground.

The Hydrological cycle has been disturbed and is a truth. This has because of:

Deforestation, anomalous increment in population, mechanical turn of events, saltiness of horticultural grounds because of extreme water system, improved guidelines of life, nursery impact because of the discharge CFCs in the climate by the people. The ozone harming substances trap heat from running away to the space bringing about an Earth-wide temperature boost.

The general impact of this danger is as per the following:

1. Ground temperature is expanding step by step.
2. Sea level is going up.

3. Excessive rains in certain pieces of the world while dry spell in different pieces of the world.

4. Water logging and saltiness of farming area and so on.

5. Acid rains in different pieces of the world.

6. Expansion of deserts.

Keeping in see the above disturbing circumstance dependent on facts, the entire world should pay attention to the issue and search for functional answers for diminish the a dangerous atmospheric deviation and receive rehearses like over the top manor, recycle more, turn off electronic gadgets, altering indoor regulators, financial utilization of water, coating of sides and beds of waterways, arranging and the executives of water supply. By embracing the previously mentioned recommendations the adjustment in the water cycle/climatic changes can be controlled adequately improving this world a spot for the people and different animals.

Q2. Briefly Describe "Ground Water Sustainability"? How can "Rainwater Harvesting" be linked to Ground water Sustainability?

Answer.

The overall goal of water resources management must be water resources sustainability. water resources sustainability as "the ability to use water in sufficient quantities and quality from the local to the global scale to meet the needs of humans and ecosystems for the present and the future to sustain life, and to protect humans from the damages brought about by natural and human-caused disasters that affect sustaining life." Because water impacts so many aspects of our existence, there are many facets that must be considered in water resources sustainability an author points out that "sustainable development is a concept still in the making." He advocates an integrated development approach based on the sustainable development of water resources on a regional scale, or water-based sustainable integrated regional development (WSIRD). Groundwater resources sustainability has various interpretations depending on whether an aquifer can be irreversibly and permanently lost or whether it is temporarily lost as a result of large drawdowns that lead to large pumping costs and possible ecological damages. When groundwater is completely depleted, the risk of no future revival is governed by the maximum possible hazard rate. Sustainability has been tied "inextricably and positively" to resilience in the literature.

At the point when a lot of ground water are pulled back from the spring neighborhood water table gets discouraged, which thus decreases the measure of ground water accessible to release to streams, wet terrains and estuaries. On the off chance that the withdrawal is proceeded past some level the ground in the zone may likewise get died down.

Effect of ground water exhaustion will be:

1. Reduction in surface water supplies.

2. Lowering of water table.

3. Water quality concerns.

4. Loss of wet land and riparian vegetation.

5. High expense of water siphoning.

6. Land subsidence.

7. Acute emergency of drinking water and flooded water.

In subcontinent during rainstorm season there are a great deal of rains bringing about surface spillover which at last advances toward ocean without being usefully utilized. Consequently, by Rain Harvesting Technique, ground water sustainability can be accomplished.

This is a procedure of assortment and capacity of rain water into normal supplies or tanks, or the invasion of surface water into underground spring before it is lost as surface overflow.

There are 2-mothods of this procedure:

1. Roof top rainwater harvesting.

2. Surface overflow rainwater.

1. In this framework, rainwater from the tops of the houses/structures is gathered to be put away in a tank or occupied into a counterfeit revive framework.

2. In urban zones, rainwater streams away as surface over stream/sheet stream. This water can be gotten and utilized for reviving springs by receiving fitting techniques.

The strategy is utilized to defeat deficiency of ground water because of populace increment, industrialization, urbanization, uneconomical utilization of water and less permeation because of expanded cleared surfaces. The rain water harvesting is connected with ground water sustainability having the accompanying effects on ground water.

1. Water table will be raised.
2. The underground disintegration will be halted.
3. Cost of water siphoning will be diminished.
4. Quality of ground water will be improved through weakening.
5. The saltiness will be controlled.

Q3. What "Quality Parameters" should be considered in designing water supply System for a Community?

Answer.

The Following Quality parameters are important and should be considered in the design of water supply system for a community.

1. **Maximum Pressure Limits:**

   The taps and valves at closed state, should be the maximum pressure condition for the system. Maximum head limits for the pipe work will be used to carry out the calculations. This scenario is used at the start of the design to be able to place any break-pressure tanks that may be required.

2. **Negative or Low Pressure Head:**

   If the pressure head becomes negative at any point in the system then two things may happen. Firstly a siphon effect is occurring which is trying to suck water into the system. This is undesirable as polluted groundwater may be introduced into the system. Secondly, large negative pressures can cause air to come out of solution in the water and cause air-blocks. Therefore the pressure head anywhere in the system never go negative.

3. **Natural Flow:**

   Natural Flow may be allowed to occur in the system at some sections of pipe. Natural flow can be problematic in that the water velocity may exceed the limit. Or increase the flow rate above the safe yield parameter, Close attention should be made to these situations.

4. **Safe Yield:**

   The safe yield is the minimum flow from the water source. It is important to not draw more than this supply from the system at any point. If this happens then air will enter the system.

5. **Velocity Limits:**

   The flow velocity in the pipelines should not be too more as particles suspended in the water will cause excessive erosion. Also if the velocity is too low then these particles will settle out of the flow and may clog the pipes at low points.

6. **Air-blocks:**

   These occur when there are topographic features between the source and the collecting tank that are lower than the collecting tank. Energy is lost from the system as these air-blocks are compressed and can result in no flow.

7. **Residual Head:**

   The residual head at a tap stand or valve is important. If it's too high it will cause erosion of the valve and if it is too low then the flow will be insignificant.

8. Arrange pipe sizes to minimize the frictional head loss between the source and the first air-block.

9. Use larger-sized pipe at the top and smaller sized pipe at the bottom of the critical sections where air is going to be trapped.
10. Air valves can be designed into the system to allow trapped air to escape.
11. The higher air blocks are the more critical ones and should be eliminated or minimized first.
12. **Cost:**

    Wherever possible smaller pipe diameters should be used, as they are cheaper. Combinations of pipes can often produce cheaper solutions than using just one pipe size. However pipe lengths should be rounded to the nearest 100m length. Also the number of concrete structures such as break-pressure tanks should be minimized.

    Other parameters to be kept in consideration are of the following.

Quantity of Water, Reliability of Water, Quality of Water, Physical and Chemical Parameters, Biological Parameters, Radiological Parameters.