

Water Resources in India

India, with its rivers, lakes, lagoons, and ponds, holds 4% of the world's water resources. Water is primarily used for drinking, irrigation, household, and industrial needs, with 92% of water going to agriculture. To reduce dependency on irregular rainfall, irrigation systems such as wells, tanks, and canals have been established, and multipurpose dams have been constructed.

Challenges Necessitating Irrigation

- **Uncertain Rainfall:** Inconsistent and uneven distribution of rainfall across the country makes agriculture heavily dependent on artificial irrigation.
- **Soil Nature:** Different soils require different amounts of water.
- **River Nature:** Many rivers are seasonal, providing water for only part of the year.
- **Increasing Demand:** With a growing population, irrigation becomes essential to increase agricultural output.

Means of Irrigation

Wells

A well is a hole dug to access groundwater, especially in areas with a high water table. It is common in states like Uttar Pradesh, Punjab, and Tamil Nadu.

Water Lifting Methods:

- **Persian Wheel:** A wheel rotated by animals to lift water.
- **Lever Method:** Used for efficient water lifting, particularly in Bihar.
- **Tube Wells:** Powered pumps lift water from deeper wells.

Advantages: Low-cost, accessible, and can be used in deeper wells. **Disadvantages:** Difficult in hilly areas, wells can dry up, and energy costs for pumps are high.

Tanks

Tanks are artificial reservoirs built to store water, especially in regions like Maharashtra and Gujarat. They help conserve rainwater and are useful in areas with unreliable rainfall.

Advantages: Useful for storing seasonal rainwater, especially in rocky terrains where wells and canals are not viable. **Disadvantages:** Tanks require maintenance to prevent silt buildup and can dry up in dry years.

Canals

Canals are major irrigation sources, particularly from perennial rivers. They include **Inundation Canals**, which only work during floods, and **Perennial Canals**, which function year-round.

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Advantages: Canals provide irrigation to dry areas and support the Green Revolution in states like Punjab. **Disadvantages:** Can lead to waterlogging and soil salinization without proper drainage systems.

Drawbacks of Conventional Irrigation

- Large areas are used for irrigation channels, reducing effective cultivation land.
- Tanks and canals face evaporation and siltation issues.
- Over-irrigation leads to waterlogging, harming soil quality.

Modern Methods of Irrigation

1. **Furrow Irrigation:** Water is applied through furrows between crop rows, reducing wastage.
2. **Spray Irrigation:** Water is sprayed onto crops, though it is expensive and may lead to overwatering.
3. **Drip Irrigation:** Water is delivered directly to plant roots through pipes, reducing evaporation and water wastage.

Water Conservation and Rainwater Harvesting

Due to overexploitation of groundwater and polluted water bodies, water conservation is crucial.

Rainwater Harvesting involves collecting rainwater from rooftops, filtering it, and storing it in tanks or wells for later use. This also helps recharge the groundwater table.

Elements of Rainwater Harvesting:

- **Catchment:** Surface collecting the rainwater.
- **Conduits:** Pipes that carry the rainwater to storage.
- **Storage:** Tanks that store the harvested water.
- **Recharge:** Methods like bore wells and recharge pits help replenish the groundwater.

By adopting modern irrigation methods and encouraging rainwater harvesting, India can optimize water usage to meet the growing demands.