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**Prepared and submitted by:**

**John Tuol Machot Jech**

**Email address: tuolmachot83@gmail.com**

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**Post graduate Diploma in WASH.**

**ASSIGNMENT Number 3**

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

Irrigation is the application of controlled amounts of water to plants at needed intervals. Irrigation helps to grow agricultural crops, maintained landscape re-vegetate spoilt soils in dry areas and during the period of less than average rainfalls. Irrigation also has other uses in crops productions including frost protection, suppressing weed growth in grain fields and preventing soil consolidation. In contrast, agriculture that relies on only direct rainfall, e.g. South Sudan agriculture is referred to as rain-fed or dry land farming.

Irrigation water usage includes water that is applied by irrigation system to sustain plant growth in agricultural, horticultural practices. Irrigation also includes water that is used for pre-irrigation, frost protection, chemical application, weed control, field preparation, crops cooling, harvesting and dust suppression.

1. **Industrial water usage**

**Industrial** withdrawals provide **water** for purposes as fabricating, processing, washing, diluting, cooling, or transporting a product; incorporating **water** into a product; or for sanitation needs within the manufacturing facility.

Water use (by the four main industrial sectors) from public water supply accounts for between 2 % (Poland) and 50 % of total use for the activities of all [NACE](http://ec.europa.eu/eurostat/web/nace-rev2/overview) classes. Self and other water supply for industrial use stands at over 60 % of this total use, reaching 90 % in some countries (e.g. 92 % in Bulgaria; 2011 data). Manufacturing and energy production together account for over 70 % of total water use (the majority of water is used for cooling purposes) in most countries, with the exception of Spain (25 % of total; 2010 data) and Turkey (13 %; 2010 data).

There are large differences among countries in the break-down of water use in industry, depending on the industry that prevails in each country

Eurostat collects data on water abstractions for four main industrial sectors:

1. [Mining and quarrying](http://ec.europa.eu/eurostat/ramon/nomenclatures/index.cfm?TargetUrl=DSP_NOM_DTL_VIEW&StrNom=NACE_REV2&StrLanguageCode=EN&IntPcKey=&IntKey=18495404&StrLayoutCode=HIERARCHIC&IntCurrentPage=1),
2. [Manufacturing](http://ec.europa.eu/eurostat/ramon/nomenclatures/index.cfm?TargetUrl=DSP_NOM_DTL_VIEW&StrNom=NACE_REV2&StrLanguageCode=EN&IntPcKey=&IntKey=18496334&StrLayoutCode=HIERARCHIC&IntCurrentPage=1),

(iii) Crop production of [electricity](http://ec.europa.eu/eurostat/ramon/nomenclatures/index.cfm?TargetUrl=DSP_NOM_DTL_VIEW&StrNom=NACE_REV2&StrLanguageCode=EN&IntPcKey=&IntKey=18506834&StrLayoutCode=HIERARCHIC&IntCurrentPage=1), and

1. [Construction](http://ec.europa.eu/eurostat/ramon/nomenclatures/index.cfm?TargetUrl=DSP_NOM_DTL_VIEW&StrNom=NACE_REV2&StrLanguageCode=EN&IntPcKey=&IntKey=18507824&StrLayoutCode=HIERARCHIC&IntCurrentPage=1) and other industrial activities.

**C- Mining use of water.**

Mining water use is water used for the extraction of minerals that may be in the form of solids, such as coal, iron, sand, and gravel; liquids, such as crude petroleum; and gases, such as natural gas. The category includes quarrying, milling of mined materials, injection of water for secondary oil recovery or for unconventional oil and gas recovery (such as hydraulic fracturing), and other operations associated with mining activities. Dewatering is not reported as a mining withdrawal unless the water was used beneficially, such as dampening roads for dust control.

**D- Hydroelectric power**

Hydropower or water power is [power](https://en.wikipedia.org/wiki/Power_(physics)) derived from the [energy](https://en.wikipedia.org/wiki/Energy) of falling or fast-running water, which may be harnessed for useful purposes. Since ancient times, hydropower from many kinds of [watermills](https://en.wikipedia.org/wiki/Watermill) has been used as a [renewable energy](https://en.wikipedia.org/wiki/Renewable_energy) source for [irrigation](https://en.wikipedia.org/wiki/Irrigation) and the operation of various mechanical devices, such as [gristmills](https://en.wikipedia.org/wiki/Gristmill), [sawmills](https://en.wikipedia.org/wiki/Sawmill), [textile](https://en.wikipedia.org/wiki/Textile) mills, [trip hammers](https://en.wikipedia.org/wiki/Trip_hammer), dock [cranes](https://en.wikipedia.org/wiki/Crane_(machine)), domestic [lifts](https://en.wikipedia.org/wiki/Elevator), and [ore](https://en.wikipedia.org/wiki/Ore) mills. A [trompe](https://en.wikipedia.org/wiki/Trompe), which produces compressed air from falling water, is sometimes used to power other machinery at a distance.

In the late 19th century, hydropower became a source for generating [electricity](https://en.wikipedia.org/wiki/Electricity). [Cragside](https://en.wikipedia.org/wiki/Cragside) in Northumberland was the first house powered by [hydroelectricity](https://en.wikipedia.org/wiki/Hydroelectricity) in 1878 and the first commercial hydroelectric power plant was built at [Niagara Falls](https://en.wikipedia.org/wiki/Niagara_Falls) in 1879. In 1881, street lamps in the city of Niagara Falls were powered by hydropower.

Since the early 20th century, the term has been used almost exclusively in conjunction with the modern development of hydroelectric power. International institutions such as the [World Bank](https://en.wikipedia.org/wiki/World_Bank) view hydropower as a means for [economic development](https://en.wikipedia.org/wiki/Economic_development) without adding substantial amounts of carbon to the atmosphere, but [dams](https://en.wikipedia.org/wiki/Dam) can have significant negative [social](https://en.wikipedia.org/wiki/Social_impact_assessment) and [environmental impacts](https://en.wikipedia.org/wiki/Environmental_impact_assessment).[[5]](https://en.wikipedia.org/wiki/Hydropower#cite_note-per-5)

**E- Aquaculture use of water**

Aqua-culture, also known as aqua-farming, is the farming of [fish](https://en.wikipedia.org/wiki/Fish), [crustaceans](https://en.wikipedia.org/wiki/Crustacean), [molluscs](https://en.wikipedia.org/wiki/Mollusc), [aquatic plants,](https://en.wikipedia.org/wiki/Aquatic_plant) [algae](https://en.wikipedia.org/wiki/Algae), and other organisms. Aquaculture involves cultivating freshwater and saltwater populations under controlled conditions, and can be contrasted with [commercial fishing](https://en.wikipedia.org/wiki/Commercial_fishing), which is the harvesting of [wild fish](https://en.wikipedia.org/wiki/Wild_fish). [Mari-culture](https://en.wikipedia.org/wiki/Mariculture) refers to aquaculture practiced in marine environments and in underwater habitats.

According to the [Food and Agriculture Organization (FAO)](https://en.wikipedia.org/wiki/Food_and_Agriculture_Organization), aquaculture "is understood to mean the farming of aquatic organisms including fish, molluscs, crustaceans and aquatic plants. Farming implies some form of intervention in the rearing process to enhance production, such as regular stocking, feeding, protection from predators, etc. Farming also implies individual or corporate ownership of the stock being cultivated." The reported output from global aquaculture operations in 2014 supplied over one half of the fish and shellfish that is directly consumed by humans; however, there are issues about the reliability of the reported figures. Further, in current aquaculture practice, products from several pounds of wild fish are used to produce one pound of a [piscivorous](https://en.wikipedia.org/wiki/Piscivorous) fish like [salmon](https://en.wikipedia.org/wiki/Aquaculture_of_salmon).

Particular kinds of aquaculture include [fish farming](https://en.wikipedia.org/wiki/Fish_farming), [shrimp farming](https://en.wikipedia.org/wiki/Shrimp_farm), [oyster farming](https://en.wikipedia.org/wiki/Oyster_farming), [mari-culture](https://en.wikipedia.org/wiki/Mariculture), [alga-culture](https://en.wikipedia.org/wiki/Algaculture) (such as [seaweed farming](https://en.wikipedia.org/wiki/Seaweed_farming)), and the cultivation of [ornamental fish](https://en.wikipedia.org/wiki/Ornamental_fish). Particular methods include [aqua-ponics](https://en.wikipedia.org/wiki/Aquaponics) and [integrated multi-trophic aquaculture](https://en.wikipedia.org/wiki/Integrated_multi-trophic_aquaculture), both of which integrate fish farming and aquatic plant farming.

**F- Recreational use of water.**

Recreational 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 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.

With the projected increase in water use for irrigation there are concerns from the community about the continued supply of quality water for household use. Sports people, such as fishing are also concerned that fishing and boating conditions on rivers should be preserved.

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

Water is the principal fluid of the human body. It constitutes approximately 75% of the total body weight. Almost all the body fluids are present as water solutions for example; blood contains 98% of the water. The main functions of the water inside the human body are described below:

1. **Water acts as the medium in which various metabolic and a biological reaction takes place.**
2. **Water helps in absorptions of various nutrients presents in the food in digestive system. By serving as the medium, it facilitates the digestion of food at various stages in digestive tract.**
3. **Water serves as medium for transport of chemicals to and from the cells.**
4. **Water helps in maintaining the body temperature through perspiration.**
5. **Water helps in removal of waste materials from the body through urine. The water balance in the body is primarily maintained by kidneys in conjunction with thirst mechanism.**

* **Water protects the tissues, spinal cord and joints**

Water does more than just quenching the thirst and regulates body temperature. It also keeps the tissues in the body moist. The people know how it feels when the eyes, nose, or mouth gets dry. Keeping the body hydrated helps it retains optimum levels of moisture in all these sensitive areas as well as in the blood, bone s and the brain. In addition, water helps protect the spinal cord and it acts as a lubricant and cushion for the joints.

* **Water helps the body removes waste**

The adequate water intake enables the body to excrete waste through perspiration, urination and defecation. The kidney uses it to help flush out waste as well as intestines. Water can also keep people from getting constipated by softening the stools and helping move the food you have eaten through your intestinal tract. However, it should be noted that there is no evidence to prove that increasing your fluid intake will cure the constipation.

* **Water aids in digestion.**

Digestion starts with saliva, the basis of which is water. Digestion relies on enzymes that are found in saliva to help breakdown food and liquid and to dissolve minerals and other nutrients. Proper digestion makes minerals and nutrients more accessible to the body. Water is also necessary to help you digest soluble fibre. With the help of water, this fibre dissolves easily and benefits the bowel health by making well-formed soft stools that are easy to pass.

* **Water prevents you from becoming dehydrated.**

The body loses fluids when you engage in vagarious exercise, sweat in high heat or come down with a fever or contract on illness that causes vomiting or diarrhoea. If you are losing the fluids for any of these reasons, it is important to increase your fluids so that you can restore your body natural rehydration levels. The doctor may also recommend that you drink more fluids to help treat other health conditions like bladder infections and urinary tract stones.

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

Water borne diseases are any illness caused by drinking water contaminated by human or animal faeces which contains pathogenic micro-organisms. The full picture of water-related is complex for a number of reasons. Over the past decades, the picture of water-related human health issues has become increasingly comprehensive with the emergence of new water-related infection disease and the re-emergence of ones already known. Data are available for WASH related disease which includes Salmonellosis, Cholera, Shigellosis, but for the others such as malaria, Schistosomiasis or the most modern infections such as legionellosis. The burden of several diseases groups can only partially be attributed to water to water determinants. Even where water plays an essential role in the ecology of diseases, it may be hard to pinpoint the relative importance of aquatic components of the local ecosystem.

* **The causes of water borne diseases**.

Water borne diseases are caused by drinking contaminated water. These diseases are common in developing countries where basic sanitation facilities are obscured. Poor awareness of hygienic practices among the masses is also a ready for its spread. Micro- organisms present in faeces of and human enters into the human body when it comes in contact with drinking water. Contaminated water is the main source of its spread. Water borne disease is most common during the rainy season and during the flooding time. Surface water can also be contaminated from sewage pipes, septic fields, chemical wastes, etc. water borne diseases can also spread through contaminated hand and cooking vessels used while cooking food or beverages. The micro-organisms present in contaminated water can also infiltrate in the wounds and nose when a person comes in contact with it for example swimming in a contaminated river or pond.

* **Symptoms of water borne diseases.**

Contaminated water with animals or human excreta can cause several diseases such as typhoid, fever, cholera, polio myelitis, diarrhoea and dysentery. They are mainly related gastrointestinal infections. Sometimes it can affect other systems of the body such as central nervous system and the skin. Several chemicals can seep into the reservoir of drinking water leading to chemical poisoning such as arsenic poisoning.

Each disease manifests its own symptom. Diarrhoea is characterized by frequent loose stools with abdominal cramps, dehydration, and Fever and body general weakness. The symptoms of dysentery are bloody stool with mucus, fever and abdominal cramps.

Polio is a neuromuscular problem where the patient affected suffers from paralysis of limbs. Typhoid is characterized by high fever, rash, abdominal pains, headache, vomiting, lack of appetite and body general weakness.

* **Treatment and prevention of water borne diseases**

The principle management of water borne diseases is to manage acute febrile condition, replacing the fluid loss from the body, adequate nutritional support and good nursing care in addition to antibiotic therapy.

In severe diarrhoea or dehydration, intravenous replacement of fluids and electrolytes are needed. The patient has to be hospitalized for the treatment. Once the patient is able to eat, He should begin with soft and semisolid diets consisting of soups and vegetable broth. Cold water sponging will help to reduce the high temperature and the patient should take rest while under treatment.

* **Prevention of Water borne diseases**

Water borne is preventable disease. Few important preventive steps taken will reduce morbidity and mortality rate to a great extent.

* Boil water before drinking
* Make certain the source of water before drinking.
* In case where the boil water is not available, drink filtrate and distilled water.
* Wash your hands at 5 critical times (**before cooking, eating food, feeding the baby, after visiting the toilet, cleaning the baby’s bottom.)**
* Keep the fingernails short.
* Eat cooked and warm food.
* Avoid eating food and drinking water from street vendors.
* Cover food and beverages utensils.

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?**

A spring is a place where groundwater flows out of the ground. The spring may flow the whole year or only sometimes. This depends on the water getting into the ground all the times or only once in a while. Water from the spring often flows downhill, along the land and this how rivers start. Some springs produce water which is good for health reasons. Sometimes, small towns may grow by these springs because many people who are ill come there to get better. These towns are called ***SPA TOWNS.***

Water contaminant is the term used to describe hazardous materials of any kind that are polluting the water source. This could include both biological and chemical substances and the water source may be ponds, lakes, oceans, rivers, springs or reservoirs used for drinking and bathing by humans.

* **How do contaminants get into the water?**

Ground water contamination occurs when man-made products such as gasoline, oil, road salts and chemicals get into the ground water, it becomes unsafe and unfit for human consumptions and uses. Materials from the land surface can move through the soil and end up in the ground water, hence, contaminating it.

* **Top Ten Things that Contaminate Water**

1. Human garbage (trash)
2. Detergents such as laundry soap
3. Algae
4. Bleach
5. Tires
6. Wastes from factories
7. Parasites from sewage leaking into the streams.
8. Bacteria
9. Gasoline
10. Dirt.

If we don't fix these problems fast our word will become one big garbage dump.

* **The advice to the communities about the prevention of contaminants getting into the drinking water.**
* **The Dangers of contaminating water.**
* The spring users should be aware about the effects of drinking contaminated water and how to prevent the contaminants entering into the water sources.
* The users should know that a contaminant is a substance or energy introduced into the environment that has undesired effect or adversely affects the usefulness of the resource. A pollutant may cause long or short term damage by changing the growth rate of plant or animal.
* The users should know that by preventing the contaminants mentioned above from entering into the spring, the prevention of water borne diseases is in its place and the people would not spend too much money treatment of the diseases, therefore, they would use the money for other valuable purposes.
* Drinking contaminated water can have serious health effects. The disease such as hepatitis and dysentery may be caused by contamination from septic tanks waste. Poisoning maybe caused by the toxins that have leached into well water supplies. Wildlife can also be harmed by contaminated groundwater. Other long term effects such as certain types of cancer may also result from the exposure to polluted water.

1. The following are pollution sources. Give two specific pollutants for each source.

A pollutant is a substance or energy introduced into the environment that has undesired effects or adversely affects the usefulness of the resource. Pollutant may cause long or short term damage by changing the growth rate of plant or animal species or by interfering with human amenities, comfort, health, or property values. Some pollutants are biodegradable and therefore will not persist in the environment in the long term. However, the degradation products of some pollutants are themselves.

* **Different types of pollutants in nature**

1. **Stock pollutants** eg. Persistent organic pollutants such as PCBs, non-biodegradable plastic and heavy metal.
2. **Notable pollutants eg.** Mercury Hg, Ozone, particular matter PM
3. **Fund pollutants eg.** Carbon dioxide etc.
4. **Light pollutants**
5. **Zone of influence, etc.**
6. A residential area:
7. **Human excreta**
8. **Waste water containing dissolved organic matter, inorganic components and heavy metals.**
9. A metal plating plant:
10. **Cyanides.**
11. **Heavy metals**.
12. Agricultural activities:
13. **Nitrates.**
14. **Phosphates and pesticides**.
15. An uncontrolled landfill site:
16. **Leachates containing dissolved organic matter and inorganic matter.**
17. **Heavy metals.**
18. Urban surface water run-off.
19. **Sediments and metals.**
20. **Hydrocarbons, rubber detergents and litter**.

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