

'Water is the driver of Nature' - Leonardo daVinci

3.1 Introduction

Water is an indispensable resource for life on earth. Approximately 70.8 % surface of earth is covered with water in the form of oceans. Out of this, about 97% is not fit for human consumption, about 2% is locked as a glacier and only less than 1% available as fresh water that can be used for human consumption and other uses.

Fig. 3.1 Water resources in world

Water is a very important source and essential for life because it has very unique characteristic such as

1. Water exists as liquid over a wide range of temperature 0-100°C with highest specific heat and latent heat of vaporization.
2. Water is excellent solvent and act as carrier of nutrient and helps to distribute them to the cells in the body, regulates the body temperature and support structure and can dissolve various pollutant and can act as carrier of large number of microorganisms
3. It is responsible for hydrological cycle which acts as resource of water to the earth. It is estimated that about 1.4 inch thick layer of water evaporates and majority of water returns to earth through hydrological cycle.

3.2 Water Use

More than 99% of earth water is unavailable for use; only 1% water is available for people, animal, plants and earth. There is an uneven distribution of water resources, tropical rain forest are receive maximum rainfall where as desert receive only little rainfall.

Due to its unique properties water is of multiple uses for all living organisms. Water is absolutely essential for all the living organisms. One can survive for weeks without food but cannot survive more than a few days without water. Since

the earliest days of mankind water availability was the major factor to decide the place of human settlements. Water dissolves nutrients and distributes them in different parts of plants and regulates the temperature and removes the waste.

3.2.1 Fresh water crisis

On global scale water availability is not a problem itself, but it's availability in right form, right time and right place is a problem. Irregularities in duration and intensity of rainfall cause floods and droughts. Out of the total water reserves of the world, about 97% is salty water (marine) and only 3% is fresh water.

Due to increased demands overuse of groundwater for drinking, irrigation and domestic purposes has lead to rapid depletion of groundwater in various regions leading to lowering of water table.

Pollution of many of the groundwater aquifers has made them unfit for consumption. Rivers and streams have long been used for discharging the wastes. due to industrialization river water are being polluted because industrial residues are pushed into the river .Civilizations have grown and flourished on the banks of rivers, but being over populated due to fast growth are polluting the natural resources of water.

3.2.2 Problems associated with water resources

These are some problems associated with use of water

- **Water Scarcity** (precipitation/evapotranspiration balance, temporal availability, per capita availability)
- **Floods and droughts** (spatio-temporal distribution; regular floods related to heavy winter or spring rains, increasing damage level due to shifting land use (settlements in flood zones) recurrent summer droughts coinciding with peak demand periods for agriculture and tourism)
- **Groundwater availability and quality** (aquifer size and access, yield, saltwater intrusion, pollution of shallow aquifers)
- **Watershed degradation** (deforestation, land use, increasing impervious (sealed) areas due to urbanization the main concern here is land use change (primarily deforestation and urbanization) and its effects on runoff patterns (flooding) and water quality including erosion/sediments with subsequent problems such as reservoir siltation/capacity loss)

- **Coastal interaction** (salinity intrusion in groundwater and estuaries, coastal pollution due to pollution runoff)

3.3 Over-Exploitation of Water

3.3.1 Groundwater

About 9.86% of the total fresh water resources are in the form of groundwater and it is about 35-50 times that of surface water supplies.

Effects of extensive and reckless groundwater usage:

1. Subsidence
2. Lowering of water table
3. Water logging

3.3.2 Surface water

Surface water mainly comes directly from rain or snow covers. The various surface sources are natural lakes and ponds, rivers and streams, artificial reservoirs. Availability of surface water decides the economy of the country. On one side surface water availability affects the productivity, but on the other side water sources may cause floods and drought. Due to unequal distribution, water may lead to national (interstate) or international disputes. Sharing of surface water due to these disputes is affecting productivity of different agro eco-zone and creating problems for government.

Recently many water conflicts at national and international levels relating to sharing of surface water are catching the headlines of newspaper.

3.4 Major Water Conflicts

Some of the major water conflicts that have become thorn in relations between states and countries are

3.4.1 Water conflict in the middle east

Countries involved are Sudan, Egypt and Turkey. It also affects countries which are water starved viz. Saudi Arabia, Kuwait, Syria, Israel and Jordan.

Fig. 3.2 Water conflict in the middle-east (courtesy :furmen.edu)

3.4.2 The Indus water treaty

This Indus water treaty dispute between India and Pakistan is lingering since long.

Fig. 3.3 The Indus water treaty (Courtesy-Indian Express)

3.4.3 The Cauvery water dispute

It involves two major states of India viz. Tamilnadu and Karnataka.

Fig. 3.4 The Cauvery water dispute (Courtesy-KBK)

3.4.4 The Satluj-Yamuna link canal dispute

The dispute is between two Northern states viz. Punjab and Haryana and UP, Rajasthan as well as Delhi has also interest in it .

Fig. 3.5 the Satluj-Yamuna link canal Dispute (Courtesy-DEEP)

In traditional water management, innovative arrangements ensure equitable distribution of water, which are democratically implemented. These disputes can be solved amicably through ‘Gram Panchayats’, if transparency is maintained. But disputes between countries or states sometimes attain war like situation and are difficult to solve.

3.5 Dams - Benefits and Problems

Water is a precious resource and its scarcity is increasing at global level. There is a pressure to utilise surface water resources efficiently for different purposes. According to World Commission on Dam Report -2001 there are 45000 large dams spread over 140 countries

3.5.1 Major benefits of dams

The major benefits of dams are

1. Hydroelectricity generation
2. Year round water supply to ensure higher productivity

3. Equal water distribution by transferring water from area of excess to area of deficit
4. Helps flood control and protects soil
5. Assure irrigation during dry periods
6. River valley projects provide inland water navigation ,employment opportunities and can be used to develop fish hatcheries and nurseries
7. River valley projects have tremendous potential for economic upliftment and will help to raise the standard of living and can help to improve the quality of life

3.5.2 Disadvantages/problems

Although dams have proved very useful over the centuries but recent past big dams has created lot of human as well as environmental issues

1. Submergence of large areas may lead to loss of fertile soil and displacement of tribal people
2. Salt left behind due to evaporation increase the salinity of river water and makes it unusable when reaches down stream
3. Siltation and sedimentation of reservoirs not only makes dams use less but also is responsible for loss of valuable nutrients
4. Loss of non-forest land leads to loss of flora and fauna
5. Changes in fisheries and the spawning grounds
6. Stagnation and water logging near reservoir leads to breeding of vectors and spread of vector-borne diseases
7. Growth of aquatic weeds may lead to microclimatic changes.

References

<http://www.youtube.com/watch?v=Y945x25tNLU>

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