CLASS 10 NOTES

GEOGRAPHY

Water Resources

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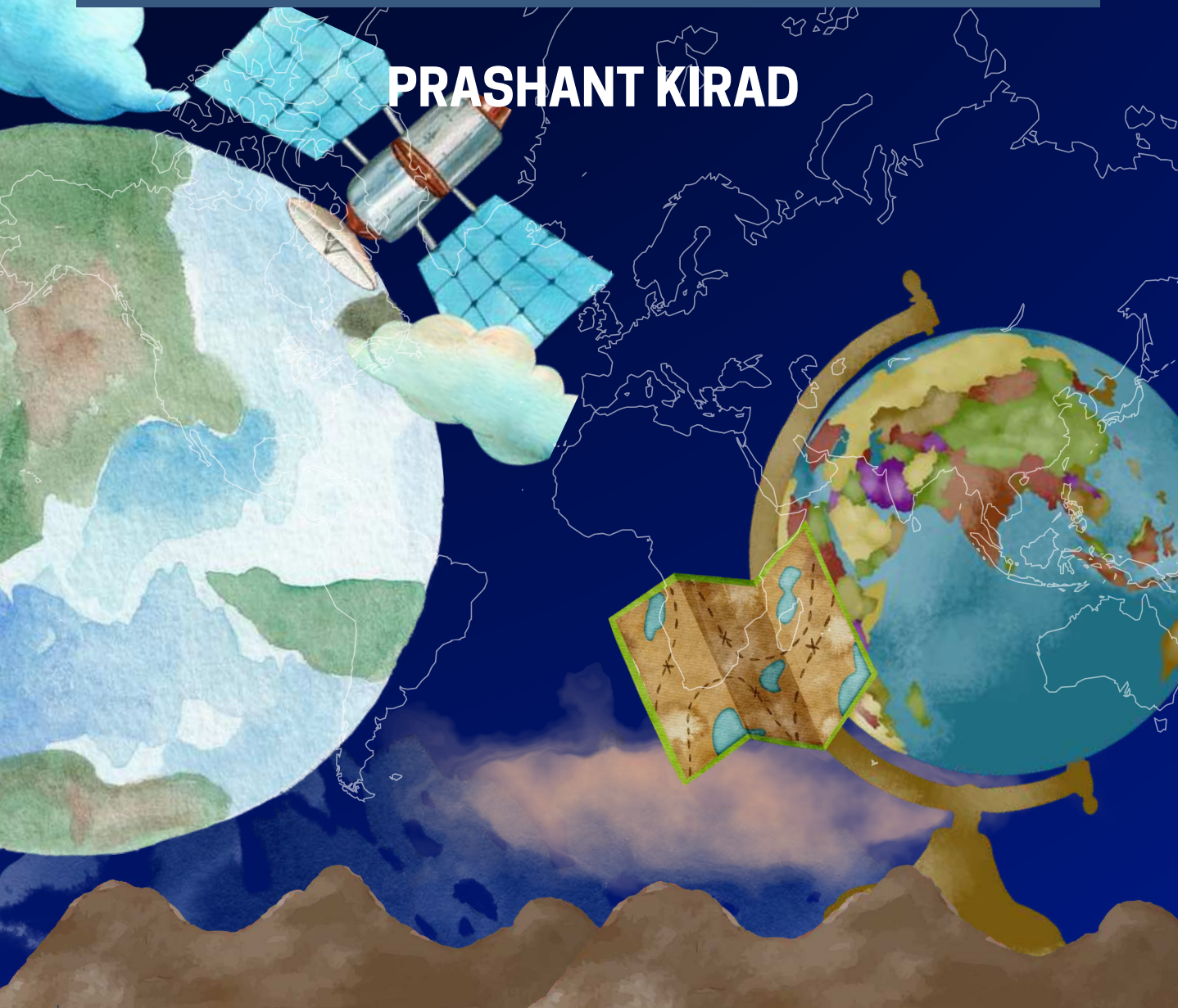

WATER RESOURCES

- Water is a renewable resource.
- Three-fourth of the Earth's surface is covered with but only a small proportion of it accounts for freshwater fit for use.
- Freshwater is mainly obtained from surface runoff and groundwater that is continually being renewed and rechanged through the hydrological cycle.
- 96.5% of the total volume of the world's water is estimated to exist as oceans and only 2.5% as freshwater.
- 70% of total freshwater is present as frozen ice in icebergs and glaciers.
- A little less than 30% of total freshwater is stored as groundwater.
- India receives nearly 4% of the global precipitation and ranks 133 in the world in terms of water availability per person per annum.
- The total renewable water resources in India are estimated at 1,897 sq km per annum.
- By 2025, it is predicted that large parts of India will join countries and regions having absolute water scarcity.

Water Scarcity

How can water be scarce when it is so abundant and renewable?
Lets understand what actually water scarcity is?

- The availability of Water Resources varies over space and time, mainly due to the variations in seasonal and annual precipitation.
- Water scarcity in most cases is caused by over-exploitation, excessive use and unequal access to water.

Falken marks defined water scarcity as :
" Water stress occurs when availability of water is between 1,000 and 1,600 cubic meter per person per year".

Reasons for water scarcity (Quantitative)

(i) Water scarcity may be an outcome of large and growing population and consequent greater demands for water, and unequal access to it.

(ii) As the population increases, the food demand also increases.
To provide food to a large population, agriculture is done on large scale. Agriculture requires much water for irrigation especially in dry-season agriculture.

It further leads to falling groundwater levels, adversely affecting water availability and food security of the people.

The solution is to develop drought-resistant crops and dry farming techniques.

(iii) Intensive Industrialisation and urbanisation causing water scarcity.

- Industries, apart from being heavy users of water, also require power to run them.
- Much of this energy comes from hydroelectric power.
- Multiplying urban centres with large and dense population and urban lifestyles have not only added to water and energy requirements but have further aggravated the problem.

Housing society have their own groundwater pumping devices to meet their water needs.

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Reasons for water scarcity (Qualitative)

- Situation where water is sufficiently available to meet the needs of the people, but, the area still suffers from water scarcity because of the bad quality of water which is polluted by domestic and industrial wastes, chemicals, pesticides and fertilizers used in agriculture, thus, making it hazardous for human use.

Need for Water Conservation and Management

- To meet the water demand effectively.
- To safeguard people from health hazards caused by drinking toxic water.
- To ensure food security.
- To ensure the continuation of our livelihoods and productive activities.
- To prevent the degradation of our natural ecosystems.
- To reduce over-exploitation and mismanagement of water resources.

Multi-Purpose River Projects and Integrated Water Resource Management

Archaeological and historical records show that in ancient times, we used to conserve water by constructing sophisticated hydraulic structures like dams built of stone rubble, reservoirs or lakes, embankments and canals for irrigation.

We have continued this tradition in modern India by building dams in most of our river basins.

Hydraulic structures in Ancient India

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(i) For channeling the flood water of Ganga, water harvesting system was built near Allahabad in the first century BC.

(ii) Dams, lakes and irrigation systems were built during the time of Chandragupta Maurya.

(iii) Sophisticated irrigation systems were found in Orissa, Andhra Pradesh, Karnataka and Maharashtra.

(iv) In the 11th century, Bhopal Lake, one of the largest artificial lakes of its time was built.

(v) The tank in Hauz Khas, Delhi was constructed by Iltutmish for supplying water to the Siri Fort area in the 14th century.

Multi-Purpose River Projects

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Dams

- A dam is a barrier across flowing water that obstructs, directs or retards the flow, often creating a reservoir, lake or impoundment.
- 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 categorized as large dams and major dams, low dams, medium height dams and high dams.
- Multi-purpose river projects large dams that serve several purposes in addition to impounding the water of a river and used later to irrigate agricultural fields. For example - the Sutluj-Beas river basin, the Bhakra-Nangal project etc.

First Prime Minister, Pt. Jawaharlal Nehru, proclaimed multi-purpose river projects as The Temples of Modern India, as they initiate development of agriculture and village economy with rapid industrialization and growth of the urban economy.

Advantages of Multi-Purpose River projects:

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- Electricity generation
- Irrigation
- Water supply for domestic and industrial uses
- Flood control
- Recreation
- Inland navigation
- Fish breeding

Disadvantages of Multi-Purpose River projects:

- It affects the natural flow of the river causing poor sediment flow and excessive sedimentation at the bottom of the reservoir.
- It destroys the habitats for the river's aquatic life.
- It submerges the existing vegetation and soil if created on the floodplains.
- It displaces the local people of the place where it is created.
- These are unsuccessful in controlling floods at the time of excessive rainfall.
- These projects included earthquakes, caused water-borne diseases and pests and pollution resulting from excessive use of water.

Movements against Multi-Purpose Projects

- 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 development 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 the nation.

- Perhaps, the landowners and large farmers, industrialists and a few urban centres are only benefitting from such projects.

Irrigation

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- 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 with regard to sharing the costs and benefits of the multi-purpose project.

Rainwater Harvesting

- Economically and environmentally viable alternative in period of resistance against Multi-Purpose Projects.
- Variation in water harvesting system, keeping the local ecological conditions and their water needs in mind.

- In ancient India, along with the sophisticated hydraulic structures, there existed an extraordinary tradition of water-harvesting system.

(i) Guls and Kuls

- In mountainous region of Western Himalayas for agriculture.
- Impoundment on hill tops.

(ii) Khadins and Johads

- Jaisalmer and Rajasthan
- In arid area, agricultural field were converted into Rain fed storage structures.

(iii) Bamboo drip irrigation system

- In Meghalaya, 200 year old system of using bamboo pipe to transport water.
- 18-20 litres of water enters the bamboo pipes and 20-80 drop reaches at the site of plants.

(iv) In the flood plains of Bengal, people developed inundation channels to irrigate their fields.

(v) Rooftop Rainwater Harvesting.

Rooftop Rainwater Harvesting

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Tanka System

- In arid and semi-arid area of Rajasthan [Bikaner, Phalodhi]
- Had Tankas [underground]
- Connected with Rooftop Rainwater Harvesting.
- Through pipes water is transported to tankas.
- Reliable Source of Drinking water.
- Beat the summer heat.

Gendathur Model

- In Gendathur, a remote backward village in Mysuru, Karnataka villagers have installed 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% 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 having Compulsory legal provision for Rooftop Rain Water Harvesting.

Map Work: E.M.A

Top 7 Questions:

3 markers

1. Identify any three hydraulic structures as part of water management programmes initiated in ancient India along with the period when they were built.

Ans. Some examples of hydraulic structures in ancient India are:

- In the 1st century BC, Sringaverapura near Allahabad had water harvesting system channelling the flood water of the river Ganga.
- During the reign of Chandragupta Maurya, dams, lakes and irrigation systems were extensively built.
- In the period of 11th century, Bhopal lake, one of the largest artificial lakes was built.
- The tank in Hauz Khas, Delhi was built by Iltutmish for supplying water to Siri Fort area in the 14th century.

2. Multi-purpose projects are 'Temples of Modern India'. Justify.

Ans. Multi-purpose river projects are "Temples of Modern India' due to following reasons:

- The multi-purpose projects controls flood as well as useful in irrigation, power generation, fish breeding, etc.
- The multi-purpose projects were considered to bring development in agriculture and the village economy with rapid industrialisation and growth in the urban economy.
- The dams were an important symbol of these projects and consequently of the modernisation of India.

3. What were the reasons for launching multi-purpose river projects in India after independence?

Ans. After independence, India initiated multi-purpose river projects through the five year plans.

The reasons for launching multi-purpose river projects in India after independence are as follows :

- Electricity generation is one of the objectives of multi-purpose projects. India generates approximately 22 percent of its energy needs through this.
- These projects control floods by storing excess water in their reservoirs.
- During the dry season, the stored water in these projects can be used to irrigate the fields.
- Trees are systematically planted around reservoirs in these projects which help in preserving the natural eco-system as well as wildlife.

4. "Traditional harvesting system is a useful system to conserve and store water". Highlight the importance of this system with two examples.

Ans. Traditional harvesting system is a useful system to conserve and store water. Some traditional water harvesting systems practised in India are:

(i) In Rajasthan the system of using underground tanks is popular. It is important for storing water for domestic use.

(i) In hilly areas like Himachal Pradesh, the system of using diversion channels is called Guls' and 'Kuls'. These are used for storing water for irrigation.

(ii) In Meghalaya, the bamboo pipe drip irrigation system is used. It is used to irrigate crops.

5. How has urbanisation posed a threat to existing fresh water resources in India?

Ans. Urbanisation has added to water scarcity. It is because today urban areas are densely populated. The lifestyle of urban areas requires huge consumption of water and power. To manage the shortage of water, housing societies and buildings have their own pumping devices to draw groundwater. This has resulted in depletion of fresh water resources and over exploitation of groundwater. Therefore, urbanisation have aggravated the problem of water scarcity.

5 markers

1. Explain any five reasons responsible for water scarcity in India.

Ans. Following are the important factors responsible for the water scarcity in the world:
(i) Water scarcity is an outcome of large and growing population and consequent greater demands for water and unequal access to it.
(ii) To facilitate higher foodgrain production, water resources are being over-exploited to expand irrigated areas and dry season agriculture.
(iii) Industries apart from being heavy users of water, also require power to run them. Much of this energy comes from hydroelectric power.

(iv) Increasing urban centres with large and dense populations and urban life styles have not only added to water and energy requirements but have further aggravated the problems.
(v) Much of water is polluted by domestic and industrial wastes, chemicals, pesticides and fertilisers used in agriculture. Thus, making it unfit for human use.

2. How have industrialisation and urbanisation posed a great pressure on existing freshwater resources in India? Explain with examples.

Ans. The number of industries are increasing after independence and have become a reason for pressure on existing fresh water resources. Freshwater is almost limited. It is renewable, but over-exploitation and mismanagement of this resource by industries are aggravating the water stress day-by-day in the following ways:
(i) Industries especially heavy industries use huge amount of fresh water for industrial purpose and pollute and waste such water.
(ii) The industries for their energy consumption purpose depend on hydroelectric projects and this electricity is generated through damming the rivers upstream. So, the river almost dries in the lower stream areas.
(iii) Industries dump the chemical waste in the river, lake, etc. which then consequently pollute the water and make it toxic. Chemicals from industries also contaminate the groundwater through seepage of industrial wastes. So, the increasing number of industries exert pressure on existing fresh water resources.