Water Resources

NOTES

Geography
Class-10

1. Water

Water is a very important natural resources available on earth. Its utility for life of humans, animals and vegetation makes it a basic need of living things on earth. Our earth is unique because of availability of water on it.

Utility of water

- Water is a basic need of our life.
- Used for domestic purposes – cooking, drinking, washing etc.
- Used for agricultural purposes
- Used in manufacturing industries
- Used for hydroelectricity generation

Distribution of water on earth

(i) Ocean Water: 96.25% - ocean water

(ii) Fresh Water:

- 2.5% - fresh water (70% - glacier & ice sheet 30% - ground water and surface run off water)
- Source of fresh water – rain, surface run off and ground water
- Only 3 percent of the total water on earth is freshwater.
- One-third of this freshwater is inaccessible to human beings.
- Only two-thirds of the freshwater is accessible to human beings and fit for consumption.
- The freshwater available to humans is obtained from surface run-off and recharge of groundwater.

Hydrological Cycle

It is the journey of water cycle that remains in a continuous flux. The total quantity of water present on earth remains constant. Water only changes its form from solid to liquid to gas and back to liquid. This is known as the hydrological cycle.

2. Water Scarcity

It is a situation in which the available water falls short of the level of demand of water in a region. Natural variations in precipitation, large and growing population, unequal access to water resources are some of the major reasons behind water scarcity.

For example, Ladakh and Rajasthan suffer from water scarcity due to variation in precipitation.

Causes of water scarcity

There are quantitative as well as qualitative causes behind water scarcity.

The Quantitative Factors

- **Variation in precipitation:** Regional disparity in availability of water resources is due to high or low rainfall in some regions like Rajasthan in India.
- **Poor water management:** Humans are responsible for poor water management through excessive use and exploitation of water resources.
- **Unequal access to water among different social groups:** Some socio-economic reasons are behind this unequal access. The rich enjoy more access to water than the poor ones.
- **Population Growth** – More population had direct impact on increased demand of water.
- **Agriculture:** Irrigated agriculture especially during dry season is the largest consumer of water. Irrigated areas are expanding for higher food grain production for the growing population.
- **Declining Groundwater level:** Farmers use well and tube wells to irrigate their farms. It leads to falling ground water levels. It badly affects the availability of water and food security of the people.
- **Industrialisation:** Industrial units of MMCs and others are heavy users of fresh water resources. Industries also requite power to run which comes mostly from hydroelectric power which contributes 22% of the total electricity production in India.
- **Urbanisation:**
  - Large and dense urban population and urban lifestyle have aggravated the problem with their increased requirement for water and energy.
  - Housing societies and colonies use pumping sets of their own having direct impact on ground water level.
  - Fragile water resources are being over exploited causing depletion of fresh water resources in many cities.

Qualitative Factors

Industries are mostly responsible for deteriorating the quality of water. Example, The Yamuna River water has become toxic die to industrial discharges.

A Report –

The assault on India's rivers- from population growth, agriculture modernization urbanization and industrialisation-is enormous and growing by the day... this entire Lifestyle stands threatened.

Source: The Citizens' Fifth Report, CSE, 1999.

Need of the hour is to conserve water resources:

We need to conserve and maintain water resources to safeguard Ourselves from health hazards, to ensure food security, continuation of our livelihoods and productive activities and also to prevent degradation of natural ecosystems.

Over exploitation and mismanagement of water resources will impoverish this resource and cause ecological crisis that may have profound impact on our lives.

3. Hydraulic Structures & Water Conservation

- Hydraulic structures are constructed to store flowing water or reduce the speed of its flow or redirect its path.
- Such structures have been constructed since ancient times to conserve water.
- Examples of such water structures are:
  - ***Dam:*** A wall that acts as a barrier against the flow of water. The wall either obstructs, directs, or slows down the flow of water.
  - ***Stone rubble:*** Stones of irregular shape, size, and texture are used as a filling to obstruct the flow of water.
  - ***Reservoir or lake:*** These are either formed naturally or created artificially by humans. These are large water bodies used as a means of water supply.
  - ***Embankment:*** An artificial wall or bank is raised above the surrounding areas to stop flooding.
  - ***Canal:*** An artificial waterway that allows the passage of boats and ships from one place to another.

Hydraulic Structures in Ancient India

Hydraulic structures were constructed in ancient times. A few examples of hydraulic structures in ancient India are:

- A well-developed water harvesting system was constructed during the first century BCE in Sringaverapura near Prayagraj to channelise the floodwater of river Ganga.
- Dams, lakes, and irrigation systems were constructed during the rule of Chandragupta Maurya.

- Old, well-planned irrigation works in Odisha, Andhra Pradesh, Karnataka, and Maharashtra are also counted under the hydraulic structures of ancient India.
- During the 11th century, the largest artificial lake of its time was built in Bhopal.
- Construction of Hauz Khas tank in Delhi by Iltutmish is also noted for its water supply to the Siri Fort area.

4. Multipurpose River Valley Projects & Integrated Water Resource Management

Dams

A Dam is a barrier to contain and regulate the flow of water forming reservoirs, man-made lakes, embankments and canals for irrigation.

- On the basis of structure, dams are timber dams, embankment dams, or masonry dams and their subtypes.
- On the basis of height, dams are large dams and major dams or alternatively low dams, medium height dams, and high dams.

Dams as Multipurpose projects

The dams and other hydraulic structures fulfil more than one purpose through integrated water resource management Many uses of the impounded water are integrated with one another. Hence Dams are referred to as multi-purpose projects.

Dans as Temples of Modern India

Jawahar Lal Nehru's statement - He used to call such multipurpose projects as *'temples of modern India'* because they contribute in the nation's economy through:

- Development of Agriculture
- Development of Village economy
- Rapid industrialisation
- Growth of urban economy

Advantages of Dams as Multipurpose Projects

Dams help conserve water

- In earlier times dams were built to collect and store river or rain water for future use and for irrigation.
- Today, dams are built as Multipurpose Projects and such projects launched after independence were thought of as the vehicle that would lead the nation to development and progress, overcoming the handicap of its colonial past.

The advantages of Dams are listed below.

- Hydropower generation
- Irrigation
- Flood control
- Domestic and industrial supply of water
- Fish breeding (pisciculture)
- Inland water navigation
- Tourism and recreation (boating, water sports etc.)
- Afforestation and soil conservation – trees are planted along the boundaries of Dams

Examples of Dams as Integrated Water Management (Multipurpose Projects):

- After independence, multipurpose projects were launched with an integrated water management approach.
- Integrated water resource management (IWRM) is a process to develop land and water resources to maximise economic and social welfare, keeping in mind the sustainability of present ecosystems.
- With this approach, dams are considered as a means for the overall development of the nation.

Examples:

- Sardar Sarovar Dam on Narmada River in Gujrat-It is one of the largest water resource projects of India covering four states.
- Bhakra Nangal Project on Sutlej-Beas River basin: Used both for hydel power production and irrigation.
- Hirakud Project on Mahanadi- for flood control and water conservation.

5. Scrutiny over Disadvantages of Multipurpose Projects

Multi-purpose projects and large dams have come under great scrutiny and opposition for a variety of reasons:

- Excessive sedimentation at the bottom-line of reservoir makes the river bed rocker. It deteriorates aquatic life habitats.
- Result in manmade flood during excessive rains.
- Loss to exotic flora and fauna due to submergence of flood plain area.
- Fragmentation of rivers obstructs the routes of migration of aquatic fauna especially for spawning.
- Salinity of soil and contamination of water.
- Changes in cropping pattern by Inducing water intensive and commercial crops.

- Social landscape has changed increasing gap between the richer landowners and the landless poor.
- Agitation due to conflicting interests like the agitation of Sabarmati basin farmers over the matter of giving higher priority to water supply in urban areas.
- Interstate territorial water dispute also arise like the Kaveri Water dispute, Krishna Godavari dispute. Such disputes regard the issues of sharing costs and benefits of the multi-purpose projects.
- Environmental issues – loss of ecology and biodiversity.

Impact on people

The local people have to suffer the most due to building of multipurpose dams.

- A large-scale displacement of local communities. Local people sacrificed their land, resources and livelihood for the sake and greater good of the nation but they still struggle for justice to their livelihood.
    - Displaced people need proper settlement
    - Proper compensation is needed
    - Alternative means of livelihood required
- People have opposed the building of Dams through different movements like Narmada Bachao Andolan and Tehri Dam Andolan.
- Environmental issues – loss of ecology and biodiversity affects life on earth.

The people keep asking: ''Are we the only ones chosen to make sacrifices for the nation? ''

The local people suffer but on the other hand, such projects seem to benefit the landowners and large farmers, industrialists and few urban centres.

Environmental Movements Against Multipurpose Projects

1. Narmada Bachao Andolan – It is an NGO fighting against the Sardar Sarovar Dam on Narmada River in Gujrat.

- It led the issue of the displaced and affected people like farmers and tribal people. The movement is supported by environmentalists and human rights activists.
- The movement was launched initially on environmental issues related to trees that would submerge under Dam water.
- Later on, the Movement raised human right issues demanding proper rehabilitation and proper compensation for the oustees (displaced people)
- Concerned states – Gujrat, Madhya Pradesh and Rajasthan and Maharashtra

2. Tehri Dam Andolan – It was launched in Uttarakhand under the leadership of Sundar Lal Bahuguna. People fight for human rights and environmental issues.

Criticism over failure of Multipurpose Projects in Achieving Their Aims

(i) Many multipurpose projects were not able to achieve the aims for which they were constructed. In many instances, these projects had adverse effects such as:

- Instead of preventing floods, they led to floods upstream due to heavy sedimentation.
- The release of dam water during heavy rains also led to floods downstream—for example, the floods in Maharashtra and Gujarat in 2006.
- Obstruction of the flow of sediments results in degradation of the surrounding land as plains are deprived of the natural fertiliser (silt) deposited by the river.

(ii) Other bad effects of multipurpose projects were:

1. Earthquakes
2. Waterborne diseases
3. Pollution due to overuse and misuse of water

6. Water Harvesting

- Water harvesting is collecting rainwater and storing it for future use before it is lost as surface runoff.
- Water harvesting has been in practice since ancient times.
- Ancient people had good knowledge of rainfall and soil types, which they used to develop a range of water harvesting techniques.
- They used to harvest rainwater, river water, groundwater, and floodwater using simple techniques to meet their future need for water.
- The methods that were used by the ancient people to harvest water were environment-friendly.

Need for Water Harvesting

- To restore groundwater levels.
- To increase infiltration of rainwater in the subsoil to improve its moisture content.
- To increase agricultural produce of the area.
- To enhance the growth of vegetation in the area.

Traditional Methods of Water Harvesting

Various traditional water harvesting techniques are as follows:

- Creating diversion channels like guls and kuls
- Rooftop harvesting
- Khadins and johads
- Inundation channels

- Tankas
- Kuis or beris
- Vav or bavadi

Guls and kuls

- Guls and kuls are channels constructed in hilly areas.
- These channels collect rainwater and function as irrigation canals.
- Such channels are commonly used in the western Himalayas for agriculture.

Rooftop harvesting

- In this method, rainwater is collected from the roofs of houses or roof catchments and stored in reservoirs.
- The reservoirs can be above or under the ground.

Khadins and Johads

- Agricultural fields are used for storing rainwater. They are known as johads in some parts of Rajasthan and khadins in Jaisalmer.
- The water is allowed to stand in these fields, which moistens the soil.

Inundation channels

- Inundation channels are long canals constructed mainly from rivers.
- They carry excess river water to agricultural fields during heavy rains and floods.
- Such channels are commonly constructed in the flood plain of West Bengal.

Tankas

- Tankas are among the best traditional methods to harvest rainwater.
- Tankas are like rooms built inside the main house or in the courtyard.
- The roof of the house is connected through pipes to these tankas that store rainwater.
- Tankas are also used for cooling effects. Underground rooms are constructed adjoining tankas to enjoy this cooling effect.

Kuis or beris

- Kuis or beris are pits dug in the catchment areas of rivers.
- They are common in the arid and semi-arid regions of Rajasthan.
- These pits collect water, which then percolates in the soil.
- The water collected by this method is known as the paar system.

Vav or bavadi

- Stepwells are known as vav in Gujarat and bavadi in Rajasthan.

- Vav or bavadi collect and store rainwater.
- The water stored is used for human consumption.

7. Rainwater Harvesting

Conservation of water

- Water is a vital natural resource and the basis of life on earth.
- Since the total amount of water on earth is unchanging and keeps moving in a cyclic manner, water can be used repeatedly after purification.
- Water harvesting is very useful socio-economically and environmentally.
- It offers an alternative to the multipurpose dam projects with their adverse effects.
- Rainwater harvesting was practiced in ancient times, too, with the help of hydraulic structures.
- Since ancient people were aware of -rainwater regimes and soil types, they developed different techniques to harvest rainwater, groundwater, river water, floodwater, and other sources.

Rainwater Harvesting

Rainwater harvesting is a method used to collect and store rainwater to meet the need of living beings. This method of water harvesting is very economical in a developing country like India.

Need for Rainwater Harvesting

Rainwater harvesting is very successful in many parts of the country. Rainwater harvesting is needed:

- To overcome the shortage of surface water
- To recharge groundwater levels
- To make water available, especially in arid and semi-arid regions during summers
- To increase infiltration of rainwater deep into the soil to provide adequate moisture to the soil
- To improve the quality of groundwater through filtration
- To improve the vegetation cover of the area

Rainwater Harvesting Techniques

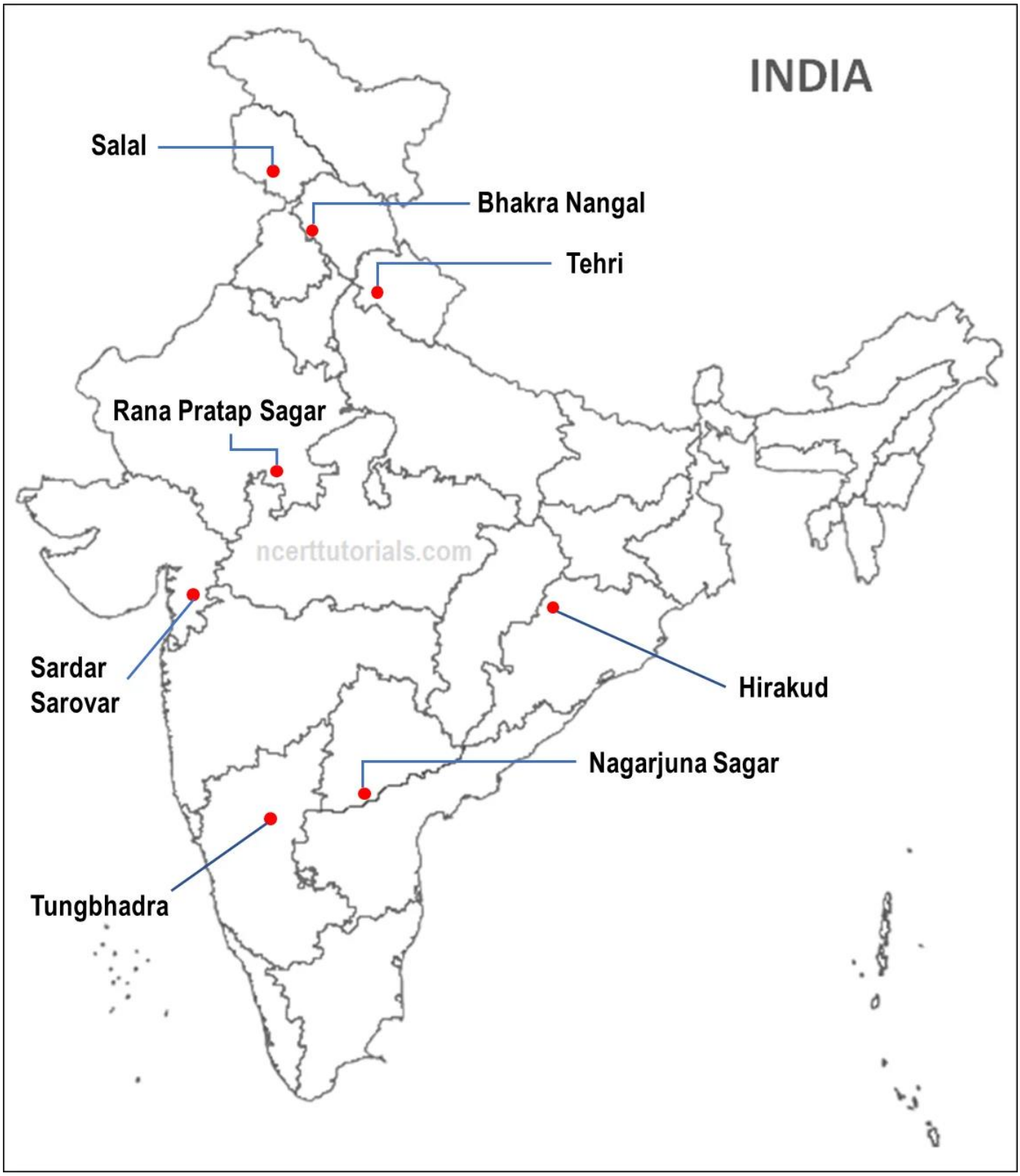
- People built diversion channels like the ‘guls’ or ‘kuls’ of the Western Himalayas for agriculture in hill and mountainous regions.
- ‘Rooftop rainwater harvesting’ is commonly practiced to store drinking water, particularly in Rajasthan.
- In the flood plains of Bengal, people developed inundation channels to irrigate their fields.

- In arid and semi-arid regions, agricultural fields were converted into rain-fed storage structures that allowed the water to stand and moisten the soil, such as *'khadins'* in Jaisalmer and '*Johads'* other parts of Rajasthan.
- The tankas are part of the well-developed rooftop rainwater harvesting system and are built inside the main house or the courtyard. This is mainly practiced in Rajasthan, particularly in Bikaner, *Phalodi*, and Barmer areas for saving the rainwater. Many houses constructed underground rooms adjoining the 'tanka' to beat the summer heat to keep the room cool.

Rainwater Harvesting in Other States

- Rainwater harvesting is also practiced in Shillong, Meghalaya, and Karnataka.
- Almost every house in Mysuru in Karnataka has a rainwater harvesting system.
- This place has an 80 percent efficiency of harvesting rainwater.
- Tamil Nadu is the first state to make rainwater harvesting compulsory. Defaulters face legal punishment in this state.
- Bamboo drip irrigation system is practiced in Meghalaya.

Map Work (Latest CBSE)



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