**Water Resources**

3/4th of the Earth’s surface is covered by water, but only 2.5% of the water is fresh water.   
In this fresh water, 70% is in the form of ice sheets and glaciers, less than 30% is in usable form which is mainly obtained from surface run off and ground water.

Reasons of Water Scarcity  
- Varied availability of resources over space and time, mainly due to variation in seasonal  
- annual precipitation  
- In most cases water scarcity is due to over exploitation, excessive use and unequal access  
- to water among different social groups  
- Water scarcity is an outcome of large and growing population, consequent greater   
- demands for water, and unequal access to it.   
- A large population requires more water not only for domestic use but also to produce   
- more food.   
--- Hence, to facilitate higher food-grain production, water resources are being over-  
--- exploited to expand irrigated areas for dry-season agriculture.   
- Irrigated agriculture is the largest consumer of water.   
--- Now it is needed to revolutionise the agriculture through developing drought resistant   
--- crops and dry farming techniques.  
- Most farmers own wells and tube-wells in their farms for irrigation to increase their   
- produce.   
--- It may lead to falling groundwater levels, adversely affecting water availability and   
--- food security of the people.

Water Shortage by Industrialization and Urbanization  
- Post-independent India witnessed intensive industrialisation and urbanisation, creating   
- vast opportunities for us.   
- Today, large industrial houses are as commonplace as the industrial units of many MNCs   
- (Multinational Corporations).   
- The ever-increasing number of industries has made matters worse by exerting pressure   
- on existing freshwater resources.   
- Industries, apart from being heavy users of water, also require power to run them. Much   
- of this energy comes from hydroelectric power. Today, in India hydroelectric power   
- contributes approximately 22 per cent of the total electricity produced.   
- Moreover, multiplying urban centres with large and dense populations and urban lifestyles   
- have not only added to water and energy requirements but have further aggravated the   
- problem.   
- If you investigate the housing societies or colonies in the cities, you will find that most of   
- these have their own groundwater pumping devices to meet their water needs.   
- Not surprisingly, we find that fragile water resources are being over-exploited and have   
- caused their depletion in several of these cities.

Water Shortage by Pollution  
- Here water is sufficiently available to meet the needs of the people, but, the area still   
- suffers from water scarcity.   
- This scarcity may be due to bad quality of water.   
- There has been a growing concern that even if there is ample water to meet the needs of   
- the people, much of it may be polluted by domestic and industrial wastes, chemicals,   
- pesticides and fertilisers used in agriculture, thus, making it hazardous for human use.   
- India’s rivers, especially the smaller ones, have all turned into toxic streams.   
- And even the big ones like the Ganga and Yamuna are far from being pure.   
- The assault on India’s rivers from population growth, agricultural modernisation,   
- urbanisation and industrialisation is enormous and growing by the day.

Need of the Hour  
- The need of the hour is to conserve and manage our water resources, to safeguard   
- ourselves from health hazards, to ensure food security, continuation of our livelihoods and   
- productive activities and to prevent degradation of our 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.

Hydraulic Structures in Ancient India   
- In the first century B.C., Sringaverapura near Allahabad had sophisticated water   
- harvesting system channelling the flood water of the river Ganga.   
- During the time of Chandragupta Maurya, dams, lakes and irrigation systems were   
- extensively built.   
- Evidence of sophisticated irrigation works have also been found in Kalinga, (Odisha),   
- Nagarjuna Konda (Andhra Pradesh), Bennur (Karnataka), Kolhapur (Maharashtra), etc.   
- In the 11th Century, Bhopal Lake, one of the largest artificial lakes of its time was built.   
- In the 14th Century, the tank in Hauz Khas, Delhi was constructed by Iltutmish for   
- supplying water to Siri Fort area.

Dams  
- A dam is a barrier across flowing water that obstructs or directs the flow, often   
- creating a reservoir or a lake.   
- “Dam” refers to the reservoir rather than the structure.   
- Most dams have a section called a spillway or weir over which or through which it is   
- intended that water will flow either intermittently or continuously.   
- Dams are classified according to structure, intended purpose or height.   
- Based on structure and the materials used, dams are classified as timber dams,   
- embankment dams or masonry dams, with several subtypes.   
- According to the height, dams can be categorised as large dams and major dams or   
- alternatively as low dams, medium height dams and high dams.

Uses of Dams  
- Dams were traditionally built to impound rivers and rainwater that could be used later to   
- irrigate agricultural fields.   
- Today, dams are built not just for irrigation but for electricity generation, water supply for   
- domestic and industrial uses, flood control, recreation, inland navigation and fish   
- breeding.   
- Hence, dams are now referred to as multi-purpose projects where the many uses of the   
- impounded water are integrated with one another.   
- For example, in the Sutlej-Beas River basin, the Bhakra – Nangal project water is being   
- used both for hydel power production and irrigation.   
- Similarly, the Hirakud project in the Mahanadi basin integrates conservation of water with   
- flood control.   
- Multi-purpose projects, launched after Independence with their integrated water   
- resources management approach, were thought of as the vehicle that would lead the   
- nation to development and progress, overcoming the handicap of its colonial past.   
- Jawaharlal Nehru proudly proclaimed the dams as the ‘temples of modern India’; the   
- reason being that it would integrate development of agriculture and the village economy   
- with rapid industrialisation and growth of the urban economy.

Dams have come under great scrutiny and opposition  
- 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.   
- 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.   
- Multi-purpose projects and large dams have also been the cause of many new   
- environmental movements like the ‘Narmada Bachao Andolan’ and the ‘Tehri Dam   
- Andolan’ etc.   
- Resistance to these projects has primarily been due to the large-scale displacement of   
- local communities.   
- Local people often had to give up their land, livelihood, and their meagre access and   
- control over resources for the greater good of the nation.   
- Irrigation has also changed the cropping pattern of many regions with farmers shifting to   
- water intensive and commercial crops.   
- This has great ecological consequences like salinisation of the soil.   
- At the same time, it has transformed the social landscape i.e., increasing the social gap   
- between the richer landowners and the landless poor.   
- In Gujarat, the Sabarmati-basin farmers were agitated and almost caused a riot over the   
- higher priority given to water supply in urban areas, particularly during droughts.   
- Inter-state water disputes are also becoming common about sharing the costs and   
- benefits of the multi-purpose project.   
- Most of the objections to the projects arose due to their failure to achieve the purposes for   
- which they were built.   
- Ironically, the dams that were constructed to control floods have triggered floods due to   
- sedimentation in the reservoir.   
- Moreover, the big dams have mostly been unsuccessful in controlling floods at the time of   
- excessive rainfall.   
- The floods have not only devastated life and property but also caused extensive soil   
- erosion.   
- Sedimentation also meant that the flood plains were deprived of silt, a natural fertiliser,   
- further adding on to the problem of land degradation.   
- It was also observed that the multi-purpose projects induced earthquakes, caused water-  
- borne diseases and pests and pollution resulting from excessive use of water.

Narmada Bachao Andolan  
- Narmada Bachao Andolan or Save Narmada Movement is a non-Governmental   
- Organisation (NGO) that mobilised tribal people, farmers, environmentalists and human   
- rights activists against the Sardar Sarovar Dam being built across the Narmada River in   
- Gujarat.   
- It originally focused on the environmental issues related to trees that would be   
- submerged under the dam water.   
- Recently it has re-focused the aim to enable poor citizens, especially the ousters   
- (displaced people) to get full rehabilitation facilities from the government.   
- People felt that their suffering would not be in vain… accepted the displacement believing - in the promise of irrigated fields and plentiful harvests.   
- So, often the survivors of Rihand told us that they accepted their sufferings as sacrifice for   
- the sake of their nation.   
- But now, after thirty bitter years of being away, “Are we the only ones chosen to make sacrifices for the nation?”

Sardar Sarovar Dam  
- Sardar Sarovar Dam has been built over the Narmada River in Gujarat.   
- This is one of the largest water resource projects of India covering four states—  
- Maharashtra, Madhya Pradesh, Gujarat, and Rajasthan.   
- The Sardar Sarovar project would meet the requirement of water in drought-prone and   
- desert areas of Gujarat (9,490 villages and 173 towns) and Rajasthan (124 villages).

Koyna Diversion  
- The Krishna-Godavari dispute is due to the objections raised by Karnataka and Andhra   
- Pradesh governments.   
- It is regarding the diversion of more water at Koyna by the Maharashtra government for a   
- multipurpose project.   
- This would reduce downstream flow in their states with adverse consequences for   
- agriculture and industry

Rainwater Harvesting  
- Rainwater harvesting is a simple method by which rainfall is collected for future usage.  
- The collected rainwater may be stored, utilised in different ways or directly used for   
- recharge purposes.

Different methods have been adopted in different areas for Rain Water Harvesting.  
- In hill and mountainous regions, people built diversion channels like the ‘guls’ or ‘kuls’ of   
- the Western Himalayas for agriculture.  
- “Rooftop rainwater harvesting” is commonly practised 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’ in other parts of Rajasthan.

Rainwater or palar pani is considered the purest form of natural water

In Shillong  
- Rooftop rainwater harvesting is the most common practice in Shillong, Meghalaya.   
- It is interesting because Cherapunjee and Mawsynram situated at a distance of 55 km.   
- from Shillong receive the highest rainfall in the world, yet the state capital Shillong faces   
- acute shortage of water.   
- Nearly every household in the city has a rooftop rainwater harvesting structure.   
- Nearly 15-25 per cent of the total water requirement of the household comes from rooftop   
- water harvesting

In Gendathur  
- In Gendathur, a remote backward village in Mysuru, Karnataka, villagers have installed, in their   
- household’s rooftop, rainwater harvesting system to meet their water needs.   
- Nearly 200 households have installed this system and the village has earned the rare distinction of being   
- rich in rainwater.  
- Gendathur receives an annual precipitation of 1,000 mm, and with 80 per cent of collection efficiency and   
- of about 10 fillings, every house can collect and use about 50,000 litres of water annually.   
- From the 200 houses, the net amount of rainwater harvested annually amounts to 1,00,000 litres

Tamil Nadu is the first state in India which has made rooftop rainwater harvesting structure compulsory to all the houses across the state. There are legal provisions to punish the defaulters.