

Q#01 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 also known as water cycle is the cycle of process by which water circulates between the earth's oceans, atmosphere and land involving precipitation as rain and snow, drainage in streams and river and return to the atmosphere by evaporation and transpiration.

Water cycle is very important to all life on earth. Stopping it would cause an endless drought, No water flow in lakes would cause overgrowth, killing many species of fish and other lake wildlife.

It's a reality that with passage of time Hydrological cycle has been disturbed by number of human activities such as damming rivers for hydroelectricity, using water for farming, deforestation and the burning of fossil fuels.

Briefly detail is discussed below.

~~① Hydroelectricity~~

In many countries electricity is generated using hydro dams which involve changing the stored gravitational energy of water held behind the dam into electrical energy that can be used, it has environmental impacts when mismanaged.

Seriously mismanaged dams can result in droughts downstream, with smaller streams completely drying up, leaving areas of unwatered land. People then have to look at ways of getting more water into these dry areas.

As the human population has increased, we need more food and to make food, we need water. Irrigation is used substantially by most countries. The problem with irrigation is that it removes water from its natural source and often causing leaching and run-off where it is used. This removal of nutrients results in farmers using more fertilisers to keep their pastures productive while the waterways become polluted and salt is brought up from lower levels.

The removal of trees (deforestation) is having a major impact on the water cycle as local and global climate change. Normally, trees release water vapour when they transpire, producing a localised humidity. This water vapour then evaporates into the atmosphere where it accumulates before precipitating back to earth as rain, sleet or snow. Deforestation in one area can therefore affect the weather in another area because if trees are cut down, there is less water to be evaporated into the atmosphere and subsequently less rain. Areas can become more prone to both droughts and flooding, impacting on plants and animals and also humans living near deforested areas.

The greenhouse effect is a natural phenomena of Earth's atmosphere trapping a range of gases, which in turn capture infrared radiation to keep our Earth at a moderate temperature range compared to the other planets in our solar system.

Human activities such as the burning of fossil fuels has an effect on the overall increase of the Earth's temperature. Raising the Earth's temperature may mean that there is an increase of evaporation, melting of ice or other process of the water cycle that adversely affect the climate on Earth.

Q#02 Briefly describe "Ground water sustainability". How can "Rainwater harvesting" be linked to 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 sustainability is really more of a perspective that frames scientific analysis.

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. It is one of the most important natural resource and plays a major role in ensuring livelihood security across the world, especially in economies that depend on agriculture. Groundwater contains mineral ions with access which slowly dissolve from soil particles.

Domestic discharge, discharge of industrial effluent, excessive use of fertilizers and pesticides, waste dump and over exploitation of the resources have badly impact on groundwater sustainability.

Rainwater Harvesting is the most traditional and sustainable method used for collecting water from natural rainfall. At the time of water crisis, it would be the most easily adaptable method of mitigating water scarcity. This system can be applied in both critical and normal situations. It is an environmentally friendly technique that includes efficient collection and storage that greatly helps to fulfill the requirements. The associated advantages of rainwater harvesting are that it can curtail the burden on the public water supply, which is the main source of city water. It can be used in case of an emergency and is solely cost effective as installation cost is low and it can reduce expenses. Also ground water level is highly recharged during rainfall with depleting groundwater levels and fluctuating climate conditions. RWH can go a long way to help to tackle these effects. Capturing the rainwater can help recharge local aquifers, reduce urban flooding and most importantly ensure water availability in water-scarce zones. Farmers can use rainwater harvesting for recharging their dry bore well. Also water quality can be improved and food production can be increased, which subsequently can increase life of water resources.

Q#03 What "Quality Parameter" should be considered in designing water supply system for community?

Water, a prime natural resource and precious national asset, forms the chief constituent of ecosystem. Water sources may be mainly in the form of rivers, lakes, glaciers, rain water, ground water water etc. Besides the need of water for drinking, water resources play a vital role in various sectors of economy such as agriculture, livestock production, forestry, industrial activities, hydropower generation, fisheries and other creative activities. The availability and quality of water either surface or ground have been deteriorated due to some important factors like increasing population, industrialization, urbanization etc.

Water quality is determined by physical, chemical and microbiological properties of water. These water quality characteristics throughout the world are characterized with wide variability. Therefore the quality of natural water sources used for different purposes should be established in terms of the specific water quality parameters that most affect the possible use of water.

\* PHYSICAL CHARACTERISTICS OF WATER:

Physical characteristic of water are determined by sense of touch, sight, smell and taste.

Major physical qualities to be considered

considered are

- ⇒ Temperature of water affects some of the important physical properties and characteristics of water: thermal capacity, density, specific weight, viscosity, surface tension, specific conductivity, salinity and solubility of dissolved gases etc.
- ⇒ Color in water is primarily a concern of water quality for aesthetic reason. Color can indicate the presence of organic substances such as algae or humic compounds.
- ⇒ Taste and Odor are human perceptions of water quality. Human perception of taste includes sour (hydrochloric acid), salty (sodium chloride), sweet (sucrose) and bitter (caffeine).
- ⇒ Turbidity is a measure of the light-transmitting properties of water and is comprised of suspended and colloidal material. It is important for health and aesthetic reasons.
- ⇒ The total solids content of water is defined as the residue remaining after evaporation of the water and drying the residue to a constant weight at 103°C to 105°C.

(\*) CHEMICAL CHARACTERISTICS OF WATER:

The chemical characteristics of natural water are a reflection of the soils and rocks with which the water has been in contact. In addition, agricultural and urban runoff and municipal and industrial treated wastewaters impact

the water quality. Microbial and chemical transformations also affect the chemical characteristics of water.

The test consist of pH hardness presence of selected group of chemical parameter highly trace chemical and B.O.D etc

\* BACTERIOLOGICAL:

For the detection of harmful organize, it is necessary to contact water quality test by taking harmful parameter under consideration while supplying water to the community

the water supply organization must ensure water quality while supplying water to the community, the main parameter of water quality are sediment transport and deposition algae, phytoplankton and chlorophyll dissolved organic matter conductivity.

Salinity and total dissolved solid pH of water, turbidity total suspended solids and water clarity water temperature and solar radiation.

WHO has also issued guide lines for drinking water quality. While supplying water to the community water sampling and analysis should be done, certified laboratories to check the quality of water keeping in mind the need of test that are required



The raw water is analysed by testing their physical, chemical and bacteriological characteristics.

- ⇒ Physical characteristics are turbidity, colour, taste and odour and temperature.
- ⇒ Chemical characteristics are pH, Acidity, Alkalinity, Hardness, Chlorides, Sulphates, Iron, Solids and Nitrates.
- ⇒ Biological characteristics are important and indicates the degree of pollution. Water polluted by sewage contain one or more species of disease producing pathogenic bacteria. The methods to estimate the bacterial quality of water are Standard Plate Count test, Most Probable Number and Membrane Filter Techniques.