

## **WATER RESOURCES**

Water claims to be an important resource. An important use of water in our country is for irrigation. Besides, water is also required in large amounts for industrial and domestic consumption.

### **USES**

- Is essential for all forms of life.
- Many uses of water include agricultural, industrial, household, recreational and environmental activities. Virtually, all of these human uses, require fresh water.
- No plant or animal species can survive without water. If water in our body drops by 1% we feel thirst, if it drops by 10% we face death.

### **HYDROLOGICAL CYCLE:**

Water from various water bodies

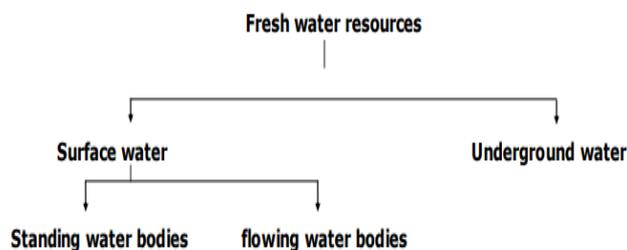
Evaporated by solar energy

Enters in to the atmosphere as clouds

Falls again on earth as rain or snow

Ultimately returns to the ocean

### **DISTRIBUTION OF WATER RESOURCES**



### **UNDERGROUND WATER**

**Aquifer:** Layers of highly permeable rock that can store water is called an aquifer. Layer of sand and gravels are good aquifers. Clay and crystalline rocks are not good aquifers.

#### **Effects of over utilization of water**

##### **1. Decrease of ground water:**

- i. Increased usage decreases the ground water.
- ii. Insufficient rain fall

iii. Building construction activities sealing the permeability of the soil.

**2. Ground subsidence:** If ground water withdrawal is greater than its recharge rate, then the sediments in the aquifers get compacted. As a result shrinkage of land surface takes place.

**Problems:** a. Structural damages to the buildings

b. Fracture in pipes.

c. Reversing the flow of canals.

**3. Lowering of water table:** Over utilization of ground water in arid and semi arid regions for agriculture disturbs the state of equilibrium of the hydrological cycle.

**Problem:** a. Lowering of water table

b. Decrease the number of aquifers

c. Change the speed and direction of water.

4. Intrusion of salt water: In coastal area over exploitation of ground water leads to the intrusion of salt water from sea. Therefore that water cannot be used for drinking and agriculture.

5. Over utilization of water causes earth quakes, landslides and famines.

6. Drying up of wells: Due to over utilization, ground water level decreases much faster than can be regenerated. It leads to drying up of dug well and bore wells.

7. Pollution of water: Near the agricultural land ground water decreases therefore water containing nitrogen enters into the ground and pollutes the ground water.

**Problem:** Water which contains excess nitrate content is not suitable for drinking.

## **REASONS FOR DECLINE OF GROUND WATER**

Population continues to rise at an unprecedented and unsustainable rate; many more areas are expected to experience this imbalance in the near future.

1. Population explosion: World population is > 6 billion and will continue to increase significantly during the next few decades - Enormous demands on the world's limited freshwater supply. The total annual freshwater withdrawals today are estimated at 3800 cubic kilometers, twice as much as just 50 years ago (World Commission on Dams, 2000).

2. Overutilization of Surface and Groundwater: Occurs at various levels. Use of more water than really needed by human beings. Many agriculturists use more water than necessary to grow crops. Industries in order to maximize short-term economic gains, does not bother its liquid waste and releases it into streams, rivers and the sea.

3. Deforestation: Once hill slopes are removed of forest cover, the rainwater rushes down the rivers and is lost. Forest cover permits water to be held in the area permitting it to seep into the ground. This charges the underground stores of water in natural aquifers. This can be used in drought years if the stores have been filled during a good monsoon. This soil and water management and afforestation are long-term measures that reduce the impact of droughts. The destruction of forests influences the regulation of natural water cycle. The removal of dense and uniform cover over the hilly zones leads to occurrence of floods in drainage basins. Nations situated in tropical climates including India experience disastrous floods caused by the indiscriminate deforestation of the slopes above the valleys.

4. Hydropower generation: Large amount of water is used for generating power which otherwise used for human needs.

5. Dams - for Agriculture and Power Generation

6. Rain fall: The erratic and inadequate rainfall results in reduction in storage in subsurface reservoirs. The building construction activities are sealing the permeable zone, reducing the area for percolation of rainwater into subsurface and increase in surface runoff.

7. India's increasing demand for water for intensive irrigated agriculture, for generating electricity, and for consumption in urban and industrial centers, has been met by creating large dams. Dams support 30 to 40% of this area.

## **FLOOD**

It is an over flow of water. It happens when the magnitude of flow of water exceeds the carrying capacity of the channel within its bank.

### **CAUSES OF FLOOD**

1. Heavy rainfall, melting of snow and sudden release of water from dams. (Flash floods)
2. Reduction in the carrying capacity of the channel.
3. Deforestation, mining and over grazing increase the runoff from rains and the level of flood raises.

### **EFFECT OF FLOOD**

1. Water spreads in the surrounding area and submerges them.
2. Cultivated land gets affected.
3. Extinction of civilization.

### **FLOOD MANAGEMENT**

1. Floods can be controlled by dams.
2. Channel management control flood.

3. Flood hazards reduced by forecasting or flood warning.
4. Flood may also be reduced by reduction of run off by increasing infiltration through appropriate afforestation in the catchment area.

## **DROUGHT**

Drought is nothing but scarcity of water, which occurs due to

1. Inadequate rain fall
2. Late arrival of rain fall
3. Excessive withdrawal of ground water.

Lack of water for the needs of agriculture, livestock, industry or human population may be termed as a drought. Drought causes serious damages to plants, animals and human life.

## **CAUSES OF DROUGHT**

1. When annual rain fall is below normal and less than evaporation, drought is created.
2. High population.
3. Intensive cropping pattern Ex: Maharashtra - There has been no recovery from drought for the last 30 years due to over exploitation of water by sugarcane crop.

## **EFFECTS OF DROUGHT**

1. Drought causes hunger, malnutrition and scarcity of drinking water an also changes the quality of water.
2. Drought causes widespread crop failure leading to acute shortage of food and adversely affects human and livestock population.
3. Worst situation of drought causes desertification.
4. Raw materials of agro based industries are critically affected during drought time, hence industrial and commercial growth decreases.
5. Drought increases the degradation of natural resources.
6. Drought causes large migration of people and urbanization.

## **DROUGHT MANAGEMENT**

1. Indigenous knowledge is essential.
2. Rain water harvesting system.
3. Construction of reservoirs to improve ground water level.

4. Modern irrigation technology (drip irrigation) very useful to conserve water.
5. Afforestation activities also improve the potential of water in the drought area.
6. Crop mixing and dry farming are the suitable methods which minimize the risk of crop failures in dry area.

## **DAMS**

Dams made significant contributions to human development and the benefits derived from them have been considerable. Large dams are designed to control floods and to help the drought prone areas, with supply of water. But large dams have proved to cause severe environmental damage. Hence an attempt has been made to construct small dams. Multiple small dams have less impact on the environment.

### **Benefits:**

Dams ensure a year round supply of water for domestic use and provide extra water for agriculture, industries and hydropower generation.

### **Problems:**

They alter river flows, change nature's flood control mechanisms such as wetlands and flood plains, and destroy the lives of local people and the habitats of wild plant and animal species, particularly is the case with mega dams.

Some of the problems are mentioned below.

- Dam construction and submersion leads to significant loss of farmland and forest and land submergence
- Siltation of reservoirs, water logging and salination in surrounding lands reduces agricultural productivity
- Serious impacts on ecosystems - significant and irreversible loss of species and ecosystems, deforestation and loss of biodiversity, affects aquaculture
- Socio economic problems for example, displacement, rehabilitation and resettlement of tribal people.
- Fragmentation and physical transformation of rivers
- Displacement of people - People living in the catchment area, lose property and livelihood
- Impacts on lives, livelihoods, cultures and spiritual existence of indigenous and tribal people
- Dislodging animal populations
- Disruption of fish movement and navigational activities

- Emission of greenhouse gases due to rotting of vegetation
- Natural disasters – reservoirs induced seismicity, flash floods etc and biological hazards due to large-scale impounding of water – increase exposure to vectorborne diseases, such as malaria, schistosomiasis, filariasis.

## **SUSTAINABLE WATER MANAGEMENT**

- Building several small reservoirs instead of few mega projects
- Developing small catchment dams and protecting wetlands
- Soil management, micro-catchment development and afforestation permits recharging of underground aquifer, thus reducing the need for large dams
- Treating and recycling municipal waste water for agricultural use.
- Preventing leakages from dams and canals and loss in municipal pipes
- Effective rainwater harvesting in urban environments
- Water conservation measures in agriculture, such as using drip irrigation, control of growing water intensive cash crops ; control of water logging.
- Pricing water at its real value makes people use it more responsibly and efficiently and reduces wastage
- In deforested areas where land has been degraded, appropriate soil management practices, making bunds along the hill-slopes and making nalla plugs can help retain moisture and make it possible to revegetate degraded areas
- Use waste water for activities that does not need fresh water – Recycling
- Adopt mini water harvesting models for domestic usage.
- Protect existing tanks
- Develop systematic water management and adopt strict water auditing
- “Save water Campaigns” for public awareness on water scarcity
- Through rainwater harvesting, community based participatory initiatives and holistic watershed management.
- Responsible water usage can only be achieved by empowering local communities and creating local accountability.

- The government should develop policies that protect water resources, promote sustainable watershed management and invest in technologies that will increase efficiency in irrigation, industrial usage and improve water harvesting techniques.

## **WATER CONFLICTS**

### **1. Conflict through use:**

Unequal distribution of water led to interstate and international disputes.

#### **National conflicts:**

- a. Sharing of cauvery water between Karnataka and TamilNadu.
- b. Sharing of Krishna water between Karnataka and Andrapradesh
- c. Siruvani – TamilNadu and Kerala

#### **International conflicts:**

Indus – India and Pakistan & Colorado River – Mexico and USA