

# Geographic Study of Groundwater and Surface Water Crisis in Alwar District

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## **Abstract**

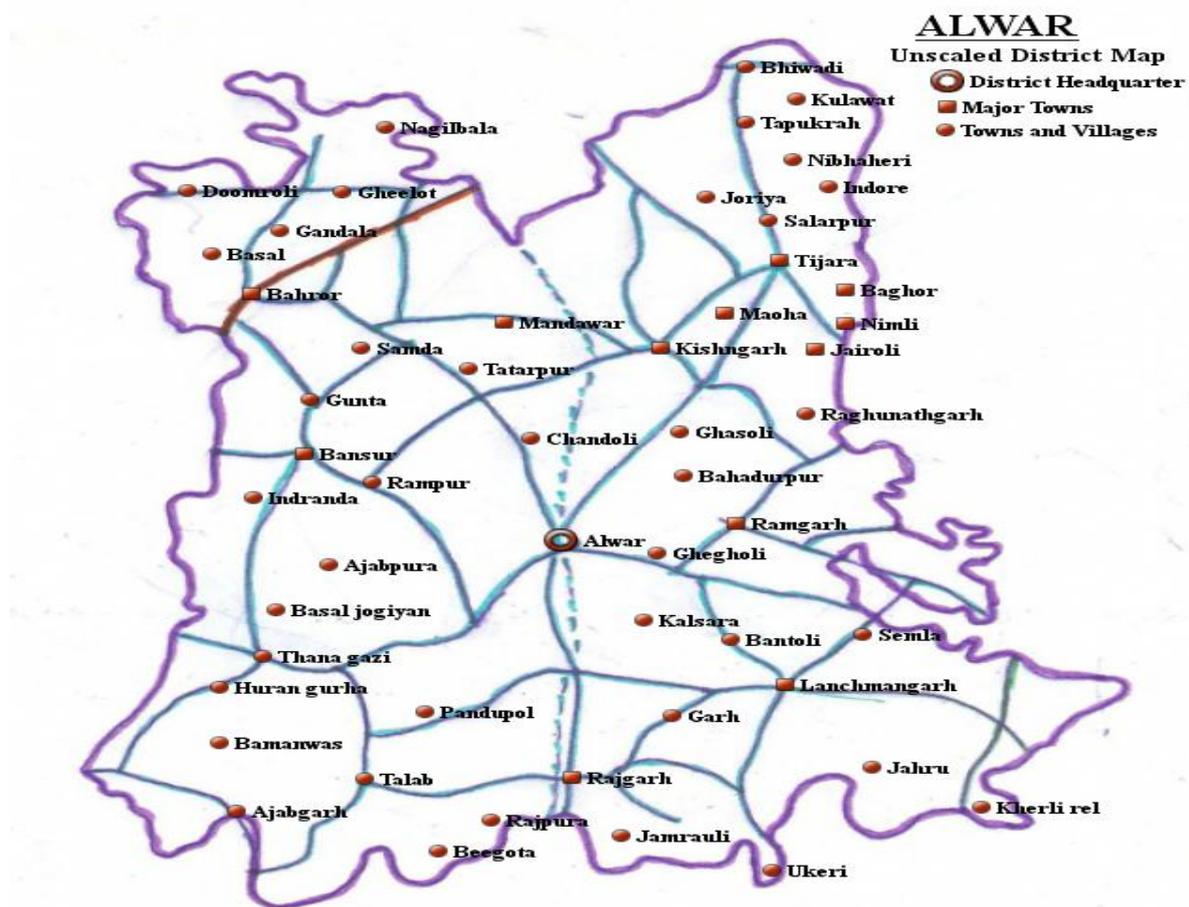
*Alwar district is an important region of Rajasthan, located between the Aravalli mountain range and the plains. Its groundwater and surface water resources have long been under pressure from human use and natural conditions. The average rainfall in the district is approximately 650 mm, but this rainfall is uneven and limited, resulting in poor water storage and recharge. Rapid urbanization, industrial development, and overexploitation of tube wells for agriculture have led to alarming groundwater levels in Alwar district, dropping to depths of over 200 meters. Lack of rainfall (a sharp decline of 60 cm) and unplanned urban development have exacerbated the situation, turning much of the area into a "dark zone." The severe drinking water crisis in Alwar district stems primarily from geographical factors such as excessive groundwater exploitation, agricultural and industrial use, and uneven rainfall due to the Aravalli Range. Groundwater levels have fallen by 10-40 meters, and in areas like Thanagazi, water extraction exceeds recharge. Therefore, this research paper presents a geographical study of the drinking water crisis in Alwar district.*

**Key Points:** *Drinking water crisis in Alwar district, groundwater levels, water levels by block, surface water, drinking water quality, Alwar's water supply system, the role of government and society, and conclusions.*

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## **I. Geographical Introduction to Alwar District:**

Located in the northeastern part of Rajasthan, Alwar district is renowned for its historical heritage, the Aravalli mountain ranges, and industrial development. It is also known as the "Lion Gateway of Rajasthan" and the "Scotland of Rajasthan." A detailed geographical introduction to Alwar district is provided here. Alwar district is located in the northeastern part of Rajasthan between 27°4' and 28°4' north latitude and 76°7' and 77°13' east longitude. Boundaries: Rewari and Mahendragarh districts of Haryana lie to the north, Bharatpur and Nuh (Mewat) districts of Haryana to the east, Dausa to the south, and Jaipur to the west. Area: The total area of the district is approximately 8,380 square kilometers. Administrative overview: It falls under the Jaipur division and is an important part of the National Capital Region (NCR). Alwar has a semi-arid climate. Summers: Summers are very hot here, with temperatures reaching up to 45°C. 'Loo' (loo) prevails in the months of May and June. Winter: Winters are pleasant, but temperatures sometimes drop to 2°C to 5°C. Rainfall: The average annual rainfall is approximately 600 mm to 700 mm. Most rainfall occurs during the monsoon (July to September). Alwar has no perennial rivers. Its rivers are primarily rain-fed: Sabi River: The largest river in the district, originating in the Sewar Hills (Jaipur). Ruparel River: Also known as the Varaha River, originates in the Udaynath Hills in Thanagazi. Chuhadasidh: Another local stream. Lakes and Dams: Siliserh Lake (known as the Nandan Kanan of Rajasthan), Jaisamand Dam, and Vijay Sagar are major water sources.



**Objectives:**

1. To conduct a geographical study of drinking water supply in Alwar district.
2. To conduct a geographical analysis of groundwater levels and quality in Alwar district.

**Hypothesis:**

1. The drinking water crisis in Alwar district is worsening due to the continuous decline in groundwater levels and rainfall.

**Data Sources**

Data on the groundwater level and drinking water supply situation in Alwar district is based on information received from the Water Resources Department.

**Current Drinking Water Situation:**

Hand pumps and wells have dried up in many villages and towns in Alwar district. Groundwater levels are falling by approximately 0.5 to 1 meter per year. In many places, water is available only at depths of 80 to 120 meters. Fluoride and salinity are problems in the available water, affecting water quality. Drinking water supply in rural areas of Alwar district often depends on tankers and tube wells. Thus, the drinking water situation in Alwar is facing not only water shortages but also deteriorating water quality. Sustainable water management, rainwater harvesting, water conservation, and the development of alternative sources are considered the main solutions to address this crisis.

**Groundwater Level Status**

Alwar is one of the districts most affected by the groundwater crisis. In many places, water is available only at a depth of 80–120 meters. A decline of 0.5 to 1 meter is being recorded every year. The situation is particularly dire in industrial and urban areas like Behror, Tijara, Neemrana, and Rajgarh.

**Reasons:**

1. Low rainfall – The average rainfall is ~650 mm, which is insufficient.
2. Rapidly growing population and industries – Water consumption is increasing.
3. Indiscriminate exploitation of groundwater – The number of tube wells and hand pumps is very high.
4. Disappearance of traditional water sources – Old stepwells, ponds, and johads have dried up or been encroached upon.

**Surface Water**

Alwar does not have any major permanent rivers. Rivers like the Sabi, Ruparel, and Chandrabhaga flow only during the rainy season.

**Lakes and Ponds:**

Jaisamand Lake – An artificial lake, a source of irrigation and drinking water.

**Situation in Rural Areas**

About 80% of the population lives in rural areas. Main sources of water: hand pumps, wells, and tube wells.

Problem: Many hand pumps and wells have dried up. Women and children are forced to fetch water from 2–5 kilometers away. Fluoride and salty water are a problem in many villages, leading to bone and dental diseases (fluorosis).

**Situation in Urban Areas**

PHED (Public Health Engineering Department) supplies water to Alwar city, Behror, Neemrana, and other towns. However, the supply is limited and irregular (sometimes once every 2–3 days).

During summer, dependence on tankers increases significantly. In industrial areas (such as Neemrana), factories have further increased groundwater pressure.

**Water Quality Problems**

Fluoride – Many villages have high fluoride levels (exceeding WHO standards).

Nitrate Pollution – Excessive use of fertilizers and chemicals in agriculture.

Salinity – The water has become saline, making it unsuitable for drinking. This is increasing the risk of kidney stones, bone diseases, and tooth decay among rural populations.



**Picture:- 1 The water level of the artificial Jaisamand Lake in Alwar is decreasing day by day.**



Picture:- 2 Decreasing water level Picture:- 3 Increasing problem

**Alwar's Groundwater Level: Detailed Description**

Alwar district is located between the Aravalli mountain range and the plains. Rainfall here averages 650 mm, but rainfall is uneven and short-lived. Irrigation and drinking water needs are entirely dependent on groundwater.

**Current Situation**

On average, groundwater is found at a depth of 60–120 meters. A decline of 15–30 meters has been recorded over the last 20–25 years. Most parts of the district have fallen into the 'Dark Zone' (over-exploited).

**Block-wise Situation**

**Tijara and Behror** – the most stressed areas, water available at a depth of 100–120 meters.

**Neemrana** – Groundwater pressure due to industrial activities, average depth of 90–110 meters.

**Rajgarh** – also experiencing a decline of 80–100 meters.

**Alwar city and surrounding areas** – average 60–80 meters.

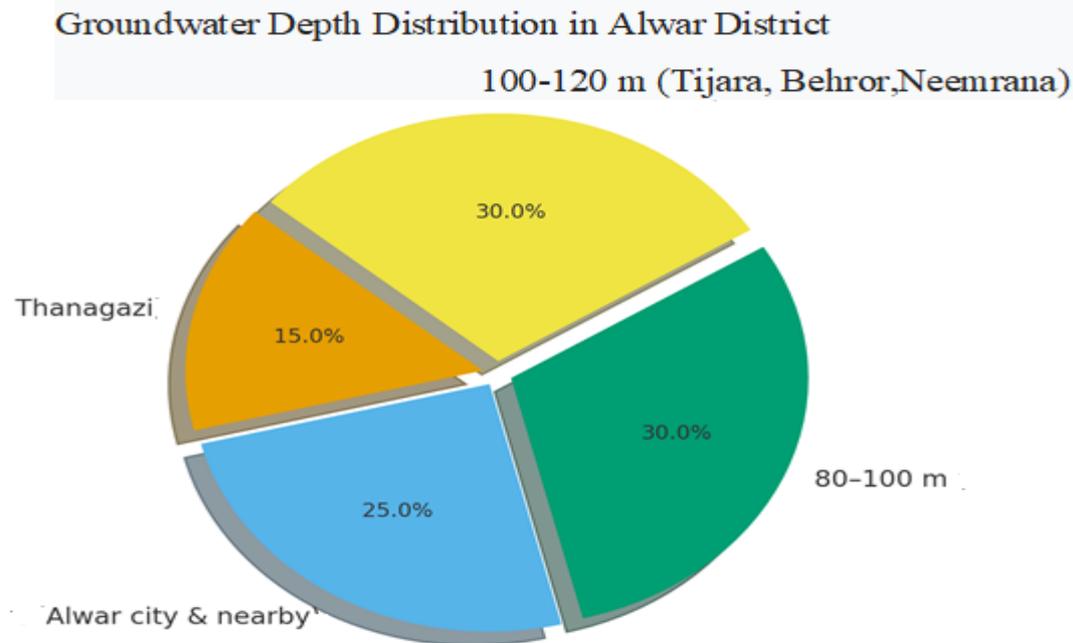
Blocks near the Aravalli (Lakshmanagarh, Thanagazi) – relatively better, with water available at 40–60 meters.

**Table 1: Groundwater Levels for Alwar District (Table)**

The table below shows data in a pie chart, showing the average groundwater depth and percentage (%) for different areas.

Groundwater depth (meters)	(%)
40–60 m (Laxmangarh & Thanagazi)	15
60–80 m ( Alwar City)	25
80–100 m (Rajgarh)	30
100–120 m (Tijara, Bahrer Neemrana)	30

◆ Groundwater depth in Alwar district



**Rate of Depletion**

Groundwater levels are falling by 0.5 to 1 meter every year. While water was available at 20–30 meters in 1980, today it is available at 80–100 meters.

**Causes of Depletion**

1. Overexploitation – Agriculture, industry, and domestic use all depend on groundwater.
2. Uneven distribution of rainfall – dependence solely on the monsoon.
3. Lack of recharge – Traditional ponds, johads, and stepwells are destroyed or neglected.
4. Industrial areas (Behror–Neemrana) – factories exploit large quantities of water.

**Drinking Water Sources – Primary Types**

Drinking water supply in Alwar comes from the following sources:

1. Groundwater (tubewells, borewells, buried wells)
2. Subsurface sources/local water storage (ponds, johads, dams, lakes, etc.)
3. High-level water projects/link pipelines (water imported from distant sources)

◆ **Alwar's Water Supply System**

**Main Sources**

**Alwar district's water supply is based on three major sources:**

Groundwater: Tubewells, borewells, and hand pumps are the main sources. Approximately 70–80% of people in rural areas depend on this source. Even in urban areas (Alwar City, Behror, and Neemrana), the majority of PHED (Public Health Engineering Department) supplies come from groundwater.

Surface Water: Jaisamand Lake, Siliserh Lake, ponds, and small dams provide partial supply to both urban and rural areas.

Rainwater rivers (Sabi, Ruparel, and Banganga) provide water for a period during the rainy season.

**Imported / Project-based Water**

Alwar will receive additional water supply in the future through the Isarda Dam Project and the ERCP (Eastern Rajasthan Canal Project).

Ram Jal Setu Yojana – A plan to bring water from remote sources by 2039.

**Rural Water Supply**

Sources: Hand pumps, tube wells, wells, small ponds.

**Problems:**

- Many hand pumps have dried up.
- In many villages, the water is saline or fluoride-containing.
- Women and children have to fetch water from 2–5 km away.

**Urban Water Supply**

**Management: PHED (Public Health Engineering Department).**

System:- Tube well/lake water is treated at pumping stations and then piped to homes. Supply is often limited and irregular – sometimes water comes once every 2–3 days.

**Summer:**

- Water demand increases.
- Heavy dependence on tankers increases.

**Industrial areas (e.g., Neemrana, Behror):**

Factories draw groundwater extensively, putting pressure on domestic water supplies.

**Challenges**

1. Continuous decline in groundwater levels.
2. Water quality issues (fluoride, nitrate, salinity).
3. Pressure from growing population and industries in urban areas.
4. Old pipeline network and leakage problems.
5. Irregular supply (once every 2–3 days).

Current drinking water quality in Alwar district

Alwar district is a region in Rajasthan where both the quality and availability of drinking water are a serious concern.

**Main water quality issues**

- 1. Excessive fluoride:** In many blocks of Alwar (such as Kishangarhbas, Behror, Neemrana, Tijara, and Laxmangarh), fluoride levels in groundwater are found to be higher than the standard. This leads to diseases like dental fluorosis and skeletal fluorosis.
- 2. Nitrate pollution:** Mixing of chemical fertilizers and sewage has increased nitrate levels in groundwater. This can cause diseases like blue baby syndrome.
- 3. Saltwater Problem:** In some areas, the TDS (Total Dissolved Solids) of water is very high, making it salty and undrinkable. This increases the risk of kidney disease and digestive problems.
- 4. Heavy Metals:** Groundwater in industrial areas (Neemrana, Bhiwadi, and Behror) has been found to contain exceeding standard levels of metals such as lead, arsenic, iron, and manganese.

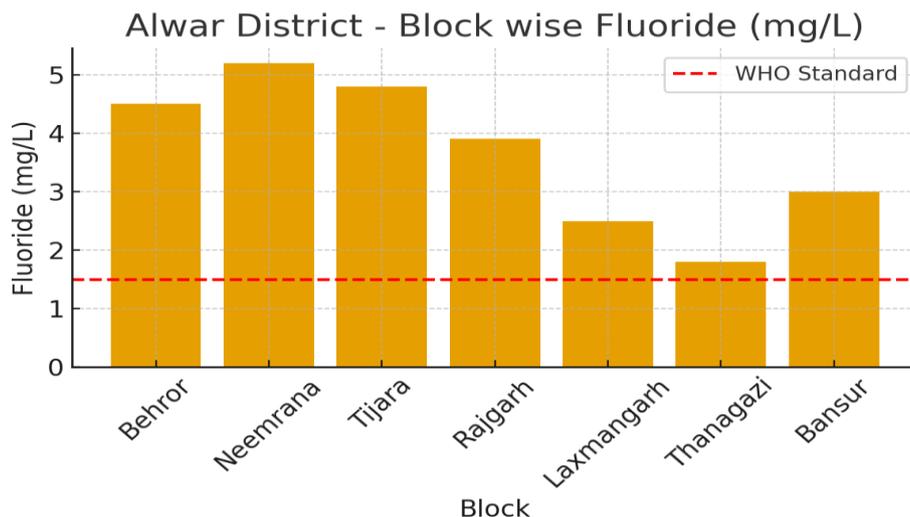
This water poses long-term health risks.

◆ **Table 2: Block-wise drinking water quality in Alwar district**

Block	Fluoride (mg/L)	Nitrate (mg/L)	TDS (mg/L)
Behror	4.5	180	3200
Neemrana	5.2	200	3500
Tijara	4.8	150	3100
Rajgarh	3.9	120	2800
Laxmangarh	2.5	220	1800
Thanagazi	1.8	160	1500
Bansur	3.0	140	2000

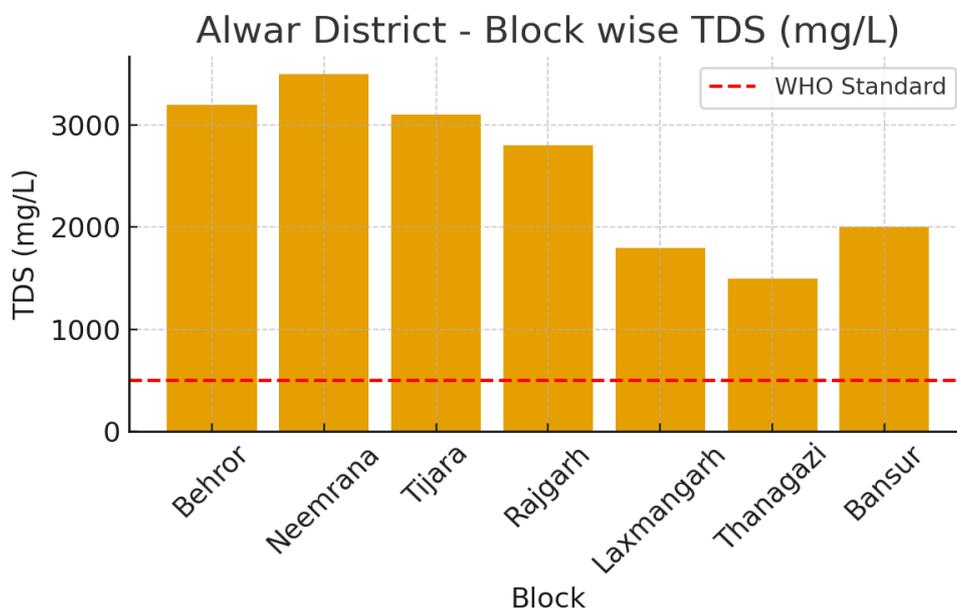
Block wise drinking water quality chart in Alwar district

Fluoride (mg/L)



Nitrate (mg/L)

TDS (mg/L)



Steps for Improvement

- Installing RO and Fluoride Removal Plants
- Promoting Rainwater Harvesting
- Making Industrial Wastewater Treatment Mandatory
- Community-Level Water Testing Campaigns
- Government and Community Initiatives

**1. Government Schemes:**

- Atal Groundwater Scheme
- Rajiv Gandhi Water Mission
- Tubewell Digging and Pipeline Expansion

**2. Water Conservation Works:**

- Check Dams, Stop Dams, Pond Deepening

- Promoting Rainwater Harvesting

## II. Conclusion

If water exploitation continues at this rate, groundwater is likely to be completely depleted. Recycling and treatment must be made mandatory in industrial areas. Rainwater harvesting must be implemented on a large scale in villages. Alternative sources of drinking water (such as supply from Rajasthan canals/dams) are needed. The drinking water situation in Alwar district is extremely worrying: groundwater levels are rapidly declining. Rural areas are forced to drink saline and fluoride-contaminated water. Urban areas are dependent on tankers and limited supplies. If water conservation and alternative water management are not implemented in time, the drinking water crisis in Alwar will become even more severe in the future.

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