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ICSE GEOGRAPHY

Based on the latest ICSE syllabus

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ICSE GEOGRAPHY

Class 10

Chapter 9: India-Water Resources

WATER RESOURCES OF INDIA

India has only about 4 per cent of world's total water resources. The main sources of freshwater are surface water and groundwater. Rainfall is the most important source of freshwater in India. Most of the rainfall in India comes from the Southwest Monsoons during June to September. The rainfall in our country is not evenly distributed.

SURFACE WATER

The surface water is available to us in the form of rivers, lakes, ponds, canals, etc. Rivers are the most important source of surface water in our country. India has a large number of major, medium and small rivers. Of these, 13 are classified as major rivers.

The mean annual flow of Indian rivers is about 2000 billion cubic metres. Of this amount, only about one-third can be utilised. The estimated storage capacity of surface water is only about 350 billion cubic metres. Thus, more than 80 per cent of surface water flows into the sea.

The **Ganga–Brahmaputra–Meghna system** has the biggest catchment area of about 110 million hectares.

India – Major river basins (sources of surface water)

GROUNDWATER

A part of rainwater percolates through rocks and soil, and is available to us as groundwater. The groundwater potential in India is estimated at about 450 billion cubic metres. Of the total groundwater resources, about 25 per cent is used for domestic, industrial and related purposes, while about 75 per cent is used for irrigating the farmland.

Well – Source of groundwater

Nearly 40 per cent of water demand in urban India is met by groundwater. Thus, the groundwater table is falling at an alarming rate.

CONSERVATION OF WATER

Water is a cyclic resource and it can be used again and again after cleaning. The best way to conserve water is its judicious use.

Some suggestions for conservation of water are as follows:

- Stop the reckless use of water resources and reduce wastage of water.
- Make proper arrangements for recycling and reuse of water.
- Reduce the pollution of water and purify the polluted water for use in agriculture and industries.
- Develop infrastructure for diverting the flood water to water-deficient and drought prone areas.

- Develop and construct water storage reservoirs in different parts of the country.
- Adopt new techniques for irrigating the farmland, which involve much less water, such as **drip irrigation**.
- Store rainwater for use during the dry season, i.e., adopt **rainwater harvesting**.

Baoli for water storage

Johad for water storage

Drip irrigation

RAINWATER HARVESTING

Rainwater harvesting is one of most successful methods for the conservation and management of water resources. Actually the **rainwater harvesting** is the collection and storage of rainwater, which can be used by humans, animals and plants.

Rooftop rainwater harvesting

Rainwater harvesting is needed due to the following reasons:

- To address the problem of shortage of surface water.
- To increase the level of groundwater (water table)

- To ensure the use of groundwater for sustainable development.
- To reduce run-off which can choke the drains.
- To improve the quality of groundwater by dilution.
- To increase agricultural production by increasing water supply through irrigation.
- To avoid the flooding of road

The **potential areas** where rainwater harvesting can be developed are as follows:

- where groundwater levels are regularly declining,
- where the aquifers have been de-saturated,
- where availability of groundwater is inadequate during dry months, and
- where due to rapid urbanisation, infiltration of rainwater into subsoil has decreased drastically and recharging has reduced.

The success of rooftop rainwater harvesting depends on the amount of rainfall and the area of the rooftop. It has the following advantages:

- The cost of recharging groundwater is less than that for recharging surface reservoirs.
- No land is wasted when the water is stored underground.
- No displacement of people is involved in roof top harvesting.
- Groundwater is not exposed for evaporation and pollution.
- Rainwater harvesting reduces the occurrence of floods.
- It reduces the impact of drought and soil erosion.

IRRIGATION IMPORTANCE AND METHODS

In India, about 65 per cent of the total population is directly or indirectly dependent upon agriculture. Water is an important input for growing crops. Water is made available to the agricultural field either by rainfall or by human efforts, i.e., through various means of irrigation.

Geographical Factors Favouring Irrigation in India

The development of various methods of irrigation in India are influenced by a number of geographical factors.

- The Northern Plains of India have extremely rich fertile soils, which can be easily broken to dig canals and sink wells. The deep clay in the subsoil acts as a reservoir for rainwater, which percolates through porous alluvium. The slope of the land is gentle, which helps the canals to carry water even to far off places.

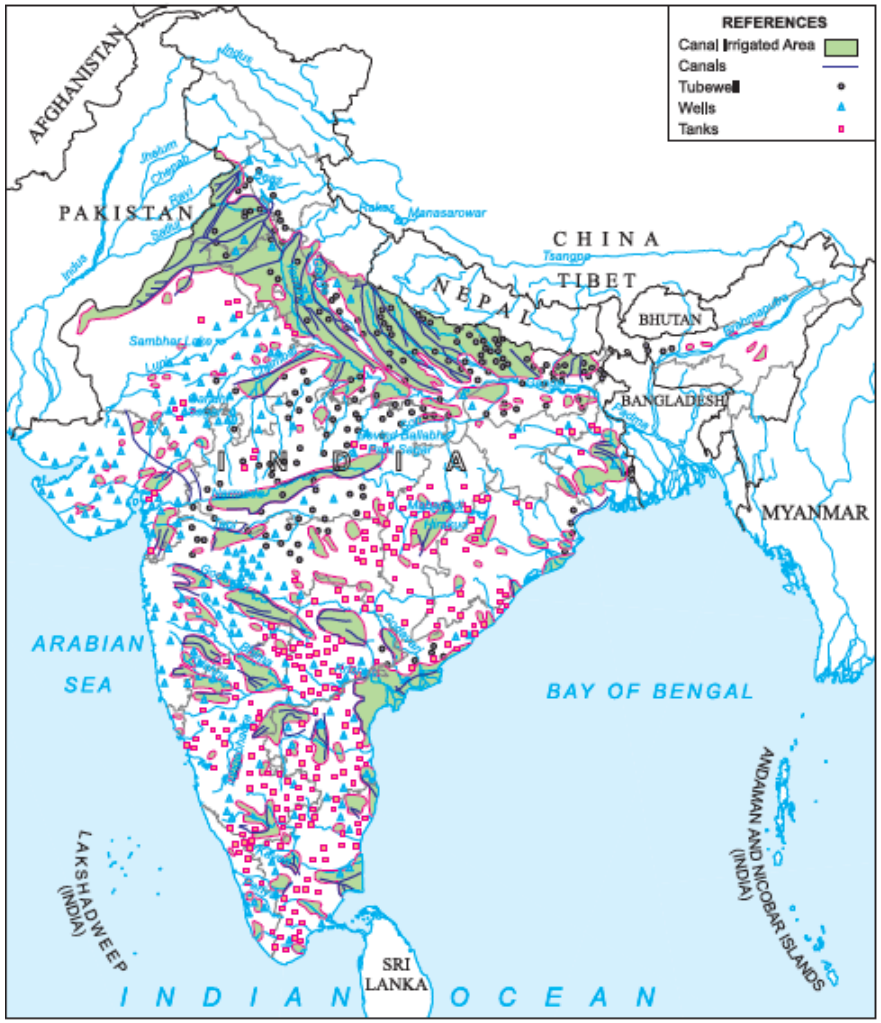
Persian wheel used for lifting water from the well

- Most of the rivers, which flow through the Northern Plains of India, originate from the snow-covered Himalaya mountains. These are perennial rivers, which can easily provide water for irrigating the farms, almost throughout the year.

METHODS OF IRRIGATION IN INDIA

The development of different methods of irrigation in India depends on the following factors:

1. The relief and slope of land
2. The softness and fertility of soils
3. The amount and distribution of rainfall
4. The availability of surface and groundwater
5. The type of rivers – perennial and non-perennial
6. The specific needs of various crops



WELL IRRIGATION

A well is a hole dug in the ground to reach and lift the subsoil or underground water, which can be used for irrigating the farmland and for other purposes.

The wells are generally of the following three types:

1. The **unlined well** or the kachcha well can be dug by the farmer near his field. This well is not lined with bricks or stones. The unlined wells are cheaper and easier to dig and maintain.

2. The **lined well** or the pucca well is lined with bricks and stones. These wells are dug in those areas where the water table is high. The lined well is more expensive to dig and maintain.

3. The **tube well** is a very deep bore, about 50 metres, which has to be dug with the help of drilling machines. The water is taken out with the help of a pump run on electricity.

The water from the well can be lifted in many ways. Some of them are as follows:

1. **The lever method** is an economical and efficient method for lifting water from shallow wells. This method is popular in Bihar, eastern Uttar Pradesh, Telangana and Andhra Pradesh.

2. **The bucket method** is used practically in all villages in India, which involves using a rope tied to a bucket to lift water manually from the well. It is also an economical and efficient method of irrigation.

3. **The Dekhli method** uses a vertical pole for balancing the bucket with an equal load fixed at the other end.

4. **The inclined plane method** or **mhote** is commonly used in Uttar Pradesh. In this method, the bullocks walk up and down a sloping ramp, which can lift a large bucket of water.

5. **The Persian wheel method** is mainly used in Punjab, Haryana, Uttar Pradesh and Rajasthan. It consists of a vertical wheel with buckets attached to the rim of the wheel.

6. **The power driven pumps** can lift water from a well which is generally more than 15 metres deep.

TUBE WELLS

The following factors favour the installation of tube wells for irrigation.

- There should be enough groundwater, because a tube well can irrigate about 100 hectares of farmland against 5 hectares by an ordinary surface well.
- The level of groundwater should be between 15 metres and 50 metres, otherwise the cost of lifting the groundwater with the help of an electric pump will be very high.

Tube well irrigation

- The power for running the pumps (electricity or diesel) should be available at subsidised rates. This can help in the lifting of the groundwater as and when required for irrigating the farmland.
- The soil should be fertile, so that it can lead to high yield and enough production from the farmland to meet the cost of irrigation by a tube well.

Uttar Pradesh has the largest number of tube wells in the country. The tube well irrigation has contributed substantially to the success of **Green Revolution** in India.

Merits of Well and Tube Well Irrigation

- A well, which can be dug at a very low cost, is the simplest and cheapest source of irrigation. The farmers in India can easily afford to have a private well in thier fields.

- The farmer is not required to pay anything to any agency of the government for irrigating the farmland with the help of a well or a tube well.
- The wells and tube wells are independent sources of irrigation and the farmers can use them as and when required or as per their neccessity.
- The useful minerals and chemicals present in the water of wells or tubewells add to the fertility of the soils.

Demerits of Well and Tube Well Irrigation

- A limited area can be irrigated with the help of a well or a tube well.
- A well or a tube well may dry up if excessive water is taken out for irrigation and other purposes.
- The efficiency of a well or a tube well depends on the availability of groundwater, which varies not only from place to place but also from season to season.
- In the dry season or during the drought, a well or a tube well is not able to provide enough water for irrigating the farmland.
- It is not possible to dig wells or tube wells in the areas of hard rocks or in the hilly regions.
- When we take out excessive water from a well or a tube well, the water table is lowered, which can adversely affect farming in the surrounding areas.

CANAL IRRIGATION

Canals were the most important source of irrigation in India up to 1960. But in 1970, canal irrigation lost its place to well and tube well irrigation.

1. **The Perennial Canals:** These canals are taken out from the perennial rivers by constructing a barrage or a weir to regulate the flow of water. Most of the canals in our country belong to this group.

2. **The Inundation Canals:** These canals are taken out directly from the rivers, without making any kind of barrage or dam. These canals use the excess water in rivers at the time of floods and are useful only in the rainy reason.

Some of the irrigation canals in India are as follows:

1. the upper Ganga canal, lower Ganga canal, Sarda canal and Agra canal in Uttar Pradesh;
2. the Sirhind canal, Bhakra canal, Bist Doab canal, and Western Yamuna canal in Punjab and Haryana;
3. the Sone, Kosi and Gandak canals in Bihar, and
4. the Indira Gandhi canal in Rajasthan.

Canal irrigation

Merits of Canal Irrigation

- Most of the canals in India provide perennial irrigation and save the crops from drought conditions.
- The canals that are part of multi-purpose river valley projects are very cheap source of irrigation.
- The sediments brought by the canal water are deposited in the fields, and thus, add to the fertility of soils.
- In the areas of little rainfall, such as in Rajasthan, the canal irrigation has helped in farming and yielded good production.

Demerits of Canal Irrigation

- Waterlogging is generally experienced along the canal routes. This is due to the seepage of water from the canals.
- The excessive flow of water in the fields through irrigation can raise the level of groundwater. Over a period of time, this causes high concentration of salt in the soil, called **reh**.
- During the rainy season, the canals can overflow their banks and **water** can cause floods in the surrounding areas.

TANK IRRIGATION

The tanks are built partly as dugouts and partly by enclosing bunds. The water collected in the tanks is used for irrigation and for other purposes. Most of the tanks are of small size and are built by individual farmers or group of farmers.

Tank irrigation

Merits of Tank Irrigation

- Most of the tanks in the peninsular plateau region
- are formed due to natural depressions in the surface and thus, do not involve high cost of construction.
- The hard and non-porous bed rock structure does not allow the loss of water through seepage and thus, tanks have longer lifespan.
- Tanks are useful in collecting surplus rainwater, which will otherwise flow into the sea.

- Fishing in the tanks is an additional activity, which provides not only food for the farmer's family, but also extra income to the farmer.

Demerits of Tanks Irrigation

- During the dry season, most of the tanks dry up and fail to supply water for irrigation.
- Over a period of time, the tanks get silted up and thus require regular destilling.
- Due to large surface area of shallow tanks, much water from the tanks is evaporated and thus lost.
- We know that the rainfall during the monsoon season is irregular, uncertain and unreliable. As and when the monsoon fails, the tanks dry up and are not dependable at that time.
- Most of the tanks have been developed over a large fertile area, which otherwise should have been used for growing crops.
- Sometimes the lifting of water from the tanks for irrigation and supplying it to the farms are not only costly but also difficult.

THANK YOU