**ASSIGNMENT 3**

1. **Explain six major non-domestic use of water.**

There are several major non-domestic uses of water. These include but not limited to: providing hydroelectric power, agriculture (irrigation), and livestock, building construction, firefighting and recreation, mining, manufacturing and other industries. Water is also necessary in many chemical reactions and laboratory tests, medical procedures, including dental treatments and dialysis. The quality of water acceptable for the various uses can be different.

1. **Providing hydroelectric power use**

Hydroelectric power, or hydro energy, is a form of renewable energy that uses the water stored in dams, as well as flowing in rivers to create electricity in hydropower plants. The falling water rotates blades of a turbine, which then spins a generator that converts the mechanical energy of the spinning turbine into electrical energy. Hydroelectric power is a significant component of electricity production worldwide. Thermoelectric Power water use is the amount of water used in the production of electric power generated with heat. The source of the heat may be from [fossil](http://www.waterencyclopedia.com/knowledge/Fossil.html" \o "View 'fossil' definition from Wikipedia) fuels, nuclear fission, or geothermal. [Fossil fuel](http://www.waterencyclopedia.com/knowledge/Fossil_fuel.html" \o "View 'fossil fuel' definition from Wikipedia) power plants typically reuse water. They generate electricity by turning a [turbine](http://www.waterencyclopedia.com/knowledge/Turbine.html" \o "View 'turbine' definition from Wikipedia) using steam power. After the steam is used to turn the turbines, it is condensed back to water by cooling it. The condensed water is then routed back to the boiler, where the cycle begins again.

1. **Agricultural use (Irrigation, livestock)**
2. The Role of Water in Agriculture focuses on the role of water in British agriculture. This book discusses the growing importance of hydrological science and agricultural hydrology. Organized into 14 chapters, this book begins with an overview of the problems of accurate rainfall measurement and its importance to agriculture. This text then presents a comprehensive study of the sources of error in agricultural water budgets. Other chapters consider the progress reports on two catchment studies and a report on the effect of agricultural treatments on water availability in the soil. This book discusses as well the sediment yields from forested and agricultural lands on an international basis. The final chapter deals with a summary of the discussions with conclusions and implications. This book is a valuable resource for hydrologists, geographers, meteorologists, agricultural scientists, applied biologists, plant physiologists, and pedologists. Engineers, administrators, and advisers will also find this book useful.

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The use of agricultural water makes it possible to grow fruits and vegetables and raise livestock, which is a main part of our diet. Agricultural water is also used for irrigation, [pesticide external](http://www.epa.gov/agriculture/pesticide.html) and [fertilizer applications external](http://www.epa.gov/agriculture/tfer.html), crop cooling (for example, light irrigation), and frost control irrigation water use is also water artificially applied to farm, orchard, pasture, and [horticultural](http://www.waterencyclopedia.com/knowledge/Horticulture.html" \o "View 'horticultural' definition from Wikipedia) crops, as well as water used to irrigate pastures, for frost and freeze protection, chemical application, crop cooling, harvesting, and for the leaching of salts from the crop root zone. Nonagricultural activities include self-supplied water to irrigate public and private golf courses, parks, nurseries, turf farms, cemeteries, and other landscape irrigation uses. When agricultural water is used effectively and safely, production and crop yield are positively affected. A decrease in applied water can cause production and yield to decrease. Management strategies are the most important way to improve agricultural water use and maintain optimal production and yield. Livestock water use includes water for stock animals, feed lots, dairies, fish farms, and other nonfarm needs. Water is needed for the production of red meat, poultry, eggs, milk, and wool, and for horses, rabbits, and pets. Livestock water use only includes fresh water. One importance of water to livestock is that it determines the performance of animals. For instance, a laying hen that hasn’t taken enough water will have no good and impressive laying performance. This is because water is highly essential in egg formation. Likewise, a dairy cow that hasn’t taken enough water will produce less milk. This is because water takes the highest part in the constituents of fresh cow milk. In a situation where the performance of animals is negatively affected due to water starvation, then big economic loss should be expected. How will a farmer feel when he sees a healthy animal die because he didn’t serve or provide an adequate quantity of water? I believe a serious farmer should feel bad. Another thing is that animals will not eat well if water is not provided when they are served feed. Animals needed to be served sufficient and cool water, which must be free from any forms of contamination. The water must be from a clean and healthy source and must be served with clean water troughs. If animals are starved of water for a very long time, they die and that will be a loss to the farmer. Water must be available for animals at all times, except in situations where there is need to withdraw water from them. Birds such as broilers and layers are very sensitive to water and it is a factor that determines their production and performance. So as feed, nutrition, and the health of livestock are being taken seriously, water intake should be taken important. When planning to establish a farm, the source of clean water to serve animals on the farm should be highly considered.

1. **Building construction use**

Water is one of the most important elements in construction but people still ignore quality aspect of this element. The water is required for preparation of mortar, mixing of cement concrete and for curing work, etc. during construction work. The quality and quantity of water has much effect on the strength of mortar and cement concrete in construction work. The water used for mixing and curing should be clean and free from injurious quantities of alkalis, acid, oils, salt, sugar, organic materials, vegetable growth and other substances that may be deleterious to bricks, stone, concrete or steel. Potable water is generally considered satisfactory for mixing. It has been observed that certain common impurities in water affect the quality of mortar or concrete. Many times in spite of using best material i.e. cement, coarse sand, coarse aggregate etc. in cement concrete, required results are not achieved. Most of Engineers/Contractors think that there is something wrong in cement, but they do not consider quality of water being used. Some bad effects of water containing impurities are following. Water is an integral part of construction. If the water quality is not maintained, the building gets damaged easily and it can be easily visible. Water is important in every step of construction. Cement concrete is the backbone of construction. Water plays a major role in cement concrete production.

1. **Firefighting use**

Firefighting is the act of attempting to prevent the spread of and extinguish significant unwanted fires in buildings, vehicles, woodlands, etc. A firefighter suppresses fires to protect lives, property and the environment. Firefighters typically undergo a high degree of technical training. The provision of water is crucial for firefighting. It is important to safeguard human life and our material assets from the destructive effects of fires. In the case of a fire, easily accessible water proves to be extremely useful. The design of water supplies for public fire protection is a well-established sector of engineering. However, when public supplies are insufficient in capacity, flow or duration then special consideration is required. For single structures, it is reasonable to assume that fire flow should be sufficient for sprinklers and hose streams. However, where multiple or complex structures exist or where the magnitude of the risk escalates due to age, construction type, lack of adequate fire service response, financial impact of loss over a large area etc. then special consideration is typically required.

1. **Recreational use**

Recreation is an essential and growing activity. It is an activity that a person does for enjoyment, usually to refresh the body and mind. Recreation often involves some degrees of exercise as well as visiting areas that contain bodies of water such as parks, wildlife refuges, wilderness areas, public fishing areas, and water parks. Recreational water refers to rivers, lakes and coastal waters.  People use recreational water for activities like swimming, surfing, water skiing, white water sports, underwater diving, sailing, boating and shellfish gathering. Recreational use of water in fresh and coastal waters as well as pools and spas can deliver important benefits to health and well-being. Yet, recreational water use also poses risks though exposure to pollution as well as physical risk such as drowning and injury. Recreational users of water may be at risk of serious and potentially fatal diseases. Recreational standards specifically focus on water quality in the places where people are most likely to be swimming or boating. “Primary” contact means you are putting your whole head under water, like when you swim, dive, or surf. “Secondary” contact means that you are near the water, like when you paddle, sail, or fish. Standards for primary contact are more strict, because there is a good chance that you’ll be swallowing some of the lake.. Recreational water can become contaminated with faecal pathogens (such as bacteria and viruses) from human sewage and animal manure.

1. **Manufacturing, mining and other industries use**

Manufacturing and other industries use water during the production process for either creating their products or cooling equipment used in creating their products. Industrial water is used for fabricating, processing, washing, diluting, cooling, or transporting a product. Water is also used by smelting facilities, petroleum refineries, and industries producing chemical products, food, and paper products. Large amounts of water are used mostly to produce food, paper, and chemicals. Mining water use includes water for the extraction of naturally occurring minerals; solids, such as coal and ores; liquids, such as crude petroleum; and gases, such as natural gas. The category includes quarrying, milling (such as crushing, screening, washing, and flotation), and other operations as part of mining activity. A significant portion of the water used for mining, about 32 percent, is saline. A reliable water supply is an important requirement for a gold-mining operation. Water for mining is sourced from aquifers, tailings dam return water and the Water Corporation.

1. **Briefly describe the important roles that water plays in the human body.**

Water in the human body is essential for several functions. These functions include but are not limited to the followings:

* Inside the body, water serves as a lubricant during digestion of our food. Water in saliva facilitates chewing and swallowing, and the food goes down into the stomach with the help of water. The functions of all the body’s cells and organs depend on water.
* Water is involved in transporting valuable nutrients around the body in the bloodstream. Nutrients are broken down in the digestive system and transported to where they are needed in the body;
* Water is used by the body to remove harmful toxins and wastes through urination and perspiration. Water also helps to reduce constipation. Drinking enough water helps body organs such as the kidneys and the liver to get rid of waste products.
* Water helps to regulate body temperature. The body controls over-heating through perspiration. When sweat evaporates from the surface of the skin, it takes heat from the body and produces a cooling effect;
* Water is A vital nutrient to the life of every cell, acts first as a building material;
* The carbohydrates and proteins that our bodies use as food are metabolized and transported by water in the bloodstream;
* Water assists in flushing waste mainly through urination;
* acts as a shock absorber for brain, spinal cord, and fetus;
* Water protects the tissues, spinal cord, and joints;
* Water helps maximize physical performance;
* Water helps prevent constipation;
* Water aids in digestion;
* Water helps with nutrient absorption;
* Water helps to lose weight;
* Water improves blood oxygen circulation;
* Water helps fight off illness;
* Water helps boost energy;
* Water helps improve mood;
* It helps keep skin bright;
* Water can also help in controlling the levels of calories in the body;
* Water in the human body can help in energizing muscles;
* Water prevents overall dehydration;
* The consumption of water can also help in keeping the skin looking good and healthy;
* Etc.

1. **List the types of people who are most vulnerable to waterborne diseases. Explain your answers why and how to overcome the diseases.**

Waterborne diseases include but are not limited to the followings:

1. Cholera: It is caused by bacteria named Vibrio cholera. This disease is gastrointestinal;
2. Diarrhea: Caused by Rotavirus or Norovirus, it results in loose stools dehydration;
3. Typhoid: It is caused by bacteria named Being gastrointestinal it is caused by consuming contaminated food or water;
4. Dysentery: It is the result of the inflammation of the intestines due to the bacteria named shield/ Salmonella;
5. Botulism: It is caused by toxins released by bacteria named Clostridium Botulinum. It is a fatal disease resulting in weakness, loss of vision and improper speaking;
6. Polio: Polio is a rare disease caused by polioviruses. It is not curable and results in the paralysis of arms, legs or diaphragm;
7. Hepatitis A and E: It causes inflammation of the liver by the Hepatitis A virus spread through contaminated food and water;
8. Diarrhea: Caused by Rotavirus or Norovirus, it results in loose stools dehydration;
9. Malaria: Malaria is a fatal waterborne disease spread by stagnant water born mosquito i.e. Plasmodium Parasite Mosquito that breeds in contaminated water bodies;
10. Filariasis: This parasitic disease is carried by black flies and mosquitoes causing Elephantiasis. This disease severely affects the limbs;
11. Giardiasis: It is a common waterborne disease caused by a Protozoa resulting in [diarrhea](https://www.medlifeweb.com/diarrhea-causes-symptoms-diarrhea-medicine-with-doses/), bloating, [stomach ache](https://www.medlifeweb.com/stomach-pain/) and gas pains;
12. Etc.

**The most vulnerable groups to these water borne diseases include:**

1. Women (ratio higher for pregnant women);
2. Young Children and Infants, Weak and sick children living (ratio higher for children living in child-headed households);
3. Older people (ratio higher for the infirm);
4. Physically and mentally disabled people;
5. People either separated from or without access to the main focus of relief assistance;
6. Refugees or displaced people scattered among the host community (might not receive the same assistance as those who are living in camps or settlements);
7. People debilitated by disease;
8. Etc.

**To overcome the water borne diseases, one has to observe the preventive and the curative measures.**

Preventive measures (Water Borne Diseases Preventions) include:

Clean water is a pre-requisite for reducing the spread of water-borne diseases. It is well recognized that the prevalence of water-borne diseases can be greatly reduced by provision of clean drinking water and safe disposal of faeces. [Disinfection](https://www.lenntech.com/disinfection.htm) is used to prevent the growth of pathogenic organisms and to protect public health. Without disinfection, the risk from waterborne disease is increased. The two most common methods to kill microorganisms in the water supply are: oxidation with chemicals such as chlorine, [chlorine dioxide](https://www.lenntech.com/chlorine_dioxide.htm) or [ozone](https://www.lenntech.com/ozone.htm), and irradiation with [Ultra-Violet (UV) radiation](https://www.lenntech.com/uv_disinfection.htm). Some additional preventive measures include:

1. Wash hands with soap or sanitizers using clean and fresh water before eating;
2. Wash utensils and clothes with disinfectants under fresh water;
3. Change the water in water coolers or air conditions on a daily basis. Don’t allow the water to stagnate, this attracts water borne mosquitoes and germs which can further enter our bodies through food or water;
4. Keep surroundings clean and maintain properly covered drainage systems. Feces should not be allowed to pass through open pipes or channels near houses;
5. Need to follow special precautions while traveling to away from home city/country where the weather or climatic conditions are wet. It may increase the chances to get [;](https://www.medlifeweb.com/travelers-diarrhea-treatment-causes-symptoms/)
6. Strict: Do not pass sewage or waste materials in water bodies thus contaminating them. This may be the source of drinking water or groundwater and may enter body in some way or the other;
7. Disinfect water before consuming especially in case of infants or patients by filtering or boiling;
8. If resources allow, install water purifiers in the workplace and home;
9. Keep the surroundings clean near groundwater sources like hand pumps, wells, etc.;
10. Use potassium permanganate or chlorine at recommended levels in water resources for purifying the water.
11. Avoid eating street foods from places nearby open drains or sewage. Avoid consuming ice products prepared from contaminated water.
12. Make sure the water is stored in clean and hygienic containers;
13. Etc.

Curative measures (Treatment of Waterborne Diseases)

* 1. In case one is suffering from a waterborne disease, make sure that the treatment of such is done instantly. Since they are carried by microorganisms like bacteria, fungi, viruses, and protozoans they may grow if not treated well at the right time and result in some severe disease.
  2. If one is suffering from diarrhea, his body will be dehydrated. He takes proper fluids with ORS and glucose to keep his body hydrated. In case the diarrhea is severe, he must see a doctor as soon as possible. Hospitalization may be suggested in case the disease can’t be treated at home. Eat nutritious food after recovery to avoid weakness and fluid loss because of repeated stools and vomits. The doctor might suggest either [Loperamid or Probiotics like medicines to control diarrhea.](https://www.medlifeweb.com/diarrhea-causes-symptoms-diarrhea-medicine-with-doses/) Take a proper dose of medicines as prescribed by the physician. In case of fever calm the temperature down using cool bags and take sufficient rest to cure the disease faster.
  3. Keep away from heavy, oily or outside food items during the treatment of waterborne diseases and even for some days after recovery.

1. **Suppose that inhabitants of a village obtain water from a spring. What advice would you give to the users about the prevention of contaminants entering the spring?**

There are many different ways that users can prevent contamination.

**The users of the spring water should be advised to:**

1. Avoid open defecation around the spring and respect a safe distance;
2. Not construct latrines above the spring because of the danger of contaminating the groundwater;
3. Use latrines properly (improved latrines);
4. Keep animals away from the spring (animals should be excluded from the surrounding area by a stock-proof fence);
5. Do not bath or wash clothes and other domestic materials close to the spring;
6. Protect the surrounding land area;
7. Making sure that solid waste landfills are used properly and very far from the spring;
8. Etc.
9. **The following are pollution sources. Give two specific pollutants for each source.**

Examples of specific pollutants for the following sources:

1. **A residential area:**
2. Human excreta;
3. Wastewater containing dissolved and suspended organic matter;
4. Suspended inorganic matter;
5. Pathogenic micro-organisms.
6. **A metal plating plant:** 
   1. cyanides,
   2. heavy metals
7. **Agricultural activities:** 
   * 1. Nitrates;
     2. Phosphates;
     3. Pesticides.
8. **An uncontrolled landfill site:** 
   * 1. Leachate containing dissolved organic matter;
     2. Inorganic components and heavy metals.
9. **Urban surface water run-off**
   1. Sediment;
   2. Metals;
   3. Hydrocarbons;
   4. rubber, detergents; litter.