19.4 WATER-TABLE

The water table is the upper surface of the zone of saturation in the ground, where all the pores and cracks in soil and rock are completely filled with water. It represents the boundary between unsaturated soil above and saturated soil below. The level of the water table can vary depending on factors like rainfall, topography, soil type, and seasonal changes. When rainwater or melted snow infiltrates the ground, it percolates downward through the unsaturated zone until it reaches the saturated zone, raising the water table.

For example, in a wetland or low-lying area, the water table may be just below or even at the soil surface, causing water to accumulate and form marshes or swamps. In contrast, in arid regions or during droughts, the water table may lie deep underground, making wells necessary to access groundwater. Pumped wells, especially in agricultural areas, often tap into water stored below the water table, and excessive withdrawal can cause the table to drop—a phenomenon known as groundwater depletion. Thus, the water table is a critical concept in hydrology, agriculture, and water resource management.

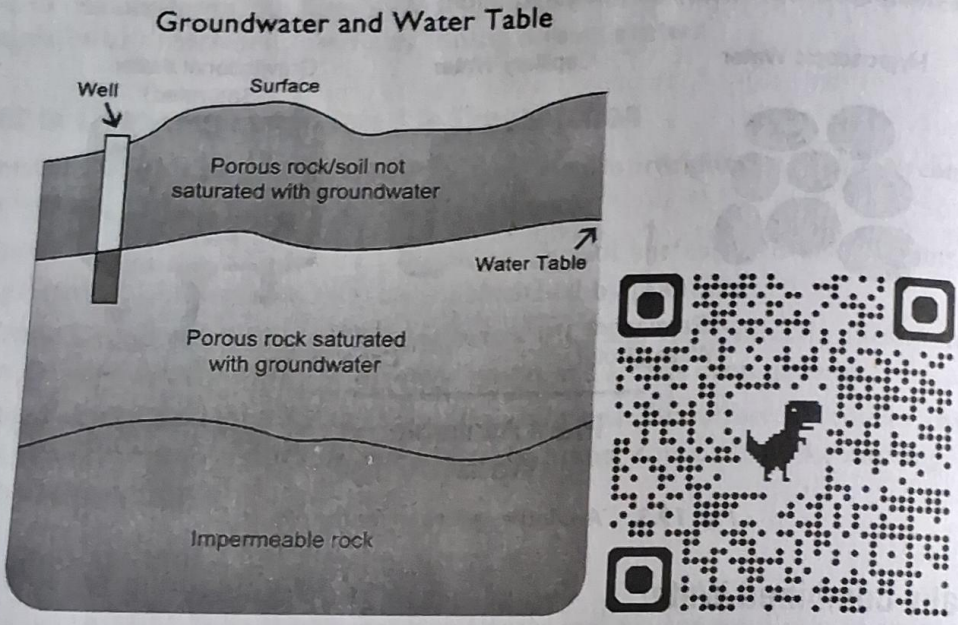

Fig. 19.4. *Illustration representing the water table. Scan the QR code to check the state-wise ground water level in India (at Niti Aayog).*

India, with its vast geographical area and agrarian economy, relies heavily on groundwater resources, which serve as the main source of drinking water for over 85% of the rural population and nearly 60% of irrigation needs. The average depth to the water table in India generally ranges from 5 to 10 meters below ground level (bgl). Water table levels in India vary significantly by region. In **coastal areas**, especially along the **west and parts of the east coast**, groundwater is generally shallow, often **less than 5 meters below ground level** (bgl). In **central and peninsular India**, water levels typically range between **5 to 10 meters bgl**, with some regions reaching **10–20 meters**. The **eastern states** commonly exhibit shallow water tables around **2 to 5 meters bgl**, while the **northern plains**, particularly the **outer plain regions**, have some of the **shallowest water levels**, often **less than 2 meters bgl**.

However, the water table in India is declining at an alarming rate, especially in northwestern states like Punjab, Haryana, Rajasthan, and parts of Uttar Pradesh. According to the Central

Ground Water Board (CGWB), as of recent assessments, more than 60% of Indian districts are critical or over-exploited groundwater levels, where annual extraction exceeds recharge.

Factors Contributing to the Lowering of Water Table in India

1. **Over-Extraction for Irrigation:** Unsustainable agricultural practices, particularly the cultivation of water-intensive crops like **rice and sugarcane** in dry regions, consume massive amounts of groundwater.
2. **Unregulated Borewells:** The widespread use of **electric and diesel pumps** for groundwater extraction, without regulation or metering, leads to uncontrolled depletion.
3. **Urbanization and Industrialization:** Expanding **cities and industries** require large volumes of water, often drawn from aquifers, with little or no recharge infrastructure in place.
4. **Low Rainwater Infiltration:** Due to **paved surfaces, deforestation,** and **soil compaction,** natural rainwater infiltration into the ground is severely reduced, affecting recharge rates.
5. **Climate Change:** Erratic **monsoon patterns,** increased **temperature,** and **reduced snowfall** in the Himalayas are affecting both **surface runoff** and **groundwater recharge** cycles.
6. **Lack of Public Awareness:** In many areas, there's **limited understanding** of groundwater as a finite resource, leading to careless or excessive usage.

Methods to Replenish the Water Table

1. **Rainwater Harvesting:** Capturing and storing rainwater from rooftops and open spaces in **percolation pits, tanks,** or **injection wells** helps recharge groundwater directly.
2. **Recharge Wells and Check Dams:** Structures like **check dams, gabions,** and **recharge shafts** slow surface runoff, allowing water to **percolate into aquifers.**
3. **Watershed Management:** Integrated development of **catchment areas** through afforestation, contour bunding, and small storage structures improves water retention and infiltration.
4. **Regulated Water Use:** Promoting **micro-irrigation techniques** like **drip** and **sprinkler systems** can drastically reduce groundwater use in agriculture.
5. **Crop Diversification:** Shifting from high water-consuming crops to **climate-resilient, low water-requirement crops** (like millets and pulses) can help balance water demand.
6. **Aquifer Mapping and Monitoring:** Advanced **remote sensing** and **GIS-based tools** are being used to map aquifers, monitor usage, and support decision-making for groundwater management.
7. **Public Participation and Policy Support:** Groundwater sustainability requires strong community involvement, supported by **laws, subsidies for rainwater harvesting,** and **education campaigns** to promote responsible usage.