Water Scarcity in Indian Villages

A Survey of The Magnitude of Water-Related Problems in Indian Villages and Its Effect on Rural Life

Introduction:

Water stress in rural India is a multidimensional challenge which impacts on human survival, economic development, and environmental sustainability. This article aims at finding out the magnitude and impacts of water-related stress in four diverse districts— Solan (Himachal Pradesh), Thiruvananthapuram (Kerala), Raichur (Karnataka), and Bikaner (Rajasthan)— to understand the regional disparities in availability, accessibility, and quality of water. Drawing upon micro-level surveys and recent data, this article highlights the urgent need for integrated and combined methods to mitigate water stress on a long term basis. Rapid population growth, unruly groundwater extraction, erratic rainfall patterns, and inadequate water management systems have compounded the challenge. Water scarcity is not merely a matter of availability but encompasses accessibility, quality, and equity of distribution. It affects health, educational attainment, agricultural productivity, and ultimately the overall quality of rural life. This article focuses on:

- Magnitude of water stress in selected districts
- Impact on rural life, with emphasis on women and children
- Complementarities of water with hygiene, education, and agriculture
- Policy recommendations for mitigation

Methodology:

This article is based on secondary surveys conducted in **four districts**, selected for their diverse physiographic and socio-economic characteristics:

District	State	Key Features
Solan	Himachal Pradesh	Hilly terrain, moderate population density, dependent on springs and khads
Thiruvananthapuram	Kerala	Coastal region, high rainfall but saltwater intrusion issues
Raichur	Karnataka	Semi-arid, frequent droughts, poor water infrastructure
Bikaner	Rajasthan	Arid desert region, critically low groundwater

Source: TERI, UNFPA, Jal Jeevan Mission, and NITI Aayog, EPW issues from time to time starting from September 13, 2003.

Findings and Analysis:

(A) Solan District

Solan district, located in Himachal Pradesh, represents a hilly terrain with moderate population density. The survey focused on Solan tehsil, which had a higher rural population density (300 persons/sq km) (Census 2011). The region depends heavily on natural springs and surface water bodies, with agriculture and households competing for limited water resources.

Four major sources of water were identified in Solan villages:

Source	Description
Tap Water	Piped water supply from khads or springs
Bawdi	Natural spring water reservoirs
Khad	Surface streams, also used for bathing and livestock
Handpumps	Installed in some villages for drinking and domestic use

Normal Water Quality Results in Selected Villages in Solan:

Village	Source Type	pH	Turbidity (NTU)	Chloride (mg/l)	Fluoride (mg/l)	Coliform Bacteria Presence	Key Observations
Panshora	Tap & Khad	~7.5	<10	~56.64	0.6–1.5	Present	Water chemically safe; coliform indicates contamination from poor sanitation. School timings were adjusted for water collection.
Deothi	Handpump	~7	<10	Moderate	~1.0	Present	Saline taste reported; bacterial contamination detected.
Madhala	Handpump	~7.5	<10	Moderate	~1.0	Present	Rusty water from handpump, presence of coliform bacteria.
Nalhog	Khad	8.5	<10	88.62	0.6–1.5	Present	Foul smell reported in khad water; bacterial contamination confirmed.
Shatal	Tap & Other	~7	<10	Within limit	~1.0	Present	Diarrhoea cases common; villagers unaware of linkage with water quality.

Permissible Limits (Bureau of Indian Standards of Drinking Water)

- **pH:** 6.5 – 8.5
- **Turbidity:** <10 NTU
- **Chloride:** 250 – 1000 mg/l
- **Fluoride:** 0.6 – 1.2 mg/l
- **Coliform Bacteria:** Should be **absent**

Water Availability and Accessibility

- Average per capita water consumption: ~8.5 litres/day (survey 2001).
- Collection burden: Women and children spent 3–4 hours daily fetching water, often making multiple trips for drinking and household uses.
- Distance travelled: During summer shortages (April–June), villagers walked 0.5–2 km extra to collect water.
- Impact on education: In Panshora village, school timings were changed to allow children to collect water in the morning.

Health Impacts

- Common diseases: Diarrhoea (especially during monsoon), fever, jaundice, cholera, vomiting.
- Survey data: Among 103 households surveyed, 32 reported diarrhoea (mostly children), and 15 reported tooth and bone problems (linked to water quality).
- Villagers' perception: They did not associate these illnesses with water quality, except in severe diarrhoea cases.

(B) Thiruvananthapuram District

Thiruvananthapuram district, located in the southern coastal region of Kerala, generally receives **abundant rainfall spread over 9–10 months a year**, ensuring better water availability compared to arid regions. However, **coastal areas face unique challenges like saltwater intrusion** into freshwater wells, affecting the quality and accessibility of drinking water.

Sources of Drinking Water:

Source	Description / Use
Open wells (private and common)	Main source for drinking and household use
Borewells	Supplementary source, especially in inland areas
Kerala Water Authority (KWA) piped supply	Used mainly for drinking; available fortnightly in some areas
Springs and ponds	Used for bathing, washing cattle, and in some cases drinking
Open wells (private and common)	Main source for drinking and household use

Water Quality Results: Selected Villages in Thiruvananthapuram, Kerala:

Village	Source Type	pH	Turbidity (NTU)	Chloride (mg/l)	Fluoride (mg/l)	Coliform Bacteria Presence	Key Observations
Karumkulam	Borewell	6	<10	127.62	<0.6	**Present**	High hardness due to saltwater intrusion; bacterial contamination found
Amboori	Pond	6	<10	248.15	<0.6	**Present**	Chemical parameters within limits but bacterial contamination detected

Source: TERI-UNFPA Study, Jal Jeevan Mission Dashboard, NITI Aayog CWMI Report

Permissible Limits (Bureau of Indian Standards of Drinking Water)

- **pH:** 6.5 – 8.5
- **Turbidity:** <10 NTU
- **Chloride:** 250 – 1000 mg/l
- **Fluoride:** 0.6 – 1.2 mg/l
- **Coliform Bacteria:** Should be **absent**

Water Availability and Accessibility

Average per capita water consumption:

- Karumkulam: ~25 litres/day
- Amboori: ~18 litres/day

Accessibility:

- 80% households had water sources within their compound or within 100 m.
- Coastal households in Karumkulam (15%) travelled 100–500 m inland to fetch potable water due to saltwater intrusion in wells.
- Seasonal shortage: Only reported during summer months, leading households to depend on alternative sources like common wells, springs, or ponds.

Health Impacts:

- Survey findings: Very few water-borne diseases reported.
- Reasons: Households practiced boiling water or using chlorine tablets, ensuring safety.
- Health records: Primary health centre and private doctors confirmed minimal water-related diseases.

(C) Raichur District

Raichur district, located in north-eastern Karnataka, is part of the **semi-arid Deccan plateau**, characterised by low and erratic rainfall, frequent droughts, and significant groundwater stress. The **Devadurga taluk** was selected for the survey due to its high-water scarcity and vulnerability indicators.

Sources of Drinking Water:

Source	Description / Use
Spring pits	Primary drinking water source for ~92% of households in both villages
Mini Water Supply Schemes (MWS)	Used by some households in Amarapura
Borewells	Main additional source in Tippaldinni
Open wells	Used for household and livestock needs, mainly in Amarapura

Water Quality Results: Selected Villages in Raichur

Village	Source Type	pH	Turbidity (NTU)	Fluoride (mg/l)	Coliform Bacteria Presence	Key Observations
Amarapura	Spring/ Open well	7-8	<10	0.6-1.5	**Present**	Water is turbid with visible insects, soil, and roots; villagers use sieving as purification. Poor sanitation around wells leads to bacterial contamination; used for household and livestock needs.
Tippaldinni	Borewell	7	<10	0.6–1.5	**Negative**	Chemically and bacteriologically safe; preferred source if functional.

Permissible Limits (Bureau of Indian Standards of Drinking Water)

- **pH:** 6.5 – 8.5
- **Turbidity:** <10 NTU
- **Chloride:** 250 – 1000 mg/l
- **Fluoride:** 0.6 – 1.2 mg/l
- **Coliform Bacteria:** Should be **absent**

Water Availability and Accessibility

Average per capita water consumption: ~12 litres/day, far below WHO recommended minimum of 40-50 litres/day.

Distance travelled:

- **Amarapura:** ~330 metres per trip
- **Tippaldinni:** ~900 metres per trip

Health Impacts:

- 70% of children in the surveyed households suffered gastrointestinal diseases (diarrhoea, jaundice) over the past year.
- Scabies and skin infections reported from use of contaminated water.
- Bone/joint pain in elderly and dental fluorosis were also noted.
- Health access is poor: the nearest Primary Health Centre is 6–10 km away.

(D) Bikaner District

Bikaner district, located in the **Thar desert region** of northwestern Rajasthan, is one of the **most water-scarce areas in India**. With **low rainfall (annual average ~260 mm)**, extreme temperatures, and poor natural recharge, Bikaner faces **chronic water shortages**. Groundwater levels are dangerously low, and much of the water is brackish or chemically unsafe for consumption. This survey focuses on four water-stressed villages in Bikaner district: Gajsukhdesar, Maiyasar, Bagseu, and Mainsar.

Sources of Drinking Water:

Source	Description / Use
Tubewells and handpumps	Main drinking sources in all four villages
Tanker supply	Common during summer, especially in remote hamlets
Rainwater harvesting tanks	Used where available, but often dry by late summer
Household storage	Essential due to irregular supply

Water Availability and Accessibility

- **Per capita availability:** Often **<20 litres/day**, significantly below the WHO minimum standard
- **Distance walked:** Women walked up to **1–2 km daily** to fetch water in summer months
- **Time spent collecting water: 3–5 hours per day**, especially during April–June
- **Tanker dependency:** In some hamlets, tankers were **the only source**, with **3–4 days** gap between deliveries.

Water Quality Results: Selected Villages in Bikaner

Village	Source Type	Fluoride (mg/l)	TDS / Salinity	Coliform Bacteria Presence	Key Observations
Gajsukhdesar	Handpump	**>1.5 (exceeds limit)**	High	**Present**	Dental fluorosis reported
Maiyasar	Tubewell	**1.2–1.8**	High	**Present**	Bitter taste; foul odour present
Bagseu	Handpump	~1.0	Very High	**Present**	Saline water unsuitable for children
Mainsar	Tanker/Stored	Not tested	N/A	**Uncertain**	Source depends on urban supply; quality varies

Permissible Limits (Bureau of Indian Standards of Drinking Water)

Fluoride: 0.6-1.2 mg/l

TDS: <500 mg/l desirable, <2000 mg/l Permissible

Coliform Bacteria: Should be absent

Health Impacts:

- **Dental fluorosis:** Observed in over 25% of children across the villages.
- **Bone/joint pain**: Reported among elderly due to long-term fluoride exposure
- **Gastrointestinal diseases**: Diarrhoea, jaundice, and vomiting common due to bacterial contamination
- **Malnutrition risk:** Increased due to poor water quality and reduced dietary intake during illness

Conclusion:

The study of water crisis across four diverse districts—Solan, Thiruvananthapuram, Raichur, and Bikaner—highlights the regional variations in water availability, accessibility, and quality that profoundly affect rural life in India. Despite differences in geography and climate, common challenges emerged: unsafe water quality, seasonal shortages, and a heavy burden on women and children for water collection.

While states like Kerala and Himachal Pradesh benefit from relatively better rainfall and infrastructure, they still face microbial contamination and accessibility issues. In contrast, semi-arid and desert regions like Raichur and Bikaner suffer from extreme scarcity, chemical contamination (especially fluoride), and weak institutional support.

The findings underscore that water stress is not merely a resource problem but a public health, gender, and development issue. Addressing it requires integrated solutions—

expanding safe water access, improving sanitation, enhancing community awareness, and fostering local participation in water governance.

Ultimately, mitigating water stress in rural India demands a people-centric, region-specific, and sustainable approach, aligning with the goals of the Jal Jeevan Mission and the broader vision of water security for all.

Thank You