



## **Water Scarcity and Its Social Impact: A Case Study of Maharashtra and India**

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### **Abstract**

*Water scarcity is an urgent and complex challenge for India — one that is increasingly shaping livelihoods, health, gender relations, migration patterns, and governance. This paper reviews the drivers of water scarcity at national and state (Maharashtra) levels, documents the social impacts (with emphasis on rural agrarian distress, urban supply inequities, health and sanitation, gendered burdens, and socio-political tensions), evaluates current policy responses and community-level adaptations, and proposes evidence-based recommendations. The analysis uses national assessments (per-capita water availability and groundwater reports), government programs, academic literature, and recent media and official data on Maharashtra's drought-affected regions (Vidarbha, Marathwada) and urban systems (Mumbai–Pune region). Key findings: India is in the 'water-stressed' to 'scarcity' range by per-capita supply metrics; Maharashtra exhibits acute spatial disparity (urban resilience in Mumbai vs chronic rural shortages in Vidarbha and Marathwada); social consequences are profound and multifaceted; and policy responses exist but require better integration, local grounding, and focus on demand-management, groundwater governance, and social equity.*

**Keywords:** *Water scarcity, Water stress, Groundwater depletion, Maharashtra, Marathwada, Vidarbha, Drought, Agriculture, Farmer distress, Migration, Gender inequality, Water governance.*

### **1. Introduction**

Water underpins food security, public health, energy production, and socio-economic stability. Although India holds a significant share of the world's renewable water resources, its large and growing population, uneven rainfall, overextraction of groundwater, poor infrastructure, and pollution create chronic and seasonal shortages.

Maharashtra — a large and economically important state — encapsulates India's water paradox: water-rich urban centers like Mumbai can experience relative supply security, while large swathes of rural Maharashtra face repeated droughts and acute shortages, often prompting relief measures like tanker deliveries and crop losses.

The social fallout includes farmer indebtedness and suicides, women's disproportionate labour burden, rural–urban migration, and tensions over resource allocation. This paper synthesizes evidence to understand causes, impacts, and policy implications.

### **2. Methods and Sources**

This is a narrative literature synthesis drawing on:

(a) official national assessments (Central Water Commission / PIB on per-capita availability; NITI Aayog's Composite Water Management Index),

- (b) groundwater and water quality reports by the Central Ground Water Board (CGWB),
- (c) peer-reviewed literature on agrarian distress in Maharashtra,
- (d) high-quality news and government reporting on drought and urban supply in Maharashtra (water tanker statistics, reservoir levels), and
- (e) policy documents and government program descriptions (Jal Jeevan Mission, AMRUT 2.0, and state drought programs).

Where possible, the most recent public data up to 2024–2025 were prioritized. The paper integrates quantitative indicators (storage levels, per-capita availability, tanker numbers) with qualitative studies on social impacts.

### **3. Water Scarcity in India: Magnitude and Drivers**

#### **3.1 Magnitude: Per-capita Availability and Groundwater Trends**

India's average annual per-capita water availability has been reassessed as approximately 1,486 cubic meters for 2021 and is projected to decline further (e.g., to ~1,367 by 2031), placing the country in the 'water-stressed' category (threshold: 1,700 m<sup>3</sup>/person/year), and moving toward scarcity if trends continue.

These national averages mask vast regional variation: some basins are water surplus, while many northern and peninsular regions are overexploited. Groundwater — the nation's primary source for irrigation and drinking water — has been declining in several regions, with dynamic groundwater resource assessments showing worrying depletion and quality concerns in parts of the country.

#### **3.2 Drivers of Scarcity**

Key drivers combine natural variability with anthropogenic pressures:

- Population growth and urbanization increasing absolute demand and concentrating needs in cities.
- Agricultural patterns that favour water-intensive crops (rice, sugarcane, some cash crops) in water-deficit zones without commensurate irrigation efficiency.
- Overextraction of groundwater driven by subsidized electricity and the inability of many smallholders to access reliable surface supplies.
- Inefficient water use and distribution losses in urban piped systems and agricultural conveyance.
- Climate variability and changing monsoon patterns, which increase drought frequency and intensity, and alter seasonal water availability.
- Pollution and degradation of freshwater bodies, reducing usable supplies.

Collectively, these drivers create a socio-hydrological gap between available resources and socially required, accessible water.

### **4. Maharashtra: Patterns of Scarcity and Vulnerability**

Maharashtra is geographically diverse: the fertile Western Ghats and Konkan coast, the industrialized urban corridors (Mumbai–Pune), and the relatively arid interior regions (Vidarbha and Marathwada). This heterogeneity shapes water risk.

#### **4.1 Rural Distress: Vidarbha and Marathwada**

Vidarbha and Marathwada experience recurrent droughts, falling reservoir levels, and extensive reliance on groundwater. Recent reporting shows dam levels in several eastern districts at critically low percentages and large deployments of water tankers to meet drinking water needs.

Tankers rise from hundreds to thousands in drought years, reflecting acute supply failures in rural habitations. These shortages impact cropping choices, irrigation availability, and livelihoods, and intensify agrarian distress in cotton- and rainfed-crop belts.

#### **4.2 Urban Dynamics: Mumbai and Pune**

Mega-cities present a contrasting picture: Mumbai has historically relied on seven lakes and inter-basin transfers to maintain supply; reservoir storage and careful operational management can temporarily deliver relative security, but distribution losses and inequitable supply (slum areas facing shortfalls) persist. In some years, Mumbai has faced mandated cuts or water-saving measures; in other seasons, reservoirs have recovered rapidly after monsoon rains.

This urban variability underscores that city-level supply security is contingent on catchment rainfall, upstream management, and distribution efficiency.

#### **4.3 Socio-Spatial Inequity**

Maharashtra exemplifies an inequitable water geography: relatively secure urban populations with infrastructure and political voice versus rural, smallholder communities dependent on uncertain rainfall and overused groundwater — leading to starkly different social outcomes when droughts strike.

#### **5. Social Impacts of Water Scarcity**

Water scarcity cascades into multiple social domains. Below, we synthesize the major impacts with evidence from Maharashtra and broader India.

##### **5.1 Agrarian Livelihoods, Indebtedness, and Farmer Suicides**

Reduced irrigation, crop failures, and falling incomes push farmers into debt. Maharashtra's Vidarbha region has been central in studies linking crop failure, indebtedness, and a high incidence of farmer suicides.

While farmer suicide is a complex phenomenon with multiple causes (socioeconomic, mental health, market failures), lack of reliable water — leading to crop failure and economic collapse — is a proximate and exacerbating factor in many cases documented in the literature.

Recent state responses focus on drought relief, loan waivers, and schemes to improve agronomic practices, but structural water solutions remain inadequate for many smallholders.

##### **5.2 Gendered Burden and Household Resilience**

In rural areas, water scarcity intensifies women's unpaid labour: fetching water, managing domestic shortages, and coping with reduced sanitation. This time poverty reduces opportunities for schooling, income generation, and civic participation.

Women also carry the health burden when water-borne disease incidence rises after water quality falls or sanitation is compromised. Gendered vulnerabilities combine with caste and class hierarchies — marginalized households are less able to access private borewells or purchase tanker water.

Multiple studies and media reports document these disproportionate burdens in drought-affected regions.

##### **5.3 Health, Sanitation, and Disease**

Intermittent supply and dependence on surface or untreated sources can increase water-borne diseases (diarrhoea, cholera risk during outbreaks) and impede hygiene practices.

In peri-urban and informal settlements, limited piped supply forces households to rely on contaminated sources, with negative health outcomes especially for children. National surveillance data and public health literature link water insecurity to higher incidence of gastrointestinal diseases and malnutrition in children, although the local burden varies with sanitation, season, and service reliability.

##### **5.4 Migration and Social Disruption**

Seasonal and distress migration is a documented coping mechanism: agricultural labourers and smallholder families migrate to towns for work when local water-dependent livelihoods fail.

Migration can be temporary (seasonal) or longer term, breaking social networks and altering rural demographics. In Maharashtra, drought years have prompted increased movement toward peri-urban centers and construction work, but migrants often land in precarious jobs with inadequate services.

Migration can mask agricultural distress in aggregated statistics while producing urban infrastructure and governance challenges.

### **5.5 Conflict, Governance, and Resource Allocation Tensions**

Scarcity raises competition between sectors (agriculture versus industry versus urban supply), between upstream and downstream users, and between states in inter-basin transfers.

Local conflicts over water points, tanker distribution, and access to tubewells are common during acute shortages. Governance failures — unclear groundwater rights, fractured institutional responsibilities, and political short-termism — amplify tensions.

Maharashtra's mobilization of thousands of tankers in drought periods is symptomatic of reactive governance rather than integrated resource management.

## **6. Policy Responses and Their Effectiveness**

India and Maharashtra have multiple programs addressing water supply, demand management, and infrastructure — but with mixed integration and uneven outcomes.

### **6.1 National programs: Jal Jeevan Mission, AMRUT 2.0, CWMI and beyond**

The Government of India has launched large programs to improve household tap connections (Jal Jeevan Mission), urban water security (AMRUT 2.0 with a focus on sewage reuse and lake rejuvenation), and performance tracking (NITI Aayog's Composite Water Management Index) to incentivize state action. These programs emphasize infrastructure, service delivery, and some elements of demand management. Their success depends on local capacities, monitoring, and complementary measures such as groundwater governance and agricultural reform.

### **6.2 State-level measures in Maharashtra**

Maharashtra has launched state drought relief programs, agricultural assistance (e.g., Nanaji Deshmukh Krishi Sanjivani Yojana), and ad hoc tanker deployments. While these measures provide emergency relief and some medium-term support, critics argue that they fail to address the root causes (fragmented water harvesting, poor watershed management, and poor enforcement of groundwater regulation). Emergency tanker provisioning, though politically necessary, is an expensive and unsustainable response if not combined with demand reduction and source recharge strategies.

### **6.3 Institutional gaps and governance challenges**

Fragmented authority: multiple agencies (state irrigation departments, municipal corporations, panchayats, basin authorities) have overlapping roles.

Data gaps: groundwater monitoring and reliable localized water accounting remain limited despite CGWB reports.

Incentive misalignment: subsidies on electricity for pumping encourage extraction; cropping incentives do not always align with water availability.

Equity blind spots: programs often fail to prioritize the poorest and socially marginalized, exacerbating unequal outcomes.

NITI Aayog's CWMI aims to bring performance pressure but requires resourcing and political will for more structural reforms.

## **7. Community and Technological Adaptations**

Despite structural challenges, communities and technologists have developed adaptive measures:

### **7.1 Water harvesting and recharge**

Traditional and modern rainwater harvesting, check dams, percolation tanks, and watershed interventions can significantly raise local water security when implemented at scale. Maharashtra has pockets where watershed programs and community tanks have improved recharge and reduced drought impacts, but scaling remains uneven.

### **7.2 Irrigation efficiency and crop diversification**

Micro-irrigation (drip and sprinkler systems) reduces water use per unit crop; shifting cropping patterns toward less-water-intensive crops in arid districts helps reduce pressure. Subsidies for micro-irrigation and extension support are necessary to encourage adoption among smallholders.

### **7.3 Urban demand management and leak reduction**

Cities can save substantial volumes by addressing distribution losses, implementing differential pricing, promoting rooftop rainwater harvesting, and reusing treated wastewater for non-potable uses. Mumbai's experience shows how reservoir operations can secure supply in the short term, but leakages and inequitable delivery need more attention.

### **7.4 Social innovations and cooperatives**

Community water user associations, cooperative management of local tanks, and stakeholder forums that mediate between farmers, municipalities, and officials have shown localized successes, particularly when combined with technical support and transparent water accounting.

## **8. Discussion: Linking Biophysical Scarcity to Social Outcomes**

The Indian and Maharashtra cases show that water scarcity is not merely a hydrological problem but a socio-economic and governance challenge. A handful of reflections:

1. Heterogeneity matters: Aggregated national indicators (per-capita availability) are useful for framing urgency but obscure intra-state inequities — Maharashtra's contrasting urban/rural outcomes are instructive.
2. Groundwater is both solution and risk: It cushions shortages but its unregulated extraction generates long-term vulnerability. Groundwater governance (metering, community rights, regulating power subsidies) is central.
3. Social dimensions amplify impacts: Gendered labour burdens, indebtedness, and migration create feedback loops that entrench poverty in water-stressed areas. Interventions must therefore be socially informed, not only technical.
4. Policy fragmentation reduces efficacy: Programs addressing supply (treatment plants, pipelines) must link with demand management (pricing, efficiency) and ecological measures (recharge, pollution control). NITI Aayog's CWMI provides one comparative tool but needs to be operationalized into local governance reforms.
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## **9. Recommendations**

To reduce water scarcity and its social harms in Maharashtra and India, an integrated, equity-focused approach is required. Key policy and operational recommendations follow:

### **9.1 Strengthen groundwater governance**

Implement transparent groundwater monitoring (expand CGWB networks), public dashboards, and local water accounting.

Phase out perverse electricity subsidies for pumping (or link them to metered, time-limited supply) to reduce overextraction.

Legal recognition and support for community groundwater institutions in critical regions.

### **9.2 Invest in recharge and catchment restoration at scale**

Prioritize watershed programs, check dams, and urban green infrastructure that increase infiltration and reduce runoff.

Incentivize public-private and community partnerships for large-scale recharge in drought-prone districts (Vidarbha, Marathwada).

### **9.3 Reorient agriculture toward water sustainability**

Promote micro-irrigation with targeted subsidies for smallholders and ensure access to credit for capital goods.

Encourage crop diversification and adjust procurement/pricing policies to reduce incentives for water-intensive crops in water-scarce zones.

Strengthen extension services and insurance mechanisms that reduce distress.

### **9.4 Urban efficiency, equity and reuse**

Prioritize loss reduction (non-revenue water), progressive pricing for excess domestic and commercial use, and targeted subsidies for poor households.

Scale wastewater treatment and reuse for industrial and landscape uses; mandate rooftop rainwater harvesting in urban permits.

### **9.5 Social protection and livelihood diversification**

Design drought-linked social protection (cash transfers, employment under MGNREGA for water conservation works) to buffer immediate distress and reduce forced distress migration.

Strengthen mental health and debt-relief counselling services for farmers in high-stress regions.

### **9.6 Institutional integration and data transparency**

Create basin-level coordination authorities with real decision-making power across sectors and jurisdictions.

Publish timely data on reservoir levels, tanker distributions, and groundwater status to enable civil society oversight and early action. CWMI or a successor should incentivize outcomes and disaggregate indicators to capture intra-state inequity.

## **10. Conclusion**

Water scarcity in India is a multi-dimensional crisis with strong geographical and social fault lines. Maharashtra's dual experience — urban water infrastructure that is resilient at times, and rural regions repeatedly pushed into crisis — makes visible the social costs of inadequate water governance. Addressing scarcity requires technical fixes (recharge, irrigation efficiency, wastewater reuse) and governance reforms (groundwater management, incentive realignment, integrated basin planning). Crucially, social equity must be central: interventions must prioritize the poor, women, and socially marginalized groups who bear the brunt of shortages. With climate variability likely to increase hydrological uncertainty, the time for integrated, scalable, and socially-attuned water policy is now.

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