Iqra National University
Department of Civil Engineering

ASSIGNMENT

Discipline: MS Civil Engineering

Course Title: Water Demand Supply and Distribution

Course Code: CE- 562

Instructor Name: Nadeem Ullah **Submited By:** Haroon Khan

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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:

The hydrological cycle is the system which describes the distribution and movement of water between the earth and its atmosphere. The model involves the continual circulation of water between the oceans, the atmosphere, vegetation and land. The water cycle is driven by energy from the sun.
The water cycle has four stages: storage, evaporation, precipitation, and run-off.

As we seen in our routine life the way things are being changed, the way it was ten to fifteen year ago, its change totally.
Following are some of the reason which will prove disturbance of hydrological cycle

Deforestation:

Due to the drastic increase of cutting and burning of wood, it reduce the evaporation and transpiration rate, which has direct impact on hydrological cycle as plant play a key role in transpiring water into vapors and similarly in the storage of water, by cutting and eliminating forest its effect or totally cut the network of hydrological cycle. Which is directly implied the disturbance of hydrological cycle.

Construction of Dams and building:

Dams and building are constructed for a variety of purposes, by construction dams on canal or rivers, its disturbed the water supply which was the major source of evaporation which convert this open water into vapors and then it came back to earth in the form of rain,
Similarly construction of high rise building replace forest or fertile land which was the major source of hydrological cycle and thus have direct impact on climate change.

Impacts of human control of the terrestrial water cycle

Anthropogenic activities have resulted in the partitioning of water between that stored on the continents and in the ocean, leading to changes in sea level. The impoundment of water in continental reservoirs also affects water quality and the time it takes for runoff to reach the ocean. Thus effect the hydrological cycle.

Changes in water storage and sea level rise

Many human activities (e.g., aquifer depletion, wetland drainage) serve to divert water to the ocean that would otherwise have been stored on the continents. Dam building, on the other hand, impounds continental runoff that would otherwise have been transported to and stored in the ocean. The balance between these positive and negative alterations can be used as a measure of net anthropogenic disturbance to the global hydrologic cycle.

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

Ans: **Groundwater sustainability** is the development and use of groundwater to meet both current and future beneficial purposes without causing unacceptable consequences.

Rainwater Harvesting

A technique used to collect, store, and use rainwater for efficient application and conservation. An effective way of utilizing large amount of water which otherwise goes as surface runoff. Traditionally, rainwater harvesting has been practiced in arid and semi-arid areas, and has provided drinking water, domestic water, water for small irrigation and a way to replenish ground water level.

As clear from both the definition ground water sustainability and Rain water harvesting,
Both the term have same meaning and same purposes, to use the both type of water for same domestic, commercial and as well as for agricultural purposes to maintain the level of water, and to eliminate the water deficiency by utilizing rain water with the ground water storage.
As the natural Water which is available in different form for our uses, some time his level drop suddenly and may cause water deficiency just like most of the countries nowadays are facing water shortage, their fore it is necessary to harvest rain water to compensate the level of water which is draft due to the excess use of water in the season which have limited or minimum rainfall.
As the rain water storage will Improvement ground water levels, water availability in wells/tube-wells • quality of ground water through dilution • living condition in rural areas, Reduction in soil erosion due to reduced surface water runoff, Conservation of surface water runoff during monsoon, Outdoor(ex. Watering plants or car wash etc.) or domestic(bathing animals etc.)

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

Ans

Water has its own taste, color, smell and constituents. Not all water can be used for all purposes. Eg. Sea water cannot be used by us for drinking. The suitability of water for different purposes is determined by its quality parameters.

Quantity and quality:
On an average, each person in a developed country uses about 260 liters of water a day in the home. The Quality of water is equally important than quantity. Even if present in huge amounts, we cannot use salt water in many life support activities.

Water Quality Parameters:
Water has its own Physical properties, Chemical composition and Biological Properties

Physical Properties:
Temperature, Colors, Odor, Turbidity, Electrical Conductivity

Temperature (T) of Water: T of surface water varies from space and time.
The temperature of Surface water is influenced by the atmospheric conditions. The temperature of groundwater is controlled by the thermal characteristics of bedrocks and the depth.

Color of water: The color of water is due to the suspended particles and organic matter. Ranges from light to dark brown.

Odor: Pure water is odorless. When water dissolves other substances, the odor is determined by them. Mostly decayed organic substances give fouling smell. Inorganic substances give earthy smell.

Turbidity: Muddiness in water. Comes due to suspended particles from clay, silt and organic matter. Water Turbidity is measured using Nephelometer

Electrical Conductivity (EC): Ability of a substance to conduct an electrical current. The presence of charged ionic species makes water conductive. Pure water is less conductive.

Chemical properties: pH, Total Dissolved Solids (TDS), Quality of Water, hardness, Salinity and Alkalinity

pH of water: Refers to the effective concentration of hydrogen ions in water. It ranges from 0 to 14. Measured using pH meters. Water is said to be acidic(less than 7) or alkaline (above 7).

Total Dissolved Solids(TDS): Concentration of non-volatile substances present in colloidal or molecular state. Total of all ions present in water, expressed in ppm or mg/L. TDS determines the suitability of water for our use and consumption.

Quality of Water: Total dissolved solids(ppm). < 1000 fresh water. 1000-10,000 brackish water, 10,000 to 1,00,000 saline. > 1,00,000 hypersaline or brine.

Hardness: Hardness of water is defined as its content of metallic ions which react with sodium soaps to produce a residue. Expressed as total concentration of Calcium and Magnesium in ppm.

Salinity of Water: Comes due to sodium and chloride. Sea water contains 35,000 ppm or mg/L of dissolved salts

Alkalinity of water: Combined effect of Bicarbonates and Carbonates with calcium ions. It has a direct relationships with pH. Carbonates will be noticeable for water having a pH of more than 8.2

Biological Properties: Dissolved Oxygen (DO), Biochemical Oxygen Demand(BOD), Chemical oxygen Demand(COD) and Microorganisms-Bacterial counts

Dissolved Oxygen(DO): Is related to the solubility of air in water at 0 deg. C. Solubility of oxygen in water decreases with high temperatures. Important property for aquatic organisms. Surface water bodies should have enough DO. If DO depletes, it will be difficult to many aquatic organisms for their survival.

Biochemical Oxygen Demand(BOD): Is a measure of the biodegradable material. It is determined by incubating a water sample and measuring the decrease in dissolved oxygen as bacteria decompose these materials.

Chemical Oxygen Demand(COD): Is determined by chemical oxidation of water with dichromate

Water Quality Parameters: Limits the suitability of water for different purposes Drinking Domestic consumption, Agriculture, Industrial Processes and Cleaning and Recreation.

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