SYNTHESIS REPORT

PLANNING FOR INDIA'S RURAL DRINKING WATER IN THE JAL JEEVAN MISSION ERA

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Dr. Vivek led the report planning and compilation, with inputs from Dr. Veena Srinivasan, Mr. Raman VR, Mr. Adarsh Dalavi, and Dr. Susan Varughese. Mr. Partik Kumar drafted the water resources management section; Ms. Anjali Neelakantan the Karnataka case study; Ms. Mukta Deodhar the Maharashtra case study; Dr. Ashish Kumar the Bihar case study; and Ms. Abriti Moktan and Dr. Sarala Khaling the Sikkim case study. Mr. Adarsh Dalavi created the state institutional maps for Karnataka, Maharashtra, and Bihar; and Ms. Abriti Moktan for Sikkim. Mr. Saad Ahmed and Ms. Kaavya Kumar edited and formatted the report. We thank Professor James L. Wescoat Jr. (Massachusetts Institute of Technology) and Dr. Daniel Smith (USAID) for their guidance, reviews, and edits.

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AQUAYA CONTACTS:
Ranjiv Khush, Project Director
ranjiv@aquaya.org

Jeff Albert, Deputy Project Director
jeff@aquaya.org

Dayna Hansberger, Senior Program and Operations Manager
dayna@aquaya.org

ABOUT THIS REPORT

This Synthesis Report, compiled as part of the Rural Evidence and Learning for Water (REAL-Water) program, provides an overview of the current state of planning for rural drinking water supply in India and in select states. We focus on drinking water planning and the barriers and enablers to achieve more holistic water resources planning. This is a critical component of the REAL-Water program's objective to support implementation research and thus inform the development of safe, equitable, and sustainable rural water supplies in low- and middle-income countries. This knowledge-building initiative contributes to the goals of USAID's Water and Development Plan, established under the US Government Global Water Strategy.

The REAL-WATER team at the Ashoka Trust for Research in Ecology and the Environment-Centre for Social and Environmental Innovation has carried out an extensive review of secondary literature, including government reports and policies, and academic research; carried out fieldwork; and conducted interviews. This report is a synthesis of our findings at multiple levels of observations that relate to the questions: 1) what is the current state of rural drinking water planning at multiple levels of governance; and 2) what holistic water resources planning issues arise in the practice of rural drinking water planning? The report focuses on water quantity-related issues. It does not go into water quality issues in detail due in part to data quantity and quality limitations.

GLOSSARY

Atal Bhujal Yojana	A Government of India program launched in 2019 that aims to improve groundwater management through a community-led, decentralized approach.
Accredited Social Health Activist	Commonly known by the acronym ASHA, they are community health workers.
Anganwadi Center	A maternity and childcare center that provides services such as health checkups, vaccinations, and pre-school education. A *Gram Panchayat* typically has several *Anganwadi* Centers.
Anganwadi Worker	An *Anganwadi* worker oversees the provision of welfare services at an *Anganwadi* Center.
Block	A block is an administrative unit comprising multiple (10s to 100s) of villages. A district consists of multiple blocks.
Crore	A crore equals 10 million.
District	Each state is divided into multiple districts for planning and implementation of government programs. The District Collector is responsible for revenue collection including canal revenue. The district government office, known as a *Zilla Panchayat* or *Zilla Parishad*, is led by a Chief Executive Officer.
Gram Sabha	A *gram sabha* is recognized under Article 243(b) of the Constitution of India as the primary body of the *Panchayati Raj*. It consists of all the members of the village and serves as a forum to discuss village-related governance and development.
Gram Sevak	An administrative officer at the *Gram Panchayat*-level appointed by the *Panchayat Raj* Department.
Gram Panchayat	Defined in Article 243 of the Constitution of India, it is the local unit of administration in the *Panchayati Raj* system of devolved governance. It comprises a single revenue village or a group of revenue villages.
Habitation	A habitation is a cluster of households in a revenue village or gram panchayat. It is "the smallest settlement for project planning purposes. A *Gram Panchayat* may include multiple villages, each of which may have multiple habitations" (Wescoat et al. 2019).
Har Ghar Jal	The phrase literally means water in every home. Under the *Jal Jeevan Mission*, the tag applies to *Gram Panchayats* where every household has a functional tap connection.
Implementation Support Agencies	Civil society organizations that mobilize and engage communities to plan, design, implement, operate, and maintain rural water supply infrastructure under the *Jal Jeevan Mission*.
Jal Chaupal	Community meetings to discuss water-related issues.
Jal Surakshak	Also known as "waterman,", it refers to the village resident overseeing water supply.
Jal Jeevan Hariyali Yojana	The Government of Bihar's program launched in 2019 to identify, rejuvenate, and conserve water bodies.
Jal Jeevan Mission	The Government of India's program launched in 2019 to provide functional piped drinking water supply to all households by 2024.
Journey Map	A journey map is a visualization of the process a person or organization undergoes to accomplish a goal.

Lakh	A lakh equals 100,000.
Lok Nirman Samiti	A committee at the *Gram Panchayat* level formed under the Bihar *Panchayat Raj* Act of 2006. It acts as a link between the ward-level Implementation and Management Committee and the block-level Implementation and Management Committee.
Mahatma Gandhi National Rural Employment Guarantee Act	A nation-wide program that guarantees 100 days of employment in every financial year to adult members of any Indian rural household.
Panchayati Raj institutions	The Constitution (73rd Amendment) Act, 1992 and Constitution (74th Amendment) Act, 1992 devolved powers and functions to *Panchayati Raj* institutions to promote local self-governance in India. It consists of a three-tier system: *Gram Panchayat* at the village level; *Block Panchayat* or *Panchayat Samiti* at the block (an administrative unit comprising many villages) level; and *Zilla Panchayat* or *Zilla Parishad* at the district level.
Panchayat Samiti	A *Panchayati Raj* institution at the intermediate block level, it oversees multiple *Gram Panchayats.*
Revenue Village	A revenue village is the main local government unit for taxation, census enumeration, and geographic information system (GIS) mapping.
Sarpanch	Also known as *mukhiya* or *gram pradhan*, it refers to the elected head of a *Gram Pranchayat.*
Scheduled Caste	The Constitution of India has designated certain marginalized castes as Scheduled Caste. The Government of India and states have affirmative action policies to benefit these groups.
Scheduled Tribe	The Constitution of India has designated certain Indigenous communities as Scheduled Caste. The Government of India and states have affirmative action policies to benefit these communities.
Village Water & Sanitation Committee	A *Gram Panchayat*-level institution comprising community members that plan, implement, and maintain rural water supply and sanitation infrastructure.
Taluk	An administrative unit for taxation purposes comprising multiple revenue villages.
Ward	Municipalities and *Gram Panchayats* are subdivided into wards for electoral purposes. Wards are distinct from villages and habitations.
Western Ghats	The Western Ghats, "possibly a fault scarp, are the crest of the western edge of the Deccan plateau. Their steep seaward slopes are deeply dissected by streams and canyon-like valleys, but on the landward side their slopes are gentle and give way to wide, mature valleys" (Hutchings et al. 2020); Britannica 2016).
Zilla Panchayat	The *Panchayati Raj* institution of government at the district level. It is known as *Zilla Parishad* in some states. Its main actors are the Chief Executive Officer and Deputy Chief Executive Officer, who often have the responsibility for water and sanitation programs.
Zilla Parishad	District *Zilla Panchayats* are known as *Zilla Parishad* in some states.

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EXECUTIVE SUMMARY

The rural drinking water sector in India is undergoing rapid changes driven by a $45-billion nationwide program called the *Jal Jeevan Mission*, committed to providing household tap connections to all rural households by the year 2024. It is transforming rural domestic water supply, water use, and water resources management in complex and diverse ways. While water is a state subject under the Constitution of India, the federal government can, and does, push nationwide programs through financial support and planning guidelines for states to implement rural water schemes, with some provision for customization by states. To date, the Government of India reports that more than half of rural households have received functional in-house tap connections (*Jal Jeevan Mission* Dashboard 2023). This national program provides the backdrop for our study of rural domestic water supply and its relationship with water resources management at the national, state, and local levels.

The physical infrastructure for rural drinking water supply under the *Jal Jeevan Mission* is being implemented through single-village or multi-village schemes, each of which has different components and implications:

- Single-village schemes tend to be groundwater based and operated by a *Gram Panchayat.*[1] Villages may have more than one water source and more than one water supply scheme. Ensuring water source sustainability entails watershed protection measures, managed aquifer recharge, upstream afforestation, and pumping practices. At present, there is limited evidence to determine whether these efforts are resulting in the source being sustained.
- Multi-village schemes tend to be surface water based and run by state-level professional agencies. Coordination across villages to ensure equitable water quantity allocation for each is critical, alongside effective operations and maintenance. Water source sustainability entails basin-scale integrated water resources management across surface and groundwater resources and water use sectors.

The analyses presented in this report questions the long-term sustainability of these drinking water schemes and their water sources for multiple reasons. First, the *Jal Jeevan Mission* emphasizes community-based management, but it applies a top-down approach that may not align well with community-based management. Second, the community-based approach has been shown to be better suited for simpler local schemes, compared to the more technologically sophisticated multi-village schemes and piped water network infrastructure envisioned at the larger watershed and aquifer scale (Hutchings et al. 2020). Third, the massive expansion of both single- and multi-village schemes in rural drinking water supply will increase demands on a water resource base that is under threat due to overexploitation by other sectors and uncertainties related to climate change.

Because India is very large and physio-graphically diverse, and water is a state subject (constitutionally under the purview of state governments), there are no simple answers to these challenges. This report comprises a desk review of the rural drinking water planning literature at the national level and reconnaissance visits to the field in four states to address whether and how current institutions can address these challenges adequately in those states. The objectives of this synthesis report are to review approaches to rural drinking water planning at national, state, and local levels; and to generate

[1] *Gram Panchayat*, defined in Article 243 of the constitution, is the basic unit of administration in the *Panchayati Raj* system of devolved governance. It comprises a single village or group of villages.

hypotheses about how to achieve more holistic water management that could be tested through further field-based research.

KEY TAKEAWAYS

1. **Rural drinking water progressis hampered by a lack of local planning and rushed efforts to achieve the 2024 deadline.** In principle, the *Jal Jeevan Mission* is part of a comprehensive Ministry of *Jal Shakti*, but its water programs remain divided by sector. In addition, we found discrepancies between the processes set out in the *Jal Jeevan Mission* Guidelines (Ministry of *Jal Shakti* 2019) and field implementation.

    - Policy guidelines at the national and state levels for rural water planning are fairly comprehensive, with requirements for community engagement, funding convergence, and source sustainability. However, actual village-level plans in the cases examined here do not reflect these planning principles. It is important to understand where such gaps exist and why.
    - Although source sustainability is mentioned extensively in the *Jal Jeevan Mission* Guidelines, it is striking that it did not emerge as a priority in stakeholder discussions. The absence of any quantification or scientific basis for aquifer recharge measures recommended to achieve source sustainability emerged from discussions with domain experts, not stakeholders involved in actual planning and implementation of schemes. This suggests that source sustainability is largely viewed as a pro-forma exercise in the planning process.
    - Pandemic-driven delays in implementation have led to a country-wide rush at all levels to meet the 2024 deadline (the next national election). This has, to some extent, hindered the deliberative local government processes envisioned in policy documents and has resulted in a focus on reaching coverage targets.

2. **States have significant differences in the institutional context of rural drinking water planning despite the national drinking water program.**

    - Maharashtra has a separate department of drinking water and sanitation; Karnataka and Bihar situate those programs in broader *Panchayati Raj* (village governments) and rural development departments. The latter have the potential for integrated rural water planning. Some states have strong supporting agencies (i.e., Maharashtra) and others have programs for groundwater management (i.e., Sikkim) that can contribute to a more holistic water management.
    - None of the states examined have demonstrated a convergence between rural drinking water planning and larger water resources management departments.

3. **Local institutional gaps in both single- and multi-village schemes work against ensuring source sustainability.**

    - Rural water security planning in the water and sanitation sector has focused more on the sustainability of individual water supply *schemes* (e.g., individual borewells), and less on the sustainability of the underlying water *sources* (e.g., entire aquifer formations). This approach has inherent limits: individual borewells cannot be sustained in isolation when the aquifers that encompass them are depleted due to withdrawals by agriculture and industry at rates higher than recharge.
    - One of the major mechanisms for convergence to achieve source sustainability is *Atal Bhujal Yojana*, the Government of India's groundwater program launched in 2019 to bring aquifers back

into balance through participatory water budgeting. But early evidence shows serious flaws in implementation (P. Kumar 2023).

4. **The *Jal Jeevan Mission* is based on a community-plus management model.**

   - The Jal Jeevan Mission emphasizes community water management at the same time as it pushes for large infrastructure investments and convergence across programs that require mature, professionalized institutions (Hutchings et al. 2015; Hutchings 2018; Hutchings et al. 2020).
   - The community-based model does not scale easily to multi-village schemes. Some multi-village schemes failed because the institutional maturity needed to manage multi-village schemes through a bottom-up, federated structure did not exist. These multi-villages schemes failed to address growing water supply inequities between communities close to the water sources and those far from the water sources.

RECOMMENDATIONS FOR THE WAY FORWARD

1. **Move toward regional water resources planning to achieve rural drinking water security.**

The need to plan for sustainability of water resources has been in the discourse globally and in India. It is also one of the strongest findings in this study of national and state water programs and policies. Even where mentioned in policies like the *Jal Jeevan Mission* Guidelines (Ministry of Jal Shakti 2019) we found a neglect of sustainable water resources management in practice, upon which local drinking water sources and schemes depend. More holistic water resources planning approaches and practices emerge as imperatives. What is needed is a focus on regional resource sustainability that affects multiple villages, in addition to focusing on the sustainability of point sources.

Key knowledge gaps include:

- What policy mechanisms are most effective for promoting regional water resources planning?
- How can current planning processes for source sustainability be made more effective in practice?

2. **Assess opportunities for state-specific convergence of drinking water-related programs in each state.**

Rural drinking water authorities cannot expect to sustain water supply sources in isolation. Although the concept of integrated water resources management has been around for decades, this report has shown that in India, the water sector remains fragmented at the national and state levels. Each state has its own conditions, challenges, and innovations. Inter-sectoral water allocation has taken place in the context of surface water bodies, though there is a need for convergence of surface water management programs. This is not the case, however, for groundwater over-abstraction, which is driven by millions of farmers who have free access to electricity. Conjunctive management of surface and groundwater is required.

Key knowledge gaps include:

- What state-specific planning mechanisms are in place to align water resources management and drinking water supply?
- How can lessons in planning be shared and adapted for implementation across states?

3. Assess the enabling conditions for *Panchayati Raj* institutions to generate innovative solutions.

State and *Panchayati Raj* institutions have not adopted an integrated approach for developing water supply schemes. Mechanisms for addressing competing demands for water are absent. In addition, community participation is either totally absent or very limited, despite guidelines to the contrary.

Key knowledge gaps include:

- Does the separation of source sustainability from the planning for drinking water supply systems make a difference for the longevity of schemes?
- Do agencies have the capacity to make sustainability assessments?
- Does it matter if the rural water supply department is within the same ministry as the water resources department? Are the planning processes and decisions different?
- Different approaches have been adopted while establishing village water and sanitation committees[2], such as those with only males versus those with a balanced representation of genders. But it is not clear whether and how the makeup of a committee matters. For instance, does the ratio of appointed to elected members make a difference in terms of effectiveness? If the committee consists of village-level functionaries, does it improve the convergence of schemes?
- What difference can innovative financing and asset management make for source sustainability?

4. Link tap functionality with aquifer sustainability.

The *Jal Jeevan Mission* has emphasized the importance of *functional* household tap connections. However, this review has shown that functionality depends on the long-term sustainability of watersheds and aquifer sources. Watershed management has a long history in India (Ahluwalia 1997; Joshi et al. 2004). Comparable attention is now needed for aquifer management, especially in complex hard rock regions. We identified efforts to establish community aquifer management such as *Atal Bhujal Yojana* in Karnataka and Maharashtra, and other initiatives of the Groundwater Surveys and Development Agency in Maharashtra. The actual implementation quality of these efforts, however, varied We propose that the only way to sustain rural drinking water in groundwater-based single-village schemes is by ensuring that the aquifer, as a whole and across all uses, is incorporated within the water budget. This may be feasible in small, localized aquifers.

Key knowledge gaps include:

- What is the performance of these innovative, community-based aquifer management programs?
- How do source sustainability approaches in single-village schemes compare with those in multi-village schemes?

Importing water via multi-village schemes, as needed, to augment drinking water supply, may productive, but only if professional management and governance structures are established to ensure that piped

[2] A Village Water and Sanitation Committee is an institution comprising community members that plans, implements, and maintains rural water supply and sanitation infrastructure.

water meant for domestic use is not diverted to non-domestic uses. **Manage the effects of piped water supply on household water-use behaviors and source sustainability.**

The *Jal Jeevan Mission* seeks to address many challenges in drinking water supply and its sustainability. One of the challenges, which may be less anticipated by policymakers, is regarding changes in human behavior. Most villages in India did not have piped water supply until recently. Even now, only about half have been declared completely covered (*Jal Jeevan Mission* Dashboard 2023).

Key knowledge gaps include:

- Households that have largely relied on public sources such as standposts and wells are unlikely to continue to fetch water when they start receiving it for free or almost free in the convenience of their home. How will this affect their water use?
- Would piped water supply lead to additional productive uses of water? How does this behavior change vary based on the level of supply?
- How would increased water use for productive purposes affect source sustainability?
- What components of water use are included in village-level action planning, as compared to the actual components of water use by households?

These and other related insights are needed to understand the impending changes in water use behavior and their implications for planning and water resources management.

5. Understand the unique context of the *Jal Jeevan Mission* and plan ahead for what might follow.

Assessing the unique context of the *Jal Jeevan Mission* and its impact will provide large-scale, actionable learning to inform rural piped water policy and investments in India and beyond. This program has changed drinking water planning objectives and methods, possibly not just in India but also by influencing policy norms across the global south. There are many potential research topics driven by its massive and short-duration investments, such as its impact on water resources supply and management, the expected versus actual benefits of piped supply on public health, the changing role of women in household water management, and changes in sanitation practices. If the *Swachh Bharat Mission* is a precedent for the *Jal Jeevan Mission*, the initial program may be followed by a decade-long support program for sustainability (*Swachh Bharat Mission* 2023). It is thus important to learn whether and how states and *Panchayati Raj* institutions can prepare for, and sustain, rural drinking water services in the post-*Jal Jeevan Mission* era.

This synthesis report has tapped some of the key scientific and policy literature on drinking water planning with an emphasis on India. Global knowledge on rural drinking water supply development can benefit enormously from new research from India, along the lines outlined above, especially around nationwide transformative programs, such as the *Jal Jeevan Mission* and the *Swachh Bharat Mission*.

1.0 INTRODUCTION

The rural drinking water sector in India is undergoing a rapid change driven by a $45 billion nationwide program called the *Jal Jeevan Mission*, committed to providing household tap connections to all rural households by the year 2024. It is transforming rural domestic water supply, water use, and water resources management in complex and diverse ways. While water is a state subject under the Constitution of India, the federal government can, and does, push nationwide programs, through financial support and planning guidelines, to states, with some provision for customization by states. As of December 2022, the Government of India reports that more than half of rural households in India have received functional in-house tap connections (*Jal Jeevan Mission* Dashboard 2023). This national program provides the backdrop for our study of rural domestic water supply and its relationship with water resources management at the national, state, and local levels. We begin with the motivation for this study in Section 2. That is followed by the methodology (Section 3), the history of rural drinking water planning (Section 4), findings on the national *Jal Jeevan Mission* (Section 5), and a comparison of four states with regard to rural drinking water planning (Section 6). The concluding section charts a way forward (Section 7) that presents six main recommendations and identifies key research gaps and priorities for each.

2.0 MOTIVATION FOR THIS STUDY

2.1 INDIA'S AMBITIOUS *JAL JEEVAN MISSION* EMPHASIZES A COMMUNITY MANAGEMENT MODEL FOR RURAL DRINKING WATER PLANNING AND SOURCE SUSTAINABILITY

1. India's rural drinking water sector is undergoing rapid transformation.

The Government of India launched the *Jal Jeevan Mission* in 2019 to provide safe and adequate drinking water through functional household tap connections to all households in rural India by 2024 (Ministry of Jal Shakti 2019) . This commitment to piped water supply for all households marks a paradigm shift from earlier minimum standards of water access within 100 meters (Ministry of Drinking Water and Sanitation 2013). It is estimated that the program will cost federal and state governments $45 billion (Department of Economic Affairs 2020). The *Jal Jeevan Mission* emphasizes a community-based management model, whereby household tap connections are planned and maintained by local habitations and *Gram Panchayats* (Ministry of Jal Shakti 2019). But this massive increase in rural drinking water supply will make additional demands on a water resource base that is already under threat due to overexploitation and climate change (M. D. Kumar, Bassi, and Kumar 2022; Chaudhuri et al. 2020).

2. Indian states are implementing the *Jal Jeevan Mission* in collaboration with the federal government.

Water is a state subject in the Constitution of India—each state has its own drinking water supply plan and is responsible for its execution within its boundaries. The *Jal Jeevan Mission* Guidelines (Ministry of Jal Shakti 2019) address various activities such as water source identification, water testing, water treatment, and distribution infrastructure development. Additionally, the program focuses on community participation, capacity building, and behavior change communication to ensure sustainability of the water supply. The Government of India partially funds the program and monitors and reviews its progress closely —captured in *Jal Jeevan Mission* Dashboard reports—to ensure that it is meeting its goals and targets.

3. The *Jal Jeevan Mission* emphasizes the role of *Panchayati Raj* institutions in water supply provision.

A "people's movement," as Prime Minister Narendra Modi envisions the mission (Jal Jeevan Mission 2021), is easier imagined than realized. The onset of Covid-19 further made the mission's systemic changes difficult to achieve. *Jal Jeevan Mission* Guidelines emphasize the role of *Panchayati Raj* institutions (district, blocks, and *Gram Panchayat* levels of government). Though the *Jal Jeevan Mission* Guidelines (Ministry of Jal Shakti 2019) deserve credit for not conceptualizing the program as a mere pipes-and-infrastructure project, current policy guidelines in Indian states do not seem to go the full distance on the crucial dimension of systemic local government and community-based changes. This is possibly due to the long duration needed for such changes, their inherent complexities, and their costs,

4. The *Jal Jeevan Mission* emphasizes planning for source sustainability.

The mission mandates the implementation of source sustainability measures such as recharge, gray water management, and rainwater harvesting. However, it does not allocate separate funds for these project components. It is expected that they will be funded in a convergent manner through allied programs such as the *Swachh Bharat Mission* for sanitation and *Atal Bhujal Yojana* for groundwater management. Source sustainability measures include:

- Promotion of conservation and recharge of water sources through watershed management practices and measures, including afforestation, springshed management, and in-stream structures like optimize water flows;
- Encouragement of groundwater replenishment through various techniques like recharge wells, recharge pits, etc.;
- Promotion of rainwater harvesting and storage systems to increase the availability of water during lean periods; and
- Preservation and restoration of traditional water sources such as tanks, ponds, and wells.

The *Jal Jeevan Mission* Operational Guidelines (Ministry of Jal Shakti 2019) expect this convergence to happen through creation of a Village Action Plan for each village. Identifying source sustainability issues and the extent of convergence is a key motivation in this report.

2.2 INDIA'S SHRINKING WATER RESOURCES BASE THREATENS SOURCE SUSTAINABILITY FOR ALL RURAL WATER USES

One of the biggest threats to rural drinking water supply in India is poor water resources management (M. D. Kumar, Kabir, and James 2016; V. R. Reddy, Rao, and Venkataswamy 2010). The vast majority (over 85 percent) of rural drinking water access is groundwater based, and in over one-third of the country, groundwater is already classified as semi-critical, critical, or overexploited (Central Ground Water Board 2020). These classifications are based on the status of groundwater quantity, and they are defined by stages of groundwater extraction: ≤70 percent of extraction is termed as safe; >70 percent and ≤90 percent is semi-critical; >90 percent and ≤100 percent is critical; and >100 percent is overexploited. Climate change is an added stressor for rural water sources sustainability. It is expected to lead to more frequent and intense weather events such as droughts, floods, and cyclones, which pose risks to drinking water supply infrastructure and source sustainability (Howard et al. 2016). There is increasing evidence for wide-ranging and varied impacts of climate change that affect the availability of water resources and water supply directly (Udmale et al. 2016; C. Singh 2021).

Rural water supply in India is marked by high spatial heterogeneity of many variables, inequality, and recurrent "slip-backs" (declines in year-to-year habitation[3] coverage) characterized by intermittency and even scheme abandonment (Chaudhuri et al. 2020). Nevertheless, the relationships between water resources management and rural drinking water supply have not been clearly articulated or well managed. For example, the concept of integrated water resources management has been around for decades , but it has focused for the most part on basin-scale water management (Lenton and Muller 2009). Watershed boundaries often cross political and administrative boundaries, and this has served as a barrier to the adoption of integrated water resources management (Giordano and Shah 2014). "Water Security Planning" is now emerging as a model for holistic water management (Kangmennaang and Elliott 2021; Sukhwani and Shaw 2022; Lankford et al. 2013). The definition of water security varies across settings and domains, but a widely accepted definition by Grey and Sadoff (2007) defines it as the "availability of an acceptable quantity and quality of water for health, livelihoods, ecosystems, and production, coupled with an acceptable level of water-related risks to people, environments, and economies." Several sustainability frameworks have been developed for drinking water supply and water resources-related planning, such as the USAID/World Bank analytical framework (USAID 2020) and the

[3] A habitation is a cluster of households. It is "the smallest settlement for project planning purposes. A *Gram Panchayat* may include multiple villages, each of which may have multiple habitations" (Wescoat et al. 2019).

financial, institutional, environmental, technological and social dimensions of sustainability (FIETS) framework (Wescoat et al. 2021). This report focuses on the challenge of source sustainability in rural water resources planning in India by appraising the current drinking water policy and planning landscape, and its implementation, at the national level and state-by-state.

2.3 THE STRUCTURE OF THIS SYNTHESIS REPORT

In the next section, we briefly describe the approach taken to produce this report. We then provide a detailed overview of the rural drinking water sector in India by listing key developments that mark the history of water governance in independent India and by summarizing major shifts in the sector. We also discuss the following aspects of the *Jal Jeevan Mission*: 1) the institutional framework for drinking water supply; 2) the broader context of water resources management institutions; and 3) the broad modalities by which physical supply infrastructure is implemented. After this summary of national-level activities, we dive into key findings from four states that we studied in detail: Karnataka, Maharashtra, Bihar, and Sikkim. Our state-level case studies are included in Appendices A-D, along with illustrative district and *Gram Panchayat* case studies. The Way Forward section of the report identifies six priorities for inquiry and action.

3.0 METHODOLOGY

We conducted the analyses for this report at multiple levels. At national and state levels, policy documents and scientific literature informed our approach. For additional insights at state and local levels, we conducted interviews with over 25 practitioners and researchers involved in the drinking water sector. We also applied journey mapping exercises to help clarify how actors understand and experience the planning process (for more information, refer to Section 3.2 and Appendix E onward). Our higher-level observations are designed to arrive at insights into India-level and state-level policies, while our micro-level observations (such as journey maps and field interviews on village-level planning) serve as illustrations and do not represent all of India or the respective states.

We realized early that national and state policy guidelines present an idealized situation that does not capture on-the-ground reality. The rapid pace at which the *Jal Jeevan Mission* is being implemented means that the situation on the ground is evolving rapidly. Also, because water is a state subject, its implementation varies from state to state, which led us to collect information at both the higher and more local levels in selected states.

3.1 DESK REVIEW OF POLICIES

As part of this review, we focused on the *Jal Jeevan Mission* and its guidelines issued in 2019 (Ministry of *Jal Shakti*, Government of India,2019, 2023). The operational guidelines explain the roles and responsibilities of various stakeholders from the national level down to the village level (Ministry of *Jal Shakti*, Government of India, 2019).

The documentation process involved:

- A review of the history of national rural water policies in India;
- An overview of the role of Indian states (as distinct from federal government institutions) from a rural water supply perspective;
- A mapping of Indian state institutions to India's *Jal Jeevan Mission* model;
- A summary of water-related funding sources for single- and multi-village schemes; and
- An examination of the drinking water planning process and its effectiveness.

Sources included policy documents and government orders, reports by funding agencies, nongovernmental organizations (NGOs) and government departments, and national and state-specific academic literature for the four states that are a part of this report. Except for Maharashtra state, relevant academic literature is relatively sparse. We studied these documents and websites to understand the history and evolution of rural domestic supply programs and policies in India and in each of the four states. We identified historical programs in each state and searched for details on those programs, which included reports from various funding agencies and state government documents. These details are reported in state-specific policy maps and case studies.

3.2 EXPERT AND KEY INFORMANT INTERVIEWS AND JOURNEY MAPS

Our second aim was to understand on-the-ground activities, vis-à-vis formal guidelines, at the state and *Panchayati Raj* institution levels. To compare actual activities with guidelines, we conducted qualitative case studies that involved interviewing stakeholders in each of the four states. To triangulate information provided by the different informants that we spoke to, we also produced journey maps (Gibbons 2018)

to show how an actor experiences a process (in this case, the planning and implementation process of rural drinking water service providers, implementation support agencies[4], village-level committees, and water supply customers [i.e., village residents]). We produced illustrative journey maps for multiple stakeholders in the case study states (Appendix I onward). This application of journey mapping methods helped identify actors' perspectives and gain insights from them about how a scheme is planned and implemented. Journey maps seek to capture richness, complexity, and interconnections through qualitative surveys. They employ a collaborative approach for understanding the planning process, and identifying the opportunities and challenges the actor faces by involving them in the process of mapping their journey through that process.

For each state, we interviewed and developed journey maps for two or more stakeholders that fit one of the following profiles:

- Rural drinking water supply providers (both government actors and non-government actors);
- Implementation support agency, which is officially mandated through the *Jal Jeevan Mission* or other non-state actors that supported the process;
- *Gram Panchayat* or village water and sanitation committee; and
- Water users (village residents).

Through interviewing and journey mapping, we aimed to identify specific challenges in the system in terms of access to data, capacity, understanding, mindsets, and departmental relationships. The full list of stakeholders with whom we spoke, along with their designations and the key insights they provided is in Appendix E.

[4] Implementation support agencies mobilize and engage communities to plan, design, implement, operate, and maintain rural water supply infrastructure under the *Jal Jeevan Mission*.

4.0 HISTORY OF THE RURAL DRINKING WATER SECTOR IN INDIA

4.1 THE JOURNEY SO FAR: NATIONWIDE PLANNING FOR WATER SERVICES

To understand the current *Jal Jeevan* Mission, it is useful to retrace the evolution of national rural drinking water planning in India (Wescoat et al., 2021). It is also important to emphasize that, as in most federal systems of government, water supply is a state subject in the Constitution of India (Schedule 7, List II, no. 17), which means that state governments formulate the laws that govern the sector within their respective states. Article 74 of the constitution lays out key roles for *Panchayati Raj* institutions at the district, block, and *Gram Panchayat* levels. Nonetheless, since India's independence in 1947, the federal government has played a critical role in shaping rural water supply programs through different funding programs and policies. While developing their own policies and institutions, states draw upon and implement guidelines put in place by the Government of India.

Briefly, India's national rural drinking water supply journey began with the country's independence from colonial rule in 1947 and was driven initially by five-year plans, which laid a roadmap for the country's economic growth. In terms of drinking water, the initial few decades were focused on habitation-level coverage through shared facilities such as community-level hand pumps and stand-posts to address basic quality and quantity issues. Subsequently, there was a shift to household-level coverage and piped water supply. Over the years, efforts to increase access across social and geographic categories became a priority, as did the enactment and enforcement of drinking water quality standards. Community participation, behavior change promotion, planning in the rural drinking water sector, and water utility reforms were also emphasized in recent years. Since independence, India has taken a big leap in rural water supply services, from only nominal provision to the ambitious goal of 100 percent coverage with functional household tap connections by 2024. The timeline below summarizes milestones in drinking water programs in India over the past six decades.

TABLE 1: A TIMELINE OF KEY EVENTS RELATED TO RURAL WATER PLANNING IN INDIA

YEAR	DEVELOPMENT
1954	The **National Water Supply Programme** was launched under the Ministry of Health, as per the recommendation of the Environmental Hygiene Committee under the First Five-Year Plan (1951–56). The purpose was to provide safe water supply to all villages within a certain period. However, rural water supply services were confined to "accessible" villages—an ambiguous term that was not clearly defined.
1961–66	The Third Five-Year Plan identified **"problem villages"** for prioritizing drinking water supply. These included: • Villages lacking sources within a mile (1.6 kilometers), • Villages with well water availability at depths more than 15 meters in the plains or 100-meter elevation in hilly terrains, and • Villages with contaminated water sources that cause waterborne diseases.
1972–73	Rural water supply services got a major push with the **Accelerated Rural Water Supply Programme**. Launched to supplement the efforts of state governments, it had an emphasis on villages with a high percentage of Scheduled Caste/Scheduled Tribe populations.

TABLE 1: A TIMELINE OF KEY EVENTS RELATED TO RURAL WATER PLANNING IN INDIA

YEAR	DEVELOPMENT
1974–79	The **Accelerated Rural Water Supply Programme gained momentum** during the Fifth Five-Year Plan. This benefited over 184,000 villages across the country (Chaudhuri et al. 2020).
1982	The "problem" villages were given top priority in the **Twenty Point Programme** that aimed to provide at least one drinking water source per village. This benefited over 83 percent of villages in the nation.
1986	The **National Drinking Water Mission**, popularly known as the Technology Mission, was launched in 1986 to provide scientific inputs and cost-effective technological solutions to address water scarcity.
1991–96	During the Eighth Five-Year Plan, the National Drinking Water Mission was renamed as the **Rajiv Gandhi National Drinking Water Mission**, and its purview was expanded to ensure environmental protection and health through integrated water resources. Water quality concerns were prioritized, particularly for habitations suffering from excess arsenic, fluoride, iron, and salinity levels.
1992	The **Constitution (73rd Amendment) Act**, a pivotal legislation for decentralized governance in India, saw the devolution of water management to *Panchayati Raj* institutions in rural areas.
1999–2000	As a result of the 73rd Amendment, a series of sector reforms were undertaken in planning, implementation, and management, based on principles of decentralized, demand-driven, and community-managed governance (i.e., involving *Panchayati Raj* institutions at district, block, and *Gram Panchayat* levels).
1999	The Department of Drinking Water Supply was established under the Ministry of Rural Development.
2002	Community-led drinking water initiatives were further scaled up as ***Swajaldhara***, a program for community management of drinking water leading to self-sufficiency of drinking water at the village level (Press Information Bureau 2002).
2004–05	The Accelerated Rural Water Supply Programme became part of **Bharat Nirman**, with the aim to provide full coverage of habitations by 2008–09. Bharat Nirman was to build rural infrastructure, including drinking water services. It focused on unserved and declining habitations.
2005	The **National Water Quality Monitoring and Surveillance Programme** was launched.
2009	The **National Rural Drinking Water Programme** was launched. The emphasis was on ensuring sustainability of water availability (40 liters per capita per day) in terms of potability, adequacy, convenience, affordability, and equity, while adopting decentralized approaches involving *Panchayati Raj* institutions and community organizations.
2011	The Department of Drinking Water and Sanitation was renamed as the **Ministry of Drinking Water and Sanitation.**
2013	The **National Rural Drinking Water Programme was revised** to focus on providing piped water supply or water within 100 meters of households, and wherever possible, enhancing service levels from 40 to 55 liters per capita per day.
2017	The **National Rural Drinking Water Programme was restructured** to make it more competitive, result oriented, and outcome based.

TABLE 1: A TIMELINE OF KEY EVENTS RELATED TO RURAL WATER PLANNING IN INDIA

YEAR	DEVELOPMENT
	The **National Water Quality Sub-Mission** was launched to provide safe drinking water to arsenic and fluoride-affected habitations by March 2021. It envisaged that these habitations would have access to safe drinking water either through piped water supply connections or through intermediate measures, such as community-based purification plants with the capacity to provide 8–10 liters per capita per day for drinking and cooking purposes.
2018	The **2018 performance audit report of the National Rural Drinking Water Programme by the Comptroller and Auditor General** of India raised serious concerns over its performance. According to the report, the program failed significantly to achieve its deliverables set for 2017. It also pointed out that the Annual Action Plans of states under the program lacked a bottom-up approach. To sum up, the overall monitoring and oversight framework of the National Rural Drinking Water Programme was found to be ineffective and devoid of adequate community involvement.
2019	The ***Jal Jeevan Mission*** was launched to provide functional household tap connections to every rural household by 2024. • A functional household tap connection must include the following features: • Water must be supplied in adequate quantities (i.e., at least 55 liters per capita per day), and • Water must consistently be of prescribed quality (i.e., Bureau of Indian Standards:10500 standard). The *Jal Jeevan Mission* also mandates the implementation of source sustainability measures, such as recharge and reuse through gray water management, water conservation, and rainwater harvesting. It incorporates community engagement and includes an extensive information, education, and communication strategy. The planning is supposed to be bottom-up, starting from the habitation level and up to the district and state levels.
2021	Publication of the Manual for the utilization of the 15 Finance Commission-tied grants to rural local bodies/ *Panchayati Raj* institutions for water and sanitation (2021-22 to 2025-26).

4.2 KEY SHIFTS IN THE PAST SIX DECADES

The timeline above lists some of the key drinking water policy and program developments in independent India. The changes over the years signal shifts in approaches to governance, infrastructure, and understanding of challenges related to quantity and quality of water supply. Here, we sum up the key shifts:

- **Habitation to household**: Until the 1990s, the major target of rural drinking water programs was to cover habitations with hand pumps and community-level standpipes. Over the past two decades, this approach has evolved to cover individual households within habitations through piped water connections. The *Jal Jeevan Mission* reinforces this by introducing the ”functionality” component and by mandating household-level connections.
- **Water supply infrastructure for service delivery and functionality:** Until recently, rural water supply development programs have focused on infrastructure delivery such as pipes and pumps (Moriarty et al. 2013). Today, the emphasis is shifting toward broader service provision requirements, including consideration of the financial, operational, and water security elements that drive sustainability. However, the *Jal Jeevan Mission* Guidelines of 2019 still do not provide a formal utility model or regulatory framework to manage water service providers.

- **Centralized to decentralized, demand-driven, community-managed water**: Until 1999, rural drinking water schemes were mainly designed and delivered in a centralized manner through federal programs, such as the Accelerated Rural Water Supply Programme and National Rural Drinking Water Programme, implemented by state governments. Today, it is driven by principles of decentralized, participatory, demand-driven, and community-led approaches to rural drinking water governance, as espoused by multilateral agencies and academicians alike (Hutchings et al. 2020; World Bank Group 2017). This is expressed in the Government of India's guidelines, especially for the *Jal Jeevan Mission* (Ministry of Jal Shakti 2019)—in principle if not in practice, as they are in a top-down document.
- **Quantity to quality**: For the initial five decades post-independence, rural water supply was seen through the lens of quantity, with limited attention paid to quality concerns. Through the Rajiv Gandhi National Drinking Water Mission in the 1990s, later through the National Water Quality Monitoring and Surveillance Programme in the 2000s, and more recently via the National Rural Drinking Water Programme and *Jal Jeevan Mission*, water quality issues have gained some prominence.
- **Sustainability of schemes and sources:** Water supply schemes have been prone to recurring slipbacks (i.e., drop in coverage on a year-on-year basis), especially schemes with the new higher-level standard of supply at 55 liters per capita per day (V. Reddy et al. 2012; Chaudhuri et al. 2020; Novellino Fajardo 2015). The *Jal Jeevan Mission*'s Operational Guidelines seek to address scheme and source sustainability challenges through a comprehensive, multipronged strategy including better planning, village-specific and community-driven planning, source sustainability interventions, water reuse, and a massive investment to provide adequate financial resources and capabilities to prevent slipback (Ministry of Jal Shakti 2019).
- **An evolution to multidisciplinarity:** Over the years, public health engineering departments, which typically handle rural drinking water supply in India, have seen a paradigm shift in core competencies, as these institutions are no longer made up of engineers and scientists alone. Sociologists and public policy professionals now play an increasingly important role in shaping water policy (e.g., through Information, Education, and Communication Guidelines ([Department of Drinking Water Supply 2010]). There has also been a shift in approaches, from more strictly technological solutions to more holistic programs, with state institutions now incorporating inputs from diverse stakeholders. For example, the Danish International Development Agency-funded water supply programs expected government implementers to have a holistic approach of providing sanitation facilities, creating village-level committees, and involving the community in decision making (Sector Status Study Team 2006).
- **Focus on capacity building, behavioral changes, inclusion of marginalized communities, and equity**: In line with the previous point, rural drinking water supply programs have shifted from being purely infrastructure projects to prioritizing capacity building of all officials and staff involved in water management. Behavior changes among users and social inclusion have also gained prominence; and equity in planning, implementation, and operation is now recognized as a critical means of ensuring the long-term sustainability of rural water schemes.

5.0 THE *JAL JEEVAN MISSION* AND ITS CONTEXT

The *Jal Jeevan Mission* sets the current approach to rural drinking water planning in India, building on previous national-level initiatives. It is an ambitious program launched by the Government of India in 2019 to provide safe and adequate drinking water through "functional household tap connections" to all households in rural India by 2024. The institutional structure of current rural drinking water programs is described in Section 5.1.

The *Jal Jeevan Mission* water supply program falls under a broader range of water policies and regulations. The Government of India provides guidance in many water-related areas, including a framework for groundwater regulation and management that has been revised over the last two decades (Cullet 2018; Planning Commission, Government of India 2011). Water quality standards are set at the national level in India. The *Jal Jeevan Mission* prescribes the Bureau of Indian Standards:10500 (2012) standard for its water quality projects (Ministry of *Jal Shakti* 2019). These standards are to be met by state-level Public Health Engineering Departments or Rural Water Supply Departments. Water quality is monitored by Village Water and Sanitation Committees through a network of laboratories and field-testing kits (Ministry of *Jal Shakti* 2019). In case of water quality issues, the respective department must take corrective actions.

Rural drinking water institutions fit within a broader array of water agencies at the national and state levels, which are briefly described in Section 5.2. In this section we describe the roles of the key agencies involved in rural drinking water supply, followed by the broader context of water resources management, and then a description of the two main types of individual and multi-village water supply schemes in Section 5.3.

5.1 RURAL DRINKING WATER SUPPLY INSTITUTIONS IN INDIA

The institutions at the federal, state, district, and village levels that play a role in the *Jal Jeevan Mission*'s execution are summarized in the figure below:

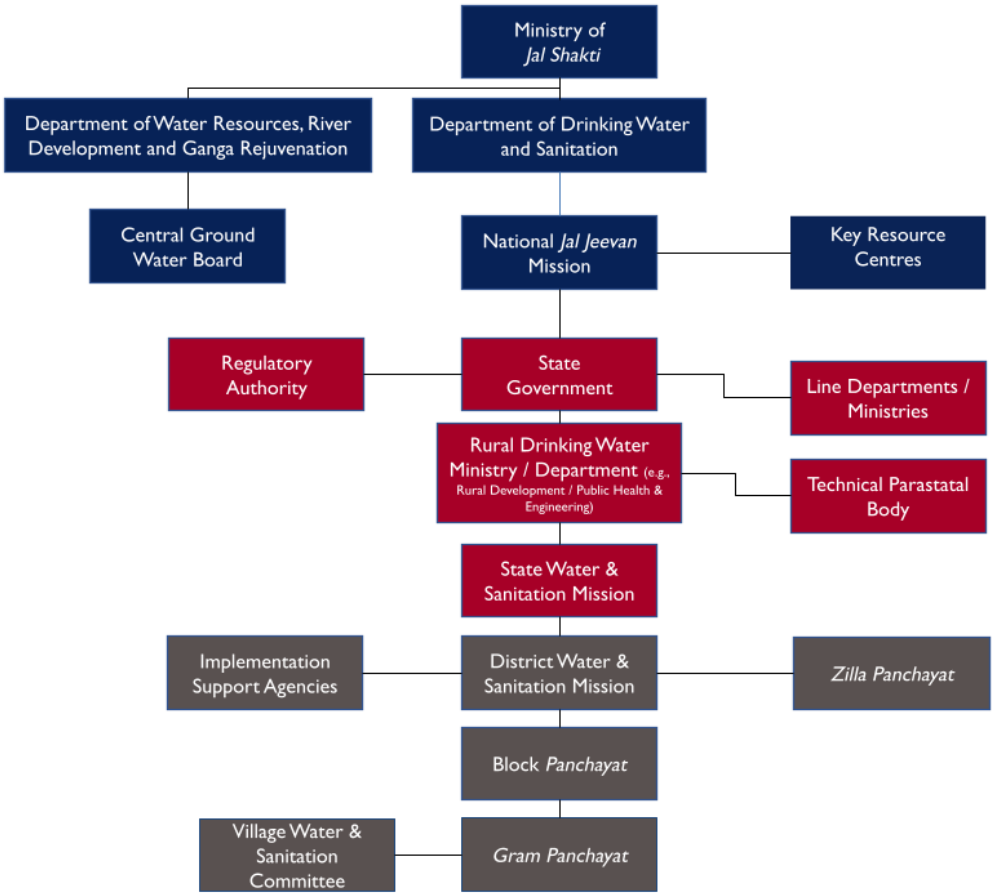

Figure 1: Institutions implementing the *Jal Jeevan Mission* at the federal (in blue), state (in red), and *Panchayati Raj* (in gray) levels.

5.1.1 NATIONAL-LEVEL DRINKING WATER INSTITUTIONS

The *Jal Jeevan Mission* is part of the national Department of Drinking Water and Sanitation, along with the *Swachh Bharat Mission,* which has focused on sanitation in rural and urban areas. These programs are part of the broader Ministry of *Jal Shakti*, the apex body governing matters related to water resources and river rejuvenation, established in 2019 (described in Section 5.2 below).

5.1.2 STATE-LEVEL DRINKING WATER INSTITUTIONS

The structure of State Water and Sanitation Missions varies from state to state, though they usually consist of three administrative committees—the Apex Committee, the Executive Committee, and the State-level Scheme Sanctioning Committee. The State-level Scheme Sanctioning Committee examines scheme proposals from the district, the Executive Committee looks after schemes' technical and financial aspects, and the Apex Committee grants administrative powers to schemes.[5] Overall, the three committees prepare State Action Plans (for a five-year period) and Annual Action Plans collectively.

[5] The term "scheme" in this sector refers to a water supply project, including its infrastructure and management.

In some cases, states have established a technical parastatal body (such as the Maharashtra *Jeevan Pradhikaran*, previously known as the Maharashtra Water Supply and Sewerage Board) to support implementation of large water infrastructure projects.

Rural domestic water supply in Indian states is usually implemented by a state-level department of the same name or by a Public Health and Engineering Department or a Department of Rural Development. The latter has the potential to address rural water subsectors in addition to drinking water and sanitation. State departments of drinking water and sanitation have sometimes been reorganized under different ministries.

Rural drinking water supply is under the subject list of the Rural Development Department in the State Governments of Karnataka and Sikkim. In Bihar, it is looked after by two ministries, the *Panchayat Raj* Department and the Public Health Engineering Department (water quality-affected areas are specially served by the Public Health Engineering Department). Maharashtra is a unique case where there is a Water Supply and Sanitation Department, which is a separate ministry, with two parastatal agencies—the Maharashtra *Jeevan Pradhikaran* and Groundwater Surveys and Development Agency—to help plan, design, and implement schemes. In all states, the *Panchayati Raj* institutions support the nodal ministries in their implementation of water supply and sanitation programs.

5.1.3 *PANCHAYATI RAJ* DRINKING WATER INSTITUTIONS

Panchayati Raj institutions play an important role in the implementation of water supply projects. They are the three levels of local government bodies in India responsible for the administration of rural areas. Together, these institutions are responsible for the overall development of rural areas and for improving the living standard of rural people by providing better services and facilities. *Panchayati Raj* consists of three levels:

1. ***Gram Panchayat:*** The lowest level of *Panchayati Raj* institutions, it is responsible for the administration of a village or a group of villages. It is composed of elected members, who are responsible for making decisions on local issues such as sanitation, water supply, and road maintenance. The *Gram Panchayat* is the lowest elected level of government in India and typically includes one or more revenue villages.

Within each *Gram Panchayat*, the village water and sanitation committee is the key community-level institution responsible for preparing Village Action Plans and providing tap connections to all households. The *Gram Panchayat* or the village water and sanitation committee is tasked with inspecting and signing off on the works completed by contractors. Its role is what defines the *Jal Jeevan Mission*'s "community-based management" approach.

2. ***Block/Taluk Panchayat:*** It is responsible for the administration of a group of *Gram Panchayats*. It is composed of elected members from the *Gram Panchayats* in relatively homogeneous areas, and it is responsible for collecting data and making decisions on issues that affect the group of villages under its jurisdiction. At the block level, the Block Development Officer of the *Panchayat Samiti* (in the case of Maharashtra) or Block *Panchayat* (in Karnataka) is the approving authority. While this intermediate level in the hierarchy of institutions plays a crucial role in integrating top and bottom levels of planning (Wescoat and Murty 2021), it is largely missing in the *Jal Jeevan Mission* Guidelines.

3. **District *or Zilla Panchayat:*** It is responsible for the administration of a district. Its legislative body is composed of elected members who are responsible for making decisions on issues that affect

the entire district. District Water and Sanitation Missions operate at the district level for planning, monitoring, and sanctioning approval of *Jal Jeevan Mission* projects. The structure of district water and sanitation offices varies across states. For example, in Maharashtra, the District Collector heads the District Water and Sanitation Mission and the Chief Executive Officer of the *Zilla Parishad*[6] serves as its Member Secretary. However, it is the Chief Executive Officer and Deputy Chief Executive Officer for Water and Sanitation who actually administer the *Jal Jeevan Mission* water supply schemes. The Collector also oversees drought declarations, which are important for source sustainability (Midstokke 2018). In Karnataka, by comparison, the *Zilla Panchayat* Chief Executive Officer heads the Water and Sanitation Mission.

5.1.4 SUPPORTING INSTITUTIONS

IMPLEMENTATION SUPPORT AGENCIES

Apart from these government institutions, the *Jal Jeevan Mission* (Ministry of *Jal Shakti* 2019) gave an increased role to civil society organizations appointed as Implementation Support Agencies to help *Gram Panchayats* and village water and sanitation committees prepare Village Action Plans; conduct information, education, and communication activities; and build capacities of government officials.

KEY RESOURCE CENTERS

In addition, Key Resource Centers were established, and their personnel appointed based on expertise and sector knowledge to organize capacity building for various stakeholders (Ministry of *Jal Shakti* 2019). Both Implementation Support Agencies and Key Resource Centers have broadly defined roles with potential overlaps and large variation in roles depending on their capabilities and the context. Typically, the former focuses on implementation while the latter serves a strategic role. The case studies in Appendix A onward provide concrete examples.

5.2 THE BROADER CONTEXT OF WATER MANAGEMENT INSTITUTIONS IN INDIA

At the national level, India established the Ministry of *Jal Shakti* (literally, the power of water) in 2019 by merging two previous ministries—the Ministry of Water Resources, River Development & Ganga Rejuvenation and the Ministry of Drinking Water and Sanitation—as two departments in the *Jal Shakti* Ministry to bring water supply and demand sector agencies under one umbrella. It is important to note that the Department of Water Resources (formerly Irrigation and Power) is much larger than the Department of Drinking Water and Sanitation. It includes international programs and 28 Attached and Subordinate Offices, Statutory Bodies, Registered Societies, and Public Sector Undertakings (see (*Jal Jeevan Mission* Dashboard 2023).

Creating the Ministry of *Jal Shakti* constituted an important step toward institutional integration for more holistic water management. However, at this early stage, the former ministries remain independent departments under the Ministry of *Jal Shakti*. Other than having one common minister at the top of the organization, the legacy of two separate institutions continues; there has been no major

[6] *Zilla Parishad* is the *Panchayati Raj* institution at the district level. It is known as *Zilla Panchayat* in some states. Here, the District Collector is the nominal head; the main actors are Chief Executive Officer and Deputy Chief Executive Officer.

reorganization to integrate or align these two departments, and they continue to function independently.

Water being a state subject in India, there are some common patterns but no exact uniformity in the institutions involved in water resources management in states and their sub-state *Panchayati Raj* levels. Table 2 depicts a generalized institutional arrangement, though there are variations by state.

TABLE 2: WATER RESOURCES MANAGEMENT AND RURAL DRINKING WATER SUPPLY INSTITUTIONS

<table>
<tr><td>LEVEL</td><td colspan="4">INSTITUTIONS</td></tr>
<tr><td rowspan="5">NATIONAL LEVEL</td><td colspan="4">Ministry of Jal Shakti</td></tr>
<tr><td colspan="3">Department of Water Resources, River Development and Ganga Rejuvenation</td><td rowspan="4">Department of Drinking Water and Sanitation</td></tr>
<tr><td>Surface Water</td><td colspan="2">Groundwater</td></tr>
<tr><td>Both Regulatory and Scientific</td><td rowspan="2">Regulatory</td><td rowspan="2">Scientific</td></tr>
<tr><td>Central Water Commission</td><td>Central Ground Water Authority</td><td>Central Ground Water Board</td></tr>
<tr><td>STATE LEVEL</td><td>Irrigation and water resources department (Major and Minor)</td><td>Ground Water Cell / Groundwater Surveys and Development Agency</td><td>Central Ground Water Board regional offices</td><td>Public Health Engineering Department</td></tr>
<tr><td>BASIN / COMMAND AREA / PROJECT LEVEL</td><td>River Basin / Irrigation Organizations</td><td></td><td></td><td></td></tr>
<tr><td>DISTRICT LEVEL</td><td>No specific body</td><td>No specific body</td><td>No specific body</td><td>Public Health Engineering Department</td></tr>
<tr><td>VILLAGE LEVEL</td><td>Water Users' Association</td><td></td><td>Village water and sanitation committee / Pani Samiti (Hindi for water committee)</td><td>Village water and sanitation committee / Pani Samiti (Hindi for water committee)</td></tr>
</table>

5.2.1 SURFACE WATER

The management of surface water is led by state governments' respective irrigation and water resources departments. They further operate through sub-wings at the canal management and project levels. An important challenge arises in India and other countries from the geographic mismatches between these canal irrigated regions, and district-administered programs (Shahid, Siddiqi, and Wescoat 2019).

After the introduction of Participatory Irrigation Management, water users' associations became functional at the water user level in some local areas (Bhatt 2013). Participatory irrigation management refers to the involvement of irrigation users in all aspects and at all levels of irrigation management, leading to better irrigation practices, and more equitable distribution of water for irrigation, which has potential for integration with local drinking water planning.

In most cases, the role of surface water resources management departments has focused on the historical role of the construction, operation and maintenance of major irrigation projects, including dams, reservoirs, and canals—with limited attention to rural drinking water planning. However, reservoirs that were historically operated for irrigation and power must increasingly serve drinking water and industrial demand (Midstokke 2018).

5.2.2 GROUNDWATER

The Central Ground Water Board under the Department of Water Resources, River Development and Ganga Rejuvenation oversees groundwater resources management at the federal level (Central Ground Water Board 2020). The board has regional offices to monitor and report on groundwater resources. At the state level, the institutional setup for groundwater management varies.

One specific program implemented by the government of India is *Atal Bhujal Yojana*, a national-level program launched by the Government of India in 2019. It aims to improve groundwater management and reduce its depletion in over-exploited and critical groundwater management areas in India (Atal Bhujal Yojana 2020). The program is implemented through a community-led and decentralized approach, with the involvement of *Gram Panchayats*, water user associations, and other local stakeholders. The program focuses on promoting the conservation and recharge of groundwater, improving water use efficiency, and strengthening institutional arrangements for sustainable groundwater management.

The core segment of the *Atal Bhujal Yojana* is the preparation and implementation of a *Gram Panchayat*-level community-led water security plans. Those plans include details of the *Gram Panchayat*-level groundwater balance derived from measurement of available water resources as well as water utilization. Based on this water balance, the plans propose potential water management interventions aimed at sustaining groundwater resources. The whole process is also termed "groundwater budgeting" (P. Kumar 2023).

At the national level, *Atal Bhujal Yojana* is managed by the Department of Water Resources, River Development and Ganga Rejuvenation. At the state level, there isn't any uniformity: the program is managed by departments ranging from irrigation to water resources, agricultural, and groundwater units, to name a few.

5.3 CONVERGENCE OF RURAL DRINKING WATER AND WATER RESOURCES PLANNING

A missing aspect of the institutional setup described above is the lack of convergence between the demand-side and the supply-side of surface and groundwater water management programs. These deficiencies have hindered integrated planning and management of water resources in India. This is equally applicable to the *Jal Jeevan Mission* as well as *Atal Bhujal Yojana*. Though it is the mandate of both *Jal Jeevan Mission* and *Atal Bhujal Yojana* to adopt an integrated management approach, through convergence of projects in the two programs, field experience and interactions with the stakeholders do not reflect these expectations. For example, the *Atal Bhujal Yojana* does not account for water supplied through the canals in *Gram Panchayats*. In some geographies, this transported surface water accounts for a large share of water availability. On the other hand, Village Action Plans of the *Jal Jeevan Mission* do not address demand- or supply-side water management measures in the agrarian or industrial domains. This fact becomes highly significant when rural drinking water and irrigation share a common source, whether from groundwater or surface water.

Competition for water resources will increase as new infrastructure is built and the capacity of existing infrastructure is increased to provide drinking water service levels of at least 55 liters per capita per day through piped water supplies to each household. Developing sustainable new water supply schemes will require integration of rural drinking water supply and other water resources institutions. Our field visits in Karnataka indicated that Village Action Plans and Water Security Plans—the planning documents of *Jal Jeevan Mission* and *Atal Bhujal Yojana,* respectively—lack integrated planning and coordinated implementation. These disconnects were observed in each of the two main modalities for implementation of new drinking water projects: single-village schemes and multi-village schemes.

5.3.1 SINGLE-VILLAGE SCHEMES

A typical single-village scheme includes pumping from a source (usually a borewell) to overhead tanks that deliver water through conveyance infrastructure to households in a habitation. Water treatment facilities are increasingly installed at the tank or point of use, especially where the water source is known to be contaminated.

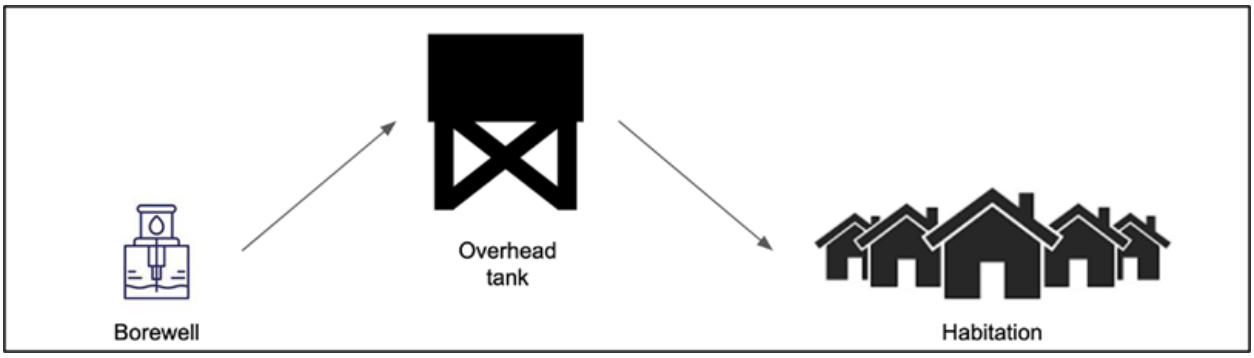

Figure 2: Water supply through a single-village scheme

Jal Jeevan Mission Village Action Plans estimate the demand for water in a single-village scheme based on the 55 liters per capita per day standard and project alternatives for meeting that demand (Ministry of *Jal Shakti* 2019). This is where convergence with other developmental programs and available infrastructure for water supply in the village can occur (Ministry of *Jal Shakti* 2019). Village Action Plans are prepared

by the *Gram Panchayat* and approved by the *Gram Sabha*[7], with the help of an Implementation Support Agency, typically a local nongovernmental organization.

Water source identification for single-village schemes in Karnataka is done by *Zilla Panchayat* Rural Drinking Water and Sanitation Department engineers. In the case of Maharashtra, the responsibility lies with Groundwater Surveys and Development Agency. In Bihar, the *Panchayati Raj* Department identifies sources for non-quality affected areas and the Public Health Engineering Department for quality affected areas. In Sikkim, the Rural Development Department identifies springs with the help of local governments.

Technical requirements are prepared by a Project Management Unit, which is a team appointed by the State Water and Sanitation Mission for technical assistance. The Zilla Panchayat's Rural Drinking Water and Sanitation Department Executive Engineer approves construction estimates. The approved technical and construction plans are submitted for another round of approval at the state level, after which tenders are floated. Monitoring the quality of work done by contractors is the duty of the *Zilla Panchayat* Rural Drinking Water and Sanitation Department. After trial runs, the scheme is handed over to the *Gram Panchayat* for operation and maintenance.

WATER RESOURCES MANAGEMENT IN SINGLE-VILLAGE SCHEMES

In single-village schemes, source sustainability is mainly addressed through managed pumping and the recharging of traditional water sources and borewells. These recharge methods are primarily implemented through the Mahatma Gandhi National Rural Employment Guarantee Act of 2005, a nationwide program that guarantees 100 days of employment in every financial year to adult members of any Indian rural household. However, the effectiveness of these interventions remains unclear as there are few documented efforts to quantify the recharge of water sources (Down to Earth 2021). This is worrying because borewell failure rates can be high (e.g., in Ramanagara, the district we studied in Karnataka, most borewells dried up within 7–10 years). Village Action Plans document current water sources and estimated water demand but fail to estimate future water source availability, which makes for an incomplete water budget. Scientifically valid tools to help *Gram Panchayats* prepare robust water budgets can enable them to understand source water availability more easily and more accurately (Srinivasan 2022).

Common challenges with respect to water resources management in single-village schemes identified in the literature review and interviews include:

Administrative versus geographical boundaries: The Village Action Plan is limited to a *Gram Panchayat*'s administrative boundaries, and thus it significantly fails to understand and incorporate natural geographical boundaries, such as aquifers and watersheds (Ministry of *Jal Shakti* 2019).

Community participation: The *Jal Jeevan Mission* and *Atal Bhujal Yojana* are participatory water management schemes as per their vision documents. But field observations indicate that in most cases, participation of the community is limited. A recent article (P. Kumar 2023) suggests that *Atal Bhujal Yojana* Water Security Plans were prepared in a hurry and thus compromised on community

[7] The *Gram Sabha* is recognized under Article 243(b) of the Indian Constitution as the primary body of the *Panchayati Raj*. It consists of all members of the village and serves as a forum to discuss village-related governance and development.

participation and institutional strengthening components of the guidelines. These findings were consistent with our field observations.

A disconnect between surface water and groundwater: Single-village planning and management remained biased toward present and primary sources of water supply and ignored the overarching water resources situation. For example, in cases where groundwater is the primary supply source, recharge from surface water bodies and inter-basin imports via canals is not included in the Village Action Plan (observation from Tumakuru field visit in January 2023). As a result, estimates of water availability can be off by 100–200 percent.

Planning document versus pro forma exercise: Village Action Plans, and Water Security Plans, are considered the backbone of the *Jal Jeevan Mission* and *Atul Bhujal Yojana* programs, but our meetings with community leaders suggest that they are often treated as a pro forma exercise to secure funding. This approach by default excludes context-based planning, incorporation of user-specific needs, as well as consideration of local hydrological features such as traditional water bodies (Hadonahalli *Gram Panchayat*, Personal Communication, February 25, 2022).

Preferences of nodal agencies: At times, state-level nodal agencies under the *Jal Jeevan Mission* influence the interventions proposed in planning documents based on their preferences. For example, our study of *Atal Bhujal Yojana* Water Security Plans in Maharashtra reflects a higher proportion of supply-side water management interventions, such as check dams, as compared to demand-side interventions, like pumping regulation. The Groundwater Surveys and Development Agency, the nodal agency of the *Atal Bhujal Yojana* in Maharashtra, has implemented supply-side measures like recharge schemes and farm ponds (Ajinkya Katkar, Personal Communication, March 8, 2022; Dhaval Joshi, Personal Communication, July 1, 2022). These are associated with bigger budgets for infrastructure construction, while demand-side management schemes involving behavior change receive less attention.

5.3.2 MULTI-VILLAGE SCHEMES

A typical multi-village scheme is based on surface water. Multi-village schemes are preferred in regions where groundwater contamination and/or scarcity are prevalent, and where single-village schemes are more likely to fail. The implementation of multi-village schemes is carried out generally in two phases: 1) the creation of a bulk water storage and distribution network; and 2) the installation of pipelines and taps to households from overhead tanks. These are known as in-village distribution networks.

Habitations (i.e., clusters of households, as defined earlier) covered under multi-village schemes follow a similar planning process to those covered under single-village ones. Based on the Village Action Plans included in the scheme, the Rural Water Supply and Sanitation Department puts out tenders for constructing the physical infrastructure for the project. One key difference between single- and multi-village schemes is in their operations and maintenance. For multi-village schemes, operations and maintenance is not the direct responsibility of individual *Gram Panchayats*. Instead, the same private contractor that installed the infrastructure usually undertakes this responsibility after construction, typically for five years. Even after this period, operations and maintenance continues to be under contract to an agency and not with *Gram Panchayats,* which reimburse the agency through tap connection fees and water tariffs.

Since there are multiple villages involved and the scale of the installed infrastructure is usually large, engineers at the district level believe that private contractors are better placed to manage bulk water supply in multi-village schemes. But even with multi-village schemes, intra-village distribution is left to the

care of the different *Gram Panchayats* and their respective village water and sanitation committees. In some states, like Tamil Nadu, it is common for *Gram Panchayats* to augment water from the multi-village schemes with their own borewells.

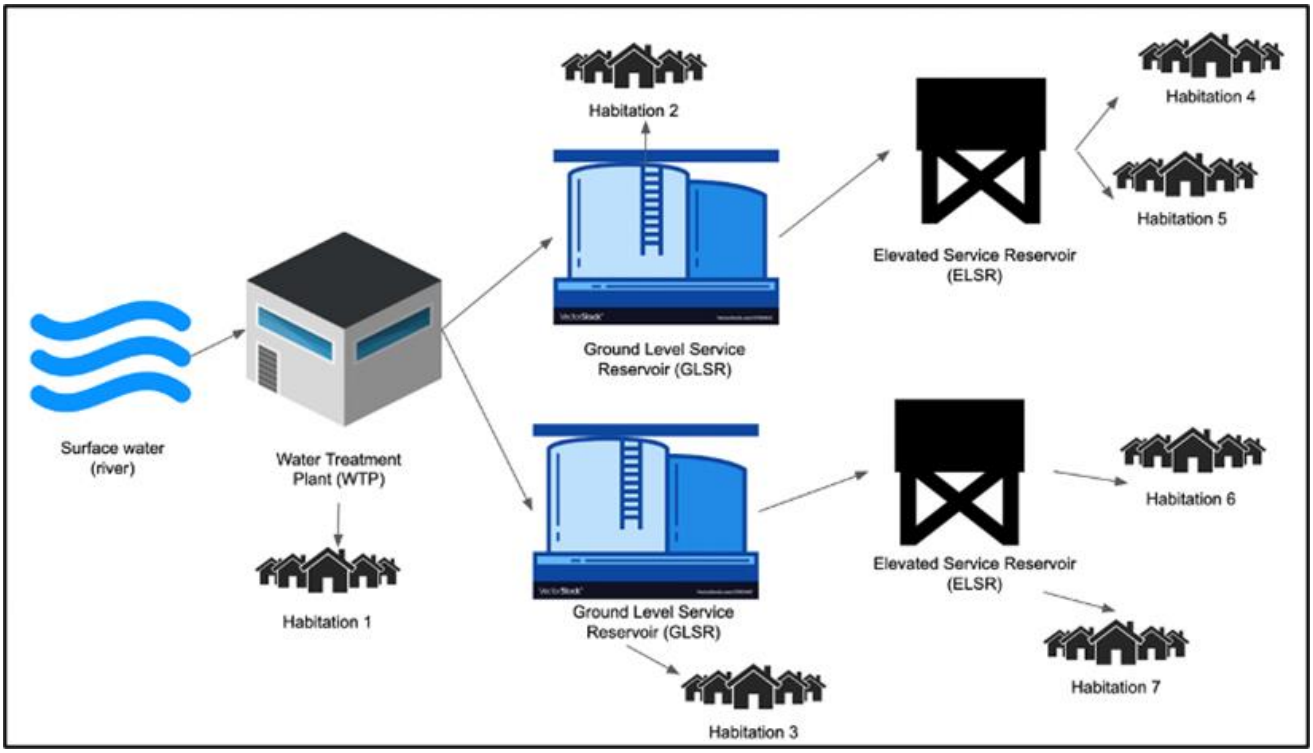

Figure 3: Water supply through a multi-village scheme

APPROACH TO WATER RESOURCES MANAGEMENT IN MULTI-VILLAGE SCHEMES

The *Jal Jeevan Mission* guidelines (Ministry of *Jal Shakti* 2019) do not provide clear directions on source sustainability for multi-village schemes. Hutchings et al. (2020) suggest that the large-scale and top-down approach create hindrances for community management and participation in multi-village schemes for rural water supply in India. The lack of community participation and localized planning can result in slip-back of drinking water services and poor overall water resources management in multi-village schemes (Sangameswaran 2014).

Further, multi-village schemes are prone to inter-sectoral disputes. In Maharashtra, some farmers in head-end villages (i.e., those who are closer to the reservoir or water source) punctured pipelines to use the water for irrigation (Ajinkya Katkar, Personal Communication, March 8, 2022). This is one of the key reasons why the scheme failed (based on his experience assessing 15 dysfunctional schemes in the district of Ahmednagar). The tail-end villages wound up getting insufficient water at low pressure. They then refused to pay for operation and maintenance bills. When the bills mounted, the scheme became dysfunctional.

Moreover, multi-village schemes require payment for energy and maintenance for the entire year (while some single-village schemes have lower costs associated with seasonal operations). Addressing the additional security required to protect water supply lines and ensure fair distribution of supply make multi-village schemes hefty financial and logistical undertakings. Planning multi-village schemes that

address financial and operational challenges is a necessary approach in many drought- and water quality-affected regions.

6.0 COMPARISON OF STATE-LEVEL WATER INSTITUTIONS

As noted above, water is constitutionally a state subject in India. State governments have been active in implementing rural water supply schemes since the country's independence, drawing in part upon national funding programs (Table 1). States have also begun to align their programs with national reforms in the drinking water sector, shifting from supply-driven to demand-driven approaches, to community management of schemes, and to greater involvement of *Panchayati Raj* institutions. Some states like Maharashtra devolved drinking water and sanitation services to local government responsibility (Wescoat and Murty 2021). In the *Jal Jeevan Mission*, states play an essential role in implementing the nationwide program through financial, administrative, and technical assistance.

Our field reconnaissance focused on four states for initial investigation and comparison. The four states represent different geographical regions of India (south, west, north, and northeast). They have different socio-economic and political conditions that Hutchings et al. (2017) characterize as middle-income social-democratic (Karnataka), high-income developmental (Maharashtra, low-income neo-patrimonial (Bihar), and mountainous regions (Sikkim).

Within each state, we focused on a case study district and one or more *Gram Panchayats* within it (Figure 4). For example, in Karnataka's Ramanagara district, a hard rock aquifer region, we focused on one single-village and one multi-village scheme. There is reportedly nitrate and fluoride contamination of water in this district. In Maharashtra, a state mostly underlain by basalt (hard rock) aquifers, we looked at Pune district, where the majority of the schemes are single-village and reliant on groundwater. In the shallower alluvial aquifer region of Bhagalpur district in Bihar, we studied another groundwater-based single-village scheme. In spring-fed Sikkim, we looked at three *Gram Panchayats* in two districts, Gyalshing and Namchi, where single-village schemes are being planned or implemented.

In each location, we drew upon literature reviews, conducted stakeholder interviews, and prepared journey maps to assess stakeholder understanding of the *Jal Jeevan Mission* process. The details of those interviews, journey maps, and references are presented in the Appendices (Section E onward).

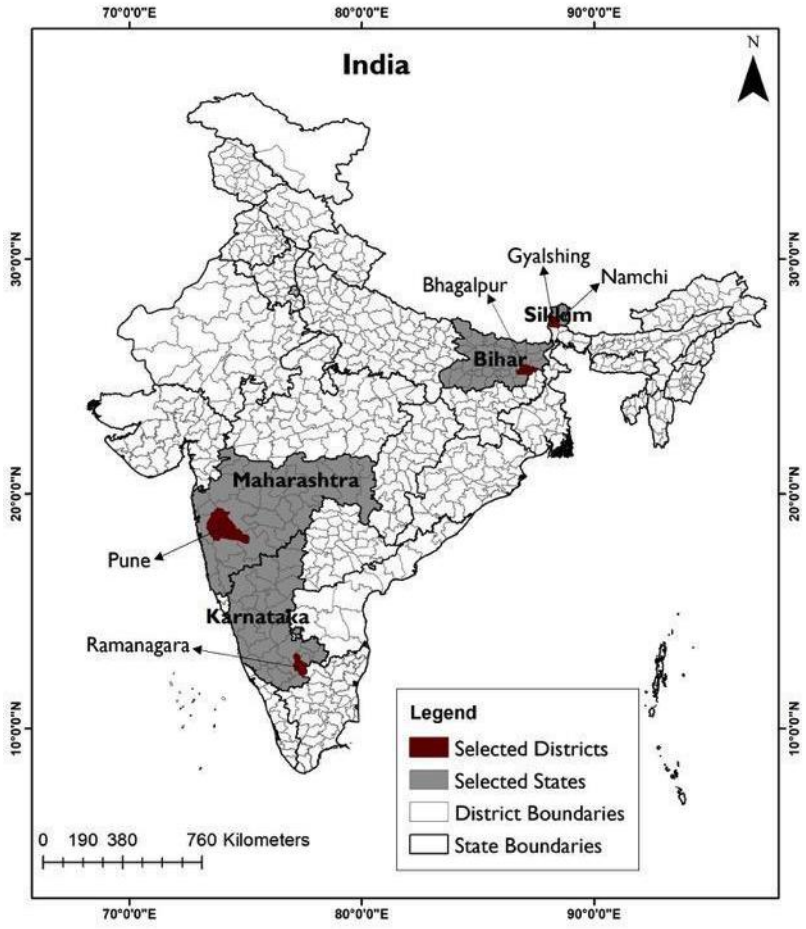

Figure 4: Map of India highlighting the states and districts selected for this study.

This section of our report compares the status of rural drinking water planning, and its relationship to water resources management, in Karnataka, Maharashtra, Bihar, and Sikkim, as summarized in the Table 3 below. The major categories of comparison are:

- State resource characteristics,
- State water resource problems,
- Piped water supply status,
- Piped water supply planning, and
- Financial parameters.

TABLE 3: HOW POLICIES AND INSTITUTIONAL STRUCTURES VARY ACROSS FOUR STATES

PARAMETERS	KARNATAKA	MAHARASHTRA	BIHAR	SIKKIM
STATE RESOURCE CHARACTERISTICS				
PHYSIOGRAPHY	Located on the Deccan plateau of peninsular India.	Situated in Peninsular India. Divided into coast, mountains, and plains.	Lies in the northern Gangetic plains. Drained by various tributaries of	Situated in the eastern Himalayan mountains

TABLE 3: HOW POLICIES AND INSTITUTIONAL STRUCTURES VARY ACROSS FOUR STATES				
PARAMETERS	KARNATAKA	MAHARASHTRA	BIHAR	SIKKIM
	Western Ghats[8] cut across north to south. Eastern plains are highly drought prone.	Soil characteristics are different in all three geographies.	river Ganga.	
AQUIFER CHARACTERISTICS	Hard rock aquifer Anthropogenic and geogenic contamination	Hard rock aquifer Anthropogenic and geogenic contamination	Alluvial aquifer Geogenic contamination	Mountain aquifer Anthropogenic contamination
STATE WATER RESOURCE PROBLEMS				
ESTIMATED PER CAPITA WATER AVAILABILITY	890.31 cubic meter/year	1217.88 cubic meter/year	1554.7 cubic meter/year	29,054 cubic meter/year
OVEREXPLOITED / CRITICAL GROUNDWATER BLOCKS	Overexploited: 52 Critical: 10 Semi critical: 35	Overexploited:10 Critical: 8 Semi critical: 63	Overexploited: 7 Critical: 5 Semi critical: 51	Nil
DRINKING WATER VULNERABILITY	Groundwater contamination, depletion, drought	Groundwater contamination, depletion, drought	Floods, geogenic contaminants	Drying springs, drought
CLIMATE STRESS	Climate stress due to drought, groundwater depletion	Climate stress due to drought, groundwater depletion	Climate stress (surface water) due to flooding	Climate stress (surface water) due to flooding
STATE INSTITUTIONAL STRUCTURE				
NODAL DEPARTMENT	Rural Development and *Panchayat Raj* Department	Water Supply and Sanitation Department	*Panchayati Raj* Department and Public Health Engineering Department	Rural Development Department
PARASTATAL AGENCY DEALING WITH RURAL DRINKING WATER SUPPLY	None	Maharashtra *Jeevan Pradhikaran* deals with technical inputs in multi-village schemes. Groundwater Surveys and Development Agency deals with groundwater assessment and inputs in planning.	None	None
DETERMINATION OF BULK WATER TARIFF	The Water Resources Department determines bulk water tariffs for all sectors.	The Water Resources Department and Maharashtra Water Resources Regulatory Authority determines the bulk water tariff for surface water | As of now, there is no charge for groundwater extraction.	Bulk water tariffs are determined by the Water Resources Department for all sectors.	For irrigation, the Irrigation and Flood Control Department of the Government of Sikkim determines the irrigation tax.
SOURCE SUSTAINABILITY ASSESSMENT	Rural Development and Panchayat Raj department conducts	Groundwater Survey and Development Authority conducts source yield certifications while planning	By *Panchayati Raj* Department and Public Health Engineering Department	No source sustainability assessment

8 The Western Ghats, "possibly a fault scarp, are the crest of the western edge of the Deccan plateau. Their steep seaward slopes are deeply dissected by streams and canyon-like valleys, but on the landward side their slopes are gentle and give way to wide, mature valleys" (Britannica 2016).

TABLE 3: HOW POLICIES AND INSTITUTIONAL STRUCTURES VARY ACROSS FOUR STATES				
PARAMETERS	KARNATAKA	MAHARASHTRA	BIHAR	SIKKIM
	V-notch[9] test for yield.			
WATER REGULATORY AUTHORITY	State has 'Karnataka Groundwater Authority " under 2011 act, which regulates groundwater use for industrial use. It identifies notified areas" to regulate groundwater.	State has a water regulatory authority through its Maharashtra Water Resources Regulatory Authority act of 2005	State has Bihar Groundwater Act of 2006, under which it is prescribed to have Bihar State groundwater Authority. It is not active	No water regulatory authority but the state has acts for irrigation tax and water supply charges
TARIFF DETERMINATION	Village water and sanitation committee determines tariff rates for the sake of operations and maintenance of in-village infrastructure. Generally, ranges between $0.36-0.61[10] per month. It can be paid yearly.	The *Gram Panchayat* and the water and sanitation committee decide the tariff. It is collected yearly with the house tax.	A ward-level committee has the power to determine the tariff (generally ₹30 per month).	The Village Water & Sanitation Committee determines the tariff.
COMPOSITION OF VILLAGE WATER AND SANITATION COMMITTEE	State follows the *Jal Jeevan Mission* guidelines. Committees comprise 10–15 members with 25 percent *Gram Panchayat* representatives, 50 percent women, 25 percent members from marginalized sections of society.	State follows the *Jal Jeevan Mission* guidelines. *Sarpanch*[11] and *Gram Sevak* are president and secretary of the committee, respectively.	Bihar has ward-level implementation and management committees. These are seven-member committees with at least a member from the Scheduled Castes	The *Panchayat* President chairs the village water and sanitation committee Composition is as per *Jal Jeevan Mission* guidelines.
APPOINTMENTS TO VILLAGE WATER AND SANITATION COMMITTEE	The members are appointed by the *Gram Panchayat.*	The members are appointed by the *Gram Panchayat.*	Ward *Sabha*[12] appoints residents to this committee.	The members are appointed by the *Gram Panchayat.*
PIPED WATER SUPPLY STATUS				
HOUSEHOLD TAP CONNECTIONCOVERAGE IN AUGUST 2019 (JJM Dashboard, 2023)	24.31 percent	33.01 percent	1.96 percent	55.34 percent
HOUSEHOLD	60.80 percent	72.38 percent	95.59 percent	77.62 percent

9 A common way to describe the yield of a new borewell is in 'inches' measured by the free, unrestrained flow of water from a borewell over a 90 degree 'V' notch. (Source: http://bengaluru.urbanwaters.in/faqs/).

10 Calculated at $1=₹ 82 (May 2023) for all conversions in this document.

11 A *sarpanch* is the elected head of a *Gram Panchayat.*

12 Lowest level of institution under Panchayat Raj in Bihar. This is because of high population density.

TABLE 3: HOW POLICIES AND INSTITUTIONAL STRUCTURES VARY ACROSS FOUR STATES				
PARAMETERS	KARNATAKA	MAHARASHTRA	BIHAR	SIKKIM
COVERAGE AS OF 24 JAN 2023				
PLANNED TAP CONNECTION COVERAGE THROUGH SINGLE-VILLAGE SCHEMES in 2020-21	14.7 percent	72.7 percent	56.6 percent	Not Available
PLANNED TAP CONNECTION COVERAGE THROUGH MULTI-VILLAGE SCHEMES in 2020-21	85.2 percent	27.8 percent	43.2 percent	Not Available
HABITATIONS WITH 100 PERCENT HOUSEHOLD TAP COVERAGE AS OF 24 JAN 2023	28.86 percent (16,683 of 57,798 habitations)	30.15 percent (30,242 of 100,294 habitations)	91.44 percent (96,798 of 105,855 habitations)	58.43 percent (1,320 of 2,259 habitations)
HABITATIONS COVERED THROUGH GROUNDWATER-BASED SCHEMES AS OF FEBRUARY 10, 2023	87.9 percent (104,462 of 118,765 habitations)	85.31 percent (106,369 of 124,679 habitations)	99.5 percent (119,266 of 119,826 habitations)	0.3 percent (Six of 2,510 habitations)
HABITATIONS COVERED THROUGH SURFACE WATER-BASED SCHEMES AS OF FEBRUARY 10, 2023	11.2 percent (13,298 of 118,765 habitations)	14.17 percent (17,676 of 124,679 habitations)	0.5 percent (348 of 119,826 habitations)	99.7 percent (2,504 of 2,510 habitations)
TARGETED SERVICE LEVEL (LITERS PER CAPITA PER DAY) UNDER JAL JEEVAN MISSION AND MUKHYAMANTRI GRAMIN PEYJAL NISCHAY YOJANA.	55	55	70	55
PIPED WATER SUPPLY PLANNING				
GUIDELINES	Planning approach has been in line with the national direction. Retrofitting of schemes is preferred. Tribal and hilly regions are expected to get solar-based single-village schemes. Quality-affected regions are to be provided with treated water. Drought-affected regions should be connected	National Rural Drinking Water Programme plans retrofitting to 55 from the 40 liters per capita per day. Standpost-to-household connections to be provided. Villages with sufficient water can implement single-village schemes. Villages with water quality issues should be provided with treated water. Multi-village schemes for water-scarce villages.	*Panchayati Raj* Department works in non-quality affected areas and Public Health Engineering Department in quality affected areas. All schemes should be designed for 70 liters per capita per day. Wards are planning units and priority is given to wards with Scheduled	Sikkim has followed the *Jal Jeevan Mission* direction given by the Government of India. It follows the same approach of planning.

TABLE 3: HOW POLICIES AND INSTITUTIONAL STRUCTURES VARY ACROSS FOUR STATES				
PARAMETERS	KARNATAKA	MAHARASHTRA	BIHAR	SIKKIM
	with regional water supply schemes.	Schools, colleges, and *Anganwadi* centers are given tap connections. Every household from Scheduled Caste habitation should be provided with a tap connection.	Caste majority. Ward[13]-level committees should approve schemes.	
ACTUAL PROCESS OBSERVED FOR PLANNING AND IMPLEMENTATION	Top-down	Top-down	Top-down	Strongly Community driven approach
NUMBER OF LABS	District Labs: 30 Sub-division Labs: 47	District Labs: 34 Sub-division Labs: 143	District Labs: 38 Sub-division Labs: 75	District Labs: 2
SINGLE-VILLAGE SCHEME PLANNING BY	Rural Drinking Water and Sanitation Department of *Zilla Panchayat*	Rural Drinking Water and Sanitation Department of *Zilla Parishad*	*Panchayati Raj* Department for areas where water quality is not a problem. Public Health Engineering Department in regions with water contamination	*Zilla Panchayat* leads the planning
MULTI-VILLAGE SCHEME PLANNING BY	Rural Drinking Water and Sanitation Department of Rural Development and *Panchayat Raj*	Maharashtra *Jeevan Pradhikaran*	Public Health Engineering Department for quality affected areas	Field observation or desk research did not reveal any planning for multi-village schemes.
SINGLE-VILLAGE SCHEME OPERATION BY	*Gram Panchayat* with the village water and sanitation committee's help	*Gram Panchayat* with the village water and sanitation committee's help	*Gram Panchayat* with the help of ward-level committees	*Gram Panchayat* with the village water and sanitation committee's help
MULTI-VILLAGE SCHEME OPERATION BY	Contractors operate for five years on the design, build, operate, and transfer model.	Ideally, the Apex Committee needs to operate, but sometimes, this duty is delegated to *Zilla Parishad.*	Contractors need to operate and maintain for five years.	None
FINANCIAL PARAMETERS				
PER CAPITA INCOME (Financial Year 2021–22)	$3400	$2745	$603	$2841
STATE BUDGET ALLOCATION TO WATER SANITATION AND HYGIENE (Financial Year 2021–22)	$ 602.9 million	$714.6 million	$778.9 million	$5.12 million
AVERAGE PER HOUSEHOLD COST OF A WATER SUPPLY SCHEME	1. Single-village scheme (Retrofit): $243.8 2. Multi-village scheme (Retrofit): $123.2	1. Single-village scheme: $61 2. Multi-village scheme: $36.5 3. Solar: $122	Single-village scheme: $108.5	Single-village scheme (retrofit): $890

Source: *Jal Jeevan Mission* documents and state government notifications. For detailed citations, see Appendix case studies.

[13] A *Gram Panchayat* is sub-divided into wards for electoral purposes. A ward is different from a habitation.

6.1 KEY SIMILARITIES AND DIFFERENCES AMONG STATES

This section discusses the key state similarities and differences presented in Table 3. Case studies of the four states with detailed information and citations are in Appendices A-D.

6.1.1 STATE RESOURCE CHARACTERISTICS

Rural drinking water supply is influenced by the physiographic and aquifer characteristics in the four states.

The four states were selected for their range of environmental conditions. In Karnataka and Maharashtra, hard rock aquifer systems of the Deccan plateau have limited groundwater storage and recharge capacity. Additionally, parts of those two states are located in the rain shadow region of peninsular India, which receives low rainfall, in some places <500 mm per year.[14] In the case of Sikkim, rainfall is abundant with an average of 2,718 mm per year, though the mountainous topography is a major barrier to accessing water. Mountain springs are dependent on rainfall and snow for their yield. Some areas of Sikkim are in a rain shadow, which affects the recharge of aquifers that feed the springs. In the state of Bihar, rainfall is more abundant, averaging 1,215 mm per year on alluvial plains that have more homogeneous aquifer supplies. However, Bihar is prone to annual monsoon floods when large tracts of land are submerged, making safe drinking water availability and quality a challenge.

6.1.2 STATE WATER RESOURCE PROBLEMS

Water resources are overexploited particularly in Karnataka and Maharashtra. Groundwater contamination issues exist in all states except Sikkim.

Notwithstanding their physiographic and climatic differences, the four states face several common problems. Three of the four states face high levels of water stress as per the Falkenmark index[15]; the water availability in these states falls below the 1700m^3 per capita per year threshold. In addition, Karnataka and Maharashtra have overexploited groundwater resources, as their hard rock aquifers are characterized by poor storage and transmission capacities (Central Ground Water Board 2020). But Bihar also has 63 blocks that are in semi-critical or worse condition. Even in water-abundant Sikkim, field interviews reported that yields from springs are diminishing, likely due to droughts, land cover change, and agricultural usage. In all states, the drinking water sector shares, and competes for, water resources with agricultural, municipal, and industrial sectors.

It is difficult to generalize about rural water quality due to data quantity and quality limitations.[16] However, our interviewees reported that groundwater contamination is a problem in Karnataka, Maharashtra, and Bihar. In all of these states, contamination is said to be largely geogenic (Fluoride, Arsenic, and Iron). In some cases, it is due to anthropogenic activities such as untreated domestic and

[14] Rainfall data for all states from the Government of India (India Meteorological Department 2015), as well as state data at the block and station levels.

[15] A region is considered under stress in the supply of water if the threshold drops below 1700 m3 per capita per year. If renewable water supply drops below 1000 m3 per capita per year, the region is considered as under chronic water scarcity. However if a region's renewable water supply drops below 500 m3 per capita per year, the region is under absolute scarcity (Ding and Ghosh 2017).

[16] E.g., While *Jal Jeevan Mission* compiles lab data, the *Jal Shakti* Integrated Management Information System database recorded no water quality affected villages in Karnataka in 2022; and the Central Pollution Control Board had only one groundwater quality datum for Karnataka in a 2021 report. https://cpcb.nic.in/wqm/2021/NWMP_DATA_2021.pdf. More data are online in the *Jal Jeevan Mission* Water Quality MIS database https://ejalshakti.gov.in/WQMIS/Report/quality_affected_habitation. .

industrial wastewater, agricultural chemicals, and salinity. Water quality requires much closer attention in future research.

6.1.3 STATE INSTITUTIONAL STRUCTURES

1. Presence of a dedicated ministry for drinking water supply and sanitation in Maharashtra while other states incorporate drinking water in a larger ministry.

The institutional context of a drinking water program is important for its effectiveness. The presence of a dedicated drinking water ministry at state levels gives it prominence in decision-making. On the other hand, it can perpetuate the fragmentation of water resources planning. Currently, Maharashtra has a ministry dedicated to drinking water supply and sanitation in rural areas. In the other three states, drinking water is the responsibility of either a Rural Development Department or a Public Health Engineering Department. These departments have to look after other aspects of rural development as well, which can either dilute their efforts or lead to more holistic rural water management. Interestingly, in Bihar, several ministries have achieved significant coordination to create a massive water infrastructure program and reportedly high drinking water coverage across the state. Each state requires its own institutional strategy to link drinking water with more holistic water management.

2. Presence of technical parastatal agencies and regulatory authority in Maharashtra.

Along with the institutional context of rural drinking water supply, it is important to have support for scientific and technical aspects of groundwater hydrology, multi-village schemes, and water use regulation. Maharashtra has established all three types of agencies. The *Maharashtra Jeevan Pradhikaran* has responsibility for large-scale drinking water engineering projects. The *Groundwater Surveys and Development Agency* supports geohydrological mapping, monitoring, and groundwater source sustainability planning. Such parastatal agencies are not present in the other three states. The state of Maharashtra has also created a Water Resources Regulatory Authority (mwrra.org) to manage water entitlements, data, and disputes, although its jurisdiction to date is limited to surface water. In the other three states, multi-purpose water use regulation and management are addressed mainly in policy documents.

6.1.4 PIPED WATER SUPPLY STATUS

1. Piped water development in the rural drinking water sector started early in peninsular India in comparison to Bihar and Sikkim.

Karnataka and Maharashtra started providing piped water supply in the 1980s with the help of external funding. For example, Maharashtra borrowed funds from the World Bank under its *Jal Swarajya* programs (Sangameswaran 2014). Bihar started piped water supply efforts at a large scale only in 2016, but its 95 percent coverage has advanced beyond most states. In Sikkim, springs were traditionally the primary source of water supply, and are now becoming a source for piped water supply.

2. Bihar has provided tap connections to 95 percent of households.

In terms of overall coverage of households, Karnataka, Maharashtra, and Sikkim have progressed to around 60–70 percent, and coverage is gradually increasing. However, Bihar has managed to achieve massive infrastructure creation from only about 2 percent of households with tap connections at the start of the *Jal Jeevan Mission* to 95 percent in the short span of about five years (*Jal Jeevan Mission*

Dashboard 2023). Bihar also reports a much larger share of habitations with 100 percent tap connection. This fast trend deserves detailed study and monitoring to assess its accuracy, causes, and sustainability. In states with more moderate progress, it is important to assess the differential equity of access to piped water supply within and between villages (Wescoat and Murty 2021; Wescoat et al. 2022).

3. Karnataka has planned new tap connections through multi-village schemes whereas Maharashtra and Sikkim prefer single-village schemes.

As a strategy to tackle water scarcity issues, Karnataka and Bihar have recently opted for surface water-based multi-village schemes. Earlier, Bihar's tap connections were almost entirely through groundwater-based single-village schemes. Maharashtra experimented with multi-village schemes and after experiencing problems of water delivery, reliability, and equity, reverted to single-village schemes. However, that is changing in favor of multi-village schemes for improved and reliable services (Sangameswaran 2014).

4. Drinking water quality remains a major concern.[17]

The "functional household tap connection" definition mandates adherence to Bureau of Indian Standards:10500 standards for quality (Ministry of *Jal Shakti* 2019), but geogenic and anthropogenic contamination are reported to be major challenges on the ground (Bandyopadhyay 2016; Chaudhuri et al. 2020). India's *Swachh Bharat Mission*, a program for an "open defecation free" India, while improving sanitation and hygiene, has created a large number of on-site sanitation facilities and this may expose shallow groundwater sources to nitrate and microbial contamination (M. D. Kumar, Bassi, and Kumar 2022). It has been estimated that poor fecal sludge management may lead to an increase in river pollution by 72 percent (Motohashi 2022). Increased piped water supply will also increase environmental drainage needs, as recognized in the *Jal Jeevan Mission Guidelines* (2019).

6.1.5 PIPED WATER SUPPLY PLANNING

1. All four states use a top-down approach to planning in major states.

Like the national government, the four states studied apply a top-down approach to planning and implementation, except in Sikkim, and to a limited extent, in Bihar where both state-level and village-level[18] planning was seen. Village-level *Panchayati Raj* institutions seem to take limited coordinating steps in planning and compiling project needs in response to national and state funding requirements (Wescoat and Murty 2021).

2. *Jal Jeevan Mission* guides piped water supply program planning and implementation except in Bihar.

[17] A detailed study of water quality is not a part of this report, as noted earlier under the About this report section, partly due to data quality and measurement limitations. For example, while the *Jal Shakti* Integrated Management Information System For, Karnataka reported *zero* water quality affected habitations, the same agency's *Jal Jeevan* Water Quality Management Information System reported 636 water-quality affected habitations (primarily fluoride and secondarily iron). Sikkim reported zero water quality affected habitations in both databases. Nearby Assam reported 7,513 iron-affected habitations in the IMIS but 21,045 in the *Jal Jeevan Mission* Water Quality Management Information System database.

[18] i.e., the "ward" level in Bihar terminology.

Karnataka, Maharashtra, and Sikkim act in accordance with the mission's guidelines. Generally retrofitting of existing schemes is preferred—as put forward by the national mission—"to grab the low-hanging fruits" for increasing coverage. However, Bihar has its own guidelines under its state-level program, in addition to the *Jal Jeevan Mission*. Since 2016, it has primarily opted to create new infrastructure with a service level of 70 liters per capita per day.

3. When it comes to planning and implementation of schemes, Maharashtra stands out for the involvement of its parastatal agencies.

In all states, single-village schemes are planned and implemented by nodal agencies at the district level. Thus for single village schemes the respective *Zilla Panchayat* and District Water and Sanitation Missions lead the implementation. In the case of multi-village schemes, nodal agencies at the district level in Karnataka and Bihar plan and implement. However, in Maharashtra, the parastatal agency Maharashtra *Jeevan Pradhikaran* leads the planning and implementation for large multi-village schemes. There is a limited role of village-level communities in planning and implementation at district and sub-district levels.

4. Operations and maintenance are the responsibility of local governments and communities.

In all states, the responsibility for the operations and maintenance of a single-village scheme is given to the *Gram Panchayat* or its village water and sanitation committee. In Karnataka and Bihar, multi-village schemes are operated and maintained by contractors who constructed them. In the case of Maharashtra, operations and maintenance should be done by *Shikhar Samiti* (a committee of village representatives for a multi-village scheme), but their inability or reluctance to operate prompts the *Zilla Parishad* to step in for this duty.

6.1.6 FINANCIAL PARAMETERS

1. Scheme retrofitting costs are high in Sikkim and Karnataka.

The four states studied are investing heavily in water, sanitation, and hygiene. Bihar has the largest allocated budget to the sector, which is understandable considering its focus on creating large new infrastructure projects. The per-household cost of retrofitting a single-village scheme is very high in Sikkim because of its topography and scattered habitations. Retrofitting costs in Karnataka are also high compared to Maharashtra and Bihar.

2. Financial sustainability lessons have not been put into practice.

The importance of financial sustainability for rural drinking water supply is well established, in India and around the world (USAID 2020; World Bank Group 2017). This is an important part of *Jal Jeevan Mission* guidelines at the national level. It includes collection of water tariffs for connection fees, monthly or annual operations and maintenance expenses, and asset management for capital replacement costs. Although all states devolve tariff collection to a local level, financial management practices and financial sustainability vary greatly within and between districts (Wescoat et al. 2022 analysis in Satara District, Maharashtra). To date, none of the four states seems to have developed strong support programs for village financial planning. With the installation of new taps and metering, it will be possible to assess patterns of water use and the difference that tariffs and other financial practices make for rural domestic water demand and sustainability. Although *Jal Jeevan Mission* has recommended metering of household tap connections, out of the four states studied, only Karnataka has made metering mandatory, and there,

users have expressed reluctance to shift to metered tariffs due to concerns about volumetric pricing (The Hindu 2021).

6.1.7 SUMMARY

The four state case studies present wide variations in conditions, challenges, and innovations—underscoring the important point that in the federal context of India each state is different. We summarize this state section with a brief profile of each state's drinking water system and its relation to water resources management.

Karnataka is facing challenges in terms of the availability of sustainable drinking water resources. There is competition across sectors for its overexploited aquifers. It also has contamination issues which further pushes the state to look for alternative sources of water, such as imported surface water from other regions. Even though there are exploitation challenges, the state is doing little in terms of regulating groundwater. There are high chances of new schemes slipping back because of falling groundwater levels and public infrastructure going defunct. A top-down approach is able to create water supply infrastructure, but water resources management needs a holistic approach with the involvement of the community to ensure source sustainability and drinking water security in rural areas.

Maharashtra also faces similar challenges as that of Karnataka in terms of water resources. But it has taken steps such as regulating water resources and establishing technical institutions to support planning. Similarly, it is in infrastructure creation mode for the *Jal Jeevan Mission,* but it needs to look further to sustain this infrastructure. The Groundwater Surveys and Development Agency recommends source sustainability measures to *Gram Panchayats* as part of its source certification for the *Jal Jeevan Mission*. However, *JJM* does not implement sustainability measures; *Gram Panchayats* are supposed to implement these through the funds available to them, either through convergence with other schemes or by using their own funds (Sachin Potude, Personal Communication, May 9, 2022). *Atal Bhujal Yojana* is active in a few districts of Maharashtra, where the Groundwater Surveys and Development Agency is the implementer and considers source strengthening. Yet on the ground, there is little to no communication between *JJM* and *Atal Bhujal Yojana* (Dhaval Joshi, Personal Communication, July 1, 2022). Steps can also be taken to involve the community in planning.

Bihar has progressed rapidly from 2 percent to 95 percent coverage (*Jal Jeevan Mission* Dashboard, 2023). But there is no water resources regulation or authority in place. Infrastructure for the rural water supply program has been created with the help of private contractors (these are private infrastructure creators). The water tariff has not yet been rolled out. Avoiding slip back of schemes will be a major goal for the state government in the coming years. In terms of source sustainability, the state is implementing *Jal Jeevan Hariyali Yojana*, which is a state-led water conservation program. This program is conserving water bodies, building recharge structures, and promoting good agricultural practices for water conservation (*Jal Jeevan Hariyali Yojana* website accessed on January 28, 2023).

In the case of Sikkim, drying springs are posing the main challenge in terms of resource availability for water supply schemes. Sikkim's tough terrain and scattered habitations are another big challenge in providing tap connections with increased service levels. For source sustainability, the Rural Development Department initiated a springshed management program, *Dhara Vikas,* in 2008. This initiative implements watershed activities in drought-prone regions of the state. It is still active and has transitioned into a community-led initiative.

Significantly, while there was no clear evidence of statewide people's movements in the rural water supply sector in the limited areas that we studied, several experts felt that it is much needed, and that the *Jal Jeevan Mission* is a great opportunity for *Gram Panchayats* and villages of their states to claim their rightful access to improved drinking water services, and to do so through a broader decentralized model of governance across water resource sectors.

7.0 THE WAY FORWARD

This research on the current state of national, state, and local drinking water planning in India reveals important knowledge gaps and hypotheses that form the basis of a comprehensive research agenda for the larger research community. The REAL-Water team highlights six key findings and recommendations below.

1. Move toward regional water resources planning to achieve rural drinking water security

The need to plan for sustainability of water resources has been in the discourse globally and in India. It is also one of the strongest findings in this study of national and state water programs and policies. Even where mentioned in policies like the *Jal Jeevan Mission* Guidelines (Ministry of *Jal Shakti* 2019) we found a neglect of sustainable water resources management, upon which local drinking water sources and schemes depend. More holistic water resources planning approaches and practices emerge as imperatives. What is needed is a focus on regional resource sustainability that affects multiple villages, in addition to focusing on the sustainability of point sources.

Key knowledge gaps include:

- What policy mechanisms are most effective for promoting regional water resources planning?
- How can current planning processes for source sustainability be made more effective in practice?

2. Assess opportunities for state-specific convergence of drinking water-related programs in each state

Rural drinking water authorities cannot expect to sustain water supply sources in isolation. Although the concept of integrated water resources management has been around for decades, this report has shown that in India, the water sector remains fragmented at the national and state levels: each state has its own conditions, challenges, and innovations. Inter-sectoral water allocation has taken place in the context of surface water bodies, though there is a need for convergence of surface water management programs. This is not the case, however, for groundwater over-abstraction, which is driven by millions of farmers who have free access to electricity. Conjunctive management of surface and groundwater is required.

Key knowledge gaps include:

- What state-specific planning mechanisms are in place to align water resources management and drinking water supply?
- How can lessons in planning be shared and adapted for implementation across states?

3. Assess the enabling conditions for *Panchayati Raj* institutions to generate innovative solutions

Several implementation challenges emerged based on our review of states and *Panchayati Raj* institutions. These institutions do not seem to have adopted an integrated approach for developing water supply schemes. In particular, there is an absence of mechanisms for addressing competing demands for water. In addition, community participation is either totally absent or very limited, despite guidelines to the contrary.

Key knowledge gaps include:

- Does the separation of source sustainability from the planning for drinking water supply systems make a difference for the longevity of schemes?
- Do agencies have the capacity to make sustainability assessments?
- Does it matter if the rural water supply department is within the same ministry as the water resources department? Are the planning processes and decisions different?
- Different approaches have been adopted while establishing village water and sanitation committees[19], such as those with only males versus those with a balanced representation of genders. But it is not clear whether and how the makeup of a committee matters. For instance, does the ratio of appointed to elected members make a difference in terms of effectiveness? If the committee consists of village-level functionaries, does it improve the convergence of schemes?
- What difference can innovative financing and asset management make for source sustainability?

4. Link tap functionality with aquifer sustainability

The *Jal Jeevan Mission* has emphasized the importance of *functional* household tap connections. However, this review has shown that functionality depends on the long-term sustainability of watersheds and aquifer sources. Watershed management has a long history in India (Joshi et al. 2004; Ahluwalia 1997), and we identified new approaches like *Jal Jeevan Hariyali Yojana* in Bihar (Down to Earth 2021) and *Jalyukt Shivar Abhiyaan* in Maharashtra (Bhadbhade et al. 2019). Comparable attention is now needed for aquifer management, especially in complex hard rock regions. We identified innovative approaches to community aquifer management such as *Atal Bhujal Yojana* in Karnataka and Maharashtra, and other initiatives of the Groundwater Surveys and Development Agency in Maharashtra. We propose that the only way to sustain rural drinking water in groundwater-based single-village schemes is by ensuring that water budget incorporates the aquifer, as a whole and across all uses. This may be feasible in small, localized aquifers.

Key knowledge gaps include:

- What is the performance of these innovative community-based aquifer management programs?
- How do source sustainability approaches in single-village schemes compare with those in multi-village schemes?

Importing water via multi-village schemes to augment drinking water supply is feasible but needs professional management and governance structures to ensure that piped water meant for domestic use is not diverted to non-domestic uses. This can ensure supply remains equitable.

5. Manage the effects of piped water supply on household water-use behaviors and source sustainability.

The *Jal Jeevan Mission* seeks to address many challenges in drinking water supply and its sustainability. One of the challenges, which may be less anticipated by policymakers, regards changes in human behavior. Most villages in India did not have piped water supply until recently and even now only about

[19] A village water and sanitation committee is an institution comprising community members that plans, implements, and maintains rural water supply and sanitation infrastructure.

half of all villages across India have been declared as completely covered (*Jal Jeevan Mission* Dashboard 2023).

Key knowledge gaps include:

- Households that have largely relied on public sources such as standposts and wells are unlikely to continue to fetch water when they start receiving it in the convenience of their dwelling units, for free or almost free. How will this affect their water use?
- How would people change their behavior when their relationship with water changes in this dramatic fashion? Would piped water supply lead to more or less productive uses of water? How does this behavior change vary based on the level of supply? The minimum expected standard is 55 liters per capita per day, but there is also a provision to plan additional water supply for cattle, and how would that affect source sustainability?
- What components of water use are included in village-level action planning, as compared to the actual components of water use by households?

These and other related insights are needed to understand the impending changes in water use behavior and their implications for planning and water resources management.

6. Understand the unique context of the *Jal Jeevan Mission* and plan ahead for what might follow.

Overall, there is a need to assess the unique context of the *Jal Jeevan Mission* and its impact. This program has changed drinking water planning objectives and methods, possibly not just in India but also influenced policy norms across the Global South. Its short- and long-term implications require detailed assessment. There are an enormous number of potential research topics driven by its massive and short-duration investments, such as its impact on water resources supply and management, the expected versus actual benefits of piped supply on public health, the changing role of women in household water management, and changes in sanitation practices. If the *Swachh Bharat Mission* is a precedent for the *Jal Jeevan Mission*, the initial program may be followed by a decade-long support program for sustainability (*Swachh Bharat Mission* 2023). It is important to consider whether and how the states and *Panchayati Raj* institutions can prepare for, and sustain, rural drinking water services in the post-*Jal Jeevan Mission* era.

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APPENDICES

These appendices present detailed case studies of four states based on a desk review, interviews, and journey mapping exercises with stakeholders in each state; a list of stakeholder interviews; a sample Village Action Plan and Detailed Project Report; and journey maps prepared in Karnataka, Maharashtra, and Sikkim.

A. CASE STUDY 1: KARNATAKA

A.1 KARNATAKA STATE CHARACTERISTICS

Karnataka in south-western India is the country's seventh-largest state in terms of area. It has a population of 61.13 million people, of which 61.4 percent live in rural areas (Census of India 2013). The state is characterized by a high level of geographic and rainfall variability. While the semi-arid eastern plains receive an average annual rainfall of approximately 300–600 mm, the western part fringed by the Western Ghats records a much higher rainfall ranging from 1,400 mm to several meters annually (India Meteorological Department 2015); and state data). This variability affects water security across the state.

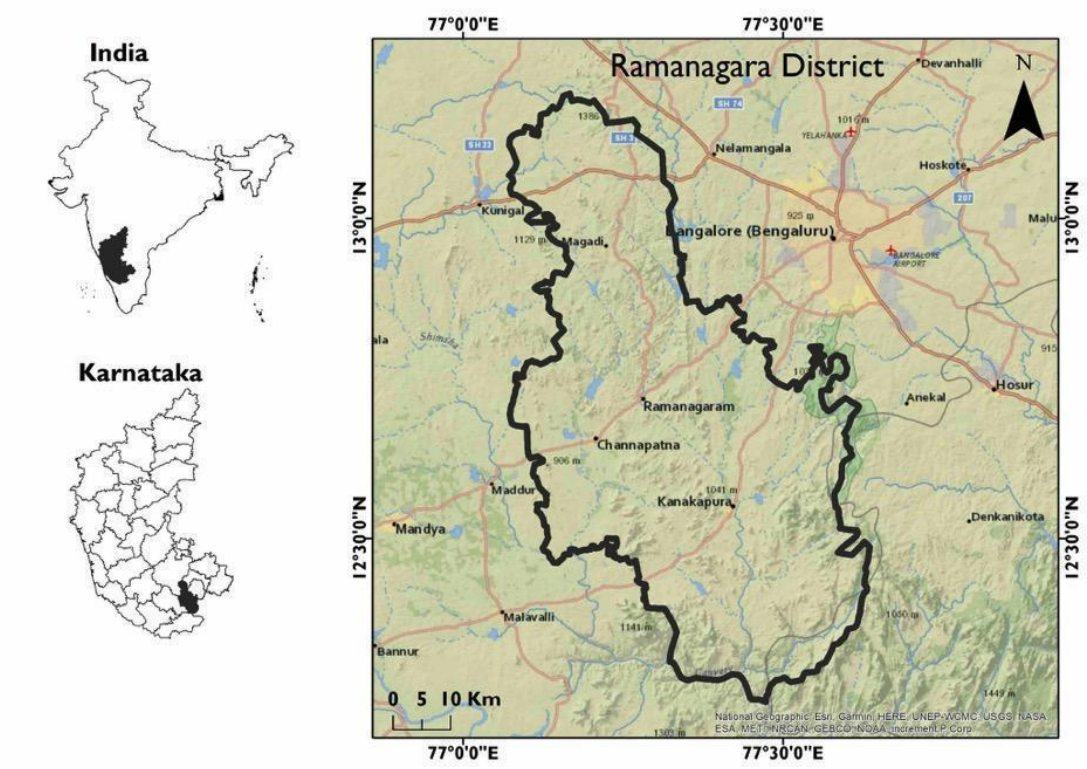


Figure A-1: Map of Karnataka and Ramanagara district

Karnataka has seven river basins as surface water sources, which include the two major ones, the Krishna and Cauvery basins. As per Karnataka's Rural Drinking Water and Sanitation Department, the seven river basins have an annual average yield of approximately 3,475.2 thousand million cubic feet (98.4 billion cubic meters) of water, of which as much as half is extracted for irrigation (Karnataka Jnana Aayoga 2019). Irrigation occurs in only 25 to 30 percent of Karnataka's cultivated area, which suggests that irrigation demand may increase further (Karnataka Department of Agriculture, Agricultural

Statistics, 2021-22 Seasonal Condition tables, Directorate of Economics & Statistics; Karnataka Jnana Aayoga 2019)

The state's aquifers are key to understanding its water security. Its eastern plains are underlain with hard rock aquifers, whose recharge rates and storage capacity are low and variable (Karnataka Jnana Aayoga 2019). The groundwater potential of the state is estimated at 17.03 billion cubic meters, and recent reports indicate that Karnataka has over drafted its groundwater by more than 50 percent (Rural Drinking Water & Sanitation Department website, accessed February 22, 2023).

A.2 EVOLUTION OF DRINKING WATER POLICIES AND SCHEMES

The state gradually shifted its focus from constructing open wells to drilling borewells for habitations. In the First Five Year Plan (1951–1956), the focus in Karnataka was on the construction of open wells for habitations that had no drinking water wells. However, less accessible habitations were excluded, and the dug wells were subject to depletion in pre-monsoon months and drought years (GWP 2016). To tackle these problems, the Government of Karnataka started a borewell program in 1971 with the support of the United Nations Children's Fund (UNICEF) (Paramasivam 2001). This was followed by the Accelerated Rural Water Supply Programme, described in the national policy history, which was the first major scheme by the Government of India that continued from 1971 until 2006. Under this program, Karnataka managed to fully cover 53,188 of a total of 56,682 habitations with a service level of 40 liters per capita per day by 2006 (Ministry of Finance 2006).

Foreign funding agencies began supporting the state government in the rural drinking water sector from the 1980s. The Danish International Development Agency was active from 1980–89 in projects related to hand pump rejuvenation, supply of drilling equipment, and the provision of spare parts and training. Subsequently during the 1990s, more external agencies, including the World Bank, also got involved in community-based integrated rural water supply and environmental sanitation projects. These programs introduced new decentralized institutional practices such as community participation through village water and sanitation committees, and capital cost sharing to foster perceptions of local ownership in the sector (Sector Status Study Team 2006). The focus on community-based management also increased during the implementation of these programs.

In the late 1990s, the Government of India pursued decentralization through sectoral reforms in the rural drinking water sector. In 1999, it piloted reforms in three districts of Karnataka. Major programs such as the *Jal Nirmal* project, *Swajaldhara*, and National Rural Drinking Water Programme also focused on promoting the community management of schemes. However, they had mixed results characterized by a lack of community participation and institutional failures according to the 2018 Performance Audit on the Natural Rural Drinking Water Programme in the Ministry of Drinking Water and Sanitation and the Sector Status Study Team (2006).

Furthermore, as per the new sector reform guidelines and 73rd Amendment to the Constitution of India (1993), decentralized *Panchayati Raj* institutions, such as District Water and Sanitation Missions, Taluk-level Water and Sanitation Committees and village water and sanitation committees or Village Development Committees were set up at the district, block, and village levels to implement and monitor activities. However, the implementation of these reforms was slow. Slow progress has been attributed to a lack of understanding regarding the thrust on decentralized governance, difficulty in convincing elected representatives, and institutional weaknesses (Sector Status Study Team 2006).

Diverse supply schemes have been operational in Karnataka from 2002 onward. Some programs like the *Jal Nirmal Abhiyan* that were state-led and World Bank-funded were active across much of the state until 2008 and mainly focused on sector reforms (Rao and Raviprakash 2014). *Swajaldhara*, a federal government program, was active in the state until 2008. It emphasized community contributions and

participation reforms. In 2010, the National Rural Drinking Water Programme, a major national scheme focusing on household and habitation level access, was initiated (2018 Performance Audit on the Natural Rural Drinking Water Programme in the Ministry of Drinking Water and Sanitation).

In August 2019, when the *Jal Jeevan Mission* was launched, the state had tap connections in 24 percent of households. So far, under the mission, the state has provided functional household tap connections to 63.9 percent of households (*Jal Jeevan Mission* Dashboard 2023).

According to the *Jal Jeevan Mission* Integrated Management Information System (IMIS) as of February 2, 2023:

- There are 409,627 rural drinking water schemes in Karnataka serving 118,775 habitations.
- Of these, 97.8 percent (104,462 habitations) are groundwater-based and 1.95 (13,298 habitations) percent are surface water-based schemes.

A 2022 survey of the functionality of household tap connections in Karnataka found 58 percent were fully functional, while 11 percent had inadequate quantity (<40 liters per capita per day) (Jal Jeevan Mission 2022).

A.3 INSTITUTIONAL MAP AND INFRASTRUCTURE PLANNING PROCESSES UNDER THE *JAL JEEVAN MISSION*

Under India's federal structure, states have primary jurisdiction over water resources, and they implement *Jal Jeevan Mission* guidelines differently, as expected. This often translates into varied institutional entities even though certain program structures remain the same, such as the presence of institutions and committees at different levels of government from the state to district, sub-district, and *Gram Panchayat* levels, as described below.

STATE-LEVEL INSTITUTIONS

The Rural Development and *Panchayat Raj* Ministry serves as the nodal state body for all water supply and sanitation projects in Karnataka. This ministry coordinates with the *National Jal Jeevan Mission* and its Key Resource Centers. This is significant as the ministry could facilitate the integration of drinking water planning with other rural water uses. Under this ministry, the Rural Drinking Water and Sanitation Department oversees the execution of all federal- and state-sponsored schemes through the State Water and Sanitation Mission.

This mission houses three committees: the apex committee, executive committee, and state-level scheme sanctioning committee. The State-level Scheme Sanctioning Committee is tasked with the technical approval of village-level schemes as well as the floating of tenders for their implementation. The Karnataka Rural Drinking Water and Sanitation Department also formulates the operations and maintenance policy for different schemes, which has a detailed list of roles and responsibilities for different stakeholders (Section H).

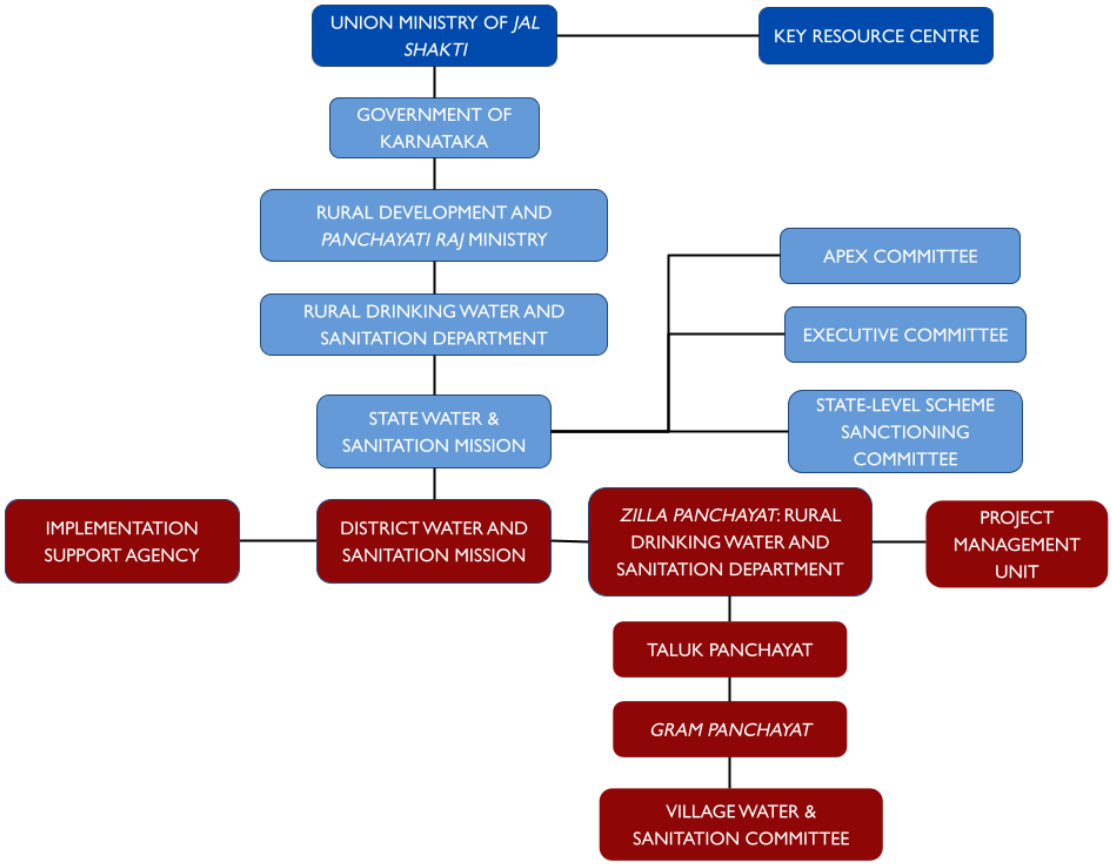


Figure A-2: Institutions at the national (in dark blue), state (in light blue) and *Panchayati Raj* (in red) levels overseeing rural drinking water supply in Karnataka.

DISTRICT-LEVEL INSTITUTIONS

At the district level, the District Water and Sanitation Mission drives *Jal Jeevan Mission* activities. Its primary role is to implement schemes through the preparation of the District Action Plan that compiles and prioritizes a list of eligible schemes in the district. Further, the Rural Drinking Water and Sanitation Department has offices in each *Taluka Panchayat*, which provide technical assistance to *Gram Panchayats* through their engineers. Private project management consultants are also hired to support the preparation of Detailed Project Reports at the district level.

INSTITUTIONS AT THE SUB-DISTRICT LEVEL

To implement projects at the village level, *Panchayati Raj* institutions at the district and *taluk* levels support the Rural Drinking Water and Sanitation Department. For instance, source identification for schemes and monitoring of the work on schemes is taken up by the *Zilla Panchayat*/ Rural Drinking Water and Sanitation Department engineers and staff. Technical estimates and proposals are prepared by the Project Management Unit and approved by the Executive Engineer. These proposals are then submitted to the State-Level Scheme Sanctioning Committee for approval.

Furthermore, at the village level, a Village Action Plan is prepared that captures the demand as well as various means to converge with other developmental schemes and available infrastructure for water supply in the village. The *Gram Panchayat* prepares this plan with the support of an Implementation

Support Agency, and the Gram Sabha approves it[20]. Subsequently, tenders are floated for construction by the State-Level Scheme Sanctioning Committee. On completion of trial runs, the scheme is handed over to the *Gram Panchayat*.

Key Resource Centres

In addition to the Karnataka state-specific institutions, there are three national-level Key Resource Centres for *Jal Jeevan Mission* based in Karnataka: 1) the Indian Institute for Human Settlements, 2) the National Law School of India University, and 3) the Indian Institute of Management Bangalore. They provide guidance to drinking water agencies in their respective fields of expertise.

CASE STUDY: RAMANAGARA DISTRICT

Located in southern Karnataka (see Figure A1), Ramanagara district had a household tap coverage of almost 70 percent under the *Jal Jeevan Mission* as of August 2022. We conducted multi-stakeholder journey mapping exercises in two locations in the Ramanagara district—Gollaradoddi *Gram Panchayat* and Lakshmipura, a settlement in Gungurahalli *Gram Panchayat*—to understand the district- and village-level implementation of *Jal Jeevan Mission* and the accompanying challenges. Ramanagara district was chosen as a case study because it represents villages that have high tap connection coverage, hard rock aquifer characteristics, and a village-level planning approach. Of the four blocks in the district, three, i.e., Magadi, Channapatna, and Ramanagara are implementing single-village schemes, while Kanakapura block is implementing a multi-village scheme.

According to the Central Ground Water Board, Ramanagara district is underlain with hard rock aquifers and has also been classified as a region with nitrate and fluoride contamination (Central Ground Water Board 2019). Moreover, as Ramanagara is a drought-prone district, planning for water resources is critical here.

In Karnataka**,** every district has an Implementation Support Agency. In Ramanagara, the WIN Society, a non-profit organization working on watershed-development programs for decades, is the Implementation Support agency. It facilitates the preparation of Village Action Plans for all single-village schemes. The plans for *Gram Panchayats* under multi-village schemes were yet to begin at the time of this fieldwork. Based on the anticipated plans, the Rural Drinking Water and Sanitation Department will put out tenders for construction of the physical infrastructure for approved projects.

GRAM PANCHAYAT AND HABITATION-LEVEL PLANNING

To understand planning at the habitation-level, we visited Lakshmipura, a settlement in Gungurahalli *Gram Panchayat* with a single-village scheme. The village water and sanitation committee of the *Gram Panchayat* is involved in the pre- and post-implementation[21] stages of the single-village scheme. The Village Water and Sanitation Committee and *Gram Panchayat* members prepare the Village Action Plan with the assistance of the Implementation Support Agency and *Zilla Panchayat* Engineers. After the single-village scheme's infrastructure is built, the village water and sanitation committee's role is to ensure drinking water supply/distribution on a daily basis within the *Gram Panchayat*.

[20] It is recognized under Article 243(b) of the Indian Constitution as the primary body of the Panchayati Raj. It consists of all the members of the village and serves as a forum to discuss village-related governance and development.

[21] For the purpose of this report, by implementation we mean the process of constructing and/or retrofitting the physical assets necessary for drinking water distribution.

Figure A-3: Overhead tank at Lakshmipura village, Ramanagara district

Discussions with the Implementation Support Agency and *Zilla Panchayat* Engineers revealed the following:

- In the case of single-village schemes, the scheme assets are handed over to *Gram Panchayats* for operations and maintenance after construction.
- In the multi-village scheme in Ramanagara, operations and maintenance for the first five years after its construction is the responsibility of the private contractor who built the infrastructure. After this, tenders are put out for another five-year period. Since there are multiple villages involved and given the scale of the infrastructure installed, engineers at the district level believe that private contractors are better positioned to manage bulk water supply.
- The intra-village distribution network, i.e., pipelines and tap connections from overhead tanks, has been left to the care of *Gram Panchayats* and their respective village water and sanitation committees in both types of schemes.

OPERATIONS & MAINTENANCE AND SOURCE OF FUNDS

According to the Rural Drinking Water and Sanitation Department's operations and maintenance policy (2021), the primary responsibility for operating and maintaining single-village schemes rests with the *Panchayat* Development Officer—the administrative head of the *Gram Panchayat*—and their staff. The policy states that the primary responsibility for cost recovery rests with consumers and the *Panchayat* Development Officer (including the staff). The *Gram Panchayat* has to coordinate tariff collection as the

secondary party responsible for cost recovery. Operations and maintenance of a multi-village scheme is the responsibility of contractors. The cost recovery for multi-village schemes is the responsibility of the office of the Rural Drinking Water and Sanitation Department at the division[22] level (Rural Drinking Water and Sanitation Department 2021).

During reconnaissance field visits in Karnataka, we observed that there are differences across villages with regard to the source of funds for operations and maintenance. Small repairs are usually done through the *Gram Panchayat*'s revenues, which include property tax, water tariff collection, etc. The payment for the water supply operator's (waterman's) salary comes from varied sources. One village (Doddatumkuru) pays from the *Gram Panchayat*'s funds, another (Nonavinakere) from the state's departmental funds, and the third village (Aralumallige) utilized the 15th Finance Commission's funds (via the state). In general, the salary of a waterman on a permanent payroll is paid by the Government of Karnataka, whereas a waterman on contract is paid through the *Gram Panchayat*'s funds (Discussion at Nonavinakere and Dasarighatta, January 2023).

Electricity bills for water pumping in small villages are paid by an arrangement made by the Government of Karnataka—60 percent of the state's Finance Commission funds are directly transferred to the electricity board to pay pending electricity bills of *Gram Panchayats* (discussion at Honnasethalli village, July 2022). Sometimes the funds can also be diverted from the 15th Finance Commission grant (Personal Communication, Vishwanath S, June 2022). We also found that Nonavinakere *Gram Panchayats* were able to pay electricity bills on their own (discussion at Nonavinakere, January 2023).

In general, we noticed a pattern that if the *Gram Panchayat* was not able to support water supply operating costs, the Government of Karnataka paid through state or federal Finance Commission funds. However, we have limited data points at this stage to generalize these findings across the entire state; it requires a larger study to arrive at the full picture of variability and sustainability of funding sources.

A.5 PLANNING CHALLENGES IN RURAL DRINKING WATER SUPPLY IN KARNATAKA

The *Jal Jeevan Mission* is being implemented in a context in Karnataka where the state is grappling with water scarcity and quality issues as water sources are diminishing, and demand is increasing.

1. Overexploitation and Contamination

Eighty-eight percent of the blocks in Karnataka are drought prone and 52 percent are classified as over-exploited, as per the latest draft of the Karnataka State Water Policy 2021. Out of 175 blocks, 10 are classified as critical (where the rate of groundwater extraction is 90–100 percent of the rate of recharge). According to the *Jal Jeevan Mission* Integrated Management Information System, the total number of water sources in Karnataka is 986,782. Of the 526,746 sources (both groundwater and surface water) tested for chemical and bacterial contamination, 24 percent sources had chemical contamination (both geogenic and anthropogenic in origin) and 0.005 percent had bacteriological contamination (at the source; bacterial contamination at the point of use is not measured in the Integrated Management Information System dataset. Cf. McGuinness et al. 2020for a study of these issues in northern Karnataka). The test results do not specify whether each source is surface water or groundwater. This has major implications for costs as many of these contaminants, especially in groundwater, have long residence times and cannot easily be removed.

[22] Division is a multi-district administrative unit. This is generally created within state departments for convenience.

The state has planned to provide drinking water through multi-village schemes to address these challenges. As part of discussions regarding Karnataka's State Annual Action Plan 2020–21, the state favors the multi-village scheme model to provide piped water supply. It aims to provide 1.4 million of the total target of 1.6 million tap connections through 338 multi-village schemes by 2024. However, the shift to multi-village schemes necessitates more sophisticated planning institutions and approaches, which are currently weak or absent.

2. Publicly accessible data on the *Jal Jeevan Mission* is vast, but also incomplete and inconsistent.

Much of this report's analysis is reliant on the *Jal Jeevan Mission*'s Integrated Management Information System. However, there are challenges with the data itself. The publicly accessible data of the *Jal Jeevan Mission*'s Integrated Management Information System specifies whether a scheme taps into groundwater or surface water. The portal is fairly detailed with easy-to-navigate web pages and spreadsheets provided through a dashboard. However, as noted above, these datasets do not provide information on whether a scheme in Karnataka is single- or multi-village. Single-village schemes generally rely on groundwater, although a few could be using local surface water sources. Multi-village schemes—prioritized in Karnataka—tend to rely on large surface water sources. The data are also outdated in parts, but are being cleaned up, as per a senior official of the *Jal Jeevan Mission* (Pradeep Singh, Personal communication, July 1, 2022).

Further, there are discrepancies in reported drinking water sources and schemes, implying that there are serious errors, either in counting or reporting or inconsistent definitions. The number of sources reported by the state of Karnataka and the *Jal Jeevan Mission* do not match, though some of the differences could be due to different dates of reported data. The state submitted that there are around 0.64 million (Annual Action Plan Meeting, June 9, 2020) water sources but the *Mission* dashboard reports 0.98 million on Feb 2, 2023. Similarly, the Rural Drinking Water and Sanitation Department reports 51,120 schemes as against *Jal Jeevan Mission,* which claims that there are 0.4 million schemes, almost an order of magnitude discrepancy. This may be because the *Jal Jeevan Mission* is counting each source as a scheme; and because different schemes might be tapping the same source, there may be double counting of sources too. There is confusion within government departments about the definitions and counting of water sources and schemes (Wescoat, Fletcher, and Novellino 2016).

3. Absence of source sustainability planning at all governance levels

When planning for water source sustainability at the village level for a single-village scheme, district engineers conduct a V-notch test[23] to assess the yield of existing borewells, and subsequently they choose one that they believe will yield enough water to meet current and estimated population growth. If none of the current borewells yield sufficient water, they drill new borewells. But current planning processes do not account for variations in rainfall levels in the district that may reduce recharge and subsequently water availability even in drought-prone districts like Ramanagara.

When engineers at the block level were asked about the sustainability of existing borewells in Ramanagara, they did not seem to have an estimate of how long they would yield water, nor did they have an alternate plan if water availability became a challenge in dry seasons or years. The *Gram Panchayat's* role in planning for future water source sustainability seems limited; their purview extends

[23] A common way to describe the yield of a new borewell is in "inches" measured by the free, unrestrained flow of water from a borewell over a 90 degree 'V' notch. (Source: http://bengaluru.urbanwaters.in/faqs/)

only to operating and managing existing built assets. This observed pattern is in direct contrast to the policy documents reviewed which state that *Gram Panchayat*s are to be empowered and expected to manage sustainable water sources, e.g., by recharging traditional water bodies, private and public borewells, and converging with other schemes to enable sustainable water resources management.

During the journey mapping exercises with *Gram Panchayats in Karnataka*, we asked them to share their current efforts for source sustainability planning. They responded that there were none. When we asked them what they would do during droughts, their response was: 'please do not wish that upon us.'[24] Source sustainability is clearly not part of the current Village Action Plans for drinking water. Conversations with the Implementation Support Agency and Rural Water Supply and Sanitation Department in the same Karnataka village suggest that they may simply be planning to rely on tankers during dry spells.

4. Little to no planning for inter-sectoral competition

For most part there was little to no convergence between planning for irrigation and drinking water use in Karnataka. Planning for increasing water demand among competing water sectors in the district—agriculture, domestic and industrial—did not emerge as a planning priority in discussions during the field visit, even in a district like Ramanagara, which is drought prone and rapidly industrializing.

Further, the implementation of the *Jal Jeevan Mission* means more water is now diverted for domestic water use. The Rural Drinking Water and Sanitation Department does not appear to consider the impact these schemes are likely to have on other sectors, even if the proportion of demand for drinking water is significantly less compared to water demand for agriculture and industries. Because drinking water use has priority, according to state water policy, farmers also have concerns about losing water sources to expanding drinking water schemes; at least in one *Gram Panchayat* in Tumakuru district, paddy farmers had reportedly blocked the diversion of a local water body to drinking water schemes (Personal communication, *Sarpanch* of Nonavinakere Panchayat, January 2023).

5. Unwillingness to shift to metered water tariffs

Karnataka' state water policy has recently mandated metering in *Jal Jeevan Mission*-certified villages. Currently, households in these *Gram Panchayats* pay around Indian ₹500-₹600 ($6-$7 at $1=₹82) as fixed annual water charges. The village Implementation Support Agencies are supposed to spread awareness on the need to install water meters and ways to use water more prudently. There does not, however, seem to be any appetite to shift to metered tariffs, as interviewees reported concerns about volumetric pricing (The Hindu 2021).

[24] Directly translated from Kannada.

Figure A-4: A *Jal Jeevan Mission* water meter in Nagaraghatta village

For example, some of the *Gram Panchayats* in Ramanagara district, including Gungurahalli, reported hesitation to install water meters in their homes. While the Rural Water Supply and Sanitation Department has ostensibly planned metering to understand water consumption levels and track them over time, households believe that they might be charged for water on a unit basis and are not willing to take on those costs themselves. A *Panchayat* President in Tumakuru district interestingly interpreted the *Jal Jeevan Mission*'s norm of 55 liters per capita per day as the free water limit, above which households would have to pay. Overall, few *Gram Panchayats* have instituted metering and volumetric tariffs as of December 2022.

B. CASE STUDY 2: MAHARASHTRA

B.1 MAHARASHTRA STATE CHARACTERISTICS

Maharashtra, located in western India is one of the country's largest and most industrialized states. It has a population of 112.37 million, which accounts for nearly 10 percent of India's total population, of which 54 percent live in rural areas (Census of India 2013).

The state can be differentiated into three distinct physiographic zones based on varying rainfall patterns and topography. The three regions include the west coast (also known as Konkan), the eastern Deccan Plateau and the Western Ghats (mountain range), which acts as a natural border between the coast and the plateau. The Deccan Plateau is further divided into drought-prone Marathwada and Vidarbha regions. The distribution of rainfall in the state varies starkly across these regions, ranging from as low as 400 mm in the eastern rain shadow regions to as much as ~5,900 mm annually in the west—along the Konkan coast and in the Western Ghats where rapid runoff poses challenges. Around 70 percent of the state's area falls under an intermediate semi-arid, 700–800 mm rainfall zone (India Meteorological Department 2015).

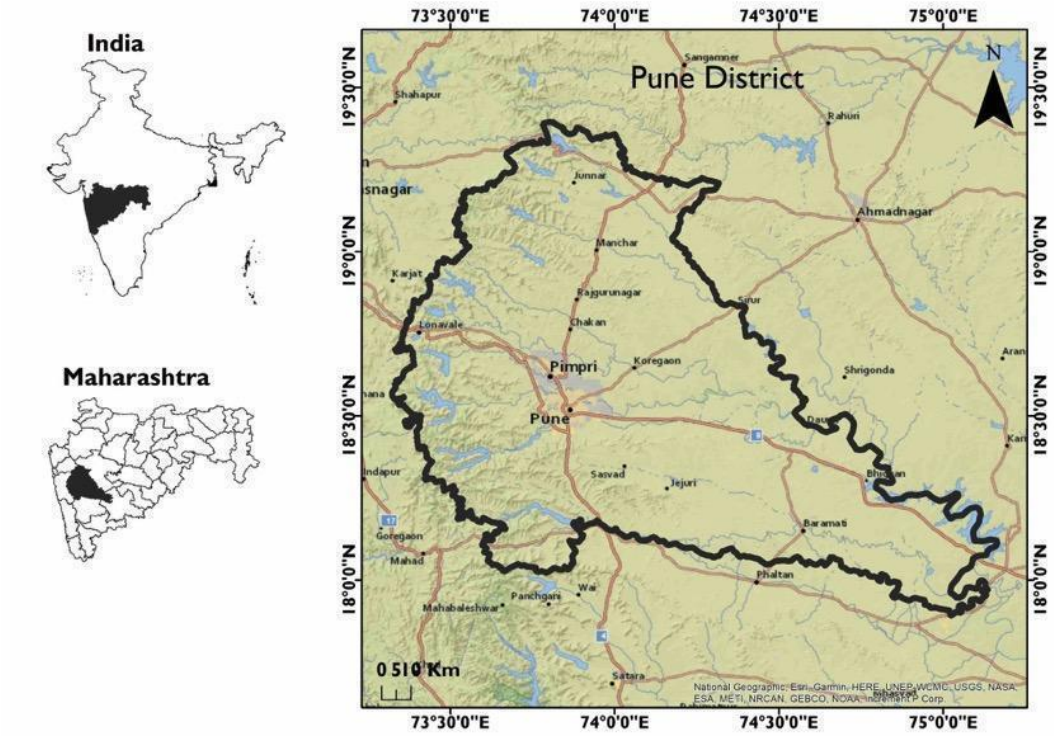


Figure B-1: Map of Maharashtra and Pune district

The state has significant surface water resources through several river basins. Rivers like Godavari, Krishna, Narmada, Bhima, Tapi, Koyana, Vainganga, and Painganga feed the major basins in the state. According to the 2018 Integrated State Water Plan, natural surface water availability (at 75 percent dependability) in the state is 139.5 billion cubic meters, of which 116.4 billion cubic meters is allocated by tribunals/interstate agreements (Government of Maharashtra 2019). The estimated groundwater availability for the state at 70 percent of net groundwater resource is 22.6 billion cubic meters.

Large parts of the state are underlain with hard rock basalt aquifers with low rates of recharge. Major parts of Maharashtra include the Deccan Trap Basalt aquifer system, which covers an area of about 249,934 sq km. Other aquifers include Archeans (32,235 sq km), mainly granites, gneisses, and schists. Precambrian and Gondwana aquifers are also part of the aquifer system of Maharashtra. Aquifers in the Purna alluvium basin have inherent inland salinity problems, making the water unsuitable for any use (Central Ground Water Board 2016).

B.2 EVOLUTION OF DRINKING WATER POLICIES AND SCHEMES

The state has moved from multi-village schemes to single-village schemes. Like other states, post-independence, efforts were targeted toward provisioning dugwells or borewells in local habitations. Starting in the 1980s, foreign bilateral and multilateral funders started supporting water supply schemes (Wescoat et al. 2021). A major shift came in the 1990s when the state pushed for multi-village schemes. Due to complex governance, lack of community capacity to operate and maintain large schemes, and source sustainability issues, these large schemes failed to make an impact and many schemes failed (Sangameswaran 2010). Hence, post 2000, many communities started to demand single-village schemes. At the same time, the federal government started sectoral reforms on a pilot basis. In 2009, the Government of India launched the National Rural Drinking Water Programme, a precursor to the current *Jal Jeevan Mission*. During this period, the state government also launched its own program (named *Jal Swarajya*) with funding from the World Bank.

Maharashtra has implemented various state as well as center-led schemes reasonably well to provide tap water connection. Even before the *Jal Jeevan Mission* launched in the state, the impact of previous programs like the Accelerated Rural Water Supply Programme, the National Rural Drinking Water Programme, and the state-level *Mukhyamantri* (Chief Minister's) Rural Drinking Water Programme were apparent. By 2018, Maharashtra had managed to cover 89 percent of habitations with mandated service levels of 40 liters per capita per day, according to the 2018 Performance Audit on the Natural Rural Drinking Water Programme in the Ministry of Drinking Water and Sanitation. The Accelerated Rural Water Supply Programme for instance, focused on reaching all habitations, while the National Rural Drinking Water Programme focused on covering more households. The *Jal Jeevan Mission* built on this trend with an increased service level mandate of 55 liters per capita per day for all households.

Considering the state's large geographical area and relatively low water availability in the Deccan Plateau region, the state has managed to cover a substantial number of households under the current *Jal Jeevan* Mission. Maharashtra began implementing the *Jal Jeevan Mission* at the end of 2019. In August 2019, only 33 percent of households had tap connections as per the enhanced norms of 55 liters per capita per day. The state has provided tap connections with improved service levels to 73 percent of households as of February 6, 2023.

Single village schemes have been preferred in the state in recent times. This trend remains the same in the *Jal Jeevan Mission*. Groundwater-based single village schemes constitute a large share of the total schemes (93 percent).

According to the *Jal Jeevan Mission* Integrated Management Information System for Maharashtra, as of February 2, 2023:

- There are 136,407 water supply schemes in Maharashtra supplying water to 124,679 habitations.

- Of these, 93.6 percent are groundwater-based, and 6.02 percent are surface water-based schemes.
- Through groundwater-based schemes, 106,369 habitations have been covered.
- Through surface water-based schemes, 17,676 habitations have been covered.

This profile presents strengths and challenges that are considered below.

As in the case of Karnataka, scheme type disaggregation (single- or multi-village) is difficult from the *Jal Jeevan Mission* data. The *Jal Jeevan Mission* Integrated Management Information System data mentions habitations covered under groundwater and surface water-based schemes, but the number of households and populations benefitting from these schemes are not indicated in the publicly available reports on that database. Moreover, like Karnataka, it is unclear how single-village schemes and multi-village schemes are distributed among these sources, even though we can be reasonably sure based on typical scheme-design and field observations that most of the former are based on groundwater sources and the latter on surface water sources.

Considering the state's mixed experience with multi-village schemes, the current implementation strategy for the *Jal Jeevan Mission* is to adopt more single-village schemes. According to the State Action Plan 2020–21, Maharashtra is planning to establish more single-village schemes and provide 4.9 million tap connections with the increased service levels mandated by the *Jal Jeevan Mission* (55 liters per capita per day for each household). Maharashtra presents a situation wherein there is a preference for single-village schemes whereas Karnataka (which is physio-graphically similar and a neighbor) promotes multi-village schemes. Maharashtra has found that multi-village schemes are complex to govern (Sangameswaran 2010) and sustain over time (Personal Communication, Ajinkya Katkar, March 2022). This makes the case for water resource sustainability even more important in the state, as local competition and drought conditions can more readily dry up single-village sources (Midstokke 2018).

The *Jal Jeevan Mission* implementation strategy has largely been to retrofit existing schemes. Under the *Jal Jeevan Mission*, schemes are either retrofitted or newly built to reach mandated service levels. However, the per household cost of retrofitting a scheme can be more than constructing a new one. Retrofitting a single-village scheme is expected to cost around ₹8,000 ($97.5 at $1= ₹ 82) per household as against ₹5,000 ($61) per household for constructing a new one (*Jal Jeevan Mission* Annual Action Plan Meeting 2020). Retrofitting an existing multi-village scheme is expected to cost around ₹7,000 ($85.3) per household and a new scheme ₹3,000 ($36.6) per household. A solar-based retrofit scheme is expected to cost ₹21,000 ($256) per household and a new scheme is at ₹10,000 ($122) per household (*Jal Jeevan Mission* Annual Action Plan Meeting 2020). Solar-based schemes are generally for a single village or a habitation, so they are a form of a single-village scheme.

Indeed, the actual cost can be even higher, e.g., the Village Action Plan of Kotavli in Ratnagiri district pegs the expense at ₹17,424 ($212.5) per household for a retrofitted single-village scheme. Considering Maharashtra's vast geographical variation in physiographic and meteorological conditions, the costs are likely to vary.

B.3 STATE- AND DISTRICT-LEVEL INSTITUTIONS

Maharashtra has strong state-level institutions to manage the planning and implementation of schemes. The Maharashtra Water Supply and Sanitation Department has primary jurisdiction for rural drinking water programs at the state level. To implement schemes in the state, *Panchayat Raj* Institution—districts, *talukas*, and *Gram Panchayats*—are the backbone for program implementation. Apart from this, the state has a technical parastatal water engineering body or multi-village schemes (Maharashtra *Jeevan Pradhikaran*) and a scientific body for hydrogeologic mapping and

analysis (Groundwater Surveys and Development Agency). The state has a promising regulatory framework and a regulatory institution (Maharashtra Water Resources Regulatory Authority), established in 2005 to regulate water resources across sectors in the state. Apart from the Water Supply and Sanitation Department, the Maharashtra Education, Health, Rural Development, Women & Child Development, and Tribal departments support water, sanitation and hygiene facilities through fund allocations. In 2019, the Maharashtra State Water Policy was passed to address growing scarcity concerns and provide a framework for integrated water management (Government of Maharashtra 2019). To implement the *Jal Jeevan Mission* and related programs, the State thus has all the relevant institutions in place as per national guidelines.

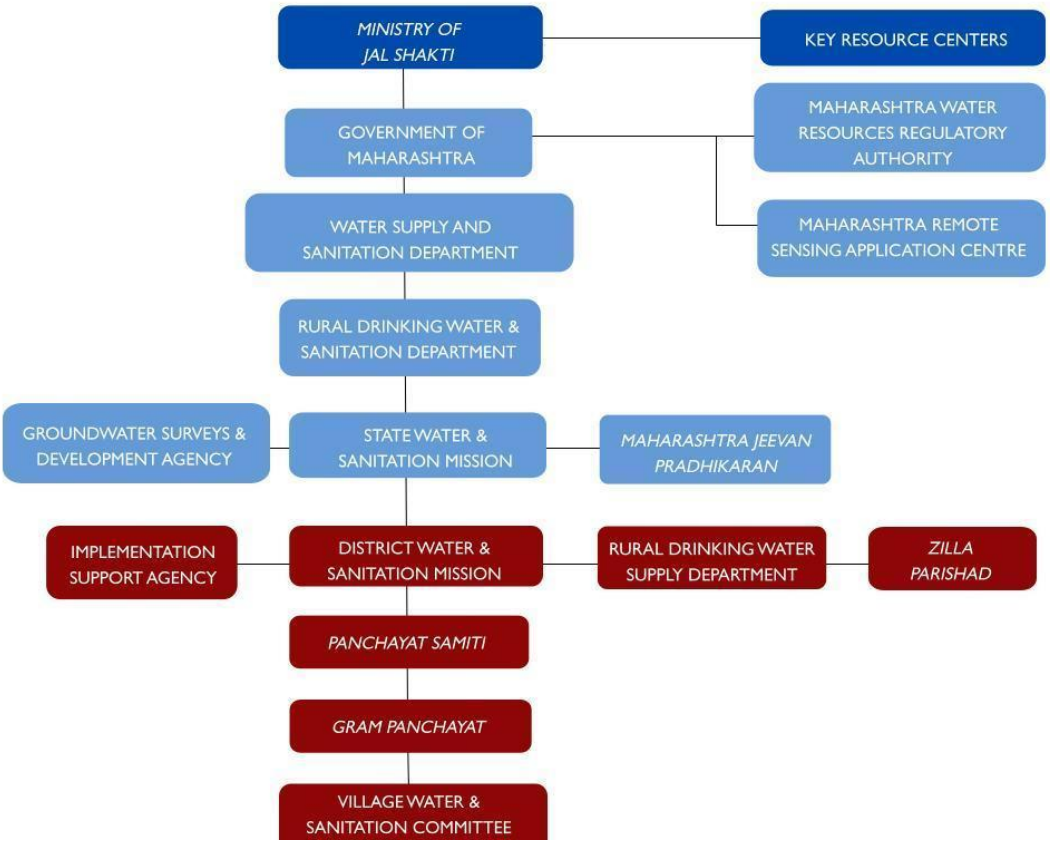


Figure B-2: Institutions at the national (in dark blue), state (in light blue) and *Panchayati Raj* (in red) levels overseeing rural drinking water supply in Maharashtra.

Maharashtra has prepared an Integrated State Water Plan. The plan allocates 15 percent of any irrigation project in the state to drinking water, prioritizing this sector over industry and irrigation. Ten percent of water storage is allocated to industrial use (2018 Integrated State Water Plan). As there is no regulation of groundwater, the plan recommends implementation of the Maharashtra Groundwater (Development and Management) Act 2009 to regulate the over-extraction of groundwater. To improve source sustainability, the Integrated State Water Plan recommends that the state government promote rainwater harvesting and recharging. The agriculture sector, supported by the Water Resources (formerly Irrigation) Department, is the largest user of both surface water and groundwater in the state (2030 Water Resource Group 2016).

Planning process for Rural Drinking Water Supply is based on villages demanding water schemes in their village. An assessment is then carried out by the Rural Drinking Water Supply and

Sanitation Department-*Panchayat Samiti* to determine whether to retrofit existing projects or implement a new *Jal Jeevan Mission* scheme in the village. After this, a Village Action Plan is made by the *Sarpanch* (who usually heads the village water and sanitation committee) and the *Gram Sevak* (who may serve as or support the secretary of village water and sanitation committee), and a Junior Engineer of the Rural Drinking Water Supply and Sanitation Department. This plan is then presented to the District *Zilla Parishad*. All the Village Action Plans from a district are collated and prioritized to create the District Action Plan, based on which the State Water and Sanitation Mission prepares a State Action Plan. Generally, Annual Action Plans are prepared every year. However, these are not generally available in the public domain.

The technical part of project implementation is overseen by the *Zilla Parishad* Rural Drinking Water Supply Department and Maharashtra Jeevan Pradhikaran. Both are involved in preparing estimates, Detailed Project Reports, and monitoring implementation work. Schemes with an estimate above ₹50 million ($609,756 at $1=₹ 82) are allocated to *Maharashtra Jeevan Pradhikaran*. Generally, large multi-village schemes fall in its domain. Tenders are floated at the district level after the State-Level Scheme Sanctioning Committee grants administrative sanction.

Apart from Maharashtra specific institutions, there are four national level Key Resource Centers for *Jal Jeevan Mission* based in Maharashtra: The Indian Institute of Technology Bombay (focusing on climate change and technology), All India Institute of Local Self Government (governance, community management), Savitribai Phule Pune University (big data, planning), and Maharashtra Environmental Engineering Training and Research Academy (technology and training). Their role is to build the capacity of various stakeholders based on each institution's respective expertise.

The Groundwater Surveys and Development Agency seems to have had a limited operational role in the *Jal Jeevan Mission based on interviews we conducted, though this deserves follow-up attention*. The Groundwater Surveys and Development Agency has historically had an important scientific role in state water planning. It provides source certificates as a part of planning and recommends demand-side management measures, which are key for ensuring the sustainability of the overall resource. However, implementing these conservation measures is the *Gram Panchayat*'s responsibility. There is a fund allocation under the *Jal Jeevan Mission* for source sustainability, and the Groundwater Surveys and Development Agency is responsible for supply-side measures like recharge shafts for wells.

The agency has prepared village-level groundwater recharge potential maps and made these available online. It is also the main actor under the *Atal Bhujal Yojana*, a source sustainability program by the Government of India, though it covers only 13 of the 36 districts in Maharashtra, leaving the rest to other programs or future implementation.

OPERATIONS & MAINTENANCE AND SOURCE OF FUNDS

Operation and maintenance funds are collected and deposited in a bank account of the village water and sanitation committee (a joint account with the *Gram Sevak*). An important task before and during scheme implementation is the collection of these funds from villagers (the contribution level can be different for Above and Below Poverty Line households). This is 10 percent of the scheme's capital budget as per the approved Detailed Project Report (the committee has a copy of the approved report). This fund is required to pay for any repairs, the waterman's salary, the electricity bill of the scheme, and similar expenses.

We visited one of the villages, Tardobachiwadi in the Pune district, to understand rural drinking water supply. The *Gram Panchayat* is responsible for the operation and maintenance of this single-village

scheme. In Tardobachiwadi, the water tariff collection rate is 20–30 percent of the billed amount, which is not sufficient to run the scheme (Discussion at Tardobachiwadi, June 2022). So, the watermen's salary and electricity bills are paid through property taxes collected by the *Gram Panchayat*. Any small repairs are also managed through *Gram Panchayat* level funds. In case of a large breakdown, it needs the financial support of block or district level panchayats. In general, operations & maintenance expenditures in this village are thus done by the *Gram Panchayat's* own funds since no federal or state government funding is allocated for that purpose (they only allocate capital expenditure). Therefore, the *Gram Panchayat* needs to build institutional capacity for collecting property tax, water tax and user charges, and other tariffs to meet requirements of operations & maintenance and asset management (Personal Communication, G. Deshpande, February 2023). The situation in other *Gram Panchayat*s where the *Jal Jeevan Mission* is being implemented remains to be seen (cf. data in Wescoat et al. 2022 for Satara District).

DISTRICT-LEVEL PLANNING: CASE STUDY OF PUNE DISTRICT

This section highlights the key insights that emerged from our field work and journey mapping exercises (Section J) conducted with the *Zilla Parishad* and Implementation Support Agency in one district in Maharashtra—Pune. Located in western Maharashtra, this district has a reported coverage of 67.47 percent households under the *Jal Jeevan Mission* as of August 2022.

Pune district can be divided into regions with high rainfall and rain shadow. Pune makes for an interesting case study from a water resource planning perspective because there is a stark difference between the western and eastern blocks of the state. Villages in the west receive a high average rainfall of 1,500–2,500 mm, while the rain shadow eastern blocks get less than 500 mm and are drought-prone (India Meteorological Department 2015). The district has both single- and multi-village schemes, which the *Zilla Parishad* and Maharashtra *Jeevan Pradhikaran* respectively implement.

PREPARING VILLAGE ACTION PLANS

The planning document for a scheme is produced with the involvement of important Panchayati Raj actors. Preparing a Village Action Plan is mainly the responsibility of the Village Water Sanitation Committee. This is a sub-committee of the *Gram Panchayat* that has been formed in villages where previous schemes like National Rural Drinking Water Programme have been implemented. It has to be newly formed in the villages where a water supply scheme is being implemented for the first time. The sub-divisional branch engineer from Rural Water Supply Division provides technical assistance for the process while the Groundwater Surveys and Development Agency, the groundwater custodian agency of Maharashtra state, helps with source (mostly groundwater) identification and analysis. Both the *Gram Sevak* and *Sarpanch*, important officers at the *Gram Panchayat* level, are involved in this process.

A technical document is supposed to be prepared with the help of a private consultancy. But delay in this process can lead to Zilla *Parishad* doing this work. After the Village Action Plan, the next step is to prepare a Detailed Project Report. The State Water and Sanitation Mission appoints agencies at the state level known as Project Management Consultants. In November 2021, the state-appointed Mumbai-based Shah Technical Consultancy for the Pune region (five districts). They were supposed to guide the whole process from Village Action Plan preparation (the first step) to declaring a village as *Har Ghar Jal* (the last step).

Since this process was taking considerable time, and the Rural Water Supply Division had limited human resources, they hired 50 contractual engineers to prepare Detailed Project Reports. As these hired engineers did not have sufficient prior experience with water supply planning, the results were limited despite the training provided.

District Annual Action Plans are prepared by two agencies: *Zilla Parishad* and Maharashtra *Jeevan Pradhikaran*. Preparation of both the Village Action Plan and the District

Action Plan were completed in 2021. The District Action Plan was divided into two Annual Action Plans for each year: 2021–22 and 2022–23. The Rural Water Supply Division, based on approval from the District Water and Sanitation Mission, prepares Annual Action Plans for schemes that fall under their responsibility, and the Maharashtra *Jeevan Pradhikaran* prepares Annual Action Plans for its larger schemes. The Annual Action Plans prepared by both agencies are submitted to the State Water and Sanitation Mission for approval.

TECHNICAL APPROVALS, IMPLEMENTATION, AND FUND MANAGEMENT

Technical proposals are classified on the basis of cost and forwarded to respective agencies for approval. There is a rigorous process followed by a technical security committee with officials deputed based on the budget for the scheme. For example, the Executive Engineer, Rural Water Supply Division, heads the scrutiny for schemes with an estimated budget of up to ₹2.5 million ($30,487 at $1=₹ 82), while the committee of Superintending Engineer of the Maharashtra *Jeevan Pradhikaran* and Executive Engineer of Rural Water Supply Division is responsible for those above ₹ 2.5 million up to ₹25 million $304,878). A scheme between ₹25 million and ₹50 million ($609,756) has to be approved by a committee consisting of the Chief Engineers of both Maharashtra Jeevan Pradhikaran and Rural Water Supply Division (Water Supply and Sanitation Department Notification. Feb 2, 2021). If the budget estimate in the Detailed Project Report prepared by the Rural Water Supply Division exceeds ₹50 million, the scheme is transferred from Rural Water Supply Division to Maharashtra *Jeevan Pradhikaran*, and it is reviewed and approved by the State Level Scheme Sanctioning Committee.

Administrative approval from the head of the District Water and Sanitation Mission starts the tendering process. Once the technical sanction is granted, the schemes are presented at the District Water and Sanitation Mission meeting, and the *Zilla Parishad* Chief Executive Officer gives orders for administrative approval. Tenders are floated to select contractor(s) for scheme implementation. Once the contractor is selected, the work order is given by the Rural Water Supply Division. Payment to Project Management Consultants and contractors is channeled through funds received from the State Water and Sanitation Mission.

Implementation of schemes is often slower than expected, leading to underspend funds. This also means the costs per scheme rise. Quarterly cost estimations for both coverage and support are conveyed to the State Water and Sanitation Mission by the Rural Water Supply Department, Maharashtra *Jeevan Pradhikaran*, and Groundwater Survey and Development Agency, separately. The Rural Water Supply Division has opened a Public Financial Management System account at the district level for the *Jal Jeevan Mission* to receive these funds from the State Water and Sanitation Mission. The sectional engineer of the Rural Water Supply Division shared with us that the funds are often under-spent as the pace of execution is slower than expected; for example, all schemes in 2021-22 Annual Action Plan were carried forward to 2022-23.

Once the implemented scheme is handed over to the local government the village can be declared Har Ghar Jal. After the scheme implementation is complete, the contractor is responsible for carrying out repairs during a one-month trial run, after which the project is handed over to the village water and sanitation committee. The last step is to declare a village *Har Ghar Jal* (literally, water in every home), i.e., the scheme is complete. The Gram Sabha has to be called to pass a resolution for this step. In Pune district, only 38 villages were declared *Har Ghar Jal* by August 15, 2022, out of a total of 1,680 villages. The declaration has to be entered into the *Jal Jeevan Mission* app so that the State Water and Sanitation Mission and National Jal Jeevan Mission update the reporting.

GRAM PANCHAYAT- AND HABITATION-LEVEL PLANNING ISSUES

We struggled to talk to *Gram Panchayat*, village water and sanitation committee members, or beneficiaries about the planning and implementation of *Jal Jeevan Mission* schemes and their roles. This

section is based on information provided by a Rural Water Supply Division engineer and the Implementation Support Agency (Sosva Training and Promotion Institute) representative we spoke to.

The involvement of the community in the planning process is minimal. Suggestions from the villagers are supposed to be considered while preparing the Village Action Plan. The Village Action Plan draft is presented at *Gram Sabha* and suggestions from village residents are taken based on which it may be revised. However, Village Action Plans were produced using an online tool with only the involvement of *Sarpanch* and *Gram Sevak*, and the community does not seem to be involved (Mandar Sathe, Personal Communication, July 2022)

Implementation Support Agencies are few and burdened with responsibilities. If the village has been allotted to an Implementation Support Agency (not all villages in the Pune district have one), the Implementation Support Agency helps with the Detailed Project Report preparation - especially the social part of it. If private land or common land is required for infrastructure installation of the water supply scheme, such as a borewell site, tank, or pipes, the Implementation Support Agency is supposed to support the village water and sanitation committee to get *bakshis patra* (gift letter) for the donation of the land from the owner or the Collector's permission in the case of common land. Ten Implementing Support Agencies are working in the Pune district, each with about 60 villages at this time. The total number of villages in the district is 1,680.

We witnessed an orientation meeting by the Implementing Support Agency with a *mahila sabha* (women's group) where *Gram Panchayat* members were also present. The Implementing Support Agency representative provided information about the aim of the *Jal Jeevan Mission*, the steps of planning and implementation, and the role of village water and sanitation committee and the village at large to the attendees.

GRAM PANCHAYAT AND HABITATION-LEVEL IMPLEMENTATION, MONITORING, OPERATIONS, AND MAINTENANCE

The contractors are required to maintain single-village schemes for one month and multi-village schemes for one year after completion. For single-village schemes, overseen by the Rural Water and Sanitation Department, the contractor takes care of operation and maintenance for one month after the scheme is completed. After this period, either the *Gram Panchayat* or village water and sanitation committee takes up the responsibility.

For multi-village schemes implemented by the Maharashtra *Jeevan Pradhikaran*, the contractor runs the scheme for one year after completion. Ideally, a *Shikhar Samiti* (a committee of villages that are a part of a multi-village scheme) has to take up the responsibility for operation and maintenance of multi-village schemes. However, *Shikhar Samitis* seem unable to run these schemes on their own. Hence, often the *Zilla Parishad* ends up undertaking the task of running the scheme.

The *Jal Surakshak* (waterman) plays an important role in ensuring the day-to-day operation of drinking water supply schemes. As most schemes being implemented under the *Jal Jeevan Mission* in the district are yet to be completed, we could not get information from beneficiaries about the timing and regularity of their water supply, or if there were any quality issues. Monitoring of water service levels should record the frequency of water supply in days per week and duration of supply for each zone in hours per day, both for the dry pre-monsoon months and for the rest of the year (Wescoat et al. 2022).

Under the *Jal Jeevan Mission*, there is no dedicated funding for source sustainability measures. Rural Drinking Water and Sanitation Department engineers told us that the funding for such structures has to come from the *Gram Panchayat* or community. They support these activities by preparing estimates and doing technical consultations.

The village water and sanitation committee conducts implementation monitoring. During construction, the village water and sanitation committee (with the assistance of the Implementing Support Agency, if present) is supposed to play a monitoring role. This includes checking the quality of infrastructure (for example checking the testing reports of cement quality), as well as water pressure from Household Tap Connections, once installed, at various locations in the village. The *Gram Panchayat* is also supposed to maintain a "stock register,", which is a record of goods purchased or stored, such as chlorine.

WATER SUPPLY IN TARDOBACHIWADI

The Tardobachiwadi village scheme was implemented under the state program and was declared *Har Ghar Jal*. Tardobachiwadi village, which we visited in Shirur block of Pune district, was given water supply under the previous water supply program, known as. Its source is a jack-well from the Ghod river, which flows through the village. The village was one of the 38 declared *Har Ghar Jal* villages by August 2022. The scheme had a budget of ₹70 million ($853,658 at $1=82) and was implemented by Maharashtra *Jeevan Pradhikaran* (it began in 2018 and was completed by 2020).

Figure B-3: A jack-well[25] in Ghod river, part of the Tardobachiwadi drinking water scheme.

Har Ghar Jal declaration does not necessarily mean that taps are functional. The *Gram Sevak* as well as village residents mentioned that water had to be provided by tankers in the summer of 2020 when the scheme was not yet fully completed, and the river had gone almost dry. They have not faced this problem in the years 2021 and 2022. The tanker expense in 2020 was covered by the District Collector's office (administered by the *Panchayat Samiti* at the block level) and not by the *Gram Panchayat*.

Individual metering is rarely done in the Pune district. The Sectional Engineer of Rural Water Supply Division said that metering is not being done at the individual household level in most villages in the Pune district, and that he feels bulk metering is necessary at the elevated storage tank or distribution zoning level to keep a record of village level water consumption. In Tardobachiwadi, however, work is underway (90 percent complete) for water meter installation for individual houses. The funding for

[25] Jack-well is a water intake structure, in which water level is at the same level as that of surface water body (https://www.constrosystems.in/jack-well-construction.asp).

individual meters is also through *Jal Swarajya 2*, which advocated metering, and not through the *Jal Jeevan Mission*. Villages with household level metering will deserve close study to estimate variations in water demand in relation to water supply and competing uses.

B.4 PLANNING CHALLENGES IN RURAL DRINKING WATER SUPPLY IN MAHARASHTRA

Maharashtra represents a special case among the four case study states as it is a pioneer in establishing and building water sector institutions, including formulating new laws for the water sector. However, many challenges remain, such as holistic and bottom-up planning for supply of rural domestic water, regular collection of water tariffs for operation and maintenance, source sustainability, and active regulation of water use by competing sectors.

While there is involvement of *Panchayati Raj* Institutions, larger community participation seems to be largely missing. *Panchayati Raj* institutions are involved in planning and implementation. For example, *Gram Panchayats* (*Sarpanch* largely) and village water and sanitation committees (*Gram Sevak*) are involved in making Village Action Plans and monitoring activities at the village level. However, the larger community, comprising different social groups, is not actively involved, and its views do not seem to be reflected in planning. The collection of water tariffs has also been a challenge for *Gram Panchayats*.

Source sustainability is a major challenge when departments are acting independent of each other. Source sustainability activities are not part of the *Jal Jeevan Mission* exclusively, and if at all planned, they must be executed through the convergence with other schemes, such as the *Swachh Bharat Mission 2.0* for waste management and *Atal Bhujal Yojana* for groundwater sustainability. However, these schemes operate independently and lack inter-departmental coordination. Government departments have their clear water sector jurisdictions and objectives. The Water Resources Department is concerned with irrigation water supply and watershed protection, and the Environment Department is concerned with pollution. The Water Supply and Sanitation Department deals with water and sanitation. Bringing these large water departments together for integrated planning remains a challenging task as they operate based on their respective targets and protocols.

There is very little coordination at the basin level of water resources management for source sustainability. Source sustainability is largely discussed at the village level, but discussion about regional or watershed-level management is missing in the planning process for Rural Drinking Water Supply. Furthermore, a strong top-down structure currently exists in Rural Drinking Water Supply planning and implementation in Maharashtra. Community involvement in scheme planning is limited, and this too affects resource sustainability at local and basin levels.

Under fast-paced programs such as the *Jal Jeevan Mission*, infrastructure creation has taken center stage in village-level planning. The planning process at the village level in Maharashtra, as in all other states, is focused on creating infrastructure for Rural Drinking Water Supply on time. Village Action Plans take note of existing infrastructure, yet details of current service levels are limited to the number of households having tap connections. Priority areas within the *Gram Panchayat* or village are hard to determine with the current planning process. Priority is decided based on the community, village water and sanitation committee, or *Sarpanch*'s input.

District level planning does not prioritize based on service level. At the district level, which regions (i.e., block, or villages) within the district are to be prioritized is not clear through the District Action Plan (see Singh et al. 2020; Wescoat et al. 2022 for prioritization methods). While the District

Water and Sanitation Mission is expected to prioritize villages that complete the planning and mobilization phase early, the planning process appears to be more focused on full coverage. Thus, there is limited attention to prioritizing for sustainable service levels in the future.

The rural drinking water sector is facing competing demands from expanding industrial and agricultural water sectors. Though per capita water availability in the state is less than the national average, the demand for water is expected to grow across sectors the industrial, agriculture, environmental, tourism, and service sectors. While the Maharashtra Industrial Development Corporation provides water to industries largely through dams and reservoirs, there is no regulation of industrial groundwater withdrawals as of now despite there being a law to regulate groundwater use. The Maharashtra Water Resources Regulation Authority has been entrusted with this responsibility. It will be a growing challenge to meet—and manage—the demands of all water sectors competing for the same resource.

Extreme weather events and climate trends pose major threats to water security in the state. Water resource availability across districts is heterogenous, even within districts. Maharashtra has faced historical drought and even famine-prone periods in the colonial period (McAlpin 1983). It is experiencing more droughts and severe floods in recent years, indicating that managing water resources will become even more challenging as extreme weather events occur with more frequency and intensity (M. D. Kumar, Bassi, and Kumar 2022).

A holistic approach to planning for multiple resource use with involvement of communities in the sustainability of sources and schemes is much needed. Going forward, Maharashtra should focus on an integrated approach to resource and source sustainability to avoid slipping back. Institutional innovations are needed to ensure that communities are truly involved and understand the importance of long-term sustainability of sources and schemes, especially in the context of fast-paced programs like the *Jal Jeevan Mission*. The construction of massive, piped infrastructure for rural drinking water supply is relatively expensive, and in some contexts questionable, for villages that already have a system (even though designed for the previous 40 liters per capita per day standard). Addressing source augmentation, and operation and maintenance innovations in existing systems could be an alternate priority and approach, so that service levels become more reliable and long-term sustainability is improved.

C. CASE STUDY 3: BIHAR

C.1 BIHAR STATE CHARACTERISTICS

Bihar lies in the Indo-Gangetic plains of India, bordered by Nepal to the north and the states of West Bengal, Jharkand, and Uttar Pradesh on the east, south, and west, respectively. It is one of the largest states in the country in terms of population, with a total of 104.10 million people, according to the 2011 census, of which 88.71 percent live in rural areas. The state's annual rainfall ranges from 1,000 to 2,000 mm (India Meteorological Department 2015).

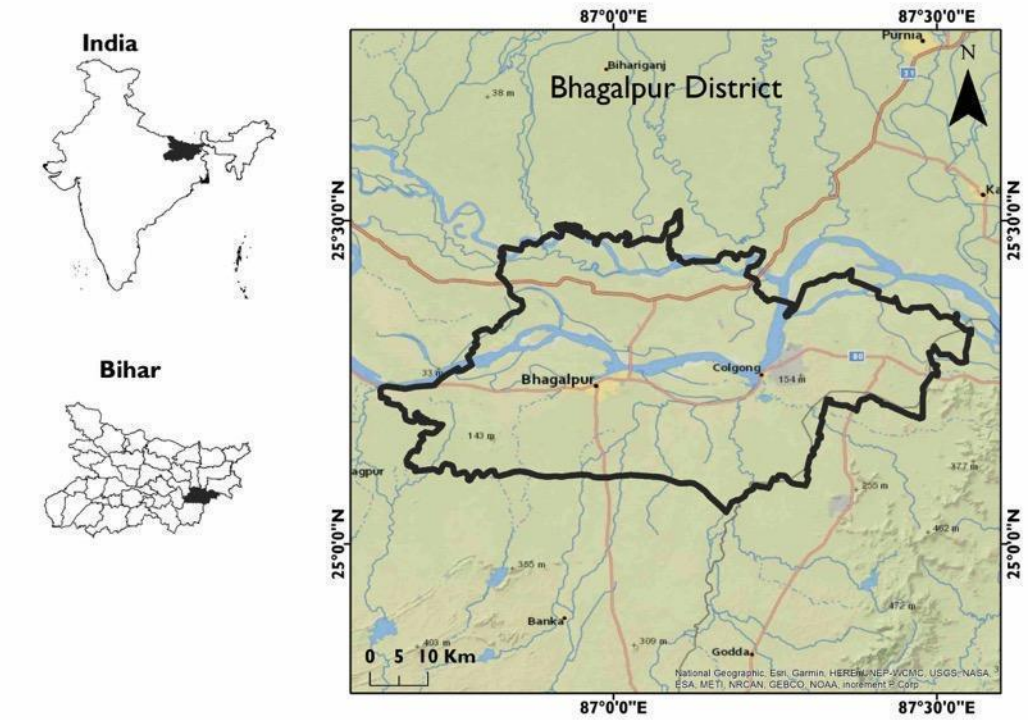


Figure C-1: Map of Bihar and Bhagalpur district

The state is drained by tributaries of the river Ganga forming large floodplains. The Ganga and its major tributaries, including the Son, Gandak, Phalgu, and Kosi, collectively traverse a distance of 3,200 kilometers in the state. Bihar's flood plains are estimated to cover 100,000 hectares (total area of Bihar being 9,416,300 hectares), but an estimated 37.24 percent of the state was flood-affected between 1998 and 2018, which poses major risks for drinking water systems (National Remote Sensing Centre 2020). The surface water resources in the state are also an important part of the state's water security. In addition to the floodplains another 69,000 hectares area is covered by ponds and tanks (Bihar State Water and Sanitation Mission (BSWSM) 2013).

Alluvial aquifers make up large parts of the aquifer systems of the state. These aquifers behave like a massive bathtub. Significantly, these systems don't respond much to local rainfall—for instance, if pumping exceeds recharge, these aquifers gradually get drawn down over decades akin to a bathtub leaking faster than the tap filling it (Srinivasan 2022).

The overall groundwater extraction is less than recharge, yet a few regions face over-extraction challenges. According to the Central Ground Water Board report in 2022, out of a total

of 534 blocks in Bihar, seven blocks have been classified as overexploited, five as critical, and 51 as semi-critical (where the level of groundwater extraction is between 70 percent and 90 percent of the rate of recharge).

Drinking water security in the state faces the dual challenges of water contamination and floods. In some areas of the state, the groundwater suffers from geogenic contaminants including arsenic, iron and fluoride (Central Ground Water Board 2021; Annual Action Plan Meeting 2020). As noted above, flooding is common in monsoons.

C.2 EVOLUTION OF DRINKING WATER POLICIES AND SCHEMES

Bihar has historically had very low levels of piped water supply in rural areas, instead preferring to focus on point sources to supply drinking water. Rural communities have thus been dependent on public hand pumps and wells for drinking water for a very long time. The number of state installed hand pumps is estimated to be between 0.7 - 0.8 million across the state. In addition to these, as many as 0.4-0.6 million hand pumps have been privately installed in Bihar (Personal Communication, Chief Engineer Public Health Engineer Department, July 2022). Dugwells also represent another prominent source of water in Bihar, given its shallow groundwater. Performance of the Centrally sponsored drinking water schemes such as the National Rural Drinking Water Programme have historically been very poor, and it only managed to provide piped water supply to a meager 1.22 percent of households in the state as of 2017, according to the 2018 Performance Audit on the Natural Rural Drinking Water Programme in the Ministry of Drinking Water and Sanitation. Only some urban areas in the state had piped water connections.

The failure of the federal government to provide piped water supply led to the state launching its own program. The various national rural drinking water supply schemes such as Swajaldhra and the National Rural Drinking Water Programme introduced by the Government of India and implemented by the Government of Bihar failed to make an impact in terms of coverage, quality as well as quantity, according to the 2018 Performance Audit on the Natural Rural Drinking Water Programme in the Ministry of Drinking Water and Sanitation. All of the above finally led to the launch of the state government's *Mukhyamantri Gramin Peyjal Nishchay Yojana* (literally "Chief Minister's Rural Drinking Water Security Scheme") (Personal Communication, Chief Engineer, Public Health Engineering Department 2022).

The shift to piped water supply in rural areas is very recent and largely relied on state implementation. All the progress in the piped water supply has been achieved only from 2016. Bihar did not have a significant program to cover households with piped water until the state government launched the *Mukhyamantri Gramin Peyjal Nishchay Yojana*. Funding for this scheme has largely been dependent on state funds.

The state government and *Panchayati Raj* institutions have been involved in implementing the scheme. Bihar has achieved massive coverage of tap connections in a very short period of time (*Jal Jeevan Mission* Dashboard 2023). The entire top-down approach of planning and implementation of state government is arguably central to this coverage. As the state is not considering charging for water, however, scheme sustainability remains in question. There are also concerns regarding contamination due to graywater and frequent floods.

Piped supply infrastructure design has had to address water quality issues in particular. Historically, Bihar relied on groundwater to provide water to its large population. As per the state's

report to the *National Jal Jeevan Mission* in 2019, around 899,459 out of 1,83,02,852 (4.91% of total) households are in quality affected habitations (Annual Action Plan Meeting 2020). Also, 0.38 million out of 0.78 million sources were tested for water quality wherein 70,000 sources (18.4% of tested sources and 9% of total sources) reported chemical contamination (Jal Jeevan Mission report (format E5), 2023) Groundwater contamination in rural Bihar and the accompanying risks to public health prompted a paradigm shift under the *Mukhyamantri Gramin Peyjal Nishchay Yojana*. This shift mandated the provision of good quality water to every family with a service level of 70 liters per capita per day. Bihar has high levels of geogenic contaminants in its groundwater (Central Ground Water Board 2021; Annual Action Plan Meeting 2020). To address this issue, the state has been gradually transitioning toward planning multi-village schemes. In areas with groundwater of adequate quality, a significant number of connections are also being planned through single-village schemes.

The state has achieved significant household coverage since 2019. As of August 2022, tap connections have been provided to 15 million households (95%) which is a big jump from a mere 0.3 million households covered in August 2019 (*Jal Jeevan Mission* Dashboard 2023). Significantly, Bihar has relied largely on the state's own finances for *Mukhyamantri Gramin Peyjal Nishchay Yojana* for funding this massive coverage effort and only in a few instances opted for accessing *Jal Jeevan Mission* funds during this period.

According to the *Jal Jeevan Mission* integrated management information system (Format B26) for Bihar:

- There are 138,844 water supply schemes in the state serving 119,826 habitations.
- Of these, 99.7 percent schemes are groundwater-based, and a negligible 0.02 percent are surface water-based.
- Two hundred and ninety (0.2%) schemes are categorized as based on other sources (i.e., other than groundwater and surface water) and these serve 212 habitations. This categorization may be an error in the data, as per *Jal Jeevan Mission* officials.
- Through groundwater-based schemes, 119,266 habitations have been covered.
- Through surface water-based schemes, 348 habitations have been covered.

However, as per our discussions with officials in charge of the system, these data do not seem to get updated on a regular basis and thus it may not reflect the recent shift toward surface water based multi-village schemes (Pradeep Singh, Personal Communication, August 2022).

Bihar has emphasized water resources management alongside expansion of piped water supply. Significantly for this study, in 2019 Bihar launched a programme of water conservation measures to protect water sources and groundwater levels for multiple use. As of August 2021, for example, around 20,000 ponds in the state that were illegally encroached upon (i.e., land of the pond converted to other uses) have been made encroachment free as a part of the *Jal Jeevan Hariyali Yojana* (Down to Earth 2021). The state is undertaking this campaign in part to create more sources for multiple uses. For instance, the total irrigation potential from this campaign is expected to be 147,254 hectares (Ministry of *Jal Shakti* 2019) through the *Jal Jeevan Hariyali* initiative, which is to be achieved in part by transferring water conserved in surplus areas to water deficit areas. The impact of this mission on drinking water sources and services will be important to monitor.

C.3 INSTITUTIONAL MAP AND PLANNING PROCESSES[26]

STATE-LEVEL PLANNING

The Public Health Engineering Department and the *Panchayati Raj* Department are the main agencies at the state level that govern the Rural Drinking Water Supply. While the former is tasked with managing regions affected by groundwater contamination, the latter plans for non-contaminated areas. There is a State Level Scheme Monitoring Unit that supports activities of the Implementation and Monitoring unit under the Principal Secretary, *Panchayati Raj* Department.

In addition, the *Mukhyamantri Gramin Peyjal Nishchay Yojana* has created decentralized institutions from district to ward[27] levels to plan and implement schemes. These institutions include the State-Level Scheme Monitoring Unit, District Water and Sanitation Committees, Block-Level Monitoring Committees, and the Ward-Level Implementation and Management Committee. The ward-level committee reaches out to block level committees to request and develop technical proposals. The Block-level committee provides technical guidance and coordinates with district-level committees for scheme approval and funds. Operations and maintenance are looked after by contractors for the first five years. As of now, communities are not involved in the operations and maintenance of new *Jal Jeevan Mission* and *Mukhyamantri Gramin Peyjal Nishchay Yojana* schemes, the sustainability of which will be important to monitor.

Interestingly, in Bihar, there are multiple new programs addressing source sustainability. The *Jal Jeevan Hariyali Yojana* (a state government initiative for water security and tree plantation), Mahatma Gandhi National Rural Employment Guarantee Act, and *Panchayati Raj*-level schemes are a few of these convergent schemes. In terms of source augmentation for rural purposes, the state is undertaking a campaign to conserve water and make surface water bodies encroachment free through its *Jal Jeevan Hariyali* initiative, described above.

DISTRICT-LEVEL PLANNING

At the district level, technical and administrative approvals are based on the budget as per a government-prescribed standard. The District Water and Sanitation Committee plans and implements schemes and activities according to a timeline and by adhering to local requirements and conditions. To support the District Water and Sanitation Committee, there is a support cell, which acts as a resource center. A Project Implementation Unit also supports the District Water and Sanitation Committee. There was no Annual Action Plan prepared for each district till 2017, when the *Mukhyamantri Gramin Peyjal Nishchay Yojana* directed the Public Health Engineering Department to develop water schemes in every ward in contaminated zones. Detailed Project Reports are prepared based on water demand, calculated as per the service level of 70 liters per capita per day water plus 15 percent for unaccounted losses. If the estimated budget is between ₹7 million ($ 85,366 at $1=₹ 82) and ₹35 million ($ 426,829), the Chief Engineer of the Public Health Engineering Department would approve the plan, while plans with a budget exceeding ₹35 million are sent to the Public Health Engineering Department headquarters in the city of Patna for technical approval. After technical approval, the

[26] The main document used to compile this section is the *Mukhyamantri Gramin Peyjal Nishchay Yojana* (SWASTH 2016). We have also drawn from our interactions with officials involved in rural drinking water supply planning and implementation, state websites, and documents.

[27] In Bihar, a *Gram Panchayat* is sub-divided into wards, usually for electoral purposes. It is different from a habitation which is a cluster of households. The term ward in Bihar is different from the standard meaning of habitation in other states.

reports are sent to the Public Health Engineering Department headquarters for administrative approval by the engineer-in-chief and funds are sanctioned.

Efforts are made to convert previous schemes into piped-water schemes. One *Gram Panchayat* has approximately 10–12 wards. If infrastructure such as pipelines and standposts were already set up by previous schemes, only infrastructure-strengthening and the installation of functional household tap connection installation are carried out under the *Mukhyamantri Gramin Peyjal Nishchay Yojana*. If these do not exist, a new scheme is planned. For example, a total of 751 single- and multi-village schemes have been planned for 1,216 wards in the Bhagalpur division of Bihar.[28]

Implementation at the ward level is done with the support of private contractors. Contractors are selected at the district level to set up the drinking water infrastructure in wards. Unplasticized polyvinyl chloride pipes are fitted in borewells and used for pipelines. The Central Institute of Petrochemicals Engineering and Technology, West Bengal inspects their quality as a third party and provides a quality check certificate, only after which the pipes are transported to the wards.

The following steps are undertaken for scheme implementation at each ward:

- Drilling a borewell;
- Laying pipes;
- Installing a motor pump;
- Staging a storage tank, e.g., with 10,000-liter capacity;
- Installing a water treatment plant, in areas where iron, arsenic or fluoride was detected in the source;
- Installing a chlorinator; and
- Providing household tap connections.

SUB-DISTRICT-LEVEL PLANNING, INCLUDING BLOCKS, *GRAM* PANCHAYATS, AND WARDS

To drive block-level activities of the *Mukhyamantri Gramin Peyjal Nishchay Yojana*, there is a Block Level Monitoring Committee. At the *Gram Panchayat* level, the Mukhiya (Village President) is responsible for implementing drinking water schemes. Owing to the large size of villages in Bihar, *Gram Panchayats* have been further divided into wards for administrative convenience. Thus, a ward-level Implementation and Management Committee oversees planning at the more local ward level and is a local institution distinctive to Bihar. The *Lok Nirman Samiti* (Public Works Committee) of *Gram Panchayats*, which looks after all the infrastructure created by the *Gram Panchayat* (SWASTH 2016) supports the Implementation and Management Committee.

[28] A Division is an administrative geographical unit consisting of several districts within a state.

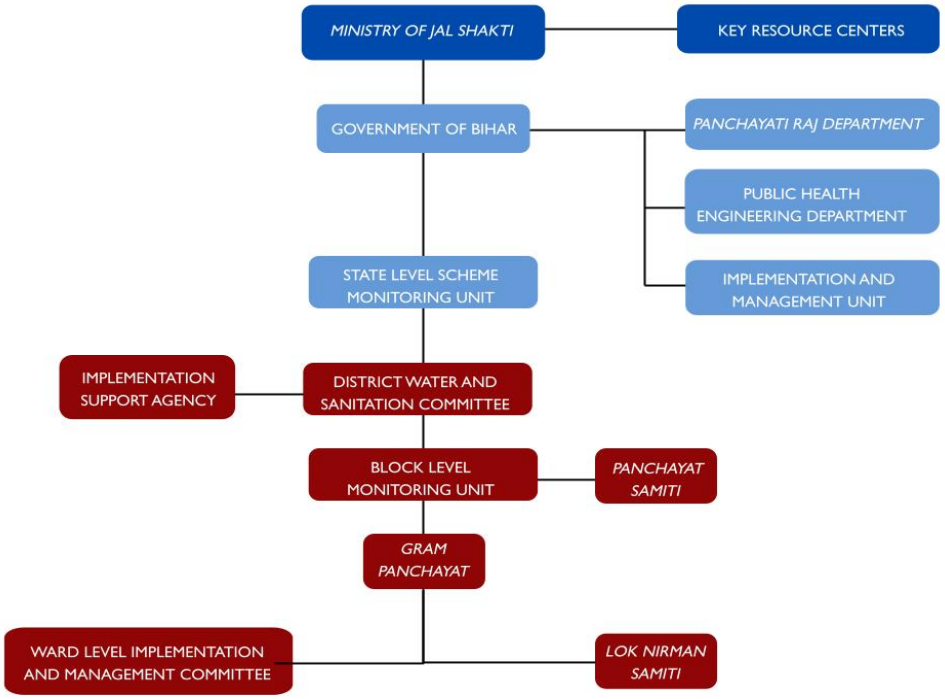


Figure C-2: Institutions at the national (in dark blue), state (in light blue) and *Panchayati Raj* (in red) levels overseeing rural drinking water supply in Bihar

***Mukhyamantri Gramin Peyjal Nishchay Yojana* guidelines require the bottom-up planning process to start at the ward level.** While state drinking water funding is a top-down process, state guidelines mandate a bottom-up planning process. The *Gram Panchayat* decides which wards are to be prioritized (e.g., wards that have a higher percentage of Scheduled Caste or Scheduled Tribe population may be selected first, and so on). The Ward-Level Implementation & Management Committee is then formed by the ward *sabha*, which is the smallest administrative subunit of the *Panchayati Raj* system in the state. An elected ward member represents it. The Ward-Level Implementation & Management Committee conducts the ward's baseline survey, which includes the number of households, existing structures, number of connections required per house (a maximum of three can be provided under the *Mukhyamantri Gramin Peyjal Nishchay Yojana*), and land availability for creating new structures.

Based on this baseline survey, the junior engineers from the Block level monitoring unit are required to prepare a technical Detailed Project Report. This is done to get technical sanction from the Block-level monitoring unit. After technical sanction is obtained, the Detailed Project Report is presented to the Block Development Officer to get an administrative sanction. This is necessary to ensure the required funds are transferred to the Ward-Level Implementation & Management Committee's bank account.

As part of the broader planning strategy in the state, both the Public Health Engineering Department and *Panchayati Raj* Department apply a mission-mode approach. Under this mission mode, the priority is to build infrastructure as sought by *Gram Panchayat*s on demand. There was no Action Plan to be prepared by the district, block, or *Gram Panchayat*. The only strategy was to provide water as demanded. The decision to implement schemes at the ward level was taken to reduce the time required to complete single- or multi-village schemes and ensure these are maintained. This top-down mission

approach has streamlined the process of creating new infrastructure but may pose issues of long-term source and scheme sustainability.

DISTRICT-LEVEL PLANNING: CASE STUDY OF BHAGALPUR DISTRICT

BHAGALPUR DISTRICT HAS A MIX OF SINGLE AND MULTI-VILLAGE SCHEMES

As this district has arsenic contaminated areas, the Public Health Engineering Department is planning and implementing surface water multi-village schemes. A total of 751 schemes (both single- and multi-village schemes) have been planned for 1,216 wards of the district. Technical and administrative approvals are given by Public Health Engineering Department engineers at different levels to allocate funds to each scheme. Tenders are then floated at the district level. Contractors implement schemes in wards with guidance from the Public Health Engineering Department.

Bhagalpur district has achieved a coverage of 95.2 percent households through piped water connection as of February 2023, according to the *Jal Jeevan Mission* dashboard. This is a large increase from the less than 2 percent functional household tap connections in this district as of 2019. The story is similar in most other districts of Bihar (*Jal Jeevan Mission* 2023).

In Bhagalpur district, due to source contamination issues in groundwater, the Public Health Engineering Department is planning and implementing both single- and multi-village schemes. The latter draw from surface water sources. The river Ganga flows through this eastern district, which borders the state of Jharkhand and is the main surface water source. However, arsenic contamination has been reported in aquifers along many stretches of the river in this district. The district has therefore adopted multi-village schemes in source water quality-affected regions and single-village schemes in the other regions.

Bhagalpur is a unique case in Bihar, where it has used more *Jal Jeevan Mission* funds because it opted for multi-village schemes. A District Annual Action Plan was made for 2019-2020, and the *Jal Jeevan Mission* funds 29 schemes covering 46 wards. These are mainly habitations that were left out of the *Mukhyamantri Gramin Peyjal Nishchay Yojana*. A large multi-village scheme covering 240 wards was also undertaken under *Jal Jeevan Mission*, due to which the share of the *Mission* funding in East Bhagalpur division is considerably higher (20 percent) than in other divisions and districts where the share of funds is only 2–3 percent.

Figure C-3: An overhead tank built under the *Mukhyamantri Gramin Peyjal Nishchay Yojana,* Bhagalpur, Bihar

C.4 PLANNING CHALLENGES IN RURAL DRINKING WATER SUPPLY IN BIHAR

1. Bihar is considered a water rich state, so there is relatively less emphasis on source sustainability.

Since rich alluvial aquifers lie beneath Bihar, as compared to the hard rock aquifers and more drought prone conditions in Karnataka and Maharashtra, the state's water planning puts less emphasis on source sustainability as groundwater levels are relatively shallow. However, pockets of groundwater depletion are emerging and there is no regulation of groundwater extraction.

There are, however, signs that borewell depths are increasing, having to be dug deeper to reach water in some parts of the state, indicating that the state will need to factor in dwindling groundwater supplies in the future. It will become important to reexamine levels of extraction in the state. In some (non-contaminated) areas under the *Panchayati Raj* Department, borewells had to be drilled to the depth of 800 feet. The Public Health Engineering Department engineer we spoke to however said that surface water sources would have been a better option than drilling to such depths.

2. Drinking water quality and supply are likely to be affected by floods, but systems are not designed to address flooding.

It is also important to get a better understanding of how floods impact rural drinking water supply here given the frequency and intensity of such events during the monsoon months.

Given that contamination is one of the state's big concerns, samples from arsenic and fluoride-affected areas are tested monthly. Non-contaminated sources are tested once in three months. However, as monsoon flooding is common in the state, understanding its effects on water supply during four monsoon-months of the year is important. The risk of bacteriological contamination is high after the flood recedes and bleaching of water sources is common.

Often pumps are fully submerged during the worst of the floods, and the water supply has to be stopped. Sometimes it may take several months to unclog the pipes and restore the supply. Often people have to be relocated, and the tubewells located at higher elevations (above the floodplain) are temporarily used for water needs, during which time the community slips back to irregular, unsafe water supply.

3. Multi-village schemes face challenges in providing consistent supplies across networks.

There is a strong preference for multi-village schemes in regions where the groundwater has geogenic contamination. As of 2021, the state government has begun to tilt in favor of surface water-based multi-village schemes (Annual Action Plan Meeting 2020).

These complex schemes are technically difficult to manage. Bigger wards face challenges, such as little or no water supply at the tail end of pipelines, which must be tackled using booster pumps and demand management. Further, systems for grievance redressal do exist in such cases, for instance a complaint register is kept at the local pump-house. In addition, village residents are supposed to discuss the problems they are facing at the monthly *jal chaupal* meetings (community meetings to discuss water-related issues), but the capacity to address these technical issues is limited, which is a topic for future district- and block-level support.

4. Community participation and water tariffs will be key to avoid slip back of newly constructed water supply schemes.

Contractors implement multi-village schemes. *Gram Panchayats* and Ward-Level Implementation & Management Committees play a limited role in multi-village schemes. Their role is limited to procuring no-objection certificates to drill borewells, construct overhead tanks, lay pipelines, etc. on private lands and supporting the contractor (in the case of schemes built by the Public Health Engineering Department).

It is unclear how the *Gram Panchayats and Committees* take on operations and maintenance once contractors' mandated period lapses. In Bihar, the contractors involved have to maintain the scheme for five years. Our understanding so far is that community participation is limited to the *Ward Sabha*, which is responsible for giving sanction to local schemes. But no significant community level capacity is being built.

Further, since the state government is not immediately planning to collect water tariff from users as of now, the financial sustainability of drinking water systems needs to be monitored. Although the *Mukhyamantri Gramin Peyjal Nishchay Yojana* guidelines have provisions in this regard, the question remains as to whether the Bihar government would continue to bear costs or transition toward pricing for water.

D. CASE STUDY 4: SIKKIM

D.1 SIKKIM STATE CHARACTERISTICS

Sikkim, located in the north-eastern part of India, has unique physiographic characteristics compared to the other states discussed in this report. It is a mountainous region with rich biodiversity. It is also the second smallest state of India with a population of 610,577, of which 74.85 percent live in rural areas (Census of India 2013). There are only six districts in Sikkim. The erstwhile West district has been bifurcated into Gyalshing and Soreng districts, East district has been bifurcated into Pakyong and Gangtok districts. The North and South districts are renamed as Mangan and Namchi districts, respectively. Sikkim's water supply challenges lie in its difficult topography, its location and infrastructure activities in eco-sensitive zones. Providing reliable and easy access to drinking water is challenging even though it has glacier-fed rivers and streams.

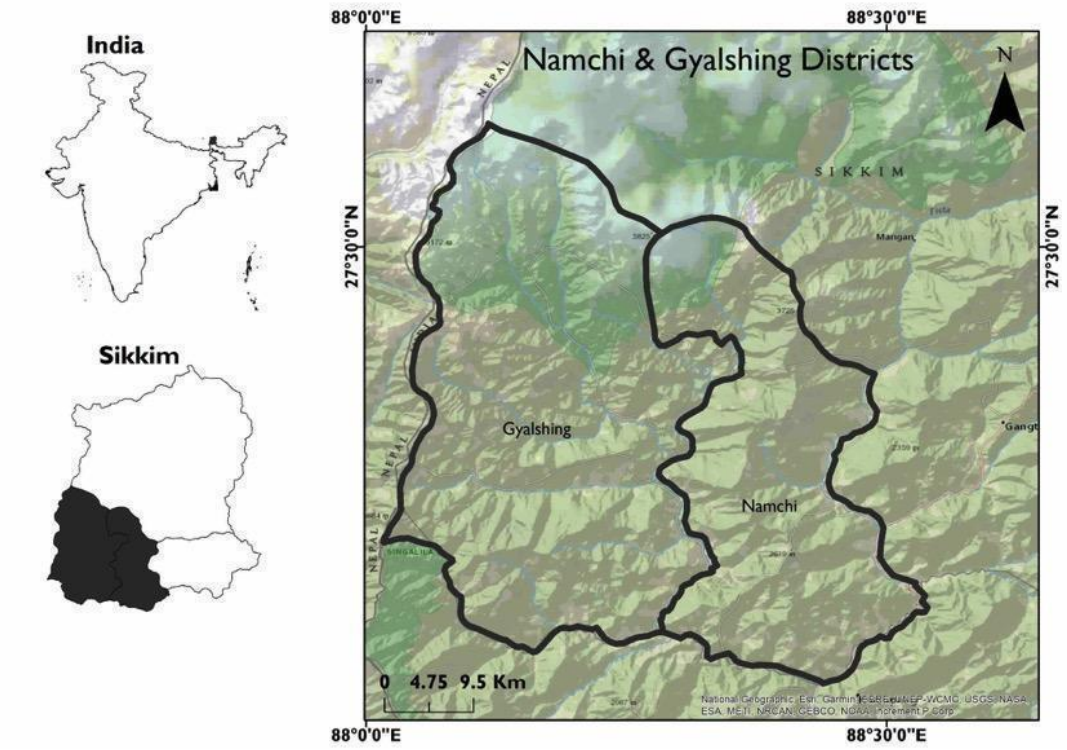


Figure D-1: Map of Sikkim highlighting Gyalshing and Namchi districts

Sikkim's surface water resources include rivers, high-altitude lakes, and springs. Teesta and Rangeet are two important rivers of the state. Furthermore, Sikkim has 534 lakes, most of which are located above 4000 m. There are 1,942 springs geo-tagged in the southern and western districts alone (Dhakal 2020). Many of these are on private land. Sikkim's rural drinking water supply is therefore mostly based on these surface water springs. People use public as well as private springs for drinking water (Field observation, 2022).

D.2 EVOLUTION OF POLICIES AND SCHEMES FOR THE DRINKING WATER SECTOR

Sikkim was among the top performing states under the National Rural Drinking Water Programme. The state had the largest habitation coverage (99.32 percent) compared to the national average (16.85 percent). This coverage was with service levels of 40 liters per capita per day (that has

subsequently increased to 55 liters per capita per day) and was not necessarily provided by piped water supplies to household taps but through or public standposts in few instances, according to the 2018 Performance Audit on the Natural Rural Drinking Water Programme in the Ministry of Drinking Water and Sanitation.

The same report identified the following areas for improvement in the state water sector:

- Sikkim reported a coverage of only 36 percent in providing drinking water facilities to schools and *anganwadis*.
- The state did not prepare the State Specific Sector Policy Framework which was essential for state level planning for preparing water supply schemes. Also, the state did not prepare a Water Security Plan.
- The State Water and Sanitation Mission met infrequently and identified the Public Health and Engineering Department (PHED) as the agency responsible for technical inputs in planning and design. PHED was crucial as they were to provide technical support to the department in planning and design of rural water supply schemes with an emphasis on source sustainability. For example, the state Public Health Engineering Department did not assess Detailed Project Reports and estimates relating to scheme works, except for two mega projects.
- The state also did not have sustainability plans for water sources. These were either not prepared or were not included in the Annual Action Plan. Social audit of the program was also absent in the state.

Notwithstanding these water sector deficiencies, Sikkim did undertake source sustainability measures early on through a state-led springshed management program known as *Dhara Vikas*.

The *Dhara Vikas* springshed management initiative was launched in 2008 by the state Rural Development Department, the nodal agency of the state government in providing rural drinking water. This initiative was launched in the drought-prone regions of the state and involved the transfer of knowledge and skills to local communities through creation of a para-state hydrogeology team (NITI Aayog 2015). The funding was primarily via the federally sponsored Mahatma Gandhi National Rural Employment Guarantee Act, but technical support was received from other government agencies and independently funded non-governmental organizations. The program involves catchment management with community involvement (Government of Sikkim, Rural Management and Development Department and United Nations Development Programme 2017).

The initiative is still active, but its impact needs to be assessed. Activities under Dhara Vikas are still being carried out, as observed from field sites in Mellidara Paiyong *Gram Panchayat* Unit. These include water harvesting through a system of digging trenches in the catchment areas. So far, two lakes have been revived and four lakes have been converted to recharge structures, and more than 100 springs have benefitted from the recharge activity (Dhakal 2020). Regular removal of silt from trenches is also being carried out in various parts of the state in *Dhara Vikas* activities, as reported from key informant interviews. Furthermore, there has been increased awareness about water security among the local community which has led to the construction of water storage tanks. However, the Rural Development Department lacks a dedicated unit and resources to carry out the monitoring work necessary to make this scheme more effective.

Figure D-2: Digging trenches in the Mellidara Paiyong *Gram Panchayat* Unit under the *Dhara Vikas* program. Picture Courtesy: Diwakar Gurung.

JAL JEEVAN MISSION COVERAGE

Sikkim has managed to reach a large share of households under the *Jal Jeevan Mission*. As of January 2023, the state has managed to cover 78 percent of households, up from 55.34 percent in August 2019, with service levels of 55 liters per capita per day (*Jal Jeevan Mission* Integrated Management Information System, January 24, 2023). Eighty-four villages and 22 *Gram Panchayats* have functional household tap connections with service levels of 55 liters per capita per day in all households.

According to the *Jal Jeevan Mission* Integrated Management Information System (Format B26) for Sikkim:

- There are 3,734 water supply schemes in the state.
- Of these, 99.84 percent are surface water based.
- Only six habitations have been covered through groundwater-based schemes.

However, it should be noted that springs are fed by groundwater, which calls for conjunctive management of surface and groundwater resources in the watersheds of mountainous states like Sikkim.

D.3 STATE AND DISTRICT LEVEL INSTITUTIONS INCLUDED IN THIS CASE STUDY

STATE-LEVEL PLANNING AND INSTITUTIONS

The Rural Development Department is the nodal agency of the state government of Sikkim tasked with providing rural drinking water. **The nodal ministry supports water supply programs in the state by assisting local governments**. It supports *Panchayati Raj* institutions financially, technically, and institutionally. It is also the nodal agency for *Jal Jeevan Mission* implementation in the state. There are various support committees in-place at different levels of

Panchayati Raj as per *Jal Jeevan Mission* guidelines. These committees help in designing, planning and implementing schemes. Sikkim stands out among the four states we studied in this report due to communities' involvement in the *Jal Jeevan Mission.*

The Rural Development Department pools financial resources through convergence with federal programs such as the Mahatma Gandhi National Rural Employment Guarantee Act and the *Rashtriya Krishi Vikas Yojana*. These resources are used to construct infrastructure for water harvesting, spring development and other necessary structures for rural water supply systems (Saraswathy & Vijayaram, 2016 in Hutchings et al. (2020); Tambe et al. 2017). The department ensures that the various schemes, policies and programs reach beneficiaries effectively.

At the state level, along with the Rural Development Department, there exists the State Water and Sanitation Mission, which was established in 2010 (Government of Sikkim, Rural Management and Development Department and United Nations Development Programme 2017). Under the State Water and Sanitation Mission, there are three committees to implement the *Jal Jeevan Mission*: the Apex Committee, headed by the Chief Secretary; the Executive Committee, headed by the Chief Engineer Rural Development Department; and the State-level Scheme Sanctioning Committee, headed by the Principal Secretary, Rural Development Department, who is also the *Jal Jeevan Mission* Director in the state. These committees include members representing various line departments.

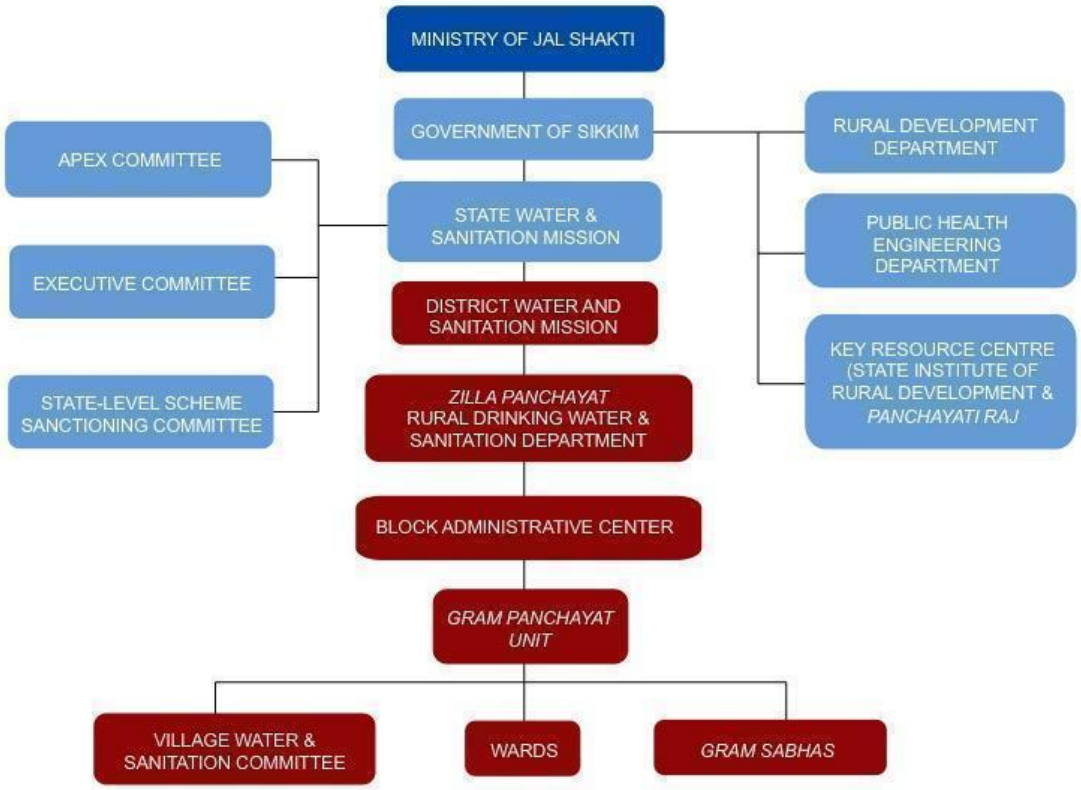


Figure D-3: Institutions at the national (in dark blue), state (in light blue) and *Panchayati Raj* (in red) levels overseeing rural drinking water supply in Sikkim

The State Water and Sanitation Mission is responsible for preparing and finalizing the State Action Plan for rural drinking water. The Public Health Engineering Department functions as a service provider with the objectives of providing a sustainable supply of safe drinking water, carrying out wastewater management and sewage treatment, improving the existing drinking water service mechanism, and generating revenue for government programs.

The State Institute of Rural Development and Panchayati Raj (SIRD) is the Government of Sikkim's Key Resource (Government of Sikkim, Rural Development Department 2020). It hosts the Communication & Capacity Development Unit, among others. This unit, established in 2006–07 under the National Rural Drinking Water Programme, is dedicated to capacity-building and dissemination of information regarding water safety and sanitation. The institute (SIRD) builds capacities of multiple stakeholders, ranging from engineers, elected *Panchayat* representatives, and field facilitators to Village level para-workers (Barefoot Engineers) (Personal Communication, Field Facilitator, June 14, 2022). Barefoot Engineers receive training regarding plumbing and water quality testing techniques, which they use at project sites. They provide a link between the Rural Development Department and *Gram Panchayat* Units and play a pivotal role in maintaining water supply. There are also some private organizations, such as the Sulabh Sanitation and Social Reforms Movement and Alkem Laboratories, which work in collaboration with the Government of Sikkim to support water, sanitation, and hygiene programs.

DISTRICT-LEVEL INSTITUTIONS

At the district level, there are various bodies to facilitate *Jal Jeevan Mission* implementation, such as the District Water and Sanitation Mission and *Zilla Panchayat*. The former, chaired by the District Collector, is tasked with making District Action Plans to provide functional tap connections to every household by 2024, while *Zilla Panchayats* play a supporting role. Sikkim has a two-tier *Panchayati Raj* system governed by the Sikkim *Panchayat* Act, 1993 (Government of Sikkim, Rural Development Department 2022). As noted above, there are four *Zilla Panchayats* in Sikkim (Government of Sikkim, Rural Development Department 2019) . The state also has a traditional democratic institution known as the Dzumsa in Lachen and Lachung villages in the Mangan district, which has been in existence for many centuries (Government of Sikkim, State Election Commission 2022) Their heads, known as Pipons, are recognized as *Zilla Panchayat* leaders under the Sikkim *Panchayat* Act, 1993.

GRAM PANCHAYAT UNITS AND VILLAGE-LEVEL INSTITUTIONS

Gram Panchayat Units, also known as Village Administrative Centers or *Gram Prashashan Kendras*, are responsible for local governance. There are functional 29 domains under their jurisdiction, including water supply. *Gram Panchayat* Unit members propose the building of water supply infrastructure specific to the requirements of concerned habitations. There are 185 *Gram Panchayat* Units consisting of 1,040 wards, whose elected representatives constitute Ward *Panchayats*. These work closely with their communities and deal with issues that come up in their respective wards. They are responsible for organizing *Gram Sabhas*, where representatives from various line departments present their programs and schemes.

In the *Jal Jeevan Mission*'s planning phase, *Gram Panchayat* Units carry out Information, Education and Communication activities. While *Gram Panchayat* Units are capable of delivering these services, they require financial assistance from the government (Saraswathy and Vijayaram 2016). Even where *Gram Panchayat* Units are financially equipped, it was evident from field visits that a few lack the capacity and human resources for their water supply systems' operations and maintenance.

The Rural Development Department appoints assistant engineers at the block level, and junior engineers at the *Panchayat* level to provide technical support to *Gram Panchayat* Units. After the initial project survey, the engineering cell—consisting of the Assistant Engineer, Junior Engineer, and Supervisor—prepares a Detailed Project Report, which includes the water supply scheme's design, implementation process, maps, and cost estimates.

These engineers also help *Gram Panchayat* Units prepare Village Action Plans and *Gram Panchayat* Development Plans. The former has a set template developed through participatory rural appraisal activities conducted by the *Gram Panchayat* Unit and helmed by the village water and sanitation committee.

Two years after the *Jal Jeevan Mission*'s launch in in 2019, 185 *Gram Sabha* meetings have been held in Sikkim, wherein drinking water supply management, water quality testing, source strengthening, and village sanitation have been discussed (Jal Jeevan Mission 2021). In these *Gram Sabhas*, community members took an oath to protect and conserve their local sources of water.

CASE STUDY: GYALSHING AND NAMCHI DISTRICTS

In Sikkim, we conducted field work and journey mapping exercises (for details, see Section K) in three *Gram Panchayat* Units: Yuksom Dubdi in Gyalshing district, and Sumbuk Kartikey and Mellidara Paiyong in Namchi district. The results are summarized below.

Case study districts are primarily dependent on rivers, streams and springs for drinking water. The state has numerous small water sources in the form of *khola* (river), *kholcha* (small stream), and *dhara* (springs). Ninety-nine percent of the water supply from these sources in villages, which have a scattered distribution of households due to the state's hilly topography and remote farmlands, is gravity-based (Personal Communication, Superintendent Engineer, *Zilla Panchayat*, May 30, 2022). There are many local schemes under the *Jal Jeevan Mission* as one scheme cannot cater to numerous scattered households.

In Gyalshing and Soreng districts, there are approximately 250 schemes and in Namchi district, there are approximately 240 schemes. Single-village schemes are preferred in Sikkim. Only one multi-village scheme, based on pumping from the Rangeet river, has been proposed for five *Gram Panchayat* Units in Namchi district, though it has not been sanctioned yet. In the two districts we studied, 11 villages and one *Panchayat* in Gyalshing district, and 14 villages and one *Panchayat* in Namchi district reported 100 percent functional household tap connections under the *Jal Jeevan Mission*. However, the mission has not investigated the environmental impacts of these schemes, which have increased the pressure on the streams from where water is already being drawn through the existing old water infrastructure, says a resident of Yuksom. There, single-village schemes include building new infrastructure for villages, thus adding to the existing infrastructure from previous schemes.

There is a standard design for single-village schemes. It begins at the water source, where sedimentation tanks are constructed. These are the main reservoirs from where the water is fed into zonal distribution tanks through 32–65 mm galvanized iron pipes depending on various factors. From there, drinking water is distributed to each household in 15 mm pipes.

Population projection and water availability are considered for the technical design of the scheme. In order to provide 55 liters per capita per day of water, which is the mandate under *Jal Jeevan Mission*, to every person in the household, a necessary calculation for the demand of water is done using the geometric increase method for the population, which also includes 10 percent of the floating population. Water availability data are collected, and tanks are designed to

collect the necessary volume of water. The diameter of the pipeline is determined accordingly to carry the required volume of water. The design also accounts for the decrease in discharge of water sources during the lean season to determine water availability throughout the year to meet demands (Personal communication during field work, 2022).

GRAM PANCHAYAT UNIT- AND HABITATION-LEVEL PLANNING

At the *Gram Panchayat* Unit level, there is the village water and sanitation committee chaired by the *Panchayat* President. It ensures the preparation of the Village Action Plan for water supply schemes.

From our journey maps with a cross-section of multiple stakeholders, consisting of barefoot engineers, assistant engineers, supervisors, *Gram Panchayat* Unit members, and residents belonging to three different *Gram Panchayat* Units, it was clear that village water and sanitation committees were not active bodies and that they lack the capacity to undertake the operations and maintenance of schemes being implemented in their villages.

Local communities have been involved at all stages in the *Jal Jeevan Mission*. Their approval of Village Action Plans in the *Gram Sabhas* is imperative to commence the implementation process. Their requirements and needs are identified during the Participatory Rural Appraisal activities conducted by *Gram Panchayat* Unit members. Water supply schemes are designed and implemented based on the work carried out by Ward *Panchayats* to map resources, including the location and number of tanks to be constructed and repaired.

Cost components in Detailed Project Reports and Village Action Plans are approved at district and state levels. In the Yuksom Dubdi *Gram Panchayat* Unit, *Jal Jeevan Mission* is in the implementation phase and 50-60 percent work has been completed. There are six single-village schemes being implemented in Yuksom. The six Detailed Project Reports along with the six Village Action Plans were formulated and sent for approval from the *Gram Sabha* to the District Water & Sanitation Mission and State Water & Sanitation Mission. Once these schemes consisting of a civil component and material cost were sanctioned, a tender was floated only for the civil component at the *Gram Panchayat* Unit.

Contractors are selected and assigned a nominee partner to execute the work. In response to the notice initiating tender for Yuksom Dubdi *Gram Panchayat* Unit, 18 contractors submitted bids consisting of the contract form, agreement, bill of quantity, enlistment, and temporary deposit receipt. Thereafter, the tender committee verified documents and awarded contracts to six government enlisted private contractors for six wards in the Yuksom Dubdi *Gram Panchayat* Unit. There is an informal arrangement in place wherein along with the six main contractors, there is at least one nominee partner working with the contractors in each ward. These partner contractors were nominated to work with the main contractors because of their political affiliation.

Infrastructure can be built on private as well as reserved areas[29]. Various officials and community members monitor these works. The contractors have commenced the work of constructing sedimentation tanks at the water sources (streams), and multiple distribution/reserve tanks at the villages. Some of these tanks are newly constructed and some of the old ones are repaired. These tanks can be constructed both in private and reserved forest areas, and the pipelines pass through private lands to reach households. The capacity of these tanks is designed according to water demand. Through site visits, the engineers and *Panchayats* monitor the work

[29] Reserved areas are government owned lands, or any other area notified as a protected area.

being implemented by the contractors. The local people also oversee the work being done in their villages.

Community takes an active part in monitoring the implementation of a new scheme once they experience a threat to water security. There was an absence of Rural Development Department water supply at the Tsong village, which falls under the Tsong Dubdi ward in the Yuksom Dubdi *Gram Panchayat* Unit. In 2019 there was a massive landslide in the Tsong village which affected 76 households. The entire Rural Development Department water distribution system was destroyed and ever since the villagers have relied on private water connections to their households from water sources (small streams) present within their village. The *Jal Jeevan Mission*'s implementation of a new project has commenced in the village and the locals actively monitor the work being done by the contractors.

The *Jal Jeevan Mission* is in the planning phase in Sumbuk Kartikey and Mellidara Paiyong *Gram Panchayat* Units in Namchi district. They are actively working with engineers to prepare plans for single-village schemes to be implemented. *Gram Panchayat* Unit members were optimistic that tenders would be floated soon, and work would commence shortly. In Sumbuk, higher authorities did not approve the Detailed Project Report for a proposed pumping project that required immense resources and time to implement. This led to slow progress of the *Jal Jeevan Mission* in this *Gram Panchayat* Unit.

As per the Village Action Plan of the Yuksom Ramgaythang ward in Yuksom Dubdi *Gram Panchayat* Unit, the population projection for water demand water at an intermediate stage (15 years from the present date) and ultimate stage (30 years from the present date) are calculated to ensure water supply for the next 30 years. The water requirement for cattle is also considered.

The Yuksom Ramgaythang Village Action Plan states that village residents have to pay 5 percent of the capital cost for the operations and maintenance of the water supply system. The 5 percent public contribution is to make the village community take the onus of ownership and management of their village water supply infrastructure and conservation of water bodies.

Communities rely on self-provision during uncertain water supply. Apart from formal water agencies and projects, informal private water user groups and individuals are also important, as they have adapted to maintain a regular water supply. Our field work was carried out in two *Gram Panchayat* Units (namely Mellidara Paiyong and Sumbuk Kartikey in Namchi district), which fall under a drought-prone area of the state. This region receives only 150 cm of rainfall per year (as compared to 250 cm in other parts), and also struggles with limited natural infiltration and high surface runoff due to the steep gorges of the Teesta and Rangit rivers (Tambe et al. 2017). It was observed that local communities have adaptive capacity to maintain access to water through private water supply connections, which is the invisible infrastructure actualizing household water supply of water.

In Sumbuk, a group of nine households comprises a private water user group dependent on a privately owned water source, which it is in the process of buying. These households did not have a regular Rural Development Department water supply, which pushed them to lay their own water pipelines.

OPERATIONS & MAINTENANCE AND SOURCE OF FUNDS

Gram Panchayat Units, water user associations, or local committees are expected to manage the water supply systems in their respective areas in the state, and they are the chief community service providers (Saraswathy and Vijayaram 2016). The highly decentralized form of governance in Sikkim state facilitates

good community participation, which works to ensure sustainable service delivery. In addition to government facilities, communities draw drinking water privately from springs or other sources.

During field visits in three villages of Sikkim, we observed that the salaries of Barefoot Engineers and the costs of small repairs are paid through *Gram Panchayat* Unit funds. The Government of Sikkim support repairs of large breakdowns in the system (discussions at Mellidara Paiyong, Sumbuk Kartikey & Yuksum Dubdi, 2022). As the schemes are gravity-based on upstream springs, there is no pumping cost incurred. In general, *Gram Panchayat* Unit funds are used for schemes' operations and maintenance.

Also, we observed that private contractors, who are laying the infrastructure for *Jal Jeevan Mission* infrastructure in Yuksom Dubdi *Gram Panchayat* Unit, are struggling to collect public contributions. Members of the public are willing to pay only after getting the household water supply (Personal communication during the field work, 2022). There is a lack of awareness among the public regarding whom they need to make the payment. The 5 percent of capital cost as a public contribution to the village water and sanitation committee for operation and maintenance may be a source of confusion. We observed that informal users' associations take up maintenance at their own cost. In Kerabari ward of Mellidara *Gram Panchayat*, villagers also pay the salary of the Barefoot Engineer.

Gram panchayats need financial and managerial as well as technical support from the state government (Saraswathy and Vijayaram 2016). We observed through multi-stakeholder journey map exercises that capacity building of village water and sanitation committees is much needed as they are inactive bodies and unable to take up operation and maintenance of completed schemes.

D.4 PLANNING CHALLENGES IN RURAL DRINKING WATER SUPPLY IN SIKKIM

Topography of the region is a barrier to benefit sharing between upstream and downstream communities. Local communities living downstream accrue the maximum benefits because of the direct access to water, while those upstream struggle with water scarcity due to lower discharge volume of water sources, irregular water supply, and the absence of water distribution systems in some remote and hilly habitations. Despite having several glacier-fed rivers and streams, and numerous springs, there are still places in rural Sikkim where people do not have reliable and easy access to water. This barrier to water security can be attributed to the difficult topography, drought risk, landslides impacting water infrastructure, scattered distribution of households along different elevations, and water governance and management issues. Innovative planning for hilly terrain is needed.

Community resorts to self-provision as water supply is intermittent. Water storage tanks are present, but they do not act as insurance against intermittent water supply. This has led to local people resorting to multiple water connections from private water sources or private connections from the main water source used by the Rural Development Department. While adaptive, this leads to immense pressure on existing water sources. Therefore, planning for water scarcity continues to be an issue.

Springshed management is complex. A case study of *Dhara Vikas* in Sikkim revealed that springshed governance is complex due to the presence of multiple stakeholders during the implementation phase (Sen et al. 2019). More research is needed on the dynamics of springshed management to identify challenges and opportunities. Most research has focused only on technical aspects of hydrogeology for spring rejuvenation (ibid.).

Lack of system functionality for updating source-related information in the Rural Development Department. During the planning phase, though extensive surveys of water sources

have been carried out by the Rural Development Department engineers, with help from the barefoot engineers, several water sources have been missed. In the Mellidara *Gram Panchayat* Unit for instance, our fieldwork revealed that despite the rigorous process of surveying and mapping, there were some water sources that were left out. Ward *Panchayats* were not able to include these missed sources of water and augment the number of single-village schemes in their wards despite taking the matter to the higher authorities. It appears that once these surveys get fed into the system, there is no way to address any changes if the surveyors have missed anything or if there has been a mistake in the data submitted.

Land acquisition responsibility is given to contractors, which often delays the work. Private contractors have been given the responsibility of land acquisition in addition to laying out infrastructure. Landowners expect contractors to compensate them for the land provided for laying of pipelines or tank construction. However, this is not something the contractors are well equipped to do, which results in delays in execution.

Source sustainability planning is missing, especially in drought-prone and rainshadow regions. The same sources are used for irrigation and drinking purposes. Based on our field visits, it was found that there is no assessment of water source sustainability (Personal Communication, Engineer, August 2022). For instance, the implementation of irrigation schemes—such as the *Pradhan Mantri Krishi Sinchai Yojana* in Mellidara *Gram Panchayat* Unit—has increased pressure on existing water sources since these sources feed the drinking water supply as well.

***Jal Jeevan Mission's* proposed average costs and actual on-ground costs do not match. Implementation costs are much higher in hilly areas.** In the Yuksom *Gram Panchayat* Unit, the single-village scheme being implemented falls under the category of retrofitting existing schemes. For this, the average household cost, as per the *Jal Jeevan Mission* guidelines, is ₹7,500 ($91.4 at $1=₹82) but the actual cost of the single-village scheme being implemented in the *Gram Panchayat* Unit is ₹72,979 ($890) per household. The cost assumptions and limits in *Jal Jeevan Mission* guidelines have not factored in the higher cost of retrofit in the hills. For instance, there are 41 schemes (augmentation, retrofitting and renovation) being implemented in the Yuksom block of Gyalshing District. The actual costs for these schemes were around ₹17 crore ($ 2.05 million), but the approved amount was around ₹15 crore ($1.8 million). Most single-village schemes involve retrofitting old schemes, which are now almost defunct. Hence, the average cost per household has increased considerably as compared to the prescribed cost under *Jal Jeevan Mission* regulations. There is a need for guidelines and cost schedules specific to hilly areas.

Sustained sources are needed to avoid slip back of newly built schemes. New schemes can construct the necessary infrastructure for drinking water demand, but ensuring the uninterrupted flow of water in the pipelines is a main challenge. If the water infrastructure is ineffectively managed, it could lead to "coping" infrastructure built by local communities, further increasing costs and mismanagement. One challenge is that even where spring mapping has occurred, information on the seasonality of flow is missing. So, planning for this is important.

E. KEY STAKEHOLDER INTERVIEWS

TABLE E-1: KEY STAKEHOLDER INTERVIEWS

NAME	AFFILIATION	KEY INSIGHTS
Geologist	Groundwater Surveys and Development Agency, Maharashtra	• In Maharashtra, *Gram Panchayats* prefer single-village schemes as these are cheaper and more within their control. • Surface water-fed multi-village schemes—implemented by a state agency and managed by representatives from villages—have all collapsed. Pipelines are ruptured and water is diverted in the head-end villages for agricultural purposes. • The *Jal Jeevan Mission* has funds for source sustainability. However, the Groundwater Surveys & Development Agency must certify and ensure a plan of action for source sustainability.
Executive Director	Water for People	Three big shifts in the current drinking water supply guidelines include: 1. Seeing water under utility or professional services delivery 2. Recognizing source sustainability 3. Government formally recognizing non-profit organizations' role and enunciating that in the guidelines. Getting water to the doorstep also means a disconnect with the natural resource and where it is coming from. Institutional structure and community connect of Public Health departments are weak. Capacity building and support for first-mile workers are missing.
Professor emeritus	Massachusetts Institute of Technology	This interaction was to refine our research design. The insights are specific to India. • There is no proper planning template for rural drinking water supply in India. The village, district, and state action plans are specified by the Government of India and the speed of implementation is too fast to allow for deliberative planning. • Framework is designed in a top-down approach. Staff are not mobilized. Planning unit needs to be rethought. • Multipurpose dams are evolving from irrigation purpose to true multi-use, not just on an emergency basis. Village allocations come as an emergency (drought declarations) through reservations. How can these structures become formalized for a more comprehensive multipurpose management of water?
Director	Megh Pyne Abhiyaan, Charitable Trust, Bihar	• In flood-affected villages of north Bihar, dug wells did not have arsenic and iron contamination. They tend to be safer than the hand pumps in the vicinity due to the aeration triggered in the process of taking out the water from the dug wells. Source sustainability and protection is important in these areas—communities need to become aware of the resources they depend on. • In 2016, the Government of Bihar implemented a household water supply scheme at the ward level. A ward comprises 100–200 families. This scale of management is more tractable as responsibilities can be fixed and monitored. In areas with water contamination, the Public Health Engineering

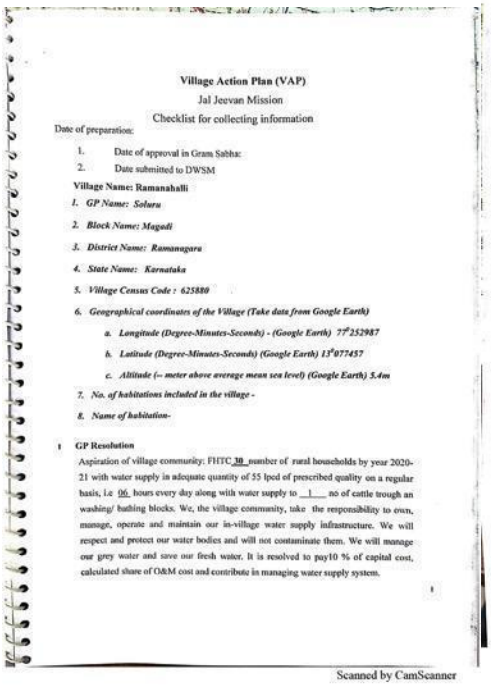
		Department builds the water supply scheme. In areas where water contamination is not a concern, the work is overseen and monitored by the *sarpanch* and a ward representative (elected member of the *Gram Panchayat*), while implementation is a private contractor's responsibility.
Staff Members	People's Science Initiative, Non-profit organization, North East and Himalayan states	In the state of Arunachal Pradesh, villagers are not willing to take responsibility for water schemes unless they get paid. There is uncertainty about where the money for operations and maintenance will come after the *Jal Jeevan Mission* is completed. There is not enough effort being put by government departments into community mobilization. In the state of Uttarakhand, some communities prefer spring water as they have high mineral content, and they like the taste better (cultural and religious context). Private contractors are constructing the rural water supply schemes -- with no effort to assess source sustainability or availability. In many places pipes have been laid, but water is yet to flow. In spring-fed villages, fecal contamination is a more common problem than sewage mixing. In Madhya Pradesh, People's Science Institute has been working in fluoride affected Dhar district since 2013 for a project supported by Frank Water. They are now a sector partner for *Jal Jeevan Mission*. By studying the hydrogeology of the region, they concluded that shallow aquifers tapped by the dug wells were the safest and not fluoride affected. They have engaged with the Public Health and Engineering Department (responsible for water supply) and interacted continuously with the local community to convey their findings as well as training for water, sanitation and hygiene to avoid bacterial contamination of the shallow aquifers.
Staff members	Advanced Center for Integrated Water Resource Management, Government of Karnataka	Drinking water is a priority. Schemes being reclassified as multi-village schemes, which are becoming more common. Many villages are only being supplied at 25–30 liters per capita per day. Villagers get the remaining water for household needs from irrigation borewell owners.
Staff Member	Advanced Center for Water Resources Development and Management	The Advanced Center for Water Resources Development and Management was involved in the early phases of the *Jal Jeevan Mission* for capacity-building, preparation of Village Action Plans and budget-based planning. They assisted in the preparation of a guidance book for *Jal Jeevan Mission*-Maharashtra. Often, village Action Plans are prepared even before community engagement, so they do not always reflect the ground reality.
PhD Candidate	University of Edinburgh, Former researcher at the Advanced Center for Water Resources Development and Management	Even though the same agency (Groundwater Surveys and Development Agency, Maharashtra) is participating in two programs—*Jal Jeevan Mission* and *Atal Bhujal Yojana*—on-ground convergence between them is hard to find, even though both work at the same level and involve groundwater management. village water and sanitation committees are mostly on paper and inactive. Water supply schemes suffer from fund crunch due to poor tariff recovery. They often fail to pay electricity bills. Whenever the source runs dry, the *Gram Panchayat* invests more money to dig deeper wells. People are dependent on reverse osmosis for drinking water in the observed villages of Osmanabad.
Independent	Engagements with World Bank, Aga Khan	A few points emerged from our wide-ranging interaction.:

Researcher	Foundation and others over three decades.	• The meaning of planning for rural drinking water supply depends on who you are talking to. Allocation of scarce resources is a huge challenge (but prioritization mechanisms may be missing). Marginalized communities need to be made a priority. • Planning lacks service standards (duration, quantity, frequency). • Goals are clear and guidelines are somewhat clear. However, there is a gap between policy and implementation.
Additional Director	(National Fund for Climate Change *Dhara Vikas*) Rural Development Department, Gangtok	Overview of the *Dhara Vikas* initiative and the role of the Rural Development Department.
Ward *Panchayat*	Mellidara Paiyong	Overview of the role of *Panchayat* and the water distribution system in the *Gram Panchayat* Unit.
Resident	Mellidara Paiyong *Gram Panchayat* Unit.	Dependence on private water connection. Part of the upstream community experiencing no direct benefit of *Dhara Vikas*.
Barefoot Engineer (Fitter)	Mellidara Paiyong	Irregularity in quality checks and discharge-volume measurement.
Resident	Mellidara Paiyong	Makes use of government as well as private water line connections.
Ward Panchayat member	Mellidara Paiyong	The water sources left out during the *Jal Jeevan Mission* planning stage have not been incorporated despite them raising the issue at the block level.
Informal Water User Group	Mellidara Paiyong	They have a smooth system to maintain the private water connection from the channel (water source) to their households.
Superintendent Engineer	South-West Circle, Jorethang	Overview of *Jal Jeevan Mission* water supply schemes in south-western districts.
Chemist	State Institute of Rural Development and Panchayati Raj, Jorethang	Overview of water quality analysis, sample collection, frequency of testing, and coverage.
Ward Panchayat member	Sumbuk Kartikey *Gram Panchayat* Unit	Immense pressure on existing water sources as they cater to more than one *Gram Panchayat* Unit and multiple private and government connections.
Panchayat President	Sumbuk Kartikey *Gram Panchayat* Unit	Overview of the water distribution system in the *Gram Panchayat* Unit. Arbitrary constitution of the village water and sanitation committee.

Barefoot Engineer (Fitter)	Sumbuk Kartikey *Gram Panchayat* Unit	Only one Barefoot Engineer received training from the *Gram Panchayat* Unit.
Field Facilitator	SIRD, Jorethang	Key resource person for a new program known as the community led spring shed management which has been introduced to place the locals as the key stakeholder in the source sustainability endeavor.
Informal Water User Group	Sumbuk Kartikey *Gram Panchayat* Unit	They have the financial resources for the private water supply connection as opposed to the other group of individuals who are socioeconomically weak.
Assistant Engineer	Sumbuk Block	Overview of the planning process of *Jal Jeevan Mission* schemes.
Residents	Sumbuk Kartikey *Gram Panchayat* Unit	Small village of Scheduled Caste community. Acute shortage of water supply; access to water depends on one's socioeconomic condition.
Munshi	Sumbuk Kartikey *Gram Panchayat* Unit	The increase in population is adding more pressure on existing water resources.
Resident	Sumbuk Kartikey *Gram Panchayat* Unit	Filed Public Interest Litigation in the High Court due to a failure of the water supply project in the *Gram Panchayat* Unit. Actively monitors various projects in the *Gram Panchayat* Unit.
Panchayat President	Yuksom Dubdi *Gram Panchayat* Unit	*Panchayat* members are actively involved in the monitoring of the work being done in various parts of the *Gram Panchayat* Unit by contractors under the *Jal Jeevan Mission*.
Junior Plumber	Yuksom Dubdi *Gram Panchayat* Unit	Active participation in the survey of water resources and distribution networks under the *Jal Jeevan Mission*. Limited to completing the task assigned, not aware of the village water and sanitation committee.
Resident	Yuksom Dubdi *Gram Panchayat* Unit	*Jal Jeevan Mission* planners are focused only on the technical aspect, the environmental aspects are not taken into consideration. Socioeconomic conditions determine access to water.
Government enlisted private contractor (nominee)	Yuksom Dubdi *Gram Panchayat* Unit	Existence of informal arrangement of contractors in the *Gram Panchayat* Unit. They work in partnership with the main contractors.
Government -enlisted private contractor (nominee)	Yuksom Dubdi *Gram Panchayat* Unit	He was not aware of the *Jal Jeevan Mission* and did not attend any programmes/communication regarding the *Jal Jeevan Mission* organized by the *Gram Panchayat* Unit.
Government	Yuksom Dubdi	Contractors are only concerned about laying of the physical infrastructure.

enlisted private contractor	*Gram Panchayat* Unit	They face immense challenges in acquiring land for construction and lack public cooperation.
Assistant Engineer	Yuksom Block	Overview of the processes under different phases of *Jal Jeevan Mission* planning and implementation.
President	Khangchendzonga Conservation Committee, Yuksom Dubdi Khangchendzonga Conservation Committee	Khangchendzonga Conservation Committee puts forth the concerns regarding various issues keeping in mind the larger vision and the long-term goals in *Gram Sabhas*, but the public understands only short-term goals and immediate impacts.
Resident	Yuksom Dubdi Khangchendzonga Conservation Committee	Dependent on private water connections, more so after the landslide that damaged the government water supply.
Supervisor	Yuksom Dubdi Khangchendzonga Conservation Committee	Poor water management and distribution system; needs immediate reforms. The village water and sanitation committee is inactive.
Local resident	Resident, Yuksom Dubdi	Exemplifies a classic example of access to water defined by one's socioeconomic class and the level of power at one's disposal.

F. SAMPLE VILLAGE ACTION PLAN



Village Action Plan (VAP)

Jal Jeevan Mission

Checklist for collecting information

Date of preparation:

1. Date of approval in Gram Sabha:
2. Date submitted to DWSM

Village Name: Ramanahalli

1. *GP Name: Soluru*
2. *Block Name: Magadi*
3. *District Name: Ramanagara*
4. *State Name: Karnataka*
5. *Village Census Code : 625880*
6. *Geographical coordinates of the Village (Take data from Google Earth)*
   a. *Longitude (Degree-Minutes-Seconds) - (Google Earth) 77°252987*
   b. *Latitude (Degree-Minutes-Seconds) (Google Earth) 13°077457*
   c. *Altitude (-- meter above average mean sea level) (Google Earth) 5.4m*
7. *No. of habitations included in the village -*
8. *Name of habitation-*

GP Resolution

Aspiration of village community: FHTC 30 number of rural households by year 2020-21 with water supply in adequate quantity of 55 lpcd of prescribed quality on a regular basis, i.e 06 hours every day along with water supply to 1 no of cattle trough an washing/ bathing blocks. We, the village community, take the responsibility to own, manage, operate and maintain our in-village water supply infrastructure. We will respect and protect our water bodies and will not contaminate them. We will manage our grey water and save our fresh water. It is resolved to pay10 % of capital cost, calculated share of O&M cost and contribute in managing water supply system.

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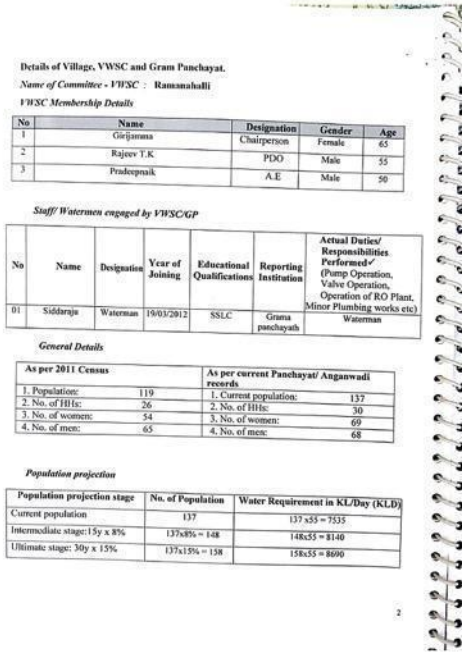

Details of Village, VWSC and Gram Panchayat.

Name of Committee - VWSC : **Ramanahalli**

VWSC Membership Details

No	Name	Designation	Gender	Age
1	Girijamma	Chairperson	Female	65
2	Rajeev T.K	PDO	Male	55
3	Pradeepnaik	A.E	Male	50

Staff/ Watermen engaged by VWSC/GP

No	Name	Designation	Year of Joining	Educational Qualifications	Reporting Institution	Actual Duties/ Responsibilities Performed✓ (Pump Operation, Valve Operation, Operation of RO Plant, Minor Plumbing works etc)
01	Siddaraju	Waterman	19/03/2012	SSLC	Grama panchayath	Waterman

General Details

As per 2011 Census		As per current Panchayat/ Anganwadi records	
1. Population:	119	1. Current population:	137
2. No. of HHs:	26	2. No. of HHs:	30
3. No. of women:	54	3. No. of women:	69
4. No. of men:	65	4. No. of men:	68

Population projection

Population projection stage	No. of Population	Water Requirement in KL/Day (KLD)
Current population	137	137 x55 = 7535
Intermediate stage:15y x 8%	137x8% = 148	148x55 = 8140
Ultimate stage: 30y x 15%	137x15% = 158	158x55 = 8690

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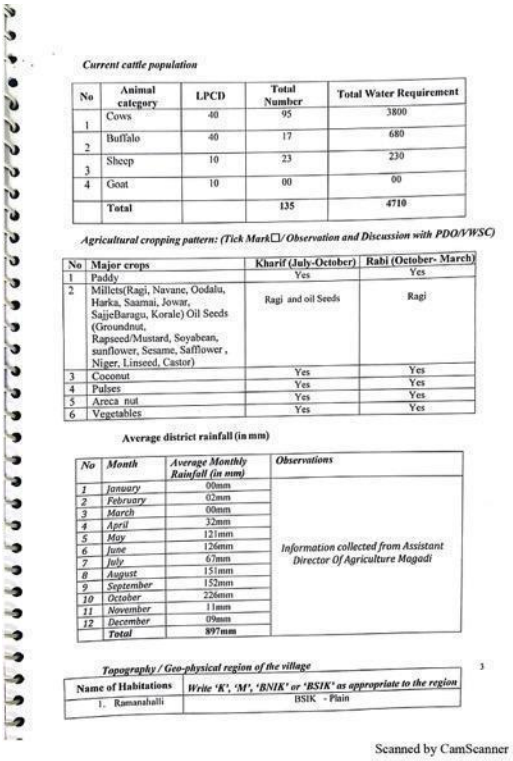

Current cattle population

No	Animal category	LPCD	Total Number	Total Water Requirement
1	Cows	40	95	3800
2	Buffalo	40	17	680
3	Sheep	10	23	230
4	Goat	10	00	00
	Total		135	4710

Agricultural cropping pattern: (Tick Mark☐/ Observation and Discussion with PDO/VWSC)

No	Major crops	Kharif (July-October)	Rabi (October- March)
1	Paddy	Yes	Yes
2	Millets(Ragi, Navane, Oodalu, Harka, Saamai, Jowar, SajjeBaragu, Korale) Oil Seeds (Groundnut, Rapseed/Mustard, Soyabean, sunflower, Sesame, Safflower , Niger, Linseed, Castor)	Ragi and oil Seeds	Ragi
3	Coconut	Yes	Yes
4	Pulses	Yes	Yes
5	Areca nut	Yes	Yes
6	Vegetables	Yes	Yes

Average district rainfall (in mm)

No	Month	Average Monthly Rainfall (in mm)	Observations
1	January	00mm	Information collected from Assistant Director Of Agriculture Magadi
2	February	02mm	
3	March	00mm	
4	April	32mm	
5	May	121mm	
6	June	126mm	
7	July	67mm	
8	August	151mm	
9	September	152mm	
10	October	226mm	
11	November	11mm	
12	December	09mm	
	Total	897mm	

Topography / Geo-physical region of the village

Name of Habitations	Write 'K', 'M', 'BNIK' or 'BSIK' as appropriate to the region
1. Ramanahalli	BSIK - Plain

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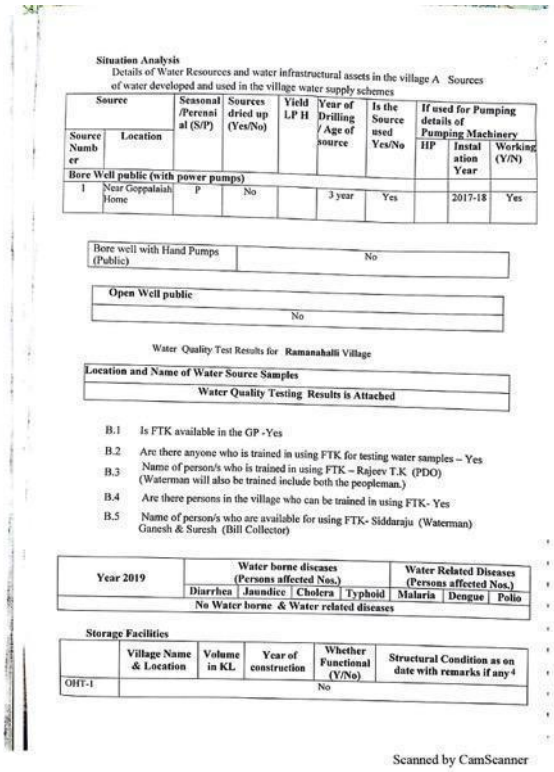

Situation Analysis

Details of Water Resources and water infrastructural assets in the village A Sources of water developed and used in the village water supply schemes

Source		Seasonal /Perennial (S/P)	Sources dried up (Yes/No)	Yield LP H	Year of Drilling / Age of source	Is the Source used Yes/No	If used for Pumping details of Pumping Machinery		
Source Number	Location						HP	Instalation Year	Working (Y/N)
Bore Well public (with power pumps)									
1	Near Goppalaiah Home	P	No		3 year	Yes		2017-18	Yes

Bore well with Hand Pumps (Public)	No

Open Well public
No

Water Quality Test Results for **Ramanahalli Village**

Location and Name of Water Source Samples
Water Quality Testing Results is Attached

B.1 Is FTK available in the GP -Yes

B.2 Are there anyone who is trained in using FTK for testing water samples – Yes

B.3 Name of person/s who is trained in using FTK – Rajeev T.K (PDO) (Waterman will also be trained include both the peopleman.)

B.4 Are there persons in the village who can be trained in using FTK- Yes

B.5 Name of person/s who are available for using FTK- Siddaraju (Waterman) Ganesh & Suresh (Bill Collector)

Year 2019	Water borne diseases (Persons affected Nos.)				Water Related Diseases (Persons affected Nos.)		
	Diarrhea	Jaundice	Cholera	Typhoid	Malaria	Dengue	Polio
No Water borne & Water related diseases							

Storage Facilities

	Village Name & Location	Volume in KL	Year of construction	Whether Functional (Y/No)	Structural Condition as on date with remarks if any
OHT-1	No				

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Cisterns 1	Near Anand Home	2000	2017-18	Yes	In good Condition
Cisterns 2	Near Bharath Home	2000	2017-18	Yes	In good Condition
Cisterns 3	Near Girish Home	2000	2017-18	Yes	In good Condition
Cisterns 4	Near Lakshman Home	2000	2017-18	Yes	In good Condition

E Other Water Sources of the Village

	Number	Approximate area in sq.m	Water availability	Remarks
Lake	01	-	Yes	-
Traditional Water Sources Katta (Check Dam) -	01	-	Yes	-
Gokattes; (Cattle Pond)	01	-	Yes	-

Information regarding Distribution Network and House Tap Connections in Ramanahalli Village

Total Number of Households as per Anganwadi Records	Total of all Habitations
Total No of Households	30
Total No of HTCs	0
Gap =Total Household Less No. of HTCs	30
Total No of FHTCs	0
No of Non Functional HTCs = HTC-FHTC	0
No. of HTCs without Tap **(Open pipe)**	0
No. of HTCs which need to be replaced	0
No. of HTCs which need to be relocated (because in the drainage line, too close to the ground, no space gap to keep a vessel to collect water etc)	01
Year of laying the distribution Network	2017-18
Pipe Material for distribution network	PVC
Any serious leakage in the distribution network (Yes/No)	No
Type of in-village road/ streets (1)Concrete-C (2)Tarroad-T (3) Kachha Road-K	C- T- K-
Is there sufficient shoulder space by the side of village streets to lay new pipeline or replace old pipeline (Y/N)? Mark availability of space by a green line on the map and lack of space by a red line on the map.	Yes
Length of concrete road to be cut for laying new pipeline or replacing old pipeline in Meters	-
No. of Hhs which have own soak pit for grey water management	- 5
No. of Hhs that are letting grey water into the drainage	24
Is there a lined drainage in the village? (Yes/No)	Yes

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Institutional Profiles and Water Demand in the Village

No	Name of Public Institutions	No of Inmates		Is FHTC available? Y/N)	Is Rain Water Harvesting structure available? (Y/N)	Soak pits available? (Y/N)
		Students	Staff & Others			
1	**Government Schools**					
	No					
1	**Anganwadi**					
	No					

History of water supply in the Village/GP

1	When was the piped water supply scheme introduced in the village/ GP (Year)	2017-18
2	Is the Village affected by drought and water scarcity in the last decade (2010-2020)	Yes
3	Is the Village affected by Cyclone and flood in the last decade (2010-2020)	No
4	Is the Village affected by any other natural calamity in the last decade (2010-2020	No
5	Any history of emergency arrangements like water supply through tanks, trains, etc.:	No
6	Has any work under MGNREGS /other schemes been undertaken to implement watershed development, source recharging including vegetative measures	Implemented Drainages And Road Work Under MGNREGS And Planning For Soak pit Construction

Washing/ bathing blocks

No	Location name	No. of Households	Population
	No		

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Source Sustainability

a. In case of groundwater source, is there a bore well recharge structure - No

b. If yes, describe.

Need Assessment for the* Ramanahalli *Village with regard to JJM

No	Water Requirement Categories	Number	LPCD	Total Requirement in Lakh Litres		
				Current Requirement	Intermediate Stage Year2037	Ultimate Design Year 2052
I	Drinking/Domestic Water Requirement					
					8%	15%
a	Total Households	30	55	-	-	-
b	Total Population	137	55	7535	8140	8690
c	Total Institutional water requirement (Students+ Staff+ Inmates)	-	10	-	-	-
d	Total Animal Population Cows & Buffalos	112	40	4480	4840	5160
e.	Sheep & Goats	23	10	230	250	260
II	Rejuvenation of water bodies					
2.1	Potential for Rainwater/ Roof water Harvesting in the Village				No	
2.2	List of existing water bodies in the village that need to be rejuvenated/ maintained				-	
III	**Grey water management**					
3.1	Grey water generated (65% of water supply): Total population x @55 LPCD x65%/1000 = KLD				4898	
3.2	No. of HHs with individual soak pits				-	
3.3	No. of HHs that need individual soak pits				22	
3.4	No. of community soak pits needed				01	
3.5	Waste water stabilization pond				No	

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Water Supply Scheme: FHTCs will be provided under which of the following category:

No	Category of FHTC	Number of FHTCs
1	Retrofitting of ongoing schemes taken up under erstwhile NRDWP for the last mile connectivity.	
2	Retrofitting of completed RWS to make it JJM compliant.	
3	SVS in villages having adequate groundwater/ spring water/ local or surface water source of prescribed quality.	
4	SVS in villages having adequate groundwater that needs treatment.	
5	MVS with water grids/ regional water supply schemes.	
6	Mini solar power based PWS in isolated/ tribal hamlets.	

Proposal for Interventions in the **Ramanahalli** Village

No	Category	Units	Approximate Cost
1	Grey water management at Institutional level	-	
2	Training and IEC activities	-	
3	Provision and effective use of water field kits	Yes	

Cost Sharing

Details	Total	GoI share	GoK share	GP Share	Community share
Total cost for **Ramanahalli** Village as per VAP	100%	37.5%	37.5%	15%	10%

Convergence (The following table indicates the possible schemes under which activity/ fund convergence is possible. Village community is to send proposals to the identified schemes as per village requirements)

Name of Scheme	Central/ State Government Department	Possible Activities that can be taken up	Funds Proposed
Fourteenth Finance Commission	GP	Grey water management	Yes
Swachh Bharat Mission - Grameen	Department of Drinking and Sanitation, M/o Jal Shakti	Grey water management, soak pits (individual/ community),waste stabilization ponds,etc.	Yes
MGNREGS	M/o Rural Development	All water conservation activities under Natural Resource Management (NRM) component	Yes

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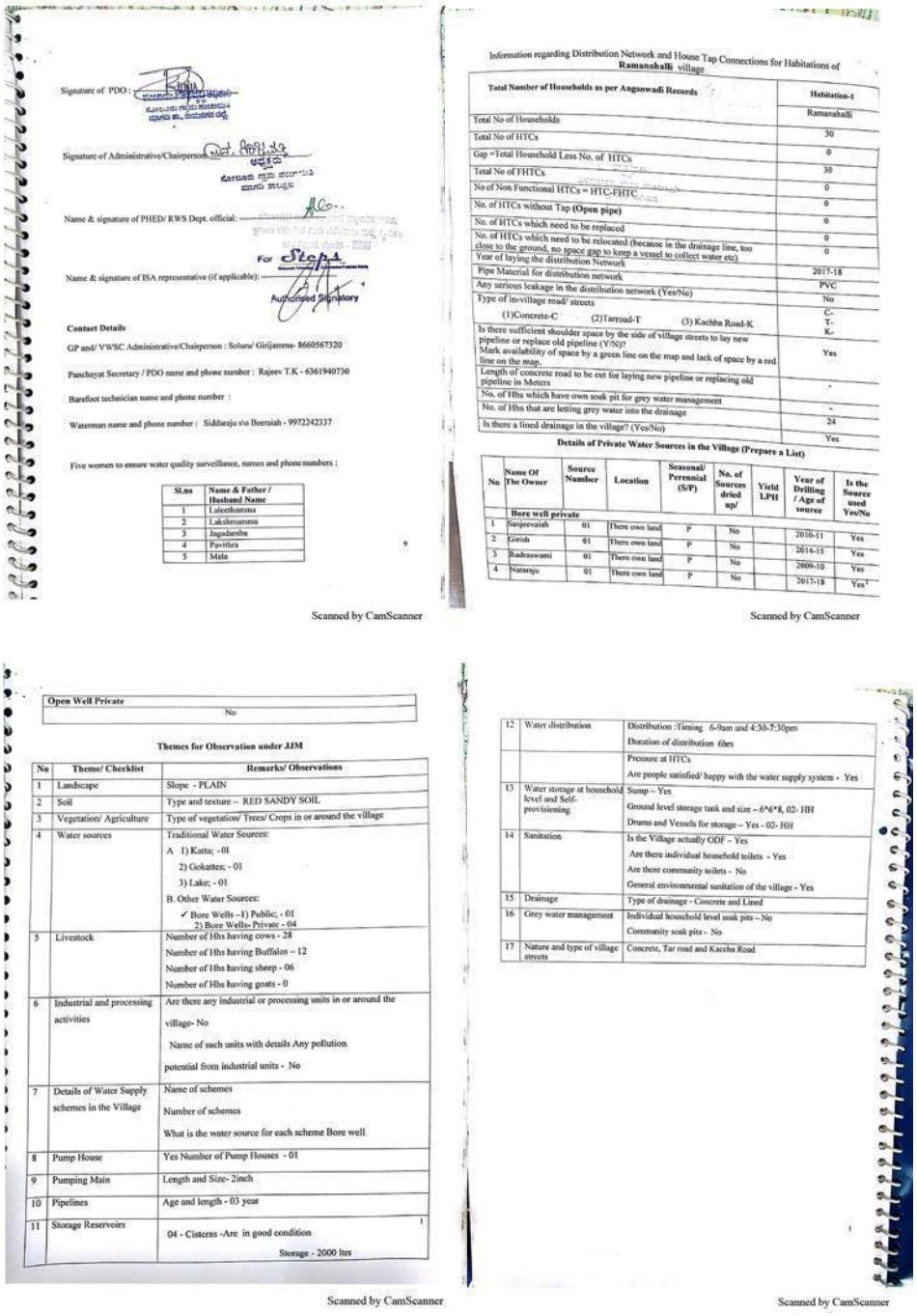

Signature of PDO :

Signature of Administrative/Chairperson :

Name & signature of PHED/ RWS Dept. official: .....

Name & signature of ISA representative (if applicable): .....

For Steps

Authorised Signatory

Contact Details

GP and/ VWSC Administrative/Chairperson : Soluru/ Girijamma- 8660567320

Panchayat Secretary / PDO name and phone number : Rajeev T.K - 6361940730

Barefoot technician name and phone number :

Waterman name and phone number : Siddaraju s/o Beeraiah - 9972242337

Five women to ensure water quality surveillance, names and phone numbers :

Sl.no	Name & Father / Husband Name
1	Laleethamma
2	Lakshmamma
3	Jagadamba
4	Pavithra
5	Mala

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Information regarding Distribution Network and House Tap Connections for Habitations of **Ramanahalli** village

Total Number of Households as per Anganwadi Records	Habitation-1
	Ramanahalli
Total No of Households	30
Total No of HTCs	0
Gap =Total Household Less No. of HTCs	30
Total No of FHTCs	0
No of Non Functional HTCs = HTC-FHTC	0
No. of HTCs without Tap (Open pipe)	0
No. of HTCs which need to be replaced	0
No. of HTCs which need to be relocated (because in the drainage line, too close to the ground, no space gap to keep a vessel to collect water etc)	0
Year of laying the distribution Network	2017-18
Pipe Material for distribution network	PVC
Any serious leakage in the distribution network (Yes/No)	No
Type of in-village road/ streets (1)Concrete-C (2)Tarroad-T (3) Kachha Road-K	C- T- K-
Is there sufficient shoulder space by the side of village streets to lay new pipeline or replace old pipeline (Y/N)? Mark availability of space by a green line on the map and lack of space by a red line on the map.	Yes
Length of concrete road to be cut for laying new pipeline or replacing old pipeline in Meters	-
No. of Hhs which have own soak pit for grey water management	-
No. of Hhs that are letting grey water into the drainage	24
Is there a lined drainage in the village? (Yes/No)	Yes

Details of Private Water Sources in the Village (Prepare a List)

No	Name Of The Owner	Source Number	Location	Seasonal/ Perennial (S/P)	No. of Sources dried up/	Yield LPH	Year of Drilling / Age of source	Is the Source used Yes/No
	Bore well private							
1	Sanjeevaiah	01	There own land	P	No		2010-11	Yes
2	Girish	01	There own land	P	No		2014-15	Yes
3	Radraswami	01	There own land	P	No		2009-10	Yes
4	Nataraju	01	There own land	P	No		2017-18	Yes

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Open Well Private

No

Themes for Observation under JJM

No	Theme/ Checklist	Remarks/ Observations
1	Landscape	Slope - PLAIN
2	Soil	Type and texture – RED SANDY SOIL
3	Vegetation/ Agriculture	Type of vegetation/ Trees/ Crops in or around the village
4	Water sources	Traditional Water Sources: A 1) Katta; - 01 2) Gokattes; - 01 3) Lake; - 01 B. Other Water Sources: ✓ Bore Wells –1) Public; - 01 2) Bore Wells- Private - 04
5	Livestock	Number of Hhs having cows - 28 Number of Hhs having Buffalos – 12 Number of Hhs having sheep - 06 Number of Hhs having goats - 0
6	Industrial and processing activities	Are there any industrial or processing units in or around the village- No Name of such units with details Any pollution potential from industrial units - No
7	Details of Water Supply schemes in the Village	Name of schemes Number of schemes What is the water source for each scheme Bore well
8	Pump House	Yes Number of Pump Houses - 01
9	Pumping Main	Length and Size- 2inch
10	Pipelines	Age and length - 03 year
11	Storage Reservoirs	04 - Cisterns -Are in good condition Storage - 2000 ltrs
12	Water distribution	Distribution :Timing 6-9am and 4:30-7:30pm Duration of distribution 6hrs Pressure at HTCs Are people satisfied/ happy with the water supply system - Yes
13	Water storage at household level and Self-provisioning	Sump – Yes Ground level storage tank and size – 6*6*8, 02- HH Drums and Vessels for storage – Yes - 02- HH
14	Sanitation	Is the Village actually ODF – Yes Are there individual household toilets - Yes Are there community toilets - No General environmental sanitation of the village - Yes
15	Drainage	Type of drainage - Concrete and Lined
16	Grey water management	Individual household level soak pits – No Community soak pits - No
17	Nature and type of village streets	Concrete, Tar road and Kaccha Road

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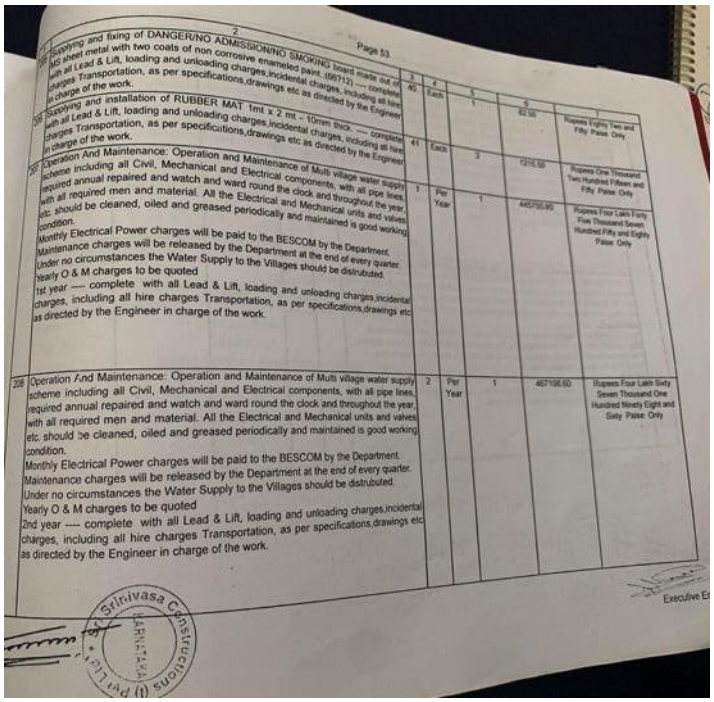
Figure F-1: Village Action Plan of Ramanahalli in Ramanagara district, Karnataka

G. SAMPLE DETAILED PROJECT REPORT



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207	Supplying and fixing of DANGER/NO ADMISSION/NO SMOKING board made out of MS sheet metal with two coats of non corrosive enameled paint. (66712) --- complete with all Lead & Lift, loading and unloading charges,incidental charges, including all hire charges Transportation, as per specifications,drawings etc as directed by the Engineer in charge of the work.	40	Each	1	82.50	Rupees Eighty Two and Fifty Paise Only
208	Supplying and installation of RUBBER MAT 1mt x 2 mt – 10mm thick --- complete with all Lead & Lift, loading and unloading charges,incidental charges, including all hire charges Transportation, as per specifications,drawings etc as directed by the Engineer in charge of the work.	41	Each	3	1215.00	Rupees One Thousand Two Hundred Fifteen and Fifty Paise Only
209	Operation And Maintenance: Operation and Maintenance of Multi village water supply scheme including all Civil, Mechanical and Electrical components, with all pipe lines, required annual repaired and watch and ward round the clock and throughout the year with all required men and material. All the Electrical and Mechanical units and valves etc. should be cleaned, oiled and greased periodically and maintained is good working condition. Monthly Electrical Power charges will be paid to the BESCOM by the Department. Maintenance charges will be released by the Department at the end of every quarter. Under no circumstances the Water Supply to the Villages should be disirubuted. Yearly O & M charges to be quoted 1st year ---- complete with all Lead & Lift, loading and unloading charges,incidental charges, including all hire charges Transportation, as per specifications,drawings etc as directed by the Engineer in charge of the work.	1	Per Year	1	440750.00	Rupees Four Lakh Forty Five Thousand Seven Hundred Fifty and Eighty Paise Only
210	Operation And Maintenance: Operation and Maintenance of Multi village water supply scheme including all Civil, Mechanical and Electrical components, with all pipe lines, required annual repaired and watch and ward round the clock and throughout the year with all required men and material. All the Electrical and Mechanical units and valves etc. should be cleaned, oiled and greased periodically and maintained is good working condition. Monthly Electrical Power charges will be paid to the BESCOM by the Department. Maintenance charges will be released by the Department at the end of every quarter. Under no circumstances the Water Supply to the Villages should be distrubuted. Yearly O & M charges to be quoted 2nd year ---- complete with all Lead & Lift, loading and unloading charges,incidental charges, including all hire charges Transportation, as per specifications,drawings etc as directed by the Engineer in charge of the work.	2	Per Year	1	467106.50	Rupees Four Lakh Sixty Seven Thousand One Hundred Ninety Eight and Sixty Paise Only

Srinivasa Constructions (I) Pvt. Ltd.

Figure G-1: "Providing Pure Drinking Water Supply Scheme in Kodihalli & other 298 habitations in Kanakapura Taluk of Ramanagara District Karnataka State," prepared by M/s Megha Engineering and Infrastructures Ltd.

H. ROLES AND RESPONSIBILITIES OF STAKEHOLDERS IN KARNATAKA

Roles and Responsibilities of Stakeholders								
Roles and Responsibilities	Stakeholders							
	RDWSD HQ	CEO - ZP	RDWSD Division	DCC	GP	Operator	PDO/ Staff	Consumers
Fixing and revising bulk water tariff	X							
Fixing initial consumer level water tariff	X (1)	X (2)						
Upward revision of consumer level water tariff	X (1)	X (2)			X (3)			
Awarding Contracts and Management of Contracts	X (1)	X	X (1)					
Preparation of O&M Plans for MVS & SVS		X (2)	X (1)			X (3)	X (1)	
Approval of O&M Plans MVS	X (1)	X (2)	X (3)					
Approval of O&M Plans SVS/IVDN	X (1)	X (2)	X (3)		X (1)			
Approval of O&M Plans	X							
Monitoring Operations of MVS	X (2)	X (1)	X (1)					
Monitoring Operations of SVS/IVDN		X (1)			X (2)		X (1)	
Operation and Maintenance of MVS			X (2)			X (1)		
Operation and Maintenance of SVS			X (3)		X (2)		X (1)	
Monitoring Service Delivery and regulatory oversight – MVS	X (2)		X (1)					
Monitoring Service Delivery and regulatory oversight – SVS	X (3) #				X (2)		X (1)	
Cost recovery – MVS	X (2)		X (1)					
Cost recovery – SVS					X (2)		X (1)	X (1)
Conflict Resolution		X (2)	X (1)	X (1)				

Note:
X (1) signifies Primary Responsibility
X (2) signifies Secondary Responsibility
X (3) signifies Tertiary Responsibility

Technical Backstopping

Figure H-1: Roles and responsibilities of stakeholders in Karnataka. Source: Operations and maintenance policy, (Rural Drinking Water and Sanitation Department 2021)

I. KARNATAKA JOURNEY MAPS

In Karnataka's Ramanagara district, we journey mapping exercises in two locations with single-village schemes. The Rural Water Supply & Sanitation Department is primarily responsible for implementing water supply schemes under the *Jal Jeevan Mission* in the state. The department's main goal is to provide adequate and safe drinking water and sanitation facilities to all rural households in the state through the implementation of federal and state programs. In Ramanagara district, single-village schemes are being implemented in Ramanagara, Magadi, and Channapatna *taluk* (dependent on groundwater), and a multi-village scheme is being implemented in Kanakapura *taluk* (dependent on water from Cauvery River near Sangama).

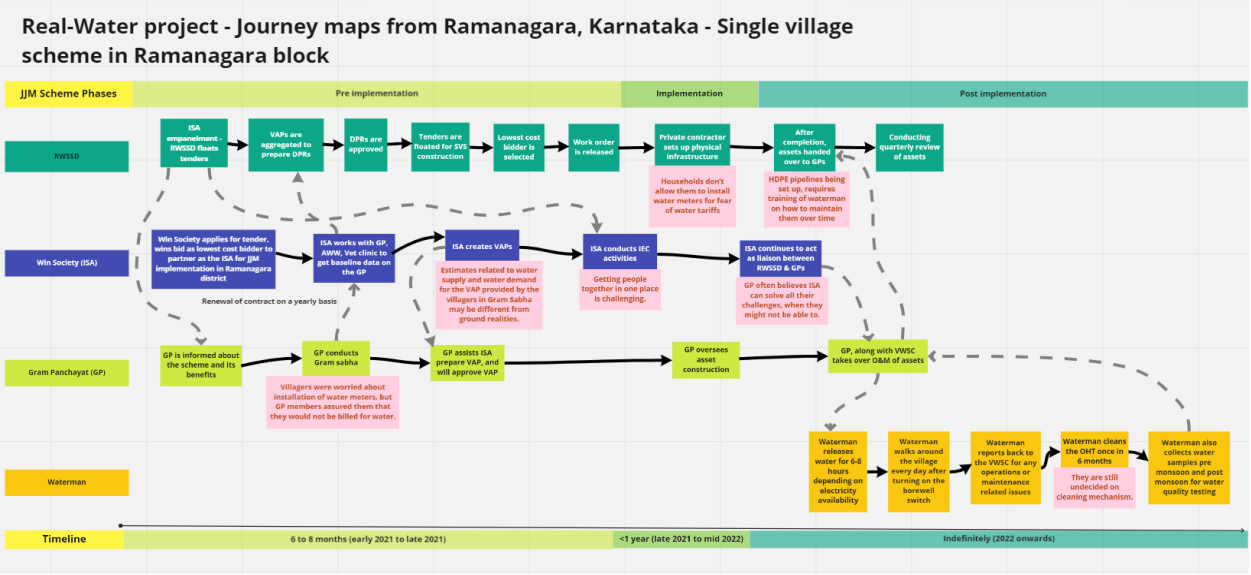

Figure I-1: Karnataka journey map

We conducted stakeholder conversations with the Executive Engineer at the Rural Water Supply & Sanitation Department, the empaneled Implementation Support Agency, a *Gram Panchayat* member, and waterman to understand how *Jal Jeevan Mission* implementation had occurred in that specific village and challenges in ensuring source sustainability.

Although source sustainability is mentioned extensively in the *Jal Jeevan Mission* guidelines, it is striking that it did not emerge as a priority in **any** of the stakeholder discussions. The absence of any quantification or scientific basis for the recharge measures being recommended to achieve source sustainability emerged from discussions with domain experts, not stakeholders involved in actual planning and implementation of water supply schemes.

TABLE I-1: JOURNEY MAP OF RURAL WATER SUPPLY & SANITATION DEPARTMENT, RAMANAGARA BLOCK, KARNATAKA

STEPS	STEP 1: IMPLEMENTATION SUPPORT AGENCY EMPANELMENT	STEP 2: VILLAGE ACTION PLAN CREATION	STEP 3: DETAILED PROJECT REPORT PREPARATION
ACTIVITIES	Empanel Implementation	Implementation Support Agency works	An external consultant agency

	Support Agency, a local civil society organization with experience in rural drinking water supply projects. The Implementation Support Agency is now WIN Society; STEPS was the former agency.	with the *Panchayat* Development Officer and village water and sanitation committee to collect the data necessary to prepare the Village Action Plan. Two staff members from the Implementation Support Agency can prepare 3–4 Village Action Plans per day. The Rural Drinking Water & Sanitation Department engineer also participates in the Village Action Plan preparation. The village water and sanitation committee has to be inclusive and consist of 50 percent women, 25 percent Scheduled Caste / Scheduled Tribe members, and senior citizens to ensure that all their needs are considered.	converts Village Action Plans into a Detailed Project Report. This report has an estimation of the cost of constructing the physical structures as well as the cost of materials required for construction. There are also empaneled agencies to prepare the Detailed Project Report.
STAKE-HOLDERS	Rural Water Supply and Sanitation Department, Civil society organization	Rural Water Supply and Sanitation Department, Civil society organization, *Gram Panchayat*, village water and sanitation committee, *Panchayat* Development Officer	Rural Water Supply and Sanitation Department, external consultant
CHALLENGES			
OUTPUTS	An empaneled agency	Village Action Plans	Detailed Project Report
STEPS	STEP 4: DETAILED PROJECT REPORT APPROVAL	STEP 5: TENDER CONTRACTING AND WORK ORDER	STEP 6: INFORMAL APPROVALS
ACTIVITIES	Detailed Project Report approval depends on the cost estimation. If it is less than ₹10 million, then the Superintendent Engineer of the Rural Water Supply and Sanitation Department can approve the report. If it is greater than ₹10 million, the Chief Engineer of the Rural Water Supply and Sanitation Department approves it.	Tenders are then put out through the Karnataka Public Procurement Portal. Private contractors bid for it and the contractor with the lowest cost bid is given the work order.	Before physical infrastructure construction begins, the Rural Water Supply and Sanitation Department presents the Detailed Project Report to village residents, explains what they get through the water supply scheme, and obtains informal agreements from them.
STAKE-HOLDERS	Rural Water Supply and Sanitation Department	Rural Water Supply and Sanitation Department	Rural Water Supply and Sanitation Department, *Gram Panchayat* / village water and sanitation committee, Village residents
CHALLENGES	-	-	-
OUTPUTS	Formal approval of Detailed Project Report	Tender development and work order creation	-

TABLE I-2: JOURNEY MAP OF WIN SOCIETY, THE IMPLEMENTATION SUPPORT AGENCY IN RAMANAGARA BLOCK, KARNATAKA			
STEPS	STEP 1: IMPLEMENTATION SUPPORT AGENCY APPLIES FOR THE TENDER	STEP 2: IMPLEMENTATION SUPPORT AGENCY WINS BID AND STEPS IN	STEP 3: IMPLEMENTATION SUPPORT AGENCY PREPARES VILLAGE ACTION PLAN
ACTIVITIES	The Rural Water Supply & Sanitation Department puts out tenders for an Implementation Support Agency in the district through the government's e-procurement website. The Implementation Support Agency applies for the tender.	The Implementation Support Agency with the lowest cost bid wins the tender and starts work.	Implementation Support Agency works with *Gram Panchayats* where schemes are being implemented to prepare Village Action Plans.
STAKEHOLDERS	Rural Water Supply & Sanitation Department, Implementation Support Agency	Rural Water Supply & Sanitation Department, Implementation Support Agency	Implementation Support Agency, *Gram Panchayat,* village water and sanitation committee, *Anganwadi* Worker, Accredited Social Health Activist, Waterman, Veterinary hospital
CHALLENGES			Estimates related to water supply and demand provided by the community in *Gram Sabha* for the Village Action Plan may be different from ground realities.
OUTPUTS	Tenders floated	Implementation Support Agency chosen	*Gram Sabha* conducted; Village Action Plan prepared
STEPS	STEP 4: IMPLEMENTATION SUPPORT AGENCY CONDUCTS INFORMATION, EDUCATION, AND COMMUNICATION ACTIVITIES	STEP 5: IMPLEMENTATION SUPPORT AGENCY LIAISES BETWEEN RURAL WATER SUPPLY & SANITATION DEPARTMENT AND *GRAM PANCHAYAT*	
ACTIVITIES	The Implementation Support Agency conducts multiple information, education, and communication activities across different habitations and villages. These have been listed on the next slide.	Implementation Support Agencies continue to act on behalf of the Rural Water Supply & Sanitation Department, given their close relationship with village representatives and communities.	
STAKEHOLDERS	Implementation Support Agency, *Gram Panchayat,* village water and sanitation committee, *Anganwadi* Worker, Accredited Social Health Activist, Schools,	Implementation Support Agency, Rural Water Supply & Sanitation Department, *Gram Panchayat*, village water and sanitation committee	

	Colleges		
CHALLENGES	Getting people together in one place is challenging.	*Gram Panchayats* often believe the Implementation Support Agency can solve all their challenges, which they might not be able to.	
OUTPUTS	Events* conducted	None	

*These include street plays, workshops, school children's marches, essay writing programs, debate programs, drawing competitions for school children, awareness activities, short films on health and hygiene, campaigns on water conversation and protection of water sources, training programs for *Panchayati Raj* institution members, training program for village water and sanitation committee members, grassroots-level training, small water bodies rejuvenation in villages, and women's self-help group awareness rallies.

TABLE I-3: JOURNEY MAP OF PRESIDENT, GOLLARADODDI *GRAM PANCHAYAT*, RAMANAGARA BLOCK, KARNATAKA

STEPS	STEP 1: *GRAM PANCHAYAT* HEARS ABOUT THE SCHEME	STEP 2: *GRAM PANCHAYAT* CONDUCTS *GRAM SABHA*	STEP 3: *GRAM PANCHAYAT* PREPARES VILLAGE ACTION PLAN WITH THE IMPLEMENTATION SUPPORT AGENCY	STEP 4: *GRAM PANCHAYAT* MONITORS ASSET CONSTRUCTION	STEP 5: *GRAM PANCHAYAT* AND VILLAGE WATER & SANITATION COMMITTEE TAKE OVER OPERATIONS AND MAINTENANCE OF ASSETS
ACTIVITIES	*Gram Panchayat* hears about the *Jal Jeevan Mission* scheme implementation and its benefits from Rural Water Supply & Sanitation Department engineers.	*Gram Panchayat* conducts Gram Sabha with all village residents to convey scheme implementation details to all residents.	*Gram Panchayat* prepares the Village Action Plan along with the Implementation Support Agency.	*Gram Panchayat* monitors the physical assets that are constructed, like pipelines from borewell to overhead tanks and distribution lines from overhead tanks to taps in households.	Post construction, *Gram Panchayat* along with the village water and sanitation committee operates and maintains the assets over time.
STAKE-HOLDERS	*Gram Panchayat,* village water and sanitation committee, Rural Water Supply & Sanitation Department	*Gram Panchayat,* village water and sanitation committee, *Anganwadi* workers, Auxiliary Nurse and Midwives, Accredited Social Health Activists	*Gram Panchayat,* village water and sanitation committee, Anganwadi workers, Accredited Social Health Activist, Waterman, Veterinary hospital	*Gram Panchayat,* village water and sanitation committee	*Gram Panchayat,* village water and sanitation committee, Waterman
CHALLENGES	-	Villagers were worried about installation of water meters, but *Gram*	-	-	-

		Panchayat members assured them that they would not be billed for the water			
OUTPUTS	-	None	Village Action Plan signed and accepted by all *Gram Panchayat* members	None	None

TABLE I-4: JOURNEY MAP OF WATERMAN, GOLLARADODDI *GRAM PANCHAYAT*, RAMANAGARA BLOCK, KARNATAKA

STEPS	STEP 1: RELEASES WATER	STEP 2: WALKS AROUND THE VILLAGE	STEP 3: OPERATIONS & MAINTENANCE	STEP 4: CLEANS OVERHEAD TANKS	STEP 5: WATER QUALITY TESTING
ACTIVITIES	Waterman releases water for 6–8 hours a day depending on electricity availability	Waterman walks around the village after switching on borewells to make sure that water is reaching every household.	If there are operations and maintenance issues, he takes them up in *Gram Sabhas* and in meetings organized with the village water and sanitation committee	Once in six months, he cleans the overhead tank.	He also has to collect water samples for testing pre- and post-monsoon.
STAKE-HOLDERS	Waterman	Waterman	Waterman, village water and sanitation committee	Waterman, village water and sanitation committee	Waterman, Rural Water Supply & Sanitation Department
CHALLENGES	Water release depends on electricity availability	-	-	They are still undecided on cleaning mechanisms.	-
OUTPUTS	Water released	-	-	Cleaned overhead tank	Samples submitted to district-level water quality labs

J. MAHARASHTRA JOURNEY MAPS

In Pune, we connected with the Rural Water Supply Division of the Pune *Zilla Parishad*, which is responsible for the execution of single-village schemes costing up to ₹50 million. There are 10 Implementation Support Agencies for *Jal Jeevan Mission* in Pune district. We spoke to a representative of Sosva Training and Promotion Institute, the Implementation Support Agency for 60 villages in Shirur block of Pune district.

We learned that 38 villages of 1,866 have been declared *Har Ghar Jal* as of August 15, 2022. In some villages, like Tardobachiwadi, the scheme was implemented under previous schemes such as *Jal Swarajya* 2. Many Implementation Support Agencies mentioned that the work for schemes under the *Jal Jeevan Mission* is close to completion in some of the villages they had worked in and that we would be able to talk to beneficiaries in a couple of months.

At the time of our field visit, the completion and handover to village water and sanitation committees after the trial run had not taken place in most villages and beneficiaries were not receiving water. That is why we have not included their journey maps.

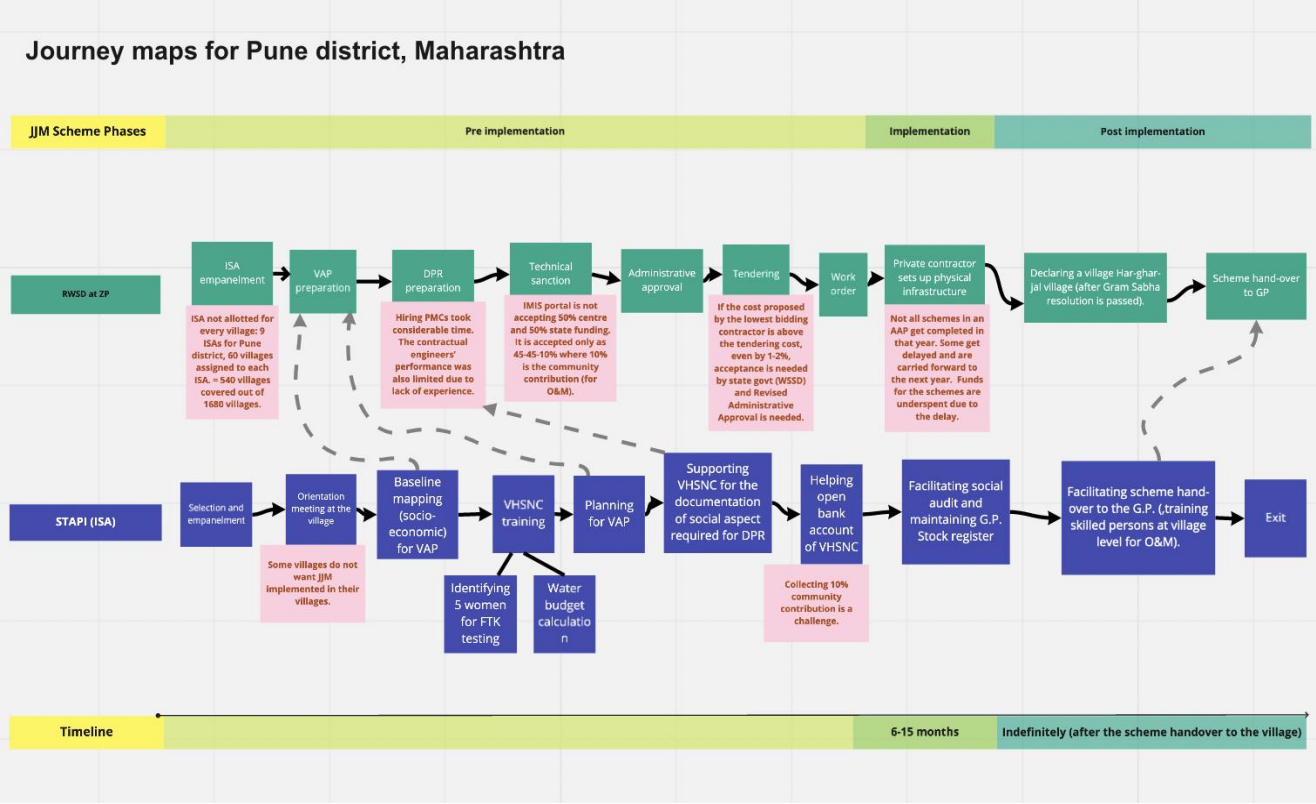

Figure J-I: Maharashtra journey maps

TABLE J-1: JOURNEY MAP OF KIRAN TAMBULKAR, SECTIONAL ENGINEER, RURAL WATER SUPPLY DIVISION, *ZILLA PARISHAD*, PUNE DISTRICT				
JOURNEY	STEP 1: VILLAGE ACTION PLAN PREPARATION	STEP 2: DETAILED PROJECT REPORT PREPARATION	STEP 3: TECHNICAL SANCTION	STEP 4: ADMINIS-TRATIVE APPROVAL

ACTIVITIES	The village water and sanitation committee prepares a Village Action Plan with the help of the Subdivision Branch Engineer of the Rural Water Supply Division at the *Zilla Parishad* level (technical support) and the Groundwater Surveys and Development Agency (water sources). The *Gram Sevak* and *Sarpanch* are involved in this process. Data is collected using the Kobo tool and gets uploaded automatically on the Integrated Management Information System portal. The Village Action Plan has a social (e.g., village population) as well as technical (e.g., water source and already existing infrastructure) component.	The State Water and Sanitation Mission appoints agencies at the state level: Project Management Consultants. Since that took considerable time, the Pune Rural Water Supply Division appointed 50 contractual engineers to prepare Detailed Project Reports for schemes in the district. Schemes are planned with population projections for the next 30 years.	Technical scrutiny committee headed according to the estimated cost: 1. Up to ₹10 million: Executive Engineer Rural Water Supply at *Zilla Parishad* 2. ₹22–35 million: Superintendent Engineer, *Maharashtra Jeevan Pradhikaran* 3. >₹35 million: Chief Engineer, *Maharashtra Jeevan Pradhikaran* Schemes with an estimated budget below ₹50 million are under the Rural Water Supply Division 's purview while those above ₹50 million go to the *Maharashtra Jeevan Pradhikaran*. The water supply scheme is added to the Integrated Management Information System portal.	At the District Water and Sanitation Mission meeting, technically sanctioned schemes are presented, and the Chief Executive Officer gives approval orders .
STAKE-HOLDERS	Village water and sanitation committee, Groundwater Surveys and Development Agency, Rural Water Supply Division	State Water Sanitation Mission, Shah Technical Consultancy [Project Management Consultants for Pune division (5 districts) appointed in November 2021], Rural Water Supply Division, 50 contractual engineers	Rural Water Supply Division, *Maharashtra Jeevan Pradhikaran*	District Water and Sanitation Mission
CHALLENGES		Hiring Project Management Consultants took considerable time. The contractual engineers' performance was also limited as they had no prior experience of working on such projects.	The Integrated Management Information System portal is not accepting 50 percent federal and 50 percent state funding. It accepts only the 45-45-10 percent allocation, where 10 percent is the community contribution. The village water and sanitation committee was supposed to collect it and use it for operations and maintenance after the scheme's construction. But now it seems as if the amount will be required while implementing the scheme (as was the case with the National Rural Drinking Water Programme). This has	

			to be conveyed to village water and sanitation committees, which would have to deposit this 10 percent in the Pune district *Jal Jeevan Mission* account.	
PHASES	PARALLEL STEP: IMPLEMENTATION SUPPORT AGENCY EMPANELMENT	STEP 5: TENDERING	STEP 6: WORK ORDER	
ACTIVITIES	The role of Implementation Support Agencies is conveying to villagers the importance of paying water tariffs.	A notice is put out on the Water and Sanitation Support Organization (now State Water and Sanitation Mission) website for the region (group of districts)-wise empanelment of contractors for rural water supply schemes' implementation.	The Rural Water Supply Division gives the work order.	
STAKE-HOLDERS	Implementation Support Agencies		Rural Water Supply Division, Water Supply and Sanitation Department	
CHALLENGES	Not every village has been assigned to an Implementation Support Agency. There are nine Implementation Support Agencies in Pune district and 60 villages have been assigned to each. Thus, 540 of 1,866 villages in the district have been assigned an Implementation Support Agency.	If the cost proposed by the lowest bidding contractor is above the tendering cost, even by 1–2 percent, acceptance is needed by the state government (Water Supply and Sanitation Department) and a revised administrative approval is needed.		
STEPS	STEP 7: SCHEME IMPLEMENTATION	STEP 8: DECLARING A VILLAGE *HAR GHAR JAL*	STEP 9: HANDOVER TO *GRAM PANCHAYAT* / VILLAGE WATER & SANITATION COMMITTEE FOR OPERATIONS AND MIANTENANCE	
ACTIVITIES	The contractor installs the infrastructure—pipelines, overhead tank, etc.—as per the requirement (some villages may have pre-existing overhead tanks or pipeline networks). All repairs in the one month	Resolution by village in a *Gram Sabha* to declare it a *Har Ghar Jal* village. It is then updated on the *Jal Jeevan Mission* app. The reporting (through the *Jal Jeevan Mission* app) goes to State Water	Village water and sanitation committee is responsible for: 1. Operations and Maintenance charge collection - that would be used for any repair, paying electricity bill, and buying chemicals (alum and chlorine) 2. Making land available for	

	of trial runs is the contractor's responsibility.	and Sanitation Mission and the National *Jal Jeevan Mission.*	borewell/ Water Treatment Plant/ pipes (in the previous stages).	
STAKE-HOLDERS	Contractor	Rural Water Supply Division, village water and sanitation committee	Village water and sanitation committee	
CHALLENGES	Not all schemes in an Annual Action Plan get completed in that year. Some get delayed and are carried forward to the next year. All schemes from 2021–2022 were carried forward as they were not completed. Funds for schemes are underspent as the implementation is not happening at the expected rate.			

TABLE J-2: JOURNEY MAP OF PRASAD KULKARNI, REPRESENTATIVE, SOSVA TRAINING AND PROMOTION INSTITUTE (IMPLEMENTATION SUPPORT AGENCY), SHIRUR BLOCK, PUNE DISTRICT

JOURNEY	STEP 0: IMPLEMENTATION SUPPORT AGENCY SELECTION	STEP 1: ORIENTATION MEETING AT VILLAGE	STEP II: BASELINE MAPPING (SOCIOECONOMIC) FOR VILLAGE ACTION PLAN
ACTIVITIES	Advertisements seeking Implementation Support Agencies for the *Jal Jeevan Mission* based on criteria like experience in the water sector, community engagement and mobilization, social and behavior change communication, liquid waste management, and operations and maintenance support were put out. The Sosva Training and Promotion Institute applied to the Water and Sanitation Support Organization (now the State Water and Sanitation Mission), stating its capability to work as an Implementation Support Agency. The Chief Executive Officer of the Pune *Zilla Parishad* asked for an action plan from the Sosva Training and Promotion Institute in October 2021. The Pune *Zilla Parishad* has allotted 60 villages (54 *Gram Panchayats*) in Shirur block of Pune district to the Sosva Training and Promotion Institute. They asked for this block as they have previously	The Implementation Support Agency talks about the *Jal Jeevan Mission* and how it will support the village in scheme implementation. It also investigates the village's population density and water supply system among other details.	The mapping for the Village Action Plan delves into the following: - Number of households, of which how many are already getting water (private / from previous government scheme) - Self-help groups - government buildings - borewells / wells - is any water tariff currently being collected? - people's participation - is waterman / *Jal Surakshak* available and currently working?

	worked in this area. The institute has a civil engineer and social worker as staff at the block level specifically for the *Jal Jeevan Mission*. The *Zilla Parishad* bears admin (travel, food, training) cost and staff (involved in *Jal Jeevan Mission*) salaries of the Implementation Support Agency.		
STAKE-HOLDERS	Water Supply and Sanitation Organization (now State Water and Sanitation Mission)	*Gram Panchayat*, village water and sanitation committee members, and other stakeholders	*Gram Panchayat*, Village residents
CHALLENGES		Some villages initially didn't want a *Jal Jeevan Mission* scheme because they already have water or the village is politically sensitive (Opposition party members see the scheme as a victory for the ruling party, so oppose it).	
STEPS	STEP 3: TRAINING	STEP 4: PREPARATION OF VILLAGE ACTION PLAN	STEP 5: SUPPORTING VILLAGE HEALTH, SANITATION AND NUTRITION COMMITTEE FOR THE DOCUMENTATION OF SOCIAL ASPECT REQUIRED FOR DETAILED PROJECT REPORT
ACTIVITIES	Village water and sanitation committee members are trained regarding the *Jal Jeevan Mission*'s objective; the role of different agencies; the committee's responsibilities and each member's role; water budget (training has not yet started); identification of observation wells by the Groundwater Surveys and Development Agency, etc. The Implementation Support Agency's role is explaining to different stakeholders why to do water budgeting. District-level geologists from the Groundwater Surveys and Development Agency are invited. The training happens at the *Panchayat Samiti* meeting, with 4–6 *Gram Panchayats*. Five women (Accredited Social Health Activist, *Anganwadi* worker, Self-help group members, etc.) from the villages are	This Village Action Plan preparation involves consultation with village residents regarding locations of the water tanks (so that water can flow with gravity, which reduces expenses as well as operations and maintenance work) among other topics. Drawing competitions, cleanliness programs in school, etc. are organized to create awareness. At the *Gram Sabha*, the Village Action Plan is presented, and suggestions are incorporated.	The Detailed Project Report has two parts: "technical" and "social." The Implementation Support Agency helps with the social part, which includes private land donation (securing *bakshis patra* or gift letter) for infrastructure installation, negotiation with the concerned villager (if required), supporting Village Water and Committee in monitoring (checking water pressure and quality), estimating differential water tariff amounts for Above Poverty Line/Below Poverty Line households, etc. The Implementation Support Agency collects the information required for documentation and submits it to the *Panchayat Samiti*, which then forwards it to the Project Management Consultant, who creates the Detailed Project Report. The committee gets a copy of the Detailed Project Report.

	selected and trained to test water using Field Test Kits. The training is given by the Health Department to the Implementation Support Agency and from Implementation Support Agency to the selected women. The testing is done once in three months for all parameters at Block Resource Centres and Cluster Resource Centres. The *Gram Sevak* or Implementation Support Agency members (they also have login details) can upload results on Integrated Management Information System.		
STAKE-HOLDERS	Village water and sanitation committee, Groundwater Surveys and Development Agency	Stakeholder groups like elderly villagers, educated villagers, Accredited Social Health Activist, *Anganwadi* members, youth, etc.	
STEPS	STEP 6: HELP OPEN A BANK ACCOUNT FOR THE VILLAGE WATER AND SANITATION COMMITTEE	STEP 7: FACILITATE SOCIAL AUDIT AND HELP MAINTAIN *GRAM PANCHAYAT* STOCK REGISTER	STEP 8: FACILITATE SCHEME HANDOVER TO THE *GRAM PANCHAYAT* (AND SUBSEQUENT EXIT)
ACTIVITIES	The Implementation Support Agency helps open a bank account for the village water and sanitation committee (and *Gram Sevak*), where the 10 percent operations and maintenance fund will be collected (5 percent contribution in tribal belts). In some difficult terrains, *shram daan* (voluntary labor) is also sought.	After the scheme is completed, a third-party inspection is done on both social and technical fronts, followed by a social audit. It includes information, such as whether households are getting water, have the schemes improved the situation of groups like women, etc. The *Gram Panchayat* maintains a stock register, which has details of scheme implementation, training, etc.	After the scheme's implementation (and trial run for a month by the contractor) and social audit, the *Gram Sabha* passes a resolution to declare the village as *Har Ghar Jal.* The Implementation Support Agency officially exits 6-8 months after the implementation. It may continue to provide unofficial support if needed, to the village.
STAKE-HOLDERS	Village water and sanitation committee, *Gram Sevak*	Village water and sanitation committee, *Gram Panchayat*	*Gram Panchayat*, Rural Water Supply Division
CHALLENGES	Collecting the 10 percent community contribution is a challenge.		

K. SIKKIM JOURNEY MAPS

Multi-stakeholder journey mapping was carried out in two districts: Gyalshing and Namchi. However, to draw insights regarding *Jal Jeevan Mission* implementation, our focus was on Gyalshing as implementation has yet to begin in the locations we covered under Namchi.

In Gyalshing, we conducted field visits in Yuksom Dubdi. The *Gram Panchayat* Unit has a population of 2,804 and 632 households. In each of the six wards in this unit, single-village schemes are being implemented. We have put together journey maps drawing from interviews with the Assistant Engineer at Yuksom block, the President of the *Gram Panchayat* Unit, a government-enlisted private contractor working in the *Gram Panchayat* Unit, and beneficiaries.

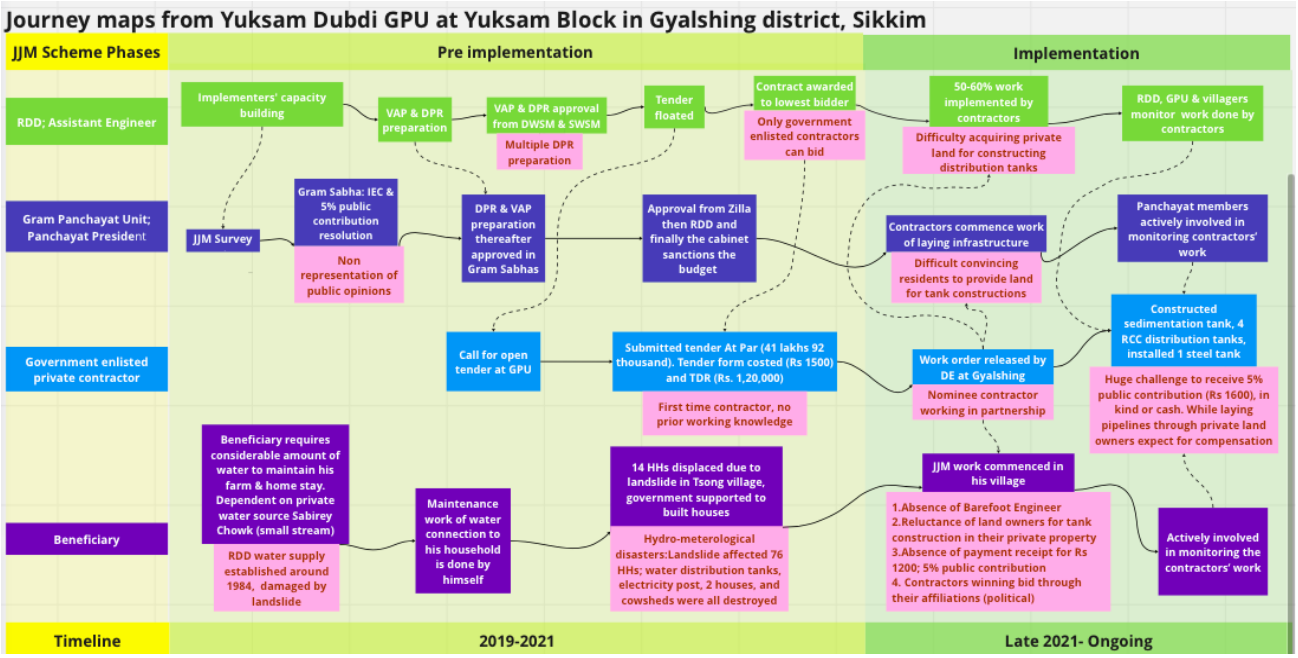

Figure K-1: Journey maps from Yuksom Dubdi *Gram Panchayat* Unit, Yuksom block, Gyalshing district, Sikkim

TABLE K-1: JOURNEY MAP OF PEMA WANGCHUK BHUTIA, ASSISTANT ENGINEER, YUKSOM BLOCK, GYALSHING DISTRICT

STEPS	STEP 1: CAPACITY-BUILDING	STEP 2: VILLAGE ACTION PLAN FORMULATION	STEP 3: DETAILED PROJECT REPORT FORMULATION	STEP 4: SCHEME SANCTIONING
ACTIVITIES	Training workshop to implement *Jal Jeevan Mission* held in Gangtok, Jorethang, Hyderabad, and Shimla.	The village water and sanitation committee prepares the Village Action Plan with the Assistant Engineer's guidance. It is then presented to the *Gram Sabha* for approval.	The Assistant Engineer, Junior Engineer, Supervisor, *Gram Panchayat* Unit, Barefoot Engineer, and Ward *Panchayats* prepare the Detailed Project Report (schemes' design, implementation, maps, etc.) after carrying out the survey.	The Detailed Project Report and Village Action Plan are sent for approval to the District Water and Sanitation Mission and thereafter, to the State Water and Sanitation Mission.

STAKE-HOLDERS	Rural Development Department	Village water and sanitation committee, Rural Development Department, *Gram Sabha*	Rural Development Department, *Gram Panchayat* Unit	District Water and Sanitation Mission, State Water and Sanitation Mission
TIMELINE	2019	2020	2020	2021
CHAL-LENGES			They had to prepare the same Detailed Project Report multiple times to reduce the cost of each household.	
OUTPUT	Working knowledge of scheme designing and implementation.	Six Village Action Plans for Yuksom *Gram Panchayat* Unit with details of habitation, population, agricultural, water sources and rainfall data.	Six Detailed Project Reports for Yuksom *Gram Panchayat* Unit.	Schemes worth approximately ₹6 crore sanctioned for Yuksom *Gram Panchayat* Unit.
STEPS	STEP 5: TENDER FLOATING	STEP 6: TENDER BIDDING & AWARDING	STEP 7: IMPLEMENTATION	STEP 8: MONITORING OF WORK
ACTIVITIES	After the schemes (civil component and material cost) are sanctioned, a tender is floated only for the civil component at the respective Village Administrative Centres. Assistant Engineer or Deputy Engineer issues tender form.	Eighteen contractors submitted contract form, agreement, bill of quantity, enlistment, and temporary deposit receipt. Tender committee verified documents and awarded the contract to the lowest bidder.	Contractors have commenced work of constructing sedimentation tanks at the water sources (streams), and multiple distribution tanks habitation wise. 50-60 percent work has been completed. Capacity of tanks designed according to water demand.	Through site visits the Assistant Engineer, Junior Engineers, Supervisor, and panchayats monitor the work being implemented by the contractors. The local people also oversee the work being done in their villages.
STAKE-HOLD	*Gram Panchayat* Unit, Rural Development Department	Block Administrative Centres, Rural Development Department, government-enlisted private contractors	Government-enlisted private contractors	Rural Development Department, *Gram Panchayat* Unit, Beneficiaries
TIMELINE	2021	2021	2021–ongoing	2021–ongoing
CHAL-LENGES		Only government enlisted contractors can bid.	Difficulty in acquiring land inside habitation zones for constructing distribution tanks.	
OUTPUT	Notice Initiating Tender	Contract awarded to six contractors in Yuksom *Gram Panchayat* Unit. Informally, two nominee partners are working with contractors in each ward.	Sedimentation and distribution tanks.	Regular monitoring of schemes' implementation

TABLE K-2: JOURNEY MAP OF BHIM BAHADUR GURUNG, PRESIDENT, YIKSAM DUBDI *GRAM PANCHAYAT* UNIT			
STEPS	STEP 1: SURVEY	STEP 2: INFORMATION DISSEMINATION	STEP 3: DETAILED PROJECT REPORT & VILLAGE ACTION PLAN
ACTIVITIES	The Plumber, *Ward Panchayats*, and Barefoot Engineers conducted the survey in the *Gram Panchayat* Unit. The water sources were geotagged.	*Gram Sabhas* were held to disseminate the information regarding the *Jal Jeevan Mission*. In the Gram Sabha, it was resolved that the community members would have to contribute 5 percent of the total costs (sanction amount) of the water supply scheme being implemented in their village.	The engineers designed the water supply scheme and estimated the costs. The Assistant Engineer and Junior Engineer prepared a Detailed Project Report. The *Gram Panchayat* Unit played a key role in the process. The Village Action Plan was developed, presented in the *Gram Sabha*, and then forwarded to the Rural Development Department.
STAKEHOLDERS	*Gram Panchayat* Unit, Rural Development Department	*Gram Panchayat* Unit, Residents, Line Departments	*Gram Panchayat* Unit, Residents, Rural Development Department
TIMELINE	2019	2020	2020
CHALLENGES		There are too many agendas to address in the *Gram Sabha*—many residents do not get the opportunity to voice their opinion.	
OUTPUT	Water resources data	Resolution for 5 percent public contribution to the water supply scheme	Village Action Plan, Detailed Project Report
STEPS	STEP 4: SANCTIONING	STEP 5: IMPLEMENTATION	STEP 6: MONITORING
ACTIVITIES	This Detailed Project Report is approved by the village water and sanitation committee, after which, it gets approved in the *Gram Sabha.* Thereafter, it goes to the district director of the planning commission in Gyalshing. Finally, it gets approval from the Rural Development Department, which sends it to the cabinet to sanction the budget.	Sedimentation tanks are constructed at the water sources, water is then supplied to the distribution/reserve tanks (these tanks are newly constructed or some of the old ones are repaired). These tanks are constructed both in private and forest reserved areas.	The *Gram Panchayat* Unit members are actively involved in the monitoring of the work being done in various parts of the *Gram Panchayat* Unit by the contractors. The Assistant Engineer, Junior Engineers, and supervisor also actively monitor the work being implemented.
STAKEHOLDERS	Rural Development Department, village water and sanitation committee, District Water and Sanitation Mission, State Water and Sanitation	Government enlisted private contractors, Rural Development Department, *Gram Panchayat* Unit	Rural Development Department, *Gram Panchayat* Unit

	Mission		
TIMELINE	2021	2021–Ongoing	2021–Ongoing
CHALLENGES		It is difficult to convince residents to provide their land for tank construction.	

TABLE K-3: JOURNEY MAP OF TASHI YANGDUP LEPCHA, A GOVERNMENT-ENLISTED PRIVATE CONTRACTOR FOR YUKSOM RAMGAYTHANG WARD IN YUKSOM DUBDI *GRAM PANCHAYAT UNIT*

STEPS	STEP 1: TENDER SUBMISSION	STEP 2: WORK ORDER RELEASE	STEP 3: IMPLEMENTATION OF THE SINGLE VILLAGE SCHEME
ACTIVITIES	After the call for tenders, he applied on the insistence of his neighbors from Barphungang Dara, where there is a shortage of water. The tender form cost him ₹1,500, along with which he submitted Tender receipt of one lakh twenty thousand rupees which would be returned on completion of the work. He had submitted the tender at par (₹41.92 lakh).	The Deputy Engineer released the work order at Gyalshing. From Yuksom Ramgaythang ward there were four bidders. He is the only one who won the bid. The Assistant Engineer and Junior Engineer constantly monitor the work. The contractors have to redo the work if they do not meet the standards.	14,000-liter reinforced concrete cement tank constructed at the Nindaley source. Three reinforced cement concrete tanks of 10,000 liters capacity each and one reinforced concrete cement tank of 5,000 liters capacity has been constructed in Yuksom ward. One steel tank of 5000-liter capacity has also been installed.
STAKE-HOLDERS	Contractors, *Gram Panchayat* Unit, Rural Development Department	Rural Development Department, Contractors	Contractors, Rural Development Department, *Gram Panchayat* Unit, wage laborers
TIMELINE	25 August 2021	October 2021	
CHALLENGES		A nominee contractor proposed by the ruling Sikkim *Krantikari Morcha* party is working in partnership with him. Working as a contractor is very difficult, they must be answerable to the public. Since the work order is in his name, only he would be responsible for any mishap and not his partner.	Huge challenge to convince people to make the mandatory 5 percent public contribution (₹1,600), in kind or cash. Only women volunteer for labor and work only for a day or two. While laying the pipelines through private land, the owners expect compensation from the contractors.
OUTPUT	Tenders from government enlisted private contractors.	Work order for the civil component of the schemes to be implemented in Yuksom Ramgaythang ward.	Construction of sedimentation and reserve/distribution tanks.
STEPS	STEP 4: PRIVATE WATER SUPPLY	STEP 5: REHABILITATION ACTIVITIES	STEP 6: IMPLEMENTATION

ACTIVITIES	He is a farmer practicing agriculture and animal husbandry. He requires a considerable amount of water to maintain his farm and homestay. *Sabirey chowk* (small stream) is the private source from where he has a pipe connection to his house. All the water line maintenance work is done by himself.	Fourteen households have been displaced after the landslide in Tsong village to Yuksom where they had their private lands, the government gave them support to build their houses.	He is actively involved in overseeing the work being done in his village under *Jal Jeevan Mission.* The villagers complain to the *Panchayat* or the Engineers, if the contractors are not doing their work properly.
STAKE-HOLDERS	Residents	Residents	Rural Development Department, *Gram Panchayat* Unit, Residents
TIMELINE	Ongoing	In 2019, the landslide affected the Tsong village.	In January 2022, *Jal Jeevan Mission* work commenced in his village.
CHALLENGES	The Rural Development Department water line was established around 1984. All the distribution systems were damaged by the earthquake that wreaked havoc at Tsong village in 2019.	The landslide affected 76 households in Tsong village out of 130 households in the Tsong Dubdi ward. The distribution tanks, electricity post, two houses, and cowsheds were all destroyed.	Absence of Barefoot Engineer for the Tsong Dubdi ward. Reluctance of landowners in giving consent for tank construction in their private property. Absence of payment receipt for ₹1,200 (5 percent public contribution). Contractors win the bid through their party affiliation.
OUTPUT	Water supply for domestic and agricultural needs	Displacement and rehabilitation of affected residents	Construction of tanks