WATER RESOURCES

CHAPTER COVERAGE

Water Scarcity

- Need for Water Conservation and Management
- Multipurpose River project
- Rain Water Harvesting
- Integrated Water Resource Management

Introduction

All living beings require water for their existence and survival. Infact without water there would be no life on the earth.

The utility of water is immense :

- (A) It is required for domestic purposes like cooking, drinking and washing etc.
- (B) It is used for agriculture, pastoral industry and manufacturing industries.
- (C) Water is also used to harness hydro-electric power.

About three-fourth of the earth's surface is covered with water, that means there is no shortage of water. Inspite of all this most of the countries of the world are facing water crisis. This is because only a small proportion of water accounts for fresh water that can be put to use.

The fresh water is mainly obtained from surface run off and ground water.

The four main stages of water cycle are -

- 1. Evaporation
- 2. Transpiration
- 3. Condensation
 - 4. Precipitation

Water : Some facts and figures

(According to the UN World Water Development Report, 2003)

(A) 96.5 % of the total volume of world's water is estimated to exist as oceans and only 2.5 % as fresh water. Nearly 70 % of this fresh water occurs as ice sheets and glaciers in Antarctica, Greenland and the mountaineous region of the world while a little less than 30 % is stored as ground water is the world's aquifers.

- (B) India receives nearly 4 % of the global precipitation and ranks 133 in the world in terms of water availability per person per annum.
- (C) The total renewable water resources of India are estimated at 1, 897 km² per annum.
- (D) By 2025, it is predicted that large parts of India will join countries or regions having absolute water scarcity.

► Water Scarcity

Water scarcity : Shortage of water as compared to its demand is known as water scarcity.

Factors responsible for water scarcity.

1. Growing Population :

It is one of the basic factors which is responsible for water scarcity. Most of our cities are facing this problem due to over population. A large population means more water not only for domestic use but also to produce more food.

2. Commercialisation of Agriculture :

The commercial crops need more water and other inputs. Assured means of irrigation like tubewells and wells are responsible for falling ground water levels.

3. Variation in seasonal and annual precipitation :

Precipitation is the main source of water in India but arrival and departure of monsoon in India is uncertain. Even the distribution of rain fall is uneven.

4. Industrialisation and Urbanisation :

The ever increasing number of industries has made matters worse by exerting pressure on existing fresh water resources. Industries apart from being heavy user of water also requires power to run them.

Most of our cities are over populated. Over population over utilizes the water resources and also pollutes the existing resources.

5. Over utilization :

Due to over utilization the water table has lowered.

6. Pollution :

Domestic waste and industrial waste are the main factors responsible for pollution of water.

Need of the hour to conserve and manage the water resources.

- 1. To safe guard ourselves from health hazards.
- 2. To ensure food security.
- 3. Continuation of our livelihoods and productive activities.
- 4. Prevent degradation of our natural ecosystem.

> Multi-purpose River Projects and Integrated Water-Resource Management

Multi purpose Project : A multipurpose project is that which fulfils a variety of purposes at the same time. Example : irrigation, generation of electricity etc.

♦ Main objectives or Advantages of Multipurpose Project :

- 1. **Generation of Power :** They produce neat, pollution free and cheapest energy which is the back bone of industry and agriculture. According to the economic survey 2005-06 these produce more than 30, 000 M.W. power.
- 2. Flood Control : These projects control the flood because water can be stored in them. These projects have converted many 'rivers of sorrow' into river of boon. Example River Kosi.
- 3. Soil Conservation : These conserve the soil because they slow down the speed of water.
- 4. **Irrigation :** They irrigate the fields during the dry seasons. Many canals have been dug and they irrigate dry areas.
- 5. Afforestation : Trees are systematically planted in and around reservoirs. This helps in preserving "Wild life" and natural ecosystem.
- 6. Water Navigation : They provide for Inland water navigation through main river or canal. It is the cheapest means of transport for heavy goods.
- 7. **Fisheries :** These provide ideal condition for the breeding of fish. Choosen varieties of fish are allowed to grow.
- 8. **Tourist Centres :** These projects are well cared and are scientifically developed. So these become the centre of tourist attraction.

> Disadvantages of Multipurpose Project

- 1. **High Cost :** The initial cost of building the dams is very high. It requires a lot of capital and engineering skills and modern machinery which is not available in India.
- 2. Adverse Impact on Environment : A vast variety of flora and fauna as well as human settlements get submerged in the water of reservoir formed by the dam.
- 3. Adverse effect on the fertility of the soil : Due to construction of dams there are no annual floods in the river. And because of this the soil of the down stream region does not get nutrient rich "silt". This decreases the fertility of the soil.
- 4. Adverse Impact on aquatic life : Due to construction of dam on the river, the fish in the down stream area do not get sufficient nutrient material.
- 5. Non-availability of water throughout the year : Most of the rivers in India flow only for few months. So water is not sufficient to build a dam.
- 6. Disputes between different states : States have disputes over sharing of water, height of the dam and so on.
- 7. **Displacement of local communities :** The local people often have to give up their land and livelihood and their meagre access and control over resources for the greater food for the Nation.
- 8. Change in cropping pattern : They provide assured means of irrigation to farmers. Due to this most of the farmers have changed the cropping pattern shifting to water intensive and commercial crops. This has led to salinisation of soil leading to ecological imbalance.
- 9. (i) Regulating and damming of rivers affect their natural flow causing poor sediment flow and excessive sedimentation at the bottom of the reservoir, resulting in rockier stream beds and poorer habitats for the rivers aquatic life.
 - (ii) Dams also fragment rivers making it difficult for aquatic fauna to migrate, especially for spawning. The reservoirs that are created on the floodplains also submerge the existing vegetation and soil leading to its decomposition over a period of time.

Rain Water Harvesting

Rainwater Harvesting : It is a technique of increasing the recharge of ground water by capturing and storing rain water by constructing structures such as percolating pits, check dams etc.

♦ Different Techniques to Conserve Water :

- 1. People of mountaneous regions had built diversion channels like 'guls' and 'kuls' for agriculture.
- 2. Rooftop rain water havesting was commonly practiced to store drinking water. eg. Rajasthan.
- 3. In the flood plain of Bengal, people developed inundation channels to irrigate their fields.

4. In arid and semi-arid regions, agriculatural fields were converted into rain fed storage structure that allowed the water to stand and moisten the soil like the 'Khadins' in Jaisalmer and 'Johads' in other parts of Rajasthan.

Rain Water Harvesting through Tanks :

- 1. In the semi arid and arid region of Rajasthan particularly in Phalodi, Bikaner and Barmer most of the houses, have underground tanks for storing water.
- 2. These tanks were part of well developed roof top rain water harvesting system.
- 3. Rain falling on the rooftops would travel down the pipe and was stored in tankers.
- 4. The first spell of rain was usually not collected as this would clean the roofs and the pipes.
- 5. The rain water from the subsequent showers was then collected.

♦ Importance of Rain Water Harvesting :

- 1. It is a reliable source of water when all other source of water dry up.
- 2. It is considered the pure form of natural water.
- 3. It can also be given to sick people.
- 4. It can be used to beat the summer heat if underground rooms adjoining the tanks are built.
- 5. To meet the increasing demand of water.
- 6. To avoid flooding of roads.
- 7. To raise the ground water level.

♦ Conservation of Water Resources :

- 1. Construction of multi-purpose projects and canals.
- 2. Solving river water disputes quickly.
- 3. Inter basin transfer of water.
- 4. Measures to raise underground water.
- 5. Rainwater harvesting and water shed development.
- 6. Avoiding pollution of water bodies.
- 7. Preventing the wastage of water.

GLOSSARY

- 1. Biosphere : Part of the earth which is covered by living organisms both plants and animals.
- 2. **Dam :** A barrier across the flowing water.
- 3. Flora : Plants of particular region or period are referred to as flora.
- 4. Fauna : Species of animals are known as fauna.
- 5. Forest : Extensive area covered with trees.
- 6. Ground water : Water which is obtained from a depth of more than 15 m.
- 7. Hydroelectricity : It is the power which is generated with the help of running water.
- 8. Multipurpose Project : A river valley project which serves a number of purposes.
- 9. Perennial Canals : Canals developed by a diverting water from rivers that flow throughout the year.
- 10. Soil : The upper layer of the ground containing weathered rocks and humus.
- 11. Water Scarcity : Shortage of water as compared to its demand.
- 12. Rain water harvesting : It is a technique of increasing the recharge of ground water by capturing and storing rainwater by constructing structures such as percolating pits, check dams etc.
- **13. Drip Irrigation :** A type of irrigation where water gets dropped in the form of drops near the roots of the plant mainly to conserve the moisture.
- 14. Inundation canal : Canal meant for diverting flood waters mainly during the rainy season.
- 15. Irrigation : Artificial means of supplying water to farm lands in the form of canals, wells, tubewells and tanks.
- 16. Surface water : Water flowing on the earth's surface in the form of rivers, lakes etc.
- 17. Tank : Natural or man made reservoir to store rain water.

Some Facts About Water

- 1. Total volume of water in ocean (world) 96.5 %.
- 2. Fresh water –2.5 %.
- 3. Ice sheets and glaciers -70 %.
- 4. Stored as ground water in world's aquifers -30 %.
- 5. India's share in global precipitations -4 %.
- 6. Average flow of water in river system in India -1869 m^3 .

	Name of the Project	River	Benefited State	Irrigation capacity (Lakh hectare)	Hydel Power Capacity (Mega)
1	Bhakra Nangal	Satluj	Punjab, Haryana, Rajasthan	14.6	1204
2	Damodar Valley	Damodar	Jharkhand, West Bengal	4.5	260
3	Gandak	Gandak	Bihar, U.P.	13.33	15
4	Chambal Valley	Chambal	Rajasthan, M.P.	4.22	386
5	Hirakund	Mahanadi	Orissa, Chhattisgarh	10	270
6	Rihand	Rihand	U.P., Bihar	2	100
7	Tungabhadra	Tungabhadra	Andra Pradesh, Karnataka	2.5	99
8	Kosi	Kosi	Bihar	8.73	20
9	Nagarjuna Sagar	Krishna	Andhra Pradesh	8.62	450
10	Narmada Valley	Narmada	M.P., Gujarat		
11	Indira Gandhi Cananl	Beas, Satluj	Punjab, Haryana, Rajasthan	11.63	

Major-Multipurpose Project of India