

Water Demand Supply & Distribution (CE-562)

Lecture - 3



Engr. Nadeem Ullah
Department of Civil Engineering,
Iqra National University Peshawar

Lecture Content

- **Sources of Water**
- **Selection Criteria of Water Sources**
- **Rainwater Harvesting**

Sources of Water

1. Seas and Oceans:

- Most of the water on Earth is stored in **seas and oceans**. This water cannot be used due to large quantity of salts dissolved in it.
- However, oceans are the ultimate source of all water on Earth.



2. Polar Ice Caps:

- The water in the Arctic and the Antarctic is frozen into **glaciers and polar ice caps**.
- Although this water is pure, it is not available for human consumption.



Sources of Water

3. Rain Water:

- **It is a major source of water.** Rain water flows in to rivers and finds its way back into the sea.
- Rain water also gets stored in some natural and artificial lakes.
- Large areas of land depend upon **rain water for irrigation.**



Sources of Water

4. Ground water:

- It is the water that seeps through the soil and collects above the non-porous rocks deep under the ground.
- This water is extracted for various use by digging wells and borewells.
- The ground water is also pumped out by farmers to be used for irrigation.
- In cities, the ground water is used for **domestic and industrial purposes.**



Sources of Water

5. Surface water:

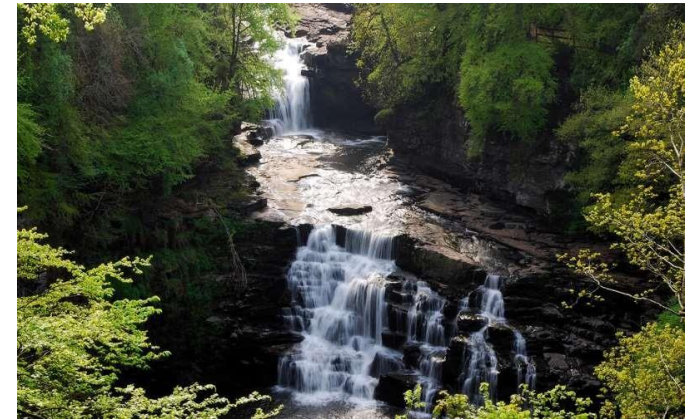
- Rain water that is found on the surface of the earth is called **surface water**.
- This water is available in the form of rivers, lakes, ponds, canals and springs.



Rivers



Lake



Spring

Sources of Water

6. Dams:

- Dams are artificial structures constructed to pond surface water.
- Most rivers get flooded during the monsoon season and have lower water level during the rest of the year.
- To ensure continuous flow through out the year, **dams** are constructed at suitable locations on rivers.



Selection Criteria of Water Sources

➤ While selecting a water source for development, the engineer must consider three primary factors:

1. Water quantity

2. Water reliability

3. Water quality

Selection Criteria of Water Sources

1. Water quantity:

- The quantity factor considers the amount of water that is available at the source and the amount of water that will be required or demanded for use.
- The amount of water that maybe available at the source depends on variables, such as the amount of precipitation, the size of the drained area, geology, ground surface, evaporation, temperature, topography, and artificial controls.

Selection Criteria of Water Sources

2. Water Reliability:

- The reliability of a water supply is one of the most important factors that the engineer considers when selecting a water source.
- A reliable water source is one that will supply the required amount of water for as long as needed.
- To determine the reliability of the water source, the engineer studies data, such as hydrological data, to determine the variations that maybe expected at the water source.

Selection Criteria of Water Sources

2. Water Reliability:

- Geological data should be studied since geological formations can limit the quantity and flow of water available.
- Also, legal advice may be necessary when selecting a water source since the laws regulating and controlling water rights may vary considerably from state to state and country to country.

Selection Criteria of Water Sources

3. Water Quality:

- The third primary factor the engineer must consider when selecting a water source is the quality of the water.
- Water supplies are generally exposed to pollution of some kind. Therefore, to ensure that water is potable, it must be tested to determine the existence of any impurities that could cause diseases, odor, foul taste, or bad color.
- In case of any impurities, the water will require treatment. In water treatment, the water is subjected to various filtration and sedimentation processes, and in nearly all cases is disinfected using chlorine or other disinfecting chemicals.

Selection Criteria of Water Sources

3. Water Quality:

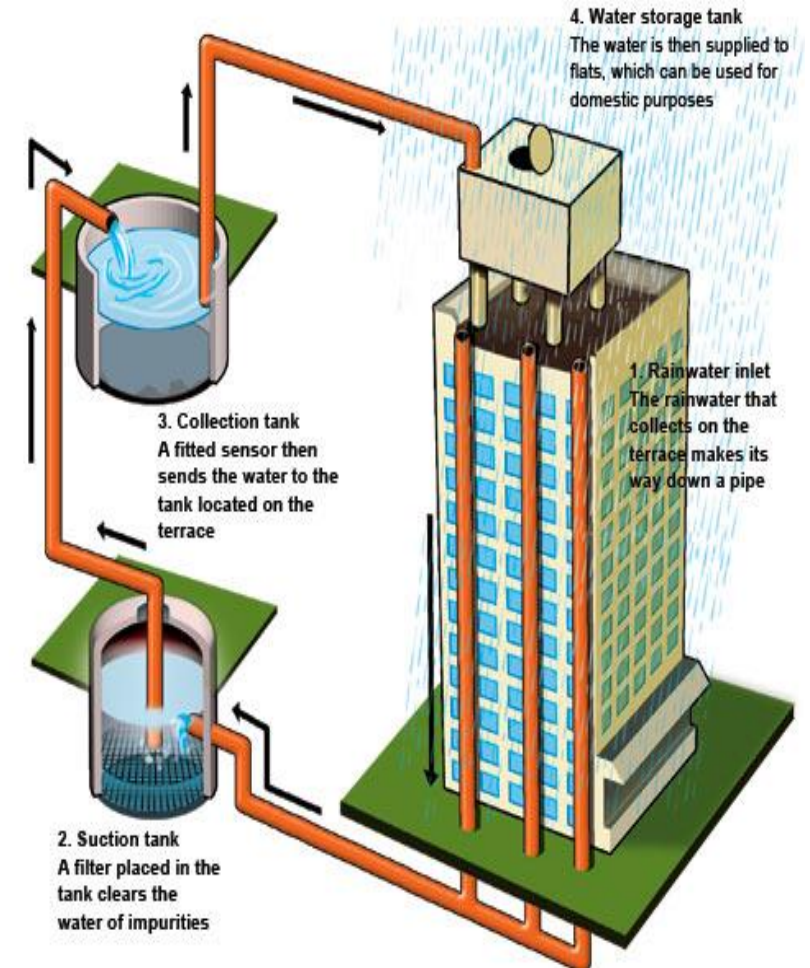
- Developing a water source includes all work that increases the quantity and improves the quality of the water or makes it more readily available for treatment and distribution.
- In developing a source, the engineer may use the construction of dams, diversion structures, digging or drilling of wells, and other improvements to increase the quantity and quality of the water.

Rainwater Harvesting

- **Rainwater harvesting** is a technique of collection and storage of rainwater into natural reservoirs or tanks, or the infiltration of surface water into subsurface aquifers (before it is lost as surface runoff).
- Basically there are two methods of rainwater harvesting.

1) Rooftop rainwater harvesting:

2) Surface Runoff rainwater:



Rainwater Harvesting

- 1) Rooftop rainwater harvesting:** It is the system in which rainwater is collected from the roofs of the houses / buildings. It can either be stored in a tank or diverted into an artificial recharge system.
- 2) Surface Runoff rainwater:** In urban areas rainwater flows away as surface overflow. This runoff can be caught and be used for recharging aquifers by adopting appropriate methods.

Rainwater Harvesting

Reasons for shortage of water:

- 1) Population increase:
- 2) Industrialization:
- 3) Urbanization:
 - (a) Increase in per capita utilization:
 - (b) Less percolation area due to increase in paved surfaces:

Rainwater Harvesting

Advantages:

- Rainwater harvesting provides an independent water supply during regional water restrictions and in developed countries is often used to supplement the main supply.
- It provides water when there is a drought, can help mitigate flooding of low-lying areas, and reduces demand on wells which may enable ground water levels to be sustained.
- It also helps in the availability of potable water as rainwater is substantially free of salinity and other salts.

Rainwater Harvesting

Reasons for rainwater harvesting:

- To conserve & augment the storage of ground water
- To reduce water table depletion
- To improve the quality of ground water
- To reduce sea water intrusion in coastal areas
- To avoid flood & water stagnation in urban areas

Thank You