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ASSIGNMENT # 01

Water Demand Supply and Distribution

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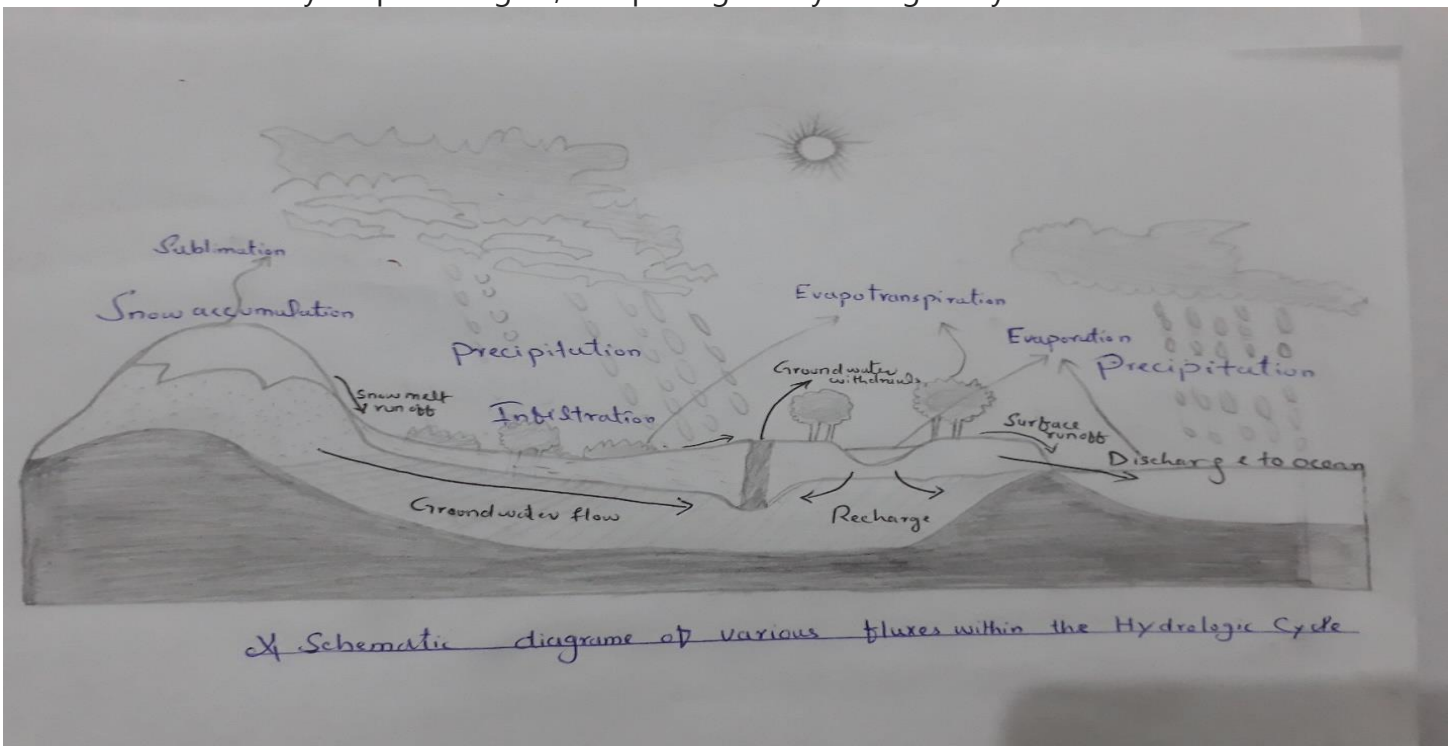
Q1. What is "Hydrological Cycle"? Now-a-days there is general discussion that Hydrological Cycle has been disturbed. Is this a myth or reality? Briefly explain.

Ans: Hydrological Cycle

The hydrological cycle describes the continuous movement of water on, above and below the surface of the Earth.

The Hydrological cycle also known as water cycle or Hydrologic Cycle.

The hydrological cycle begins with the evaporation of water from the ocean and from the land surface. As moist air is lifted, it cools and water vapor condenses to form clouds. Moisture is transported around the globe until it returns to the surface as precipitation. This precipitation can fall on open bodies of water, be intercepted and transpired by vegetation, and become surface runoff and/or recharge groundwater. Water that infiltrates into the ground surface can percolate into deeper zones to become a part of groundwater storage to eventually reappear as stream- flow or become mixed with saline groundwater in coastal zones. In this final step, water re-enters the ocean from which it will eventually evaporate again, completing the hydrological cycle



Schematic diagrame of various fluxes within the Hydrologic Cycle

Now-a-days there is general discussion that Hydrological Cycle has been disturbed. Is this a myth or reality?

No it's not a myth or false belief but it's a reality that the Earth's hydrological cycle continues to undergo extreme changes due to the combination of global climate change, growing population, and regional land use change, which together have substantial cumulative effects on the global water system.

Q2. Briefly describe "Ground water Sustainability"? How can "Rainwater Harvesting" be linked to ground water sustainability?

Ans: GROUND WATER SUSTAINABILITY

Groundwater sustainability is the development and use of groundwater resources to meet current and future beneficial uses without causing unacceptable environmental or socioeconomic consequences.

Groundwater resource or aquifers are under stress from the cumulative impact of large scale municipal, irrigation, and industrial wells, in addition to thousands of domestic wells. In some areas current groundwater supplies are inadequate to sustain future water demands. So that's why Rainwater Harvesting be linked to ground water during a crisis period.

Rainwater Harvesting be linked to ground water sustainability because harvesting rainwater is a potential universal solution to cover ever-increasing water demands while limiting adverse environmental impacts such as groundwater depletion and flooding. Indeed, ground water are recharged by precipitation with rainfall being the main source and major component of the hydrological cycle. Thus, rainwater harvesting systems entailing carefully harvesting, storing, and transporting rainwater are suitable solutions for water supply as long as rain falls on earth.

Although, Traditional knowledge, skills, and materials can be used for Rain water harvesting. During the rainy season, an individual can collect water on his rooftop and manage it on his own. Reserved rainwater on rooftops can be used for self-purposes or domestic use. Water from different rooftops of a lane can also be collected through a piped network and stored for some time. This water can be then channeled to deep wells to recharge groundwater directly, to ponds to recharge groundwater slowly, and to reservoirs to dilute reclaimed water for non-potable use. Similarly, Harvesting of Rainwater in a systematic way thus prevents water logging. Furthermore, utilization of collected rainwater highly releases the dependency on groundwater sources.

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

Ans: To provide safe quality of water to a community is an important consideration in the protection of human health. For designing water supply system to a community the following quality of parameters should be considered.

Per Capita Supply: It is the annual average amount of daily water required by one person and includes the domestic use, industrial and commercial use, public use, wastes, etc.

Per capita Demand in liters/day/head =Total yearly water requirement of the city in Liters / 365xDesign population q=V/365P

Generally the per capita demand values ranges between 10-300 lpcd. These
Variations in total water consumption of different cities or towns depend upon Size and type of city, Climatic conditions, Class of consumers, Quality of water, Pressure in the distribution system, Sewerage Facilities, System of supply, Policy of metering system, Cost of water etc.

Source of Supply: A rural water supply schemes have been traditionally designed based on Tube wells. However, where the quantity of ground water is insufficient or quality of ground water is not of required standards, surface sources are chosen depending upon the availability. In some areas springs /infiltration galleries may also be used as source of drinking water.

Water Quality: The drinking water required to the community shall conform to the relevant clauses so as minimize health hazards to the community. The quality of water supplied shall satisfy WHO criteria.

Storage: Water storage facilities are constructed within a distribution network to meet the peak flow requirements exerted on the system and to provide emergency storage.

Treatment: Ground waters, which are free from odor and color and turbidity problems, can be supplied after plain disinfection by chlorinating. Surface waters may require conventional treatment consisting of sedimentation, filtration and disinfection. The treatment proposed for water shall be such that it is easy to maintain and operate by the village community.

Water Transmission: Water Transmission refers to the transportation of the water from the source to the treatment plant and to the area of distribution. For small community water supplies pressurized pipelined are most common. Free-flow conduits are preferred in hilly areas or in areas where the required slope of the conduit more or less coincides with the slope of the terrain. Routes needs always to be checked with community members.

Distribution system: The purpose of distribution system is to deliver water to consumer with appropriate quality, quantity and pressure. Distribution system is used to describe collectively the facilities used to supply water from its source to the point of usage.

Design Velocity: The design velocity in the distribution system shall be not less than 0.6m per second to prevent silting in the pipes.

Type of Pipe Material for Pipelines for Water Distribution: Various types of pipes are used for water supply system including metallic and non-metallic pipes. Most common types of pipes used for water supply system are:

- Galvanized Iron Pipes – metal pipe
- Mild Steel Pipes metal pipe
- Poly Vinyl Chloride pipes - non- metal pipe
- High Density Poly Ethylene Pipes - nonmetal pipe
- Ductile Iron Pipes

For water mains, mainly GI and MS pipes or even large HDPE pipes are used, while for branch/service pipes, most commonly used are galvanized iron and HDPE/PVC pipes.

Pumps: Submersible pumps shall be provided for all bore wells and centrifugal pumps/submersible pumps for canal based water supply schemes. While calculating the capacity of pump, the resulting suction head, delivery head and frictional losses shall be considered appropriately. Only commercially available pump capacities shall be adopted for water supply to the community.