

## Chapter - 6 Water Resources

### Water Resources of India

- India contributes about 2.45% world's geographical area, the 4% of the world's water resources and about 16% of world population.
- India receives water from annual precipitation i.e. 4000 cubic km, and surface and groundwater sources i.e. 1869 cubic km. But only 60% (1122 cubic km) from these two sources of water are beneficial and usable.

### Surface Water Resources

- River, lakes, ponds and tanks are four main sources of surface water resources in India.
- About 10,360 number of river and tributaries existed here and each tributary is more than 1.6 km long.
- The mean annual flow in all the river basin in India is estimated to be 1,869 cubic km. But only about 690 cubic km or 32% of these water can be utilised due to topographical, hydrological and other constraints.
- Size of catchment area/river basin and rainfall in its catchment area control the flow of water in a river. Water availability in rivers is more during monsoon than other seasons in India.
- In India, Ganga, Brahmaputra and Indus have large catchment area. Catchment areas of Ganga and Brahmaputra and Barak rivers fall into the high rainfall receiving area thus, have 60% of total water resources and have only 33% of the surface areas in India, but most of the water is not utilised.
- On the other hand, in the Peninsular rivers like Godavari, Krishna, Kaveri, etc mean annual flow of water is less, but much of their water resources has been utilised.

## Groundwater Resources

- There is about 432 cubic km of total replenishable ground water resources available in India. Ganga and Brahmaputra basins have about 46% of the total replenishable groundwater resources.
- The level of groundwater utilisation is relatively high in the river basins of North-Western parts and Southern parts of India.
- States having very high utilisation of groundwater are Punjab, Haryana, Rajasthan and Tamil Nadu.
- States having moderate utilisation ground water are Gujarat, Uttar Pradesh, Bihar, Tripura and Maharashtra.
- States having low Utilisation of groundwater are Chhattisgarh, Odisha, Kerala, etc.
- It is assumed that if the utilisation of water continue with the present rate, there are chances that it will limit the development and create a situation of social upheaval disruptions.

## Lagoons and Backwaters

- Some states of India have indented coastline and thus a number of lagoons and lakes have formed. Examples of such states are Kerala, Odisha, and West Bengal.
- Due to brackish water-bodies, these water resources are used for fishing and irrigating certain varieties of paddy crops, coconut, etc.

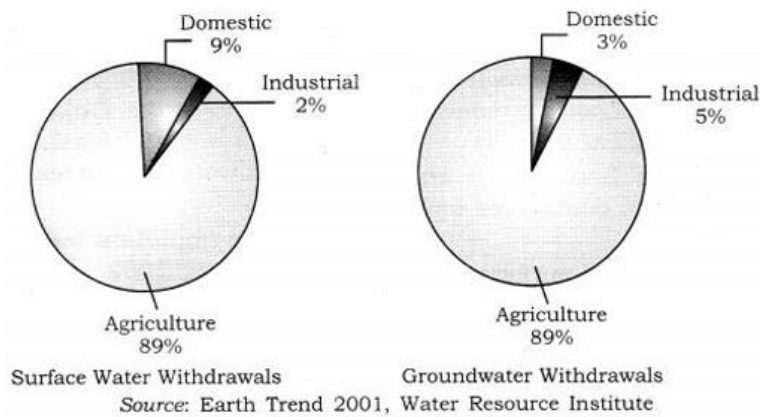


## Water Demand and Utilisation

- Agriculture, being an important part of Indian economy, alone uses about 89% of surface water and 92% of groundwater.
- Most of the developmental projects, river valley projects like the Bhakra-Nangal, Hirakund, Damodar Valley, Nagaijuna Sagar, Indira Gandhi Canal project, etc as well as five year plans were started to provide water to agricultural sector and increase agricultural production.
- Besides this, utilisation of surface and groundwater for domestic purposes are 90% and 3% and for industrial sector are 2% and 5%, respectively.

### **Demand of Water for Irrigation**

- Need for irrigation is very high in India due to the spatial and temporal variation of rainfall.
- As winter and summer season are more or less dry in most parts of India. So, without irrigation agriculture cannot be practised in these parts.
- Some crops like rice, sugarcane, jute and other are water intensive and require more water to grow.
- Irrigation helps to grow multiple crops, gives more agricultural productivity, and along with HYV seeds gives more yield at fast rate.
- For e.g. Punjab Haryana and Western Uttar Pradesh which have more than 85% of net source area under irrigation.
- Total net irrigated area in Punjab under wells and tube wells is 76.1% where as it is 51.3% in Haryana. These states utilise a large share of their groundwater resources and thus, it is the major cause behind the depletion of these resources.
- Besides these in Rajasthan and Bihar, the concentration of flouride in groundwater is also increasing due to over withdrawal of this resource.
- Whereas in West Bengal and Bihar, the concentration of arsenic has been increased because of the same reason.



## Emerging Water Problems

- Rapid growth in population and pollution from various sources like industries, agriculture, and domestic sources are the major problems which are responsible for declining the availability of potable water.
- The per capita availability of water in India is also decreasing day by day.

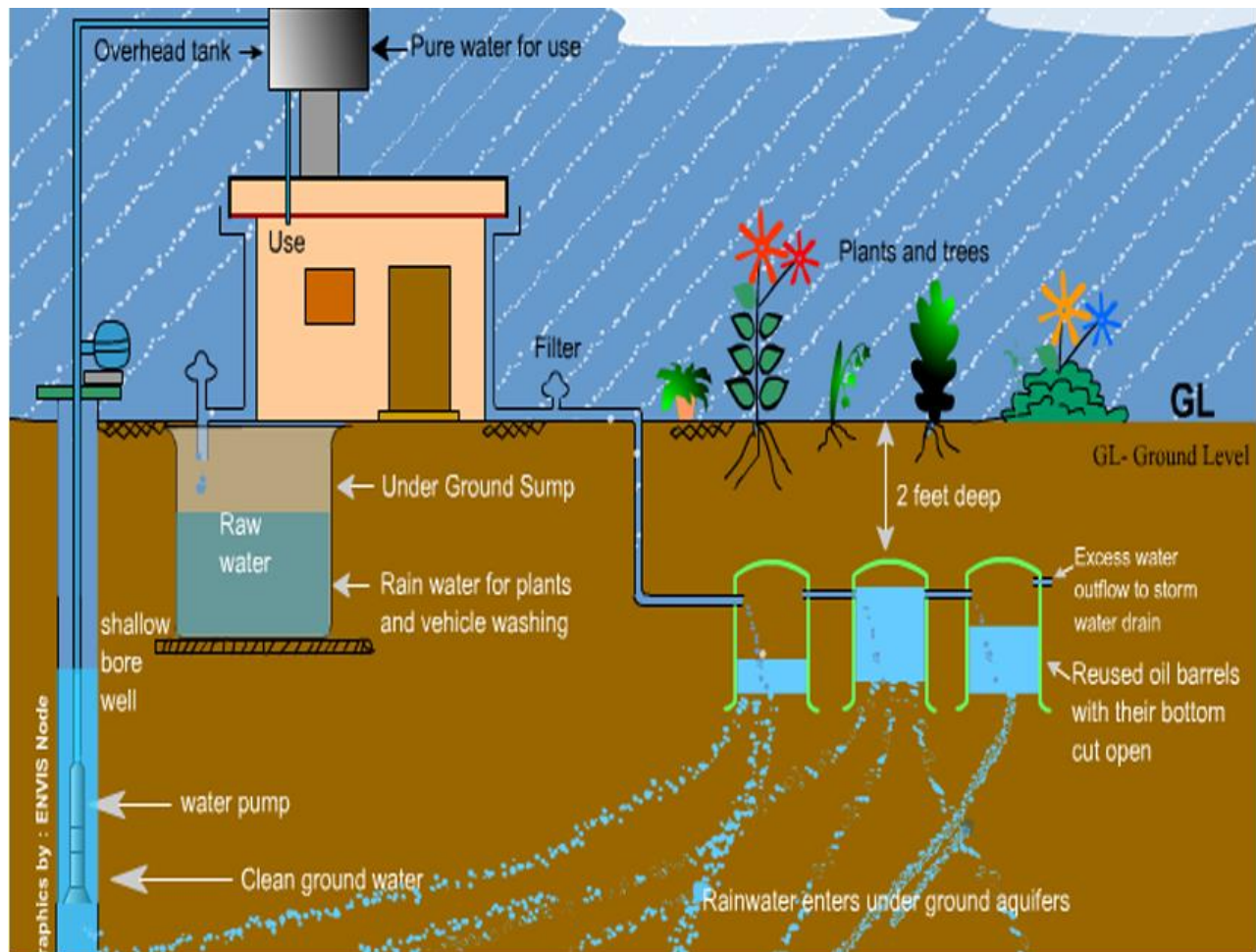
## Deterioration of Water Quality

- Water quality means water free from unwanted foreign substances that make water polluted i.e. micro organisms, chemicals, industrial and other wastes.
- These toxic substances are responsible for water pollution by dissolving or suspended in lakes, streams, rivers and oceans.
- Sometimes, such pollutants seep down and pollute groundwater.
- The most polluted rivers in India are Ganga and Yamuna.

## Water Conservation and Management

- The conservation and management of water become necessary after decreasing the availability of fresh water and increasing its demand by increasing population.
- For Sustainable development and maintaining the quality of life the government should encourage people to adopt watershed development,

rainwater harvesting, recycling and reuse of water, conjunctive use of water for availability of quality water for long time.



## Prevention of Water Pollution

- Availability of water resources are shrinking with a faster rate. It is seen that hilly areas have less dense population and thus, have high quality of water in their rivers. Whereas plains have dense population and thus have low quality of water in their rivers, and here water is widely used for irrigation, domestic works and industrial works.
- Plains also contribute more in polluting water sources by draining agricultural wastes (chemical fertilisers and insecticides) solid and domestic wastes and industrial wastes.
- During summer, concentration of pollutants in rivers remains high because of low amount of water which unable to flow these pollutants.



- Water quality of national aquatic resources at 507 stations have been monitored by the Central Pollution
- Control Board (CPCB), with the collaboration of State Pollution Control Boards.
- The analysis of data recorded from these stations shows that the major rivers of India are most polluted by the organic and bacterial pollution.
- Yamuna river is most polluted river in the country between Delhi and Etawah. Other severely polluted rivers are the Sabarmati at Allahabad, the Gomti at Lucknow, the Kali, the Adyar, the Cooum (at entire stretches), the Vaigai at Madurai, Musi at Hyderabad and the Ganga at Kanpur and Varanasi.
- Ground water is also polluted because of high concentration of heavy toxic metals, fluoride nitrates at different parts of the country.

### **Legislative Provisions and Laws to Prevent River Pollution**

- Government has taken various steps to minimise river and water pollution but due to some obstacles, these were proved to be less effective, for e.g. Water (Prevention and Control of Pollution) Act of 1974, and Environment Protection Act of 1986 were unsuccessful as in 1997, 251 polluting factories were established along the rivers and lakes.
- The Water Cess Act of 1977 which was made to prevent pollution, was also less effective. So there is an urgent need to create awareness in public about the importance of water in life. It will result in reducing the pollutants from agricultural activities and industrial discharge.

### **Recycle and Reuse of Water**

- Recycle and reuse is a simple and best way to conserve fresh water and make it available for all.
- Industries can use water of low quality and their waste water for cooling and fire fighting, which can decrease the cost of water for them and conserve fresh water.

- Water could be collected after bathing and washing utensils, washing clothes and cars can be a better option for gardening.
- Today, reusing and recycling of water is limited to few people but there is enormous scope for replenishing water through recycling.

## **Watershed Management**

Watershed management basically refers to efficient management and conservation of surface water. Watershed management includes:

1. ground water resources.
2. prevention of surface runoff.
3. storage and recharge of ground-water by different methods such as percolation tanks, recharge wells, etc.
4. the conservation, regeneration and judicious use of all natural resources (land, water, plants and  
1. animals) and human resources.
5. create a balance among natural elements as well as in society.
6. community participation is a key to success of a Watershed Development programme.

There are various Watershed Development and management programmes started by both Central and State Government at national and state level in India like:

### **Haryali**

It is sponsored by the central government while gram panchayats of different villages execute it with the public participation. This programme enabled people to conserve water for various uses such as drinking, irrigation, fisheries and afforestation.



## Neeru-Meeru (Water and You)

Programme in Andhra Pradesh and Arvary Pani Sansad (in Alwar, Rajasthan) are examples of state initiated watershed development programmes.



- Under these two programmes numerous percolation tanks, dug out ponds (johad), check dams, etc were constructed for harvesting water with the help of public participation.
- Tamil Nadu is only state which has made the construction of water harvesting structures compulsory in the houses.
- The construction of a building without the structure of water harvesting is not allowed.
- Despite having such programmes, still most of the people in India are not aware with the benefits of watershed development and management of water.
- Thus, there is a need to encourage more people to participate in this programme.



## Rain Water Harvesting

Rain water harvesting is a cheap and environmental friendly technique that guides us to store rainwater into bore wells, pits and also recharge groundwater aquifers for different uses.

There are various benefits of rainwater harvesting which are as follows:

1. It increases water availability.
  2. Checks the declining groundwater level.
  3. It improves the quality of groundwater by dilution of pollutions like fluoride and nitrates.
  4. It prevents soil erosion and flooding.
  5. It can be used to arrest salt water intrusion in coastal areas, if used to recharge aquifers.
- There are numerous methods to harvest rain water in India
  - In traditional rain water harvesting techniques, water is usually collected in any surface water body i.e. lakes, ponds, irrigation tanks, etc of rural areas.
  - Another technique is kund or tanka which is a covered storage under ground tank.
  - This technique is widely used in Rajasthan.
  - Rain water harvesting structure can be made on the open spaces and even on the roof tops of the houses and the collected water can be used for domestic use by large number of people and reduce their dependence on ground water.

## Other Methods

- To solve the problem of water scarcity, we can use brackish water of arid, semi- arid and coastal areas after the desalinated processes.

- By interlinking of rivers, water can be transferred from the water surplus areas to water deficit areas.

## **Highlights of India's national Water Policy, 2002**

The National water Policy, 2002 stipulates water allocations priorities broadly in the following order i.e. drinking water, irrigation, hydro-power, navigation, industrial and other uses.

The main objectives of this policy are to provide water to all human beings and animals, regular monitoring of surface and ground water quality, create awareness of water as a scarce resource, create conservation consciousness among people through education, regulation, incentives and disincentives, etc.