GROUNDWATER

DEPLETION ON RISE IN JHARKHAND

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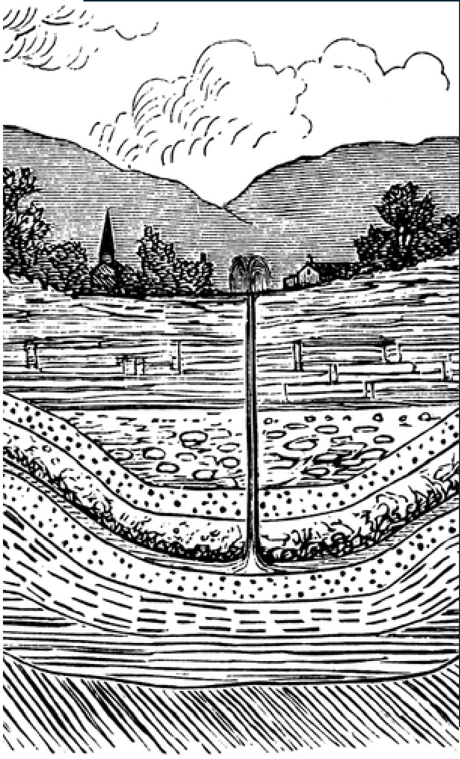
Jharkhand



, is an eastern Indian state that split from Bihar in 2000. The state has 24 districts and comprises **7.8%** area that is home to **2.72%** of India's population. The Chota Nagpur Plateau is where the majority of the state is located. The state is renowned for its forests, hills and waterfalls. As the bulk of the state is covered by bush or forest, the term "Jharkhand" means "the land of bush or forests". Also the state has **40%** mineral resources of the country. The state has several surface and groundwater resources. The river Damodar, known as the 'Dev' river in Jharkhand, is one of the **longest rivers in Jharkhand.** Also, there are several other rivers that join the Ganga from the north are Gandak, Ghagra, Burhi Gandak, Mahananda, Kosi, etc. and few others join Ganga from the southern part are Sakri, Punpun, Karmansa, Phalgu, Kiul, etc. The total replenishable groundwater resources of the state is **6.2 billion cubic meters** as of 2022 **(CGWB 2022)** and the stage of groundwater development of the state is 31.35%. Rainfall in Jharkhand ranges from 1100 mm to 1442 mm, of which 500 mm of groundwater and 23800 mm of surface water are produced. However, because of the geographical arrangement, roughly 80% of surface water and 74% of groundwater leave the state, which is to blame for 38% of Jharkhand's drought.

Status of groundwater

Despite the state's good rainfall, insufficient storage facilities, hard rocky aquifers etc., limit the amount of surface water that can be utilised. Because there are no artificial recharging facilities and minimal natural recharge of groundwater, the status of groundwater is also poor, and as a result, the water label in the plateau is declining. An effort has been made to understand the situation of groundwater resources in recent years to understand the spatio-temporal trend of groundwater resources by analysing the data of Central groundwater Board. It reveals that during the post monsoon period, Gumla district's groundwater level declined and many parts show ground to water level depth more than 20 meter below ground level. To meet the increasing water demands and to gain resilience to climate change impacts, they need to have further studies to find out the potential for rainwater recharge and also to promote optimal usage of groundwater resources.

Researchers found that the majority of the groundwater potential recharge zones of the entire state is located in eight districts because of the alluvial plain region or a few mountains in that region using Remote Sensing and Analytic Hierarchy Approach techniques (Kumar et al.2023). These districts are **Godda, Sahibganj, Pakur, Dumka, Purbi, Singhbhum, Saraikela-kharsawan, and parts of Ranchi.** There is scope to analyse the intricate relationship between geological features and groundwater availability, providing a valuable foundation for future studies, resource planning initiatives and also to plan for new recharge structures based on a feasibility study and rejuvenate traditional recharge systems in Jharkhand.

Seasonal variation in Groundwater levels

The spatio-temporal variation of groundwater levels in the districts of Jharkhand was analysed. Groundwater data collected from more-than 200 wells (out of the 452 wells of Central groundwater Board) spread across the state (CGWB, 2021).

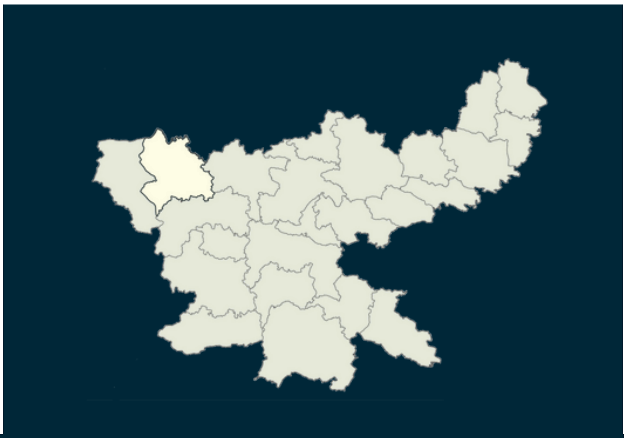


Figure 1. Depth to water level in Jharkhand during August 2021(Source: CGWB, 2022)

Groundwater levels in different monitoring wells were recorded and six groupings were made based on the range of water level data viz. 0-2, 2-5, 5-10, 10-20, 20-40 and above 40 mbgl (CGWB, 2022). In August, the minimum and the maximum depth to water levels have been recorded as 0.50 meter below ground level (mbgl) and 12.25 mbgl both in **Ranchi** district. About 54% of wells have water levels ranging between 2 to 5 mbgl (Fig.1).

Figure 2. Depth to water level in Jharkhand during November 2021 (Source: CGWB,2022)

Minimum ground to water level was recorded in Pakur i.e., 0.35 meter below ground level and the maximum depth to water levels recorded was 10.09 mbgl in Hazaribagh. Out of the wells monitored, 68% had water level ranges from 2 - 5 mbgl which covers almost the entire Jharkhand State. The water level in the range of 5- 10 mbgl has been observed in 19% of wells. groundwater level of 0–2 mbgl depth range has been observed only 13% at different locations. Only 1% has shown water levels more than 10 mbgl (Fig.2).

Figure 2. Depth to water level in Jharkhand during November 2021 (Source: CGWB,2022)

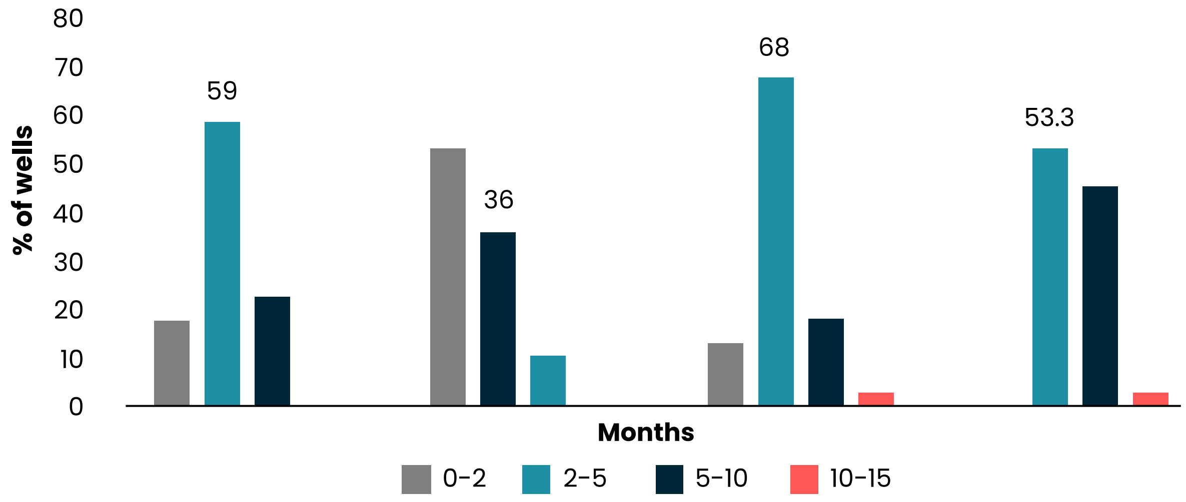


Figure.4 Percentage of wells with water levels in different depth ranges from 0 to 40 meter below ground leve

As shown in figure 5, for all the seasons except for monsoon, the groundwater level ranged from 2 to 5 meters below ground level. In monsoon season the maximum number of wells in the state were in the depth to water level of 2 to 5 meter below ground level. In the post monsoon and in winter seasons, some of the wells' depth level fell to more than 10 meters below ground level (Fig.4).

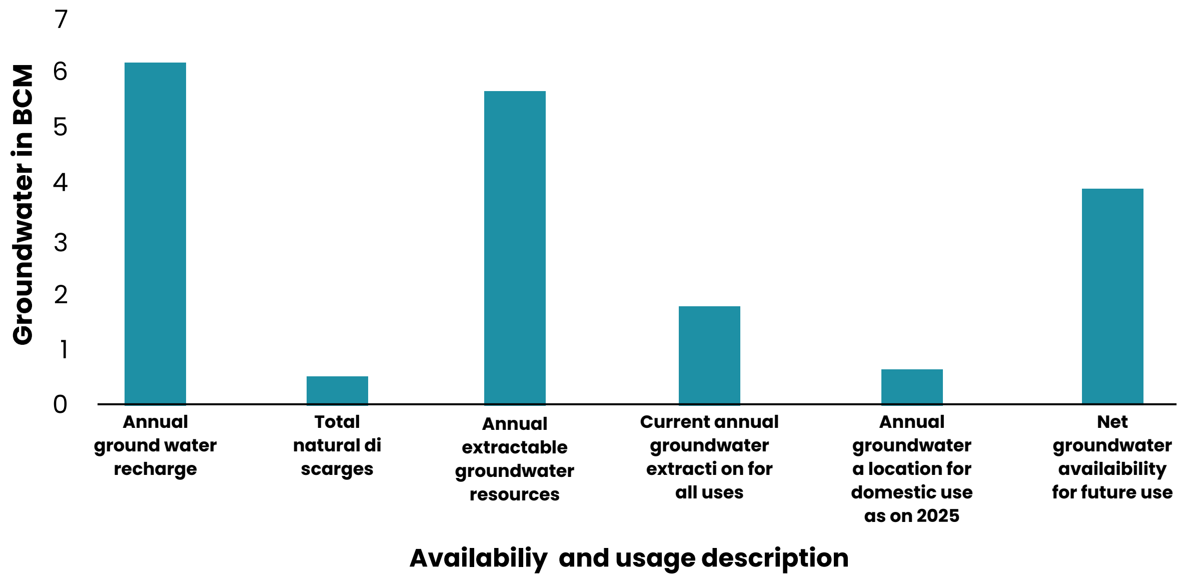


Fig.5 Dynamic Groundwater and surface water sources (in billion cubic meters) in Jharkhand (Source: CGWB 2022)

As per the latest report, the total current annually extracted groundwater is 1.79 billion cubic meters, out of which 0.93 billion cubic meters is used for irrigation, 0.65 billion cubic meters is used for domestic use and 0.21 billion cubic meters is used for domestic purposes(Fig.5). Researchers made an effort to identify the groundwater potential recharge zones of the entire Jharkhand state using Remote Sensing and Analytic Hierarchy Approach techniques, it was found that most of the high potential area is located in eight districts due to the alluvial plain region or a few mountains in that region namely **Godda, Sahibganj, Pakur, Dumka, Purbi, Singhbhum, Saraikela-kharsawan** and part of the **Ranchi** (Ashwini et. al. 2023).

Table.1
Dynamic Groundwater and surface water sources in Jharkhand (Source: CGWB 2022)

Table.1 Dynamic Groundwater and surface water sources in Jharkhand (Source: CGWB 2022)

Description	in BCM
Annual groundwater recharge	6.2
Total natural discharges	0.51
Annual extractable groundwater resources	5.69
Current annual groundwater extraction for all uses	1.79
Annual groundwater allocation for domestic use as on 2025	0.65
Net groundwater availability for future use	3.92
State of groundwater extraction-31.35%	

Research findings based on reports by Government and Research publications

Drought

Due to the geographical setup, about 80% of surface water and 74% of groundwater go outside the state and **cause 38% of the drought in Jharkhand** (JRDJHb).

Rainfall

Jharkhand receives **1100 mm to 1442mm rainfall,** out of which 23800 MCM comes as Surface water and 500 MCM as groundwater.

In the **pre-monsoon season of 2022**, the groundwater level of the state had declined by two metres. In 2022, the monsoon rainfall received was in deficit by more than **60%, and about 90% of reservoirs were only 40% full** (CGWB 2022).

Aquifer

In Jharkhand, groundwater is found under semi-confined confined aquifers in the fractures situated at **a deeper level.**

In most regions of the districts **Purbi Singhbhum, Ranchi and Saraikela,** the groundwater **is declining** as revealed by a study of depth to groundwater level (DGWL) conducted over the period 1996–2018 (Swain et. al. 2022).

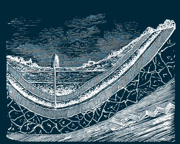
Eight districts in the alluvial plain region are potential recharge zones i.e. Godda, **Sahibganj, Pakur, Dumka, Purbi, Singhbhum, Saraikela-kharsawan and part of the Ranchi** (Ashwini et. al. 2023).

Since the introduction of tube wells, the groundwater levels in the state have declined over the last two decades.

In the districts of **Bokaro, Giridih, Godda, Gumla, Palamu, Ranchi**, the fluoride concentration in groundwater was beyond permissible limit.

Nowadays the **tube well exerts more pressure** on groundwater resources in deep aquifers, especially in the urban areas of Ranchi.

Groundwater

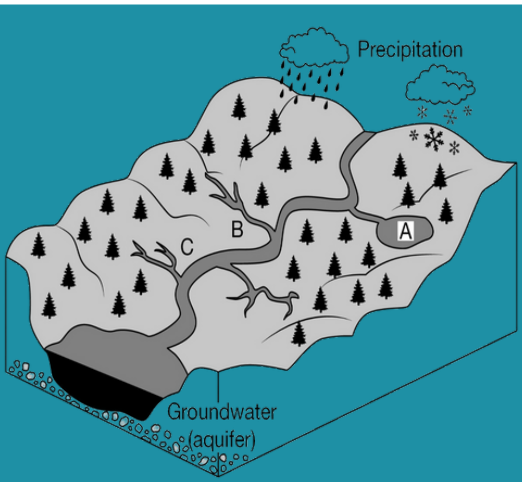


In the pre monsoon season of 2021, the shallowest water table level was found in **Hazaribagh district** found below 0.03 mbgl (meter below ground level), and the deepest water table level was found at 9.7 mbgl in **Koderma district** (CGWB 2021).

As per the report by CGWB, the available groundwater resources for future usage is **3.92 billion cubic meters** (Table.1 & Fig. 5).

Recommendations

- **Baseline study** of all active groundwater sources, suggesting relevant policy recommendations
- Conservation of traditional wetland to be protected for **effective groundwater recharge** during monsoons.
- **Desiltation/dredging** of surface water bodies like streams, rivers and canals for better percolation and recharge of aquifers during monsoons
- **Rejuvenation of dried up/deteriorated** traditional water storage units like ponds, tanks etc.
- **Artificial recharge structures** to be constructed based on a research of aquifer characteristics and land use surveys.
- **Massive awareness programmes** to be done for promoting sustainable use of water, avoiding water wastages in agricultural and domestic sectors, also during supply and distribution etc.
- **Research** to be conducted in surface and groundwater resources and based on that implementation of integrated watershed management to be carried out for conserving water resources.
- **Assessing the existing policies**, Acts and schemes related to water conservation for their effectiveness.



Overall, this write-up emphasises the urgent need for better management and conservation of groundwater resources. The report recommends implementing policies to regulate the use of groundwater resources, adopting technology and practices for water conservation and water use efficiency, promotion of low-water requirement crops like millets and other indigenous rice varieties, and shifting from water intensive crops. There is a need to conduct research on the status of recharge and discharge zones of the state and to construct rainwater recharge structures based on a feasibility study of the respective locations. Cropping pattern, selection of crops and mode of irrigation must be mapped. Awareness should be created among the locals on the status and encourage them for conserving water by wise usage of water. The usage of water for domestic-agricultural sectors should be budgeted. The state needs to find solutions to tackle the deficit in water quantity by improving restoration of deeper and dynamic aquifers by following an integrated watershed management method.

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