

ENVIRONMENTAL SCIENCE

WATER RESOURCES

- Water is an indispensable resource. Around 97% of world surface is covered with water. Most of the animals and plants have 60-65% of water in their body
- Water resources are sources of water that are useful or potentially useful. Uses of water include agricultural, industrial, household, recreational and environmental activities. Virtually all of these human uses require fresh water.

DISTRIBUTION OF WATER ON EARTH:

- 97% of the water on the Earth is salt water. Only three percent is fresh water; slightly over two thirds of this is frozen in glaciers and polar ice. The remaining unfrozen freshwater is found mainly as groundwater, with only a small fraction present above ground or in the air Fresh water occurs mainly in two forms 1. Ground water and 2. Surface water.

Groundwater: About 9.86% of the total fresh water resources is in the form of groundwater and it is about 35-50 times that of surface water supplied

Aquifer: The layer of soil which is permeable has the ability to store water is called an aquifer. It is generally made up of gravel, sand etc.

Unconfined aquifer: it is covered by permeable layer. The recharge of this layer is by rainfall or snowmelt.

Confined aquifer: sandwiched between impermeable layers. The recharge is through unconfined aquifer layers.

USES OF WATER:

1. DOMESTIC USE: Water used in the houses for the purposes of drinking, bathing, washing Clothes, cooking, sanitary & other needs. The recommended value according to Indian standard specification for domestic use is 135 liters/day
2. INDUSTRIAL USE: Water is required for various industries such as cement, mining, textile, leather industries.
3. PUBLIC USE: This includes water used for public utility purpose such as watering parks, Flushing streets, jails etc.
4. FIRE USE: Water is used in case of accidents and to prevent the fire issues.
5. IRRIGATION: To grow crops which is the main sources for food?
6. OTHER USES: Hydro electric power generation requires water.

OVER UTILIZATION OF GROUND WATER AND SURFACE WATER

Over use of groundwater has following effects.

Over utilization of water leads to rapid depletion of water resources, ground subsidence,

lowering of water table and water logging.

Reasons:

Economic development, rapid industrial growth and population explosion. The use of ground water and surface water rates which are higher than that of recharge ultimately leads to

- Water scarcity
- Water logging
- Salination
- Alkalization
- Water pollution or contamination
- Creates declining of water levels
- Crops failure and reduction in agricultural production
- Over pumping of ground water create drought, famine and food shortage
- Over pumping of ground water sea water intrusion in coastal aquifers

Lowering of water table: Excessive use of ground water for drinking, irrigation and Domestic purposes has resulted in rapid depletion of ground water in various regions leading to lowering of water table & drying of wells.

The reasons for shortage of water are:

1. Increase in population,
2. Increasing demand of water for various purposes.
3. Unequal distribution of fresh water.
4. Increasing pollution of water sources cause over exploitation.
5. Ground subsidence: When ground water withdrawal is greater than its recharge rate, the sediments in the aquifer become compacted. This is called ground subsidence which may cause damage of buildings, destroy water supply systems etc.

Drought: A drought is an extended period of months or years when a region notes a deficiency in its water supply whether surface or underground water. Generally, this occurs when a region receives consistently below average precipitation.

- 1) We can define drought in four main ways:
 - 2) Meteorological drought: related to rainfall amounts
 - 3) Hydrological drought: determined by water levels in reservoirs
 - 4) Agricultural drought: related to the availability of water for crops
 - 5) Socioeconomic Drought: related to demand and supply of economic goods
- a) **Meteorological Drought:** Meteorological drought is generally defined by comparing the rainfall in a particular place and at a particular time with the average rainfall for that Place. The definition is, therefore, specific to a particular location. Meteorological drought leads to a depletion of soil moisture and this almost always has an impact on crop production.
- b) **Hydrological Drought:** Hydrological drought is associated with the effect of low rainfall on water levels in rivers, reservoirs, lakes and aquifers. Hydrological droughts

usually are noticed some time after meteorological droughts. First precipitation decreases and, Sometime after that, water levels in rivers and lakes drop.

- c) **Agricultural Drought:** Agricultural drought mainly effects food production and farming. Agricultural drought and precipitation shortages bring soil water deficits, reduced ground water or reservoir levels, and so on. Deficient topsoil moisture at planting may stop germination, leading to low plant populations.
- d) **Socioeconomic Drought:** Socioeconomic drought occurs when the demand for an economic good exceeds supply as a result of a weather-related shortfall in water supply. The supply of many economic goods, such as water, forage, food grains, fish, and hydroelectric power, depends on weather. Due to variability of climate, water supply is sufficient in some years but not satisfactory to meet human and environmental needs in other year

FLOODS

A flood is an overflow of water that submerges land which is normally dry. The European Union (EU) Floods Directive defines a flood as a covering by water of land not normally covered by water. Flooding may occur as an overflow of water from water bodies, such as a river or lake, in which the water overtops or breaks, resulting in some of that water escaping its usual boundaries, or it may occur due to an accumulation of rainwater on saturated ground in an area flood. Floods can also occur in rivers when the flow rate exceeds the capacity of the river channel, particularly at bends in the waterway. Floods often cause damage to homes and businesses if they are in the natural flood plains of rivers.

Flood management:

- Dams and reservoirs can be constructed
- Embankments and proper channel management
- Flood way should not be encroached
- Forecasting or flood warning
- Decrease of run off by infiltration through afforestation or rain water harvesting etc

CONFLICTS OVER WATER

Water conflict is a term describing a conflict between countries, states, or groups over an access to water resources. The United Nations recognizes that water disputes result from opposing interests of water users, public or private.

A wide range of water conflicts appear throughout history, though rarely are traditional wars waged over water alone. Instead, water has historically been a source of tension and a factor in conflicts that start for other reasons. However, water conflicts arise for several reasons, including territorial disputes, a fight for resources, and strategic advantage.

These conflicts occur over both freshwater and saltwater, and between international boundaries. However, conflicts occur mostly over freshwater; because freshwater resources are necessary, yet limited, they are the center of water disputes arising out of need for potable water. As freshwater is a vital, yet unevenly distributed natural resource, its availability often

impacts the living and economic conditions of a country or region. The lack of cost-effective water desalination techniques in areas like the Middle East, among other elements of water crises can put severe pressures on all water users.

According to the 1992 International Conference on Water and the Environment, Water is a vital element for human life, and any human activity relates somehow to water. Unfortunately, it is not a renewable resource and in the future it "might get worse with climate change.

Water conflicts occur because the demand for water resources and potable water extend far beyond the amount of water actually available. Elements of a water crisis may put pressures on affected parties to obtain more of a shared water resource, causing diplomatic tension or outright conflict.

The Cauvery water dispute: Out of India's 18 major rivers, 17 are shared between different states. In all these cases, there are intense conflicts over these resources which badly seem to resolve. The Cauvery river water is a born of contention between Tamilnadu and Karnataka and the problem is almost hundred years old. Tamilnadu occupying the downstream region of the river wants water-use regulated in the upstream state Karnataka refuses to do so and claims its privacy over the river as upstream user. The river water is almost fully utilized and both the 14 states having increasing demands for agriculture and industry. The consumption is more in Tamilnadu than Karnataka where the catchment area is rockier. On June 2, 1990, the Cavery Water dispute tribunal was set up which through an interim award directed Karnataka to ensure that 205 TMC of water was made available in Tamilnadus mettur dam every year, till a settlement was reached. In 1991-92 due to good monsoon, there was no dispute as there was good stock of water in Mettur, but in 1995, the situation turned into a crisis due to delayed rains and an expert committee was set up to look into the matter which found there was a complex cropping pattern in Cauvery basin. Samba paddy in winter, Kurvai paddy in summer and some cash crops demanded intensive water, thus aggravating the water crisis. Proper selection of crop varieties, optimum use of water, better rationing and rational sharing patterns, and pricing of water are suggested as some measures to solve the problem.

Causes: Conflicts through use

1. Shipping traffic in international water
2. Dam construction
3. Construction of power stations
4. Conflicts through pollution-rhine river, Europe
5. Distributional conflict-relative storage

Conflicts management:

- Enact laws to check practices to control water pollution
- Sharing river solved by interlinking river
- Power must be given to national water authority

DAMS-BENEFITS AND PROBLEMS

- Dams are built across the river in order to store water for drinking, agricultural, industrial purpose. Now days they are mainly used for the hydropower production.

- Today there are more than 45,000 large dams around the world, which play an important role in communities and economies that harness these water resources for their economic development.
- Current estimates suggest some 30-40% of irrigated land worldwide relies on dams. Hydropower, another contender for the use of stored water, currently supplies 19% of the world's total electric power supply and is used in over 150 countries. The world's two most populous countries – China and India – have built around 57% of the world's large dams.

BENEFITS:

- a) River valley projects with big dams have usually been considered to play a key role in the development process due to their multiple uses.
- b) India has the distinction of having the largest number of river valley projects.
- c) The tribal's living in the area pin big hopes on these projects as they aim at providing employment and raising the standard and quality of life.
- d) The dams have tremendous potential for economic upliftment and growth. They can help in checking floods and famines, generate electricity and reduce water and power shortage, provide irrigation water to lower areas, provide drinking water in remote areas and promote navigation, fishery etc

PROBLEMS:

The impacts of big dams can be upstream as well as downstream levels. The upstream problems include the following:

- a) Displacement of tribal people
- b) Loss of forests, flora and fauna Fragmentation and physical transformation of rivers.
- c) Serious impacts on riverine ecosystems.
- d) Social consequences of large dams due to displacement of people.
- e) Water logging and Stalinization of surrounding lands.
- f) Dislodging animal populations, damaging their habitat and cutting off their migration routes.
- g) Fishing and travel by boat disrupted. Large dams have had serious impacts on the lives, livelihoods, cultures and spiritual existence of indigenous and tribal peoples. They have suffered disproportionately from the negative Impacts of dams and often been excluded from sharing the benefits. In India, of the 16 to 18 million people displaced by dams, 40 to 50% were tribal people, who account for only 8% of our nation's one billion people.

MCQ

1. Explain the water resources
2. Write the benefits and problems of dams