

Water resources

The United Nations has recognized access to water as a basic human right, stating that water is a social and cultural good, not merely an economic commodity.

Water covers 70% -75% of earth's surface of which 97% is locked in sea or oceans.

3% is fresh water

2.15% of fresh water is in polar ice caps

< 1% available as surface and sub surface water (rivers, streams, lakes) with which we have to manage ourselves.

Water is renewable resource. It may change its form but quantity of water on earth has remained same for millions of years.

Out of 1400 million cu.km. of water available on earth, only 14 million cu.km. is fresh water. Water is an important component of all living beings.

Significance of Water

Due to its unique properties, water is of multiple uses for all living organisms.

Water is absolutely essential for life.

Most of the life processes take place in water contained in the body.

Uptake of nutrients, their distribution in the body, regulation of temperature, and removal of wastes are all mediated through water.

Human beings depend on water for almost every developmental activity.

Water is used for drinking, irrigation, and transportation, washing and waste disposal for industries and used as a coolant for thermal power plants.

Water shaped the earth's surface and regulates our climate.

Our country is a monsoon land. The bulk of rainfall is confined to a brief period of 3-4 months that is from July to October.

Types of water sources

(A) Surface water

- a) Sea water
- b) Rivers and streams
- c) Natural Lakes and Ponds
- d) Artificial impounding Reservoirs
- e) Estuaries

(B) Ground water

- a) Deep boring
- b) well

Surface water:

A) Sea water:

Although 97% of the total water is in the ocean, but it is no more directly used for human consumption. The salinity is very high; it can be potable after desalinization.

B) Rivers and streams

There are 14 major, 44 medium and 55 minor river basins in the country.

The major river basins constitute about 83-84% of the total drainage area.

This, along with the medium river basins, accounts for 91% of the country's total drainage.

India has the largest irrigation infrastructure in the world, but the irrigation efficiencies are low, at around 35%.

C) Natural lakes and Ponds

Lakes are inland depression that hold standing freshwater through out the year. They may vary in size from small lakes of fewer acres to large lakes covering thousands of square miles. They may range in depth from a few feet to over 5,000 feet.

Ponds are generally small temporary or permanent shallow water bodies and are considered as small bodies of standing water so shallow that rooted plants can grow over most of the bottom.

Water from these sources are more uniform in quality than flowing water.

D)Artificial impounding Reservoirs

These are formed by construction of hydraulic structure like Dams across river valleys.

GROUND WATER:

India's groundwater resources are almost ten times its annual rainfall.

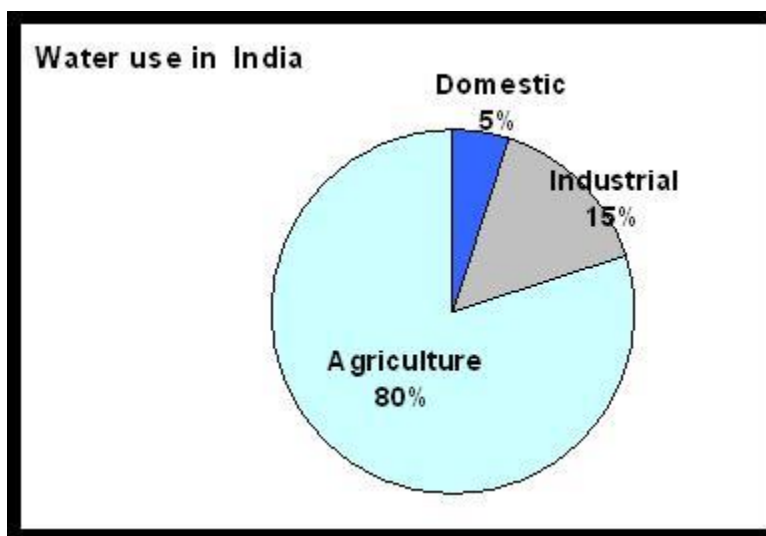
According to the Central Groundwater Board of the Government of India, the country has an annual exploitable groundwater potential of 26.5 million hectare-meters.

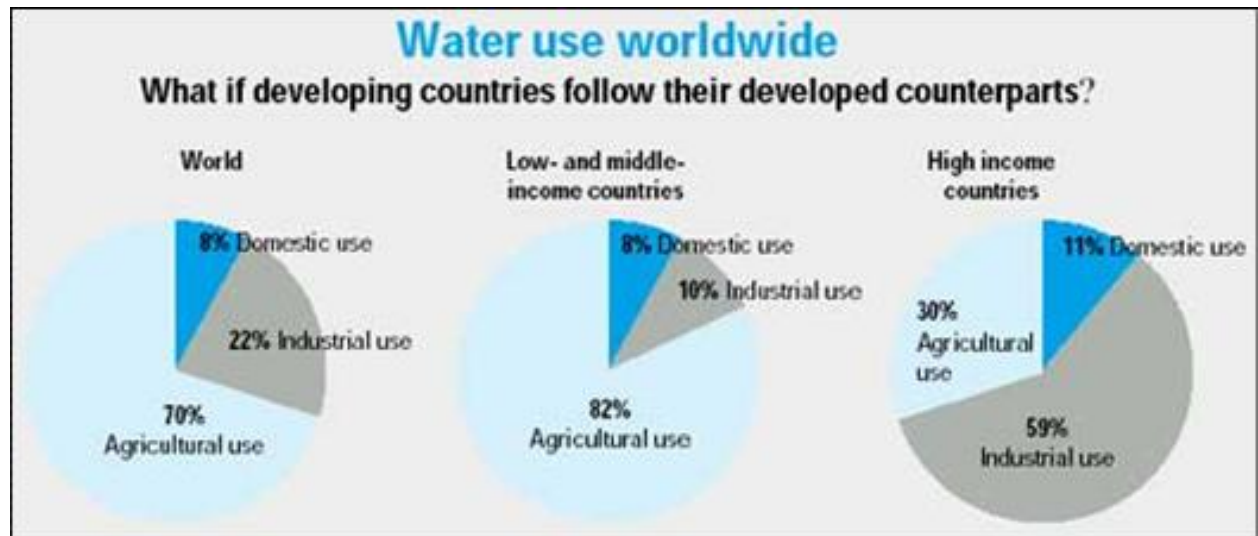
Nearly 85% of currently exploited ground water is used only for irrigation.

Besides, groundwater is now the source of four-fifths of the domestic water supply in rural areas, and around half that of urban and industrial areas.

However, according to the International Irrigation Management Institute (IIMI), the water table almost everywhere in India is falling at between one to three meters every year.

Utilization of Water





Reasons for decline of ground water

- ▶ **Population explosion:** World population is > 6 billion and will continue to increase significantly during the next few decades resulting in 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).
- ▶ **Overutilization of Surface and Groundwater:**

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.
- ▶ **Deforestation:**
 - ❖ Once hill slopes are denuded 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 influence 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.

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

Dams - for Agriculture and Power Generation. 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.

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 per collation of rainwater into subsurface and increase in surface runoff.

FLOODS AND DROUGHT

Heavy rainfall often causes floods in the low-lying coastal areas. Prolonged downpour can also cause the over-flowing of lakes and rivers resulting into floods. When annual rainfall is below normal and less than evaporation, drought conditions are created.

Causes of flood and drought

Deforestation, overgrazing, mining, rapid industrialization, global warming etc., have contributed largely to a sharp rise in the incidence of floods.

Deforestation leads to desertification and drought too. When the trees are cut, the soil is subject to erosion by heavy rains, winds and sun.

The removal of thin top layer of soil takes away the nutrients and the soil becomes useless.

The eroded soils exhibit droughty tendency.

Preventive measures

Clear knowledge in control of drought and desertification can be very useful for dealing with the problem.

Carefully selected mixed cropping helps to optimize production and minimize the risks of crop failures.

Social forestry and Wasteland development can prove quite effective to fight the problem, but it should be based on proper understanding of ecological requirement and natural process.

BIG-DAMS –BENEFITS AND PROBLEMS

A number of big, medium and minor dams have been envisaged under different river valley projects. These dams have been undertaken for irrigation, power generation and water supply. These dams, hailed as the Temples of Modern India by the country's first Prime Minister, Jawaharlal Nehru, have increased agricultural production, power generation and reduced dependence on imports.

Benefits

- ▶ River valley projects with big dams play a key role in the development process due to their multiple uses.
- ▶ These dams aim at providing employment for tribal people and raising the standard and quality of life.
- ▶ Dams can help in checking floods and generate electricity and reduce water and power shortage, provide irrigation water to lower areas, provide drinking water in remote areas and promote navigation, fishery.

▶ **Problems**

- ▶ We can study the environmental side effects of river valley and
- ▶ Hydel-power projects in three categories as under:
- ▶ Upstream (Effect within and around the area covered by the dam and reservoir) effects.
- ▶ Downstream effects consequent to the alternation in hydraulic regime.
- ▶ Regional effects in terms of overall aspects including resources use and socio-economic aspects.

▶ **The upstream problems:**

- ▶ 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
- ▶ Loss of forests, flora and fauna - Dam construction and submersion leads to significant loss of arable farmland and forest and land submergence
- ▶ Disruption of fish movement and navigational activities

- ▶ Siltation and sedimentation of reservoirs, water logging and salination in surrounding lands reduces agricultural productivity
- ▶ Loss of non-forest land
- ▶ Stagnation and water logging near reservoir
- ▶ Biological hazards due to large-scale impounding of water – increase exposure to vector borne diseases, such as malaria, schistosomiasis, filariasis
- ▶ Reservoir induces seismicity causing earthquakes
- ▶ Microclimatic changes
- ▶ Growth of aquatic weeds

Downstream problems :

Water logging and salinity due to over irrigation

Microclimatic changes

Reduced water flow and silt deposition in river

Flash floods

Salt water intrusion at river mouth

Loss of land fertility

Outbreak of vector-borne diseases like malaria.

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 waterlogging.

Pricing water at its real value makes people use it more responsibility 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

Domestically use water by **VED** principle- use for **V**ital activities, control for **E**ssential activities, cut down for **D**esirable activities.

. 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 Resources Management Organizations:**

| | | | |
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| (1) | Central Pollution Control Board | Concerning | Water Quality |
| (2) | Central Water Commission | Concerning | Surface Water |
| (3) | Central Ground Water Board | Concerning | Ground Water |
| (4) | Indian Metrological Department | Concerning | Precipitation |
| (5) | Central Public Health & Environment Engineering | Concerning | Water Supply, Sanitation & Sewage Disposal |
| | (Ministry of Urban Development) | | |
| (6) | Ministry of Agricultural and ICAR | Concerning | Water use for Agricultural |
| (7) | Department of Environment Wildlife (Ministry of Environment and Forest) | Concerning | Environment Forests and Impact |
| (8) | Department of Forest Management | Concerning | Watershed |
| (9) | Department of Power | Concerning | Hydro-Electric Power |