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Course : Certificate in wash

Course unit : Module one questions

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Module one questions

1. Explain why there is so much opposition to large dams
2. Briefly but in details explain benefits of large dams
3. Other than the ways discussed above, briefly discuss any technologies through which people access water in cities and rural areas
4. Is there a significant difference between water quality in shallow wells and boreholes? Justify your answer with a detailed explanation.
5. Explain the frequency of testing wells and what is your opinion if you found bacteria in your well?
6. Discuss any diseases related to mismanagement of water and how the same affects the economy of the country in question
7. Explain the sources of surface water and how the concerned authorities are safeguarding the same
8. Explain the characteristics of good rainwater harvesting system
9. What steps should the state or the water management authorities put in place to promote use of and harvesting of rainwater.
10. What is your take on recycling used water and the repugnancy associated with it?

**Answers to question one.**

First and fore most a dam is man-made reservoir constructed for the purpose of holding water or underground streams to supply water for human consumption and activities such as agriculture through irrigation, industrial use, generation of hydroelectricity to mention but a few.

There has been so much opposition to the construction of large dams due to the following;

Human displacement; the construction of large dams especially for commercial purposes require lager area for its establishment as a result many people end up being displaced from their initial location to another place which may not be favorable for human settlement.

Secondly, large dams causes blockage of flowing rivers from following its original route, yet many people depend on the same source of water drawn from the rivers thus making water accessibility difficult to those who 100% relay on the water from the rivers.

The construction of large dams also leads to deforestation and destruction of wild life habitat which in the long run affects the ecological setup of the environment and the climate.

Economically, the construction of large dams are opposed due to the fact that they require huge sum of capital for both machinery and labor as a result many communities with low per capita income cannot afford to acquire the machineries and labor for the construction of the dams.

Many people also oppose the construction of large dams due to the fear of accidents that might occur during its construction leading loss of life and property.

Large dams are a source of flooding. In the area where large dams are constructed, there are high chances of flooding with its associated disadvantages.

**Answers to question two.**

Hydroelectricity power generation; Energy plays a key role for socio-economic development of a country. Hydro Power provides a cheap, clean and renewable source of energy which is the most advanced and economically viable resource of renewable energy. Unlike thermal power stations, Hydro Power stations have fewer technical constraints and the hydro machines are capable of quick start and taking instantaneous load variations.

Enhanced inland navigation is a result of comprehensive basin planning and development, utilizing dams, locks and reservoirs that are regulated to play a vital role in realizing large economic benefits of national importance.

Irrigation, Dams and reservoirs are constructed to store surplus waters during wet periods, which can be used for irrigating arid lands. One of the major benefits of dams and reservoirs is that water flows can be regulated as per agricultural requirements of the various regions over the year as such they render unforgettable services to mankind for meeting irrigation requirements on a large scale. There is a need for construction of more reservoir based projects despite widespread measures developed to conserve water through other improvements in irrigation technology.

Water for human consumption and industrial use As a result of the large variations in hydrological cycle, dams and reservoirs are required to be constructed to store water during periods of surplus water availability and conserve the same for utilization during lean periods when the water availability is scarce. Properly designed and well-constructed dams play a great role in optimally meeting the drinking water requirements of the people. The water collected and stored in the reservoirs is vastly used for meeting industrial needs in the manufacturing of products and chemicals

Recreation: The reservoir made possible by constructing a dam presents a beautiful view of a lake. In the areas where natural surface water is scarce or non-existent, the reservoirs are a great source of recreation.

Symbol of Economic development and technology being in control of the nature and the possibility of pulling large dam projects has been a rite and source of pride along with other objectives, recreational benefits such as boating, swimming, fishing etc. linked with lakes are also given due consideration at the planning stage to achieve all the benefits of an ideal multipurpose project.

Flood Control The water conserved by means of dams and reservoirs at the time of floods can be utilized for meeting irrigation and drinking water requirements and hydro power generation. The dams are designed, constructed and operated as per a specific plan for routing floods through the basin without any damage to life and property of the people

**Answers to question three.**

Canals; these are man-made channels constructed from a water reservoir preferably Dams, lakes or rivers to convey water along with pipes over a large distance to cities and farms to be used where there is no source of natural water. For example Suez Canal linking the Mediterranean Sea and the Gulf of Suez (1869), the Kiel Canal is connecting the North and Baltic Seas (1895), and the Panama Canal linking the Atlantic and Pacific Oceans (1914). The construction of navigation canals also enables easy movement of people and their good less expensive. However their construction is associated with high environmental, economic and social costs.

Wells; a well refers to a human-made hole dug in the ground for accessing water. Wells have been in use for millennia as a way of getting water for human consumption however due to the advance in technology around the 21st century, drilling technology with the availability of electrical energy; hand-dug wells have been substituted by a borehole which has made life comfortable in place where there is water. The same water can also be tapped into tanks and pumped for irrigating farms thus increasing agricultural production.

**Answers to question four**

The most important aspect of depth is not the well’s absolute depth–30 or 40 or 100 feet–but rather how far its casing extends below the water table. A well casing is a steel pipe that serves as the lining of your well that keeps it from caving in and helps protect the well from contamination from surface water. Well depth can affect both the quality and quantity of water pumped from a well.

The quality of water in a well is influenced by the land use activities that take place in its recharge area. (That is an area where water from precipitation is transmitted downward to an aquifer.)

A well that is not deep enough to reach the water table will yield no water at all. Shallow wells are mostly susceptible to contamination from activities in the local area. Some part of the year it might be dry because of seasonal fluctuations in the water table. A deep well in this case would be better protected from local contamination and would not likely go dry even during drought years.

If you install a shallow well, your water quality will be most influenced by your activities and those of your neighbors whereas for a deeper well, the quality will be generally influenced by the soil, rock, and geology that the water flows through. There is one other element to consider in this problem, and that is time. The water that you draw from a deeper well is likely to be older, having been in the ground for a longer time than water from a shallow well. That fact gives rise to some important consequences.

The water quality you see in a shallow well today is probably the result of land uses in the past year or two. The water quality in a deep well may reflect land uses of ten or more years ago, but not necessarily. Deep wells may only be influenced by the surrounding rock and soil formations through which the water flows. However, if your neighbor spills five gallons of gasoline, it might show up in your shallow well fairly quickly, especially if there has been abundant rainfall, irrigation, or other water-using activities. You can taste and smell gasoline at 1 part per million (so, 1 gallon of gasoline can contaminate 1 million gallons of water). If the landfill a mile uphill leaks, it could take many years for the contaminants to show up in your deep well. Groundwater in Basin and Range aquifers moves very slowly compared to water in streams–approximately a foot per day, or a mile in 16 years.

Water quality in a deep well usually changes more slowly than in a shallow well. That’s because groundwater does some mixing as it moves through the aquifer. A spill a mile away from your deep well in the Basin and Range aquifer might be substantially diluted with clean aquifer water before it gets to your well. Shallow wells are quite sensitive to what’s going on immediately around them, and their quality may vary season by season.

Some chemicals, such as pesticides or gasoline residues, break down or change over time. If a pesticide soaked into the ground a mile away from you, it might be substantially changed in the time it would take to reach your deep well. In a shallow well, where your water may only have been in the ground for a year, there is much less time for such changes to occur.

The most important tests used in water-quality surveillance or quality control in small communities are those for microbiological quality (by the measurement of indicator bacteria) and turbidity and for free chlorine residual and pH where chlorination is used. These tests should be carried out whenever a sample is taken, regardless of how many other physical or chemical variables are to be measured. The recommended minimum frequencies for these critical measurements in well once initially, thereafter as periodically for residual chlorine Situations requiring testing if the situation demands and water is chlorinated, change in environmental conditions, outbreak of waterborne disease, or increase in incidence of waterborne diseases

**My opinion if bacteria are found in my well**

I will notify all users of water from the same source to use an alternate source of drinking water or to bring water to a rapid rolling boil for at least one minute before use and I will do this by putting warning Post and notices in prominent locations to alert users to use another source of drinking water. For example schools or daycares, warning notices will be posted at every entrance to every building and every structure that is part of the designated facility.

Secondly I will report and notify the public health unit of my community in person with a written document requesting to carry out sample test and to advice on the remedies to be undertaken in order to disinfect the contaminated well.

Then I will follow any other action as directed by the health medical officer.

**Answers to question six**

Diarrhea is characterized by loose, watery stool and is caused by drinking contaminated water from human fecal matter. When the water source is not managed well with an increase in the population, the unappropriated disposal of human wastes results into contamination of water source thus leading to diarrhea.

Bacterial infections In general terms, the greatest microbial risks are associated with ingestion of water that is contaminated with human or animal feces. Wastewater discharges in rivers and wells are the major source of fecal microorganisms, including pathogens

**Typhoid** Typhoid is caused by Salmonella typhi, which is spread through contaminated food or drink. If water is exposed to sewerage contaminated with the bacteria, people who consume the water will get sick.

**Mosquito-borne diseases** A severe drought can increase mosquito-borne diseases. Although droughts mean less water, stagnant water creates the perfect breeding ground for mosquitoes. The need and urge to reuse their water, buckets of water may result in an increased mosquitos population thus leading to the wide spread of malaria, Filarial and trypanosomes

When compared with other major diseases, diarrheal disease ranked fourth as a cause of death, and second for burden of disease. Poor water supply, sanitation and personal and domestic hygiene ranked among the highest risk factors, being responsible for 5.3% of deaths and 6.8% of disease burden.

Infectious diarrhea is the greatest contributor to the disease burden from water, sanitation and hygiene, with the most common transmission routes being the waterborne and water-washed routes.

Diseases related to poor water supply, sanitation and hygiene have significant economic impact on society. Costs are borne by the health sector, households inflicted with illness, and businesses. The greatest cost to the health sector is the cost of treating those who become ill from diarrheal disease.

Private costs include not only the direct costs of treatment, but also the opportunity cost of time – in seeking care and in time taken off work – and the negative impact on household income. Furthermore, poor water and sanitation entails additional costs for households, such as treatment costs, hauling or water purchase costs, and time to access sanitation facilities.

**Answer to questions seven.**

Surface water is [water](https://en.wikipedia.org/wiki/Water) on the surface of the planet such as in a [river](https://en.wikipedia.org/wiki/River), [lake](https://en.wikipedia.org/wiki/Lake), [wetland](https://en.wikipedia.org/wiki/Wetland) or surface reservoir and the sources of surface water can be explained as follows

Rivers are formed along more or less defined channels to drain from land all the water received in the form of rainfall and melting of snow from high altitudes. Their development is the work of ages.

 Streams, Rainwater infiltrate into the soil and subsequently join the ground water storage. When the natural relief is such that the ground surface at any point falls below the top surface of groundwater reservoir then there exists greater hydrostatic pressure in the soil mass. The groundwater under pressure then finds way through the soil into the depression forming a, stream.

 Lakes, Rainwater in excess of all sorts of losses runs off the surface of the earth. When this water is caught in very big natural depression a lake is formed. Lakes also derive water from groundwater. This water is also available for use whenever required.

Reservoirs, when some obstruction like a dam or a weir is constructed at the narrowest point of a valley to store large quantity of water behind it reservoir or artificial storage is formed. This water can be very conveniently used for various purposes with provision of suitable hydraulic structures.

However to safe guard these surface water sources, the authority can manage the water catchment area from which the water runs off. Settlement should be within the recommended condition of the water authority and obstructions from streams.

On the other hand to overcome drought variations, water should be stored by the constructions of reservoir both to surface and rain water as well.

The management of water (the water authority) should undertake water treatment by first the removal of water solids, disinfection, and sedimentation and by filtration.

**Answers to question Eight.**

A rainwater harvesting system comprises components of various stages - transporting rainwater through pipes or drains, filtration, and storage in tanks for reuse or recharge. The common components of a rainwater harvesting system involved in these stages are illustrated here.   
  
 Catchments: The catchment of a water harvesting system is the surface which directly receives the rainfall and provides water to the system. It can be a paved area like a terrace or courtyard of a building, or an unpaved area like a lawn or open ground. A roof made of reinforced cement concrete (RCC), galvanized iron or corrugated sheets can also be used for water harvesting. 

Coarse mesh at the roof to prevent the passage of debris

Gutters:  Channels all around the edge of a sloping roof to collect and transport rainwater to the storage tank. Gutters can be semi-circular or rectangular and could be made using:

* Locally available material such as plain galvanized iron sheet (20 to 22 gauge), folded to required shapes.
* Semi-circular gutters of PVC material can be readily prepared by cutting those pipes into two equal semi-circular channels.
* Bamboo or betel trunks cut vertically in half.

The size of the gutter should be according to the flow during the highest intensity rain. It is advisable to make them 10 to 15 per cent oversize.

Gutters need to be supported so they do not sag or fall off when loaded with water. The way in which gutters are fixed depends on the construction of the house; it is possible to fix iron or timber brackets into the walls, but for houses having wider eaves, some method of attachment to the rafters is necessary.

Conduits are pipelines or drains that carry rainwater from the catchment or rooftop area to the harvesting system. Conduits can be of any material like polyvinyl chloride (PVC) or galvanized iron (GI), materials that are commonly available.

A first flush device is a valve that ensures that runoff from the first spell of rain is flushed out and does not enter the system. This needs to be done since the first spell of rain carries a relatively larger amount of pollutants from the air and catchment surface.

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Filter The filter is used to remove suspended pollutants from rainwater collected over roof. A filter unit is a chamber filled with filtering media such as fibre, coarse sand and gravel layers to remove debris and dirt from water before it enters the storage tank or recharges structure. Charcoal can be added for additional filtration

**Answers to question nine.**

Rain water harvesting can be made mandatory for all government buildings including schools, hospitals and other offices. These systems should provide model for public to follow.

It should also be mandatory for private buildings with more than 100sqm floor area. Necessary provision can be made in national building code

It should be made mandatory for the school to maintain their water system in good condition and children should be encouraged to drink rain water at schools d. School education and public education/awareness need to be intensified

Ground water recharge through rain water harvesting and rain water use for agricultural uses should be encouraged

Government should accord priority to this program and provide Government should accord priority to this program and provide incentives to the community for popularizing the system

Rain water harvesting cell/unit need to be created within the ministry of water to coordinate and monitor the program and provide technical guidance to community

**Answers to question Ten.**

Recycled water is water that's been used before. It's a valuable resource that can be used for many different things. Recycling and re-using water is a great way to save drinking water and help care for the environment. Saving drinking water by recycling means we have extra water available in case of drought - and for a growing population.  
  
There is no need to use drinking water to flush toilets or water sports fields. Recycled water can do the job safely and just as well.

Recycling the water that is used in your area, means that you do not have to take water from other areas. Many areas where pure water is plentiful are delicate ecosystems that suffer when their water is removed. When the water is recycled, it makes it easy for places like the wetlands to keep their water supplies

Many times, recycling water not only prevents its removal from sensitive environments, but it keeps wastewater from going into bodies of water such as ocean or rivers. Recycling water takes wastewater such as sewage and reuses it, instead of routing it directly into the nearest river or ocean where it could spread pollution and disrupt the aquatic life.

However if proper management guidelines and appropriate risk management principles are not followed, recycled water can be of potential risk to human health and the environment at large.

### Microbial pathogens in wastewater from sewage effluent are the major concern for human health when recycling water. The major groups of pathogens, Bacteria, Viruses and Helminths and the environmental risks are Salinity, Sodality and sodium which affect the growth of plants cover, soli dispersion and reducing water infiltration on heavier textured soil.

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