



Chapter – 3 – Lecture Notes

Geography

“Water Resources”

Introduction:

- We know that three-fourth of the earth's surface is covered with water, but only a small proportion of it accounts for freshwater that can be put to use.
- This freshwater is mainly obtained from surface run off and ground water that is continually being renewed and recharged through the hydrological cycle.
- All water moves within the hydrological cycle ensuring that water is a renewable resource.
- **In many Countries People wastes millions of gallons Drinking water everyday due to this many people living in other part of the country didn't get enough Water to drink.**
- **Not only Human but Animals are dying due to lack of Water for Drink specially in Summer.**
- **So, “Don't flush our planet's most valuable resource.”**
- **WATER a Renewable Resource-** Freshwater can be obtained directly from precipitation, surface run off and groundwater that is continually being renewed and recharged through the hydrological cycle. All water moves within the hydrological cycle ensuring that water is a renewable resource.

Water Scarcity and the Need for Water Conservation and Management

- When we speak of water shortages, we immediately associate it with regions having low rainfall or those that are drought prone.
- The availability of water resources varies over space and time, mainly due to the variations in seasonal and annual precipitation, but water scarcity in most cases is caused by over-exploitation, excessive use and unequal access to water among different social groups.

• Causes of water scarcity

1. Significant aspects of water scarcity

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

- To facilitate higher food-grain production, water resources are being over-exploited to expand irrigated areas and dry-season agriculture.
- Most farmers have their 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.

(ii) Increase in Industrialization: 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.

(iii) Over Exploitation of Resources: 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.

- Most housing societies or colonies in the cities, have their own groundwater pumping devices to meet their water needs, thus fragile water resources are being over - exploited and have caused their depletion in several of these cities.



2. Other Aspects of Water Scarcity

- In many areas **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.**
- 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.
- **Need to conserve and manage our water resources**
 - There is need to conserve and manage our water resources so as to:
 - (i) Safeguard ourselves from health hazards
 - (ii) To ensure food security
 - (iii) Continuation of our livelihoods
 - (iv) Productive activities
 - (v) 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.

River Projects as Means of Conservation

1. Multi - purpose river projects and integrated water resources management

- Since ancient times we have been constructing **sophisticated hydraulic structures like dams built of stone rubble, reservoirs or lakes, embankments and canals for irrigation.**
- 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.
- A dam is a barrier across flowing water that obstructs, directs or retards the flow, often creating a reservoir, lake or impoundment.
- “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.
- **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.



2. Multi-purpose projects - 'temples of modern India'

- 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.
- **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).**

• **Threats to Multi-purpose projects and large dams**

- 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.
- Submerge the existing vegetation and soil leading to its decomposition over a period of time.
- **Cause of many new social 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.
- 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 salinization of the soil.

• **Objections to the projects**

- 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.
- **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.**
- Multi-purpose projects induced earthquakes, caused water- borne diseases and pests and pollution resulting from excessive use of water.



Rainwater harvesting

- Rainwater harvesting is the accumulation and storage of rainwater for reuse on-site, rather than allowing it to run off
- Water harvesting system, a viable alternative, both socio- economically and environmentally.
- **Water-Harvesting System Practiced by People**
 - People had in-depth knowledge of rainfall regimes and soil types and developed wide ranging techniques to harvest rainwater, groundwater, river water and flood water in keeping with the local ecological conditions and their water needs.
 - **In hill and mountainous regions, people-built diversion channels like the 'guls' or 'kuls' of the Western Himalayas for agriculture.**
 - **'Rooftop rain water harvesting'** was 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 like the 'khadins' in Jaisalmer and 'Johads' in other parts of Rajasthan.**
- **Rooftop rainwater harvesting being done in various parts of Rajasthan**
 - In the semi-arid and arid regions of Rajasthan, particularly in Bikaner, Phalodi and Barmer, almost all the houses traditionally had underground tanks or tankas for storing drinking water.
 - The tanks could be as large as a big room.
 - **The tanks were part of the well-developed rooftop rainwater harvesting system and were built inside the main house or the courtyard.**
 - They were connected to the sloping roofs of the houses through a pipe.
 - Rain falling on the rooftops would travel down the pipe and was stored in these underground 'tankas'.
 - The first spell of rain was usually not collected as this would clean the roofs and the pipes.
 - The rainwater from the subsequent showers was collected.
- **Adaptations of traditional Rainwater harvesting methods**
 - In many parts of rural and urban India, rooftop rainwater harvesting is being successfully adapted to store and conserve water.
 - **In Gendathur, a remote backward village in Mysore, 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 liters of water annually.**
 - From the 20 houses, the net amount of rainwater harvested annually amounts to 1,00,000 liters.

“Conserve Water, Conserve Life.”