*South Sudan*

*Lakes States –Rumbek*

*Mott McDonald (Water for Lakes project)*

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*Assignment 3*

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

**Answer**

**The different uses of water**

Water is used in many ways: for domestic purposes, in industry, in commercial establishments (such as hotels and restaurants), in farming (for agriculture and animal-rearing), and for emergency uses such as fire-fighting. Note that the *quality* and *quantity* of water for each use is different. Water for domestic purposes needs to be of high quality but is used in relatively small amounts, whereas usage in industry or agriculture could cope with water of a lower quality but the demand is much higher in terms of quantity.

1. **Irrigation use**

About 70% of water used globally is in irrigation. In Ethiopia, the total area under irrigation is increasing and irrigation channels. **Spray irrigation**, where pressurized water is sprayed over plants to feed them, is often used on large farms but greater efficiency of water use can be achieved by **drip-feed irrigation** systems. In drip-feed irrigation, water is fed to the roots of plants through narrow pipes dripping water onto the soil surface near the base of the plant. This takes the water directly to the growing crops and reduces losses by evaporation.

1. Industrial use

In many industries water is essential. Some industries use piped water supplied from water treatment plants while others draw the water themselves from underground sources and treat it on site for use. The water may be used either as part of the production process or as an ingredient, where water is one of the components of the product, for example in a soft-drink plant. In the production process, it can be used for cooling, washing, diluting, boiling or cooking, transportation of raw materials (for example, moving potatoes in a food factory), and as a cleaning agent.

1. **Mining use**

Mining activities use huge amounts of water in processing ore to extract minerals. In Ethiopia, mining for gold and other valuable metals is an increasingly important part of the national economy and would not be possible without the use of water

1. **Use in power generation**

The rivers of Ethiopia have enormous potential for generating **hydroelectric power (HEP)**. HEP uses the energy from moving water and converts this to electrical energy. The development of HEP has transformed energy supply in recent years and more schemes are under construction or planned. However, it is important to realize that in HEP the water is not ‘used’ in the sense of being consumed, because after passing through the HEP plant the water continues on its path in a river channel.

1. **Aquacultural use**

Water can also be used in **aquaculture**, which is the farming of aquatic organisms such as fish, crustaceans and molluscs for food. Fish farming, obviously needs water for the fish to live in! In this case, water is used to hatch fish eggs under controlled conditions, and the fish are grown to maturity in tanks or ponds, before being sold for food. Although not currently practiced in Ethiopia, the business potential for aquaculture has been recognized and it may be introduced in the future (Rothuis et al., 2012).

1. Recreational uses

Water plays an important role in recreational activities and here again it is not consumed in the process of its use. Boat trips are popular on many of Ethiopia’s lakes and several resorts have been built on their shores.

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

**Answer**

**Importance of water for human health**

Water makes up about 70% of an adult human being’s weight. In the human body, blood contains about 82% water and our brain is made up of about 95% water. Losing just 2% of our water content can result in signs of dehydration, fuzzy short-term memory and difficulty in focusing on smaller print or words displayed on a computer screen.

**Water has several roles in relation to human health:**

* Water plays an important part in keeping us and our environment clean. It is essential for good personal hygiene. We use water to wash our hands and bodies, and also to wash places in our homes that could possibly harbor harmful micro-organisms (such as toilets).
* Many of our foods are prepared with water and others naturally contain large amounts of water (e.g. milk is made up of approximately 88% water; eggs 66%; fish 80%; potatoes 75%; and beef 77%).
* 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.

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

**Explanation**

Each year, waterborne disease afflict hundreds of millions of people, primarily those living without safe, accessible water in developing countries.

Infants, young children, older people and debilitated by disease are the most vulnerable. Water in the human body is essential for several bodily functions. The disease associated with water can be classified as waterborne, water-washed, and water-based and water related.

**Effects of waterborne disease in health and its prevention**

Water pollination occurs when unwanted materials, industrial waste, human waste or animals waste, garbage, sewage effluents, etc. enter into the water, changes the quality of water which makes it harmful to the environment and also to human health. Water borne disease are caused by drinking water or eating food washed in water which is polluted, contains protozoa that can cause infections like Amoebiasis giardiasis, toxoplasmosis, etc contains viruses like hepatitis A or E or water may contain bacteria like E.coli, cholera or typhoid fever or water with parasites like roundworm, hookworm and ringworm, waterborne diseases are generally caused by polluted water from contamination of human or animals waste in the water.

According to world health Organization (WHO) 80% of diseases are water borne. Drinking water in various countries does not meet WHO standards 3.1% of deaths occur due to the un-hygiene and poor quality of water.

**Water borne illnesses have two main causes.**

* **Pollution**- Dangerous levels of chemicals, nitrates or heavy metals in the water supply due to industrial pollution or the over-use of agricultural chemicals.
* **Dirt & contamination:** Bacteria**,** viruses and parasitic organisms invisibly contaminated the water and cause disease. Much of this contamination is through water coming into contact with an animal and human waste. Just gram of feces can contain up to 100 billion microbes.

Waterborneillnesses are many and varied, from diarrhea and cholera to polio and meningitis, the can be credibly severe, life-changing and even life-threatening to those who infected but there are steps you can take to protect yourself from waterborne diseases and illnesses.

**Dysentery** is caused by either bacteria or protozoa and causes inflammation of the intestines, severe abdominal pains and diarrhea, often with blood. The intestinal lining can be compromised, impairing nutrient absorption, causing bleeding allowing bacterial infections and even the exit of pathogens into the bloodstream.

**Typhoid** **fever**. Typhoid Is a life-threatening illnesses one can contract by eating food handled by a person shedding the salmonella typhi bacteria or by eating food washed with water contaminated by sewage with the salmonella typhi bacterial. Once ingested, the bacteria multiply in the bloodstream. Symptoms include a very high fever, stomach pains, headache, extreme fatigue, joint pain and loss of appetite sometimes, to a rash will spread across the abdomen know as rose spots.

**Cholera**. Cholera is an acute, diarrhea illnesses caused by infection of the intestine with the bacterium vibrio cholera. Cholera is globally having increase steadily since 2005. Epidemics are generally related to fecal contamination of water supplies or street vendor foods. Severe cause may cause profuse watery diarrhea, vomiting and legs cramps. The rapid loss of body fluids can lead to dehydration and shock and without treatment, death can occur within hours.

**Hepatitis** **A.** Hepatitis A is a liver disease caused by the hepatitis A virus. The virus enters the water via the feces of an infected person. This can happen through broken pipes or by sewage overflows. Accordingly the virus can spread through water used to wash food. Hepatitis A typically causes by fever, vomiting, stomach pain, jaundice or yellowing of the skin and eyes, dark urine and fatigue.

When there is not an adequate supply of clean water for washing, eye and skin infections can easily occur and be very difficult to clear.

**Trachoma**. Trachoma is responsible for visual impairment or blindness. Women and children are most vulnerable populations. It is an infectious disease spreading through personal contact and by flies that have been in contact with the discharge from eyes or nose of the infected person.

**Shigellas**. Shigella is another infectious disease that can spread from an infected person to contaminated water or food. Shigellas and the E.coli bacteria are the most common cause of traveler’s diarrhea, often from eating salad or sandwiches that have involved hand contact by someone who has picked up the bacteria from feces or feces-contaminated water and not washed their hands properly.

**Prevention of waterborne disease includes**

* Makes sure that the water is visibly clean and free from and sand and silt. You can filter the water to get rid of any visible dirt.
* Only drink clean and safe water. Use either clean portable water or water that has been treated with water purifiers. Do not consume untreated water.
* Make sure that the stored water is free of germs and clean for later use.
* In bathing water, if it is not clear, put some antiseptic liquid to get rid of harmful bacteria.
* Practice exceptional hand hygiene by washing hands meticulously with soap after using the toilet, before and after preparing food, before eating or drinking anything.
* Children should always wash hands when they enter a home after playing games and also everyone should wash hands while entering the home.
* Make sure that the food is wash and thoroughly cooked to get rid of harmful bacteria and other hazardous germs.
* Immunize yourself to safeguard yourself from vaccine-preventable diseases like Typhoid, Hepatitis A, and Polio etc.
* As far as possible use disposable glass and plates while eating or drinking from outside.
* Avoid previously prepared food reused after long hours exposed food.
* Regular get water treatment device like filters, RO unit, etc, services and maintained.

Waterborne illnesses can strike anywhere, but they might be more dominant in the rural locations, majorly due to poor infrastructure when its coms to providing clean safe water, sanitation, and drainage. This is a myth, waterborne illnesses can impact anyone, however dependent on the illnesses it cause and it can have a much more severe impact in young children, babies, the elderly and those living with chronic conditions like heart disease, diabetes kidney disease etc.

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?**

Answer

Groundwater may emerge above ground as a spring. This happens in locations where the water table reaches the surface, or where the boundary between a permeable layer of underground rock and an impermeable layer reaches the ground surface,

Spring are normally found at the foot of mountains and hills, in lower slopes of valleys, and near the banks of major rivers. The water emerging at a spring may vary in volume and contamination levels, in response to the amount of rainfall Springs are likely to be polluted by direct contamination from run-off seeping through the topsoil unless the surrounding land area is protected. A spring supply issuing from a deep, water-bearing layer, rather than a permeable layer near the surface, can produce both a consistent volume and a better-quality supply

**Advice**

**Spring source protection**

* Whether the spring originates from shallow or deep rock layers, animals should be excluded from the surrounding area by a stock-proof fence.
* Springs should be protected from flooding and surface water pollution by constructing a deep diversion ditch above and around the spring. The ditch should be constructed so that it collects surface water running towards the spring and carries or diverts it away. It needs to be deep enough to carry all surface water away, even in a heavy rainstorm.
* Small springs are typically protected by a ‘spring box, which is constructed of brick, masonry or concrete, and is built around the spring so that water flows directly out of the box into a pipe or cistern, without being exposed to outside pollution such as run-off, bird droppings and animals. The spring box should have a watertight cover with a lock. Larger springs serving towns are protected in a similar way.

1. **The following are pollution sources. Give two specific pollutants for each source.**
2. **A residential area:**
3. **A metal plating plant:**
4. **Agricultural activities:**
5. **An uncontrolled landfill site:**
6. **Urban surface water run-off**

**Answers**

**Possible sources of water pollution**

Having looked at the various types of pollutant, let us now consider their sources.

1. **Human excreta**

Open defecation and poorly constructed pit latrines are obvious sources of human waste and can easily pollute surface and groundwater. Where water-flushed sewerage systems are present, inadequately treated sewage can also be a major source of human waste. (Note the difference between the words ‘sewage’ and ‘sewerage’. **Sewage** is mixed wastewater that contains human waste from flush toilets, commercial and industrial wastewater, and frequently also surface water run-off. **Sewerage** is the network of underground pipes – sewers – through which the sewage flows.)

Untreated or partially treated sewage can contribute to high levels of oxygen demand in the water and also introduce toxic substances into the aquatic environment, in addition to pathogenic micro-organisms.

In Ethiopian towns and cities many households use **septic tanks** to dispose of their sewage. These are underground tanks into which sewage is piped. The waste remains in the tank for long enough for the solids to settle out and the settled sewage is discharged from the tank, usually into the surrounding soil via a soak away. If the tank is too small to retain the sewage for long enough, or if many septic tanks are close together, or if they leak or are cracked, this can lead to pollution of groundwater. It is the aim in Ethiopia to have septic tanks that keep the sewage inside for a minimum of three days so that the organic solids will settle out as sludge.

1. **Metal plating plants**

There are ways in which water is used in industry and manufacturing. The range of different uses and processes can produce waste in the form of many different types of organic and inorganic material in suspension or in solution. In many cases, much of the water used can be recycled but there is almost always an effluent discharge that requires treatment.

Food processing generates large volumes of effluent containing natural organic compounds such as carbohydrates, proteins and fats. Factories producing chemicals often generate low volumes of highly toxic waste streams. Toxic effluents can also be produced in the paper, leather and electroplating industries. For example, cyanides and heavy metals may be present in wastewaters from electroplating. These plants can also be the source of highly acidic wastes.

Manufacturing and industrial effluents should be treated at their points of origin but many production plants in Ethiopia (such as tanneries and breweries) do not have proper effluent treatment systems. This results in the discharge of untreated or partially treated effluent into the nearest water bod.

1. **Agriculture activities**

The intensive rearing of animals results in large volumes of organically polluted wash water from cleaning animal houses. This slurry is often stored in lagoons or tanks prior to spreading on land. However, problems occur when these lagoons or tanks leak or overflow, allowing the slurry to flow into watercourses or infiltrate groundwater. Other agricultural pollutants include pesticides and fertilizers.

Cultivation and overgrazing can make soil erosion more likely, resulting in soil particles being washed into rivers and lakes. For example, in some areas where run-off from the surrounding land has washed silt into the reservoir, thus reducing the volume of water it can hold.

1. **An uncontrolled landfill site:**

Domestic and commercial solid waste should be disposed of in a properly designed and constructed landfill site. Many landfill sites, particularly those that are older and less well designed and managed, generate leachate, which is highly polluting. (**Leachate** is any liquid that has passed through matter and picked up dissolved substances and/or suspended solids as it passed through.) Leachate can contain dissolved organic matter and many different types of inorganic components depending on the type of waste. Where industrial waste has been dumped, a toxic chemical stream may also be produced. These leachates should be collected and treated so that pollution of groundwater and rivers does not arise.

1. **Urban surface water run-off**

Rainwater that runs off road surfaces, roofs, parking areas, etc. carries with it a variety of components. The bulk of the contaminants can be traced to motor vehicles. Surface water run-off can cause damage to streams, rivers and lakes by degrading the water quality and harming aquatic life. The pollutants present can hinder the growth and reproduction of fish and other creatures, and affect photosynthetic activity. Plant nutrients may contribute to eutrophication.

The pollutant that may be present in rainwater run-off is sediment, copper, lead, Hydrocarbons and detergent.

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