Subject: Water Demand Supply and Distribution

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Submitted By: **Rashid latif**

Reg;No: 15202

Submitted To: **Engr Nadeem ullah**

Department: MS (CE)

IQRA NATIONAL UNIVERSITY PESHAWER

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

Hydrological cycle: The hydrological cycle of the earth is the sum total of all processes in which water moves from the land and ocean surface to the atmosphere and back in form of precipitation.

OR

Hydrological cycle is also known as the "water cycle"; it is the normal water recycling system on Earth. Due to solar radiation, water evaporates, generally from the sea, lakes, etc. Water also evaporates from plant leaves through the mechanism of *transpiration*. As the steam rises in the atmosphere, it is being cooled, condensed, and returned to the land and the sea as precipitation. Precipitation falls on the earth as surface water and shapes the surface, creating thus streams of water that result in lakes and rivers. A part of the water precipitating penetrates the ground and moves downward through the incisions, forming aquifers. Finally, a part of the surface and underground water leads to sea.

The hydrologic cycle begins with the evaporation of water from the surface of the ocean. There are five processes at work in the hydrologic cycle: condensation, precipitation, infiltration, runoff and evapotranspiration. These occur simultaneously and, except for precipitation, continuously. Together, these five processes make up the Hydrologic Cycle. Water vapor condenses to form clouds, which result in precipitation when the condition

Hydrological cycle includes:

1) Evaporation
2) Condensation
3) Precipitation
4) Interception
5) Infiltration
6) Percolation
7) Transpiration
8) Runoff and storage

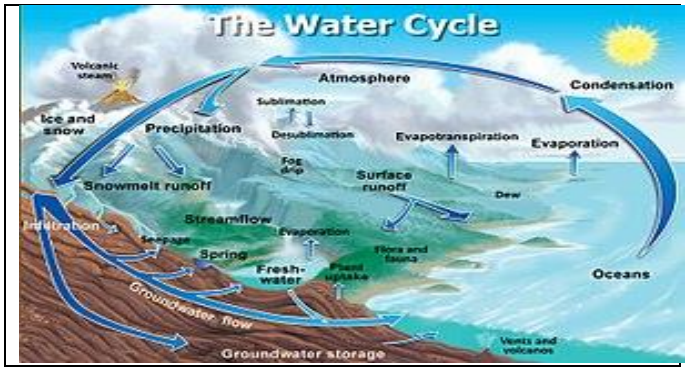


Fig.1 Source Google

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

Now a days hydrological cycle has been disturbed by population growth, industrialization, urbanization, land-use changes and improved standards of living. In many countries resources are already fully committed and water will become a scarce commodity all these above factors affect the hydrological cycle.

Population growth: Due to high population growth in the world the portable water usage has also increased day by day. Therefore with high growth of population urbanization is also increased due to which the paved area is more and water runoff is increased due to which infiltration or penetration of water into ground has been decreased.

Agriculture: In many developing countries the water used for agriculture purpose and they don't follow the engineering techniques to save water that's way most of the water loss due to mismanagement.

Industries: Most of the industries produced CO2 which go directly into air and warm atmosphere rapidly, Where in Hydrological cycle warm air come from ocean to land side and after rising it cool and vapor's convert to rain or Snow and then come to land or ocean and sea surface but due to CO2 atmosphere warm and whole process disturbed. Now a days according to environmental scientist due to lockdown in the whole world most of the industries are closed and vehicles are less than normal days traffic due to which ozone layer changes abruptly and the quantity of CO2 is also decreased due to which it Hydrological cycle has been go to normalize..

Improved Standard of life:

Due to improved standard of life every one now a days struggle for improving life standard that's way high rise building and vehicles increased day by day and these all things related to industries which produce CO2 and effect directly effect Hydrologica cycle.

Conclusion:

From the above discussion we have conclude that main reason for Hydrological disturbance is human being. Because majority of the industries and traffic are closed now a days and CO2 decreased due to which temperature of the atmosphere come

down due to this change hydrological cycle again start to normalize but Due to paved portion of the world the water level increased in sea due to which it is impossible to completely recover the Hydrological cycle.

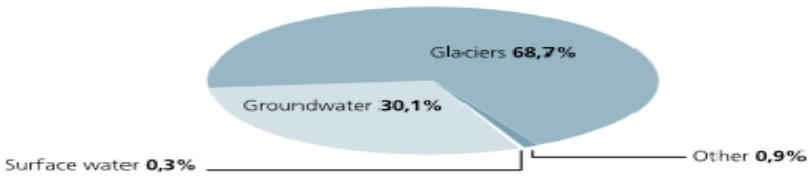
Q2. Briefly describe **"*Ground water Sustainabilty*"?** How can we **"*Rain water harvesting*"** be linked to **"*Ground water sustainability*"**

Ground water Sustainability: Ground water can be defined as 'It is the water that seeps through and collect above the non-porous rocks deep under the ground. The Water extracted from different use by digging wells and bore wells. The ground water also pumped out by farmer for irrigation purposes.

The Ground water sustainability can be defined as 'Groundwater sustainability is the development and use of groundwater resources to meet current and future beneficial uses without causing unacceptable environmental or socioeconomic consequences". It is further defines sustainable principles as those choices, decisions, actions and ethics that will best achieve ecological/biological integrity; protect qualities and functions of air, water, soil and other aspects of the natural environment; and preserve human cultures. Although many states have recognized the importance of sustainable water use, most states have not explicitly incorporated sustainability principles into the laws and policies that guide their allocation of groundwater.

Factors affecting groundwater supplies and use

- Methods that promote the wise use of groundwater supplies
- Need to determine strategies that promote groundwater sustainability
- Need for cooperative efforts to fill data gaps and undertake priority research
- Need for increased collaborative educational efforts



Distribution of fresh water on earth

Rain water Harvesting:

Water is considered an everlasting free source that can be acquired naturally. Demand for processed supply water is growing higher due to an increasing population. Sustainable use of water could maintain a balance between its demand and supply. Rainwater harvesting (RWH) is a technique to conserve water and later use it in irrigation and other purposes.

There are two types of techniques to be used.

- **Rooftop rainwater harvesting**:

  It is the system in which 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.

- **Surface Runoff rainwater**:

  In urban areas rainwater flows away as surface overflow. This runoff can be caught and be used for recharging aquifers by adopting appropriate methods.

How can "*Rain water Harvesting*" be linked with "*Ground water Sustainability*".

The Collection of rain water from the roof top and building and also from runoff catchment area can easily be used for domestic purposes in towns and cities. This collected water can be treated chemically of physically to become portable for drinking and other purposes. In case of emergency it can be used for agriculture purposes or can be used in Latrines for flushing. This water can be used to recharge the ground water as well if the water table goes down. The collected water from this technique is very important this water can be used for most of the purposes in place of drain out from the well. If there is too much rain or catchment area is large this will be transferred via piping system to ground water SO it can be reused for household purposes.

There are many ways to send the rain water to ground. Most simple technique is to dig a pit in open and clean area which can be not accessible to polluted water. The pit should be deep enough that water can reached up to porous layers of soil that can allow the water to pass through it and can be added to underground water.

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

And: Quality parameters that should consider an engineer during designing the water supply system for Community:

While selecting a water source for development, the engineer must consider three primary factors:

1. Water Source
2. Water reliability
3. Water quality
4. Per capita Demand

Water Source: For a public water supply, the raw water source must provide a quantity sufficient to meet all municipal, institutional, and industrial uses as well as the fire-fighting demand. Either surface water or groundwater may be used. Although most water systems are supplied from only one source, there are instances when both surface water and groundwater sources are utilized. The source must be capable of supplying enough water for the rural community.

Water Reliability: The reliability of a water supply is one of the most important factors that the engineer considers when selecting a water source. A reliable water source is one that will supply the required amount of water for as long as needed. To determine the reliability of the water source, the engineer studies data, such as hydrological data, to determine the variations that maybe expected at the water source. Geological data should be studied since geological formations can limit the quantity and flow of water available. Also, legal advice may be necessary when selecting a water source since the laws regulating and controlling water rights may vary considerably from state to state and country to country. The stability and reliability of Water distribution systems (WDSs) is one of the important factors in ensuring public safety and the continuous operation of urban functions.

Water quality:

The basic requirements for drinking water are that it should be clear (low turbidity), not salty, free from offensive taste or smell, free from chemicals that may cause corrosion or encrustation, free of heavy metals, with not excessive sodium, sulphate and nitrate but above all free from pathogenic organisms as bacteria and viruses which may cause

disease. The WHO guidelines should be taken in measures because these standards are often considered as long term goals. High turbidity implies the presence of particles or colloidal material, which provides adsorption sites for chemicals that might be harmful.

Per capita Demand:

The designer should keep in mind the per capita demand for designing the water supply system for community. The design should be minimum for 20 years according to population growth. The peak hours should be consider as well as the life style and habits of people should be taken in measures to design the water supply system.

Best Regards