

# Sustaining Rural Water Supply Services

Lessons From Arghyam's Engagement  
With Operation And Maintenance  
From 2019 to 2025

By  
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# Foreword

Over the past two decades, Arghyam's work in the water sector has been shaped by a continuous process of learning—through partnerships with communities, civil society organisations, governments, and researchers across diverse geographies in India. This journey has taken us from supporting early pilots and innovations to engaging with large-scale public programmes that aim to transform access to safe drinking water.

The 'Jal Jeevan Mission' represents one of the most significant shifts in India's water sector, bringing piped water supply to millions of rural households. As this transformation unfolds, the sector is entering a new but equally important phase - ensuring that these systems continue to deliver reliable and safe services over time. It is at this juncture that the question of operation and maintenance becomes central.

At Arghyam, our current approach has increasingly focused on leveraging technology—particularly through a Digital Public Infrastructure (DPI) lens - to strengthen water service delivery systems. While technology offers powerful tools for improving coordination, enabling data-driven decision-making, and amplifying citizen voices at scale, we also recognise that technology alone cannot solve the challenges of sustaining water systems.

The domain encompassing multiple complexities—of institutions, human behaviour, financing, and governance—remains at the core, and deepening our understanding of these dimensions has been critical to our work. Over the years, we have engaged with a wide range of contexts—from community-led initiatives and state programmes to analytical studies and national-level dialogues—to better understand what enables water systems to function reliably.

This report reflects that journey of learning. It brings together insights from various engagements across states such as Bihar and Assam, thematic studies

on water sector livelihoods and financing, and discussions with practitioners and policymakers across the country. What emerges is a recognition that sustaining rural water services is not merely a technical or administrative challenge, but a systems problem—one that requires alignment across institutions, people, resources, and processes.

A recurring theme across our work has been the importance of grounding proposed solutions in both context and practice. India's water sector is characterised by significant diversity in geography, institutional arrangements, and implementation approaches. Understanding this diversity—across policies, practices, and lived realities—has been essential to shaping our thinking and interventions.

As we look ahead, we see our role as contributing to this evolving ecosystem by combining domain knowledge with technological innovation, supporting governments in strengthening service delivery systems, and working with partners to generate and share evidence from the field.

This report is an attempt to synthesise some of these learnings and to contribute to the broader conversation on sustaining rural water services. We hope it serves as a useful resource for practitioners, policymakers, and partners working toward the shared goal of ensuring that every household not only has access to water but can also rely on it every day.

Arghyam continues to be guided by a spirit of optimism, partnership, and possibility. Sustaining water services at scale is a complex challenge, but one that can be met through collective effort, continuous learning, and the thoughtful application of both technology and domain knowledge.

**Anuj Sharma**  
CEO, Arghyam

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# Acknowledgments

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This report draws on a wide range of engagements, partnerships, and contributions across the rural water sector.

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We sincerely thank our implementation partners. The ‘Aga Khan Rural Support Programme India (AKRSP(I))’ played a central role in the Muzaffarpur engagement in Bihar, working closely with communities and local institutions to strengthen operation and maintenance (O&M) systems. We also acknowledge ‘Water For People’ for their partnership and continued engagement in advancing learning and practice in this space.

We are deeply appreciative of the frontline workers—Jal Mitras, Anurakshaks, pump operators—and members of community institutions such as VWSCs, WUCs, and WIMCs, who shared their time, experiences, and insights. We would also like to thank the communities and households that welcomed us into their villages and homes, often extending generous hospitality during field visits. Their openness and willingness to engage form the very foundation of this report.

We acknowledge the contributions of our research and knowledge partners, including the ‘JustJobs Network’, for their work on understanding the rural water workforce and related themes. We are grateful to practitioners, researchers, and policymakers who participated in discussions and in the national

symposium organised in collaboration with the Indian Institute of Management Bangalore and the eGov Foundation. These engagements have helped shape several of the reflections presented in this report.

We also thank the Arghyam Board for their continued guidance, particularly for helping shape the organisation’s approach to balancing core thematic work with the use of technology, to enable impact at scale.

Finally, we acknowledge the contributions of colleagues at Arghyam whose work across programme design, implementation, research, and writing which have made this synthesis possible.

## **Team Arghyam**

# Executive Summary

India's rural water sector has undergone a dramatic transformation in recent years. The Jal Jeevan Mission (JJM), launched by the Government of India in 2019, has significantly expanded access to piped drinking water across rural India. Millions of households that once relied on distant sources or hand-pumps now have tap connections within their homes.

While this expansion marks a major achievement, it also brings new challenges to the forefront: primarily, how to ensure that these water systems continue to function reliably over time.

Sustaining rural water services requires more than just infrastructure. Pumps must be operated regularly, electricity bills must be paid, leaks must be repaired, and water quality must be monitored, while community institutions must manage the systems effectively. In other words, ensuring reliable water services requires strong systems for operation and maintenance (O&M).

Over the past few years, Arghyam has undertaken several initiatives to better understand the systems that support sustainable O&M in rural water supply. These include field engagements, analytical studies, and sector-wide dialogues. Together, these initiatives, spanning the period of April 2019 to December 2025, provide insights into the institutional, financial, technological, and human dimensions of sustaining rural water services.



A major field engagement in Bihar demonstrated approaches to strengthening community-led operation and maintenance of piped water supply systems. Complementary analytical work in Assam examined the financial and institutional realities faced by Water User Committees responsible for managing water systems. Research conducted with the JustJobs Network explored the range of jobs and tasks involved in water management across states, while a small study of pump operators provided insights into the working conditions of frontline workers responsible for operating rural water systems.

In addition, Arghyam convened a national symposium in collaboration with the Indian Institute of Management-Bangalore and the eGov Foundation to reflect on the sustainability of rural piped water systems and identify emerging policy and practice challenges.

Across these initiatives, several common insights have emerged.

**First**, community institutions play a critical role in sustaining water systems, but their capacities vary widely. Strengthening these institutions requires sustained engagement rather than one-time training interventions.

**Second**, frontline workers form the operational backbone of rural water systems. Operators such as Jal Mitras, Anurakshaks, and pump operators perform the daily work required to keep systems functioning, yet their roles often remain under-recognised.

**Third**, financial sustainability remains a complex challenge. While community tariffs can support some operational expenses, many systems require continued public financing to manage electricity costs, major repairs, and infrastructure replacement.

**Fourth**, digital tools can help strengthen water service delivery-- not only through monitoring but also by building trust, improving transparency, and simplifying workflows for frontline workers. Their impact depends on how effectively they are designed for real-world use and integrated into institutional processes.

**Finally**, sustaining rural water services requires policy and governance systems that recognise water supply as an ongoing public service, rather than as a one-time infrastructure project.

This report synthesises the lessons emerging from Arghyam's recent work and reflects on the systems required to sustain rural water services over the long term.

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# Abbreviations

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FHTC	Functional Household Tap Connections
GP	Gram Panchayat
HH	Household
IEC	Information, Education, and Communication
IMIS	Integrated Management Information System
INR	Indian Rupee
IVR	Interactive Voice Response
JJM	Jal Jeevan Mission
MIS	Management Information System
MVS	Multi Village Schemes
O&M	Operation and Maintenance
PHED	Public Health Engineering Department
PRI	Panchayati Raj Institutions
PWD	Public Works Department
PWSS	Piped Water Supply Schemes
P&RD	Panchayat and Rural Development
R&M	Repair and Maintenance
SVS	Single Village Schemes
VWSC	Village Water and Sanitation Committees
WIMC	Ward Implementation and Management Committee
WUC	Water User Committee



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# 1. Arghyam's Engagement With Operation And Maintenance

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## 1.1 The First Decade And A Half: Identifying Underinvested Areas And Supporting Experimentation

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Arghyam was established in 2005 with the vision of ensuring safe, sustainable water for all. Over the past two decades, the organisation has worked across multiple dimensions of water security in India through partnerships with civil society organisations, research institutions, governments, and community groups to advance sustainable water management.

In its early years, Arghyam supported a wide range of pilot initiatives and innovations aimed at addressing gaps in the water and sanitation sector, while developing its own understanding of the diversity of context, problems and potential solutions. These efforts spanned three broad thematic areas: rural water, rural sanitation, and urban water and sanitation. The objective was to identify under-invested areas in the sector and to support the experimentation of solutions that could improve access, sustainability, and the governance of water services.

Several early initiatives focused on strengthening water sources and improving local water security. For example, Arghyam supported projects that promoted rooftop rainwater harvesting and groundwater recharge in water-stressed regions, working with organisations such as Disha in Bihar, BIRD-K in Karnataka, and the DHAN Foundation in Andhra Pradesh.

In Kerala, Arghyam partnered with the district administration of Thrissur to support the Mazhapolima open well recharge programme, which revived thousands of open wells by diverting rainwater into them. Similar efforts in Rajasthan helped revive traditional water-harvesting systems such as bavris, tankas, kunds, and nadis in arid landscapes.





Across these initiatives, certain principles became central to Arghyam's work:

- Community participation in managing water resources
- Strengthening local institutions
- Building a scientific understanding of water systems
- Ensuring that interventions were designed for long-term sustainability.

Over time, these early pilots evolved into more programmatic initiatives supported through a cohort of partners. Arghyam developed programmatic lines of work on issues such as Participatory Groundwater Management, Springshed Management, Water Quality, and Water Governance. These programmes brought together multiple organisations working across different geographies to jointly develop knowledge, tools, and approaches to address complex water challenges.

One of the most significant efforts during this period was the Participatory Groundwater Management (PGWM) programme, which sought to empower communities with scientific knowledge about aquifers and groundwater systems. Through action research, capacity building, and partnerships with civil society organisations and government institutions, the programme helped develop new approaches to managing groundwater as a shared resource.

Through these collaborations, Arghyam and its partners were able to demonstrate effective models, generate knowledge, and influence policy discussions in the water sector. However, as these initiatives expanded, a key challenge became increasingly evident: the scale of India's water challenges outpaced the scale at which solutions were being implemented.

## 1.2 From Pilots To Scale: A Strategic Pivot

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By the mid-2010s, it had become clear that while many promising approaches had emerged from field pilots and partner-led programmes, the scale of the water crisis required a different approach. The complexity and magnitude of water challenges meant that interventions in a few limited pockets could not achieve population-scale impact.

Reflecting on more than a decade of engagement in the sector, around 2017-18, Arghyam recognised the need to rethink how solutions could reach millions rather than a few thousand people. This led to an organisational shift towards exploring ways to achieve impact at scale, including leveraging digital technologies to enable this.

This transition marked an important strategic pivot for Arghyam—from supporting a large number of independent projects through civil society partners to focusing on system-level interventions designed to influence public programmes and sector-wide practices.

In response to these evolving sectoral realities, Arghyam articulated a new strategic approach, built around four key pillars:

### 1. Working at Scale

Addressing India's water challenges requires solutions that can operate at a population scale. This necessitates designing approaches that can be adopted across large geographies and institutional systems.

### 2. Working with Government

Given the scale of public investments and the reach of government programmes, collaborating with government institutions has become central to enabling systemic impact.

### 3. Technology as an Enabler

Advances in digital technologies offer immense new possibilities for improving coordination, transparency, and data-driven decision-making in water service delivery systems.

### 4. Participation of Stakeholders

Sustainable water systems require the participation of multiple actors—including communities, frontline workers, local governments, civil society organisations, and government departments.

Together, the four pillars continue to shape Arghyam's current approach to strengthening water governance and service delivery systems.

## 1.3 Shifts In The National Context: From NRDWP To Jal Jeevan Mission

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Around the same time that Arghyam was rethinking its strategy, India's rural water sector was undergoing a major transition.

For several decades, rural drinking water programmes in India had focused primarily on infrastructure creation through schemes such as the National Rural Drinking Water Programme (NRDWP). While these efforts helped expand coverage of drinking water infrastructure, challenges related to the reliability, maintenance, and sustainability of water systems remained widespread.

In 2019, the Government of India launched the Jal Jeevan Mission (JJM) with the ambitious goal of providing functional household tap connections to every rural household. The mission marked a shift from viewing water supply as infrastructure creation to recognising it as a need for reliable service delivery, requiring regular water supply, quality monitoring, and sustained operation and maintenance of systems.

This represented an important shift, particularly when understood in the context of the significant socio-cultural burdens associated with the lack of reliable access to safe water—particularly the time and physical effort required for water collection, which disproportionately affects women and girls, as well as the persistence of caste and class-based inequities in access to water sources. In many regions, reliance on unsafe or distant sources also exposed communities to risk of water contamination and associated health impacts.



Or for March 2026, this image below can be used

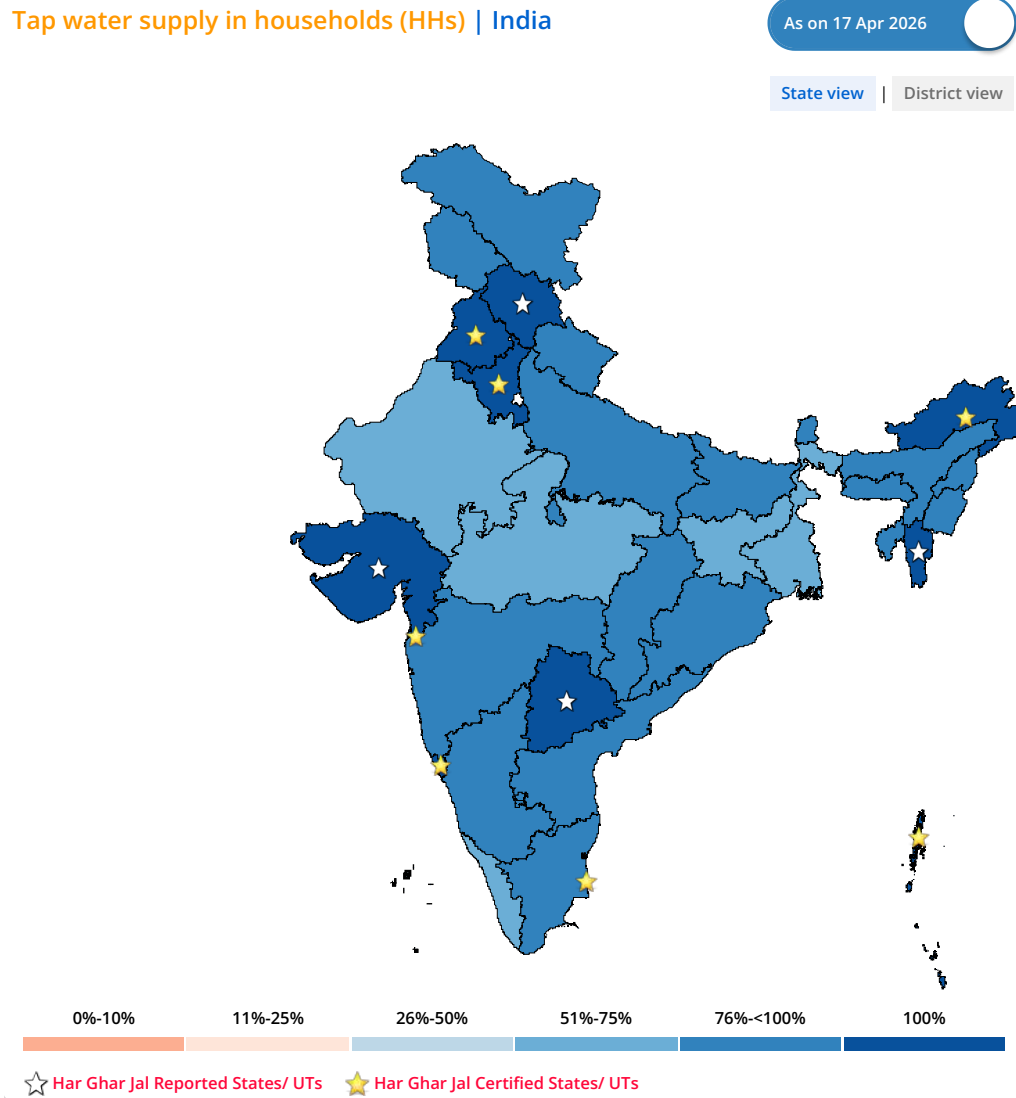


Figure 2: Tap water supply to households in India - coverage from 2019-2026

Source: <https://ejalshakti.gov.in/jjmreport/JJMIndia.aspx>

This national shift also created an important opportunity to rethink the institutional, financial, and technological systems required to sustain rural water services. During this period, Arghyam continued to engage across multiple dimensions of water security—including participatory groundwater management, water quality, and natural resource management—in diverse geographies across the country. These efforts were complemented by the emerging use of technology to strengthen capacity building and system processes at scale. Together, these engagements generated valuable insights for improving various aspects of water service delivery, including operation and maintenance. In recent years, around 2022, Arghyam made a deliberate strategic choice to bring these learnings together and focus them more directly on strengthening service delivery under the Jal Jeevan Mission.

## 1.4

# Why Operation And Maintenance Matters

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The expansion of piped water supply infrastructure under programmes such as the Jal Jeevan Mission represents a major achievement in improving access to drinking water. However, the long-term success of these investments depends on the ability of systems to function reliably over time.

Operation and maintenance (O&M), therefore, becomes a critical component of sustainable water service delivery. Ensuring that water systems continue to function requires attention to a range of factors, including the effective functioning of local institutions, the availability of trained frontline workers, sustainable financing mechanisms, strong systems for day-to-day operations, active monitoring, repair and infrastructure management.

Since the strategic pivot towards impact at scale, with technology as a key lever, Arghyam has engaged with these issues through a range of initiatives. These include -

- A three-year engagement in Muzaffarpur district, Bihar, to strengthen community-led operation and maintenance of piped water supply schemes.
- Analytical studies in Assam examined the financial and institutional realities faced by Water User Committees responsible for managing rural water systems.
- Research conducted in partnership with JustJobs Network explored the range of jobs and livelihoods associated with water management across several states.
- A study of pump operators to gain insight into the roles and working conditions of frontline workers responsible for operating rural water systems.
- A national symposium, convened in collaboration with the Indian Institute of Management Bangalore and the eGov Foundation, to reflect on the sustainability of piped water supply systems and identify emerging policy challenges.

A brief overview of these initiatives is provided in Annexure 1: Overview of Arghyam's O&M Related Initiatives.

## 1.5 Understanding O&M As A System

Across these initiatives, a common insight emerged: sustaining rural water services requires attention to multiple interconnected dimensions. Infrastructure must function reliably. Local institutions must be able to manage operations and finances. Frontline workers must have the skills and incentives to perform their roles effectively. Financing systems must support routine operations. Policy frameworks must clarify responsibilities and support service delivery.

Discussions at the national symposium organised by Arghyam and its partners highlighted the importance of addressing sustainability across four domains: institutional, operational, financial, and physical systems, collectively representing the “Four D” framework for analysis of water utilities (A.K. Biswas et al, 2020)<sup>1</sup>.

While the initiatives described in this report were not originally designed around this framework, the lessons emerging from them closely align across the four domains.

### Box 1: The 4d Framework For Sustainable Water Systems

Discussions at a national symposium on the sustainability of piped water systems highlighted four dimensions that shape sustainable water services:

- *Institutional systems*
- *Operational systems*
- *Financial systems*
- *Physical systems*

Addressing sustainability across these interconnected domains is essential for ensuring reliable rural water services.

<sup>1</sup> Biswas, A.K., Sachdeva P.K., & Tortajada C. (2020). *Phnom Penh Water Story*. Springer.





## 2. Learning And Insights On O&M

As infrastructure creation under the Jal Jeevan Mission nears completion in many states, the focus of the rural water sector is increasingly shifting towards service delivery. Ensuring that water supply systems function reliably over time requires sustained attention to operation and maintenance (O&M), informed by both prior experience and ongoing field-based experimentation and learning. This includes developing clearer operational processes, strengthening capacity building systems, and designing tools that improve visibility into processes and performance. Together, these efforts can support more responsive decision-making and greater accountability for service delivery.

Arghyam's recent work across multiple initiatives — including field engagements in Bihar, analytical studies in Assam, workforce research conducted with the JustJobs Network, a cross-state study of pump operators, and a national symposium on the sustainability of piped water systems — provides insights into the practices required to sustain rural water services.

Although these initiatives differ in their scope and context, they collectively highlight recurring themes that shape the sustainability of rural water supply systems. These themes relate to the functioning of local institutions, the role of frontline workers, the financing of operation and maintenance (O&M), the potential use of digital tools, and the policy frameworks that shape service delivery systems.

This chapter synthesises the lessons emerging from these initiatives.



## 2.1

# Theme 1: Community Institutions And Local Governance - A Non-Negotiable Foundation

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Community institutions are widely recognised as the foundation of rural water governance in India. Under programmes such as the Jal Jeevan Mission (JJM), these local committees are expected to manage the operation and maintenance of village water systems. Across states, these institutions are known by different names—for example, Village Water and Sanitation Committees (VWSCs), Water User Committees (WUCs), or Pani Samitis—and may vary in their legal status, powers, and functional roles. In many contexts, VWSCs established under earlier programmes such as the Swachh Bharat Mission have been carried forward, with JJM building on and expanding its role in managing rural water services.

These institutions typically perform several important functions. They collect user charges, maintain financial records, oversee the functioning of pumps and pipelines, respond to complaints from households, and coordinate with government departments when technical support is required. In principle, they serve as local utilities that represent community interests while managing water infrastructure.

However, the effectiveness of these institutions varies widely. In many places, while committees have been formally constituted, they are still developing the capacities required to function effectively: meetings may be irregular, roles and responsibilities may not be clearly understood, and financial management practices may still be in the process of evolving.

This gap between infrastructure creation and institutional readiness represents one of the central challenges of sustaining rural water systems.

### 2.1.1. Building Institutions Through Practice

Experiences from Arghyam's work suggest that effective community institutions rarely emerge fully formed. Instead, they evolve gradually through repeated engagement with the management of water systems.

In the Bihar engagement in Muzaffarpur district, for instance, local institutions known as Ward Implementation and Management Committees (WIMCs) were supported to strengthen their role in overseeing water supply schemes. The intervention focused not only on the technical aspects of water supply but also on building institutional processes through which communities could collectively manage their systems.

Activities such as

1. Training and inputs on role expectation,
2. Regular committee meetings with a focussed agenda (such as service continuity and tariff collection),
3. Maintaining record books, and
4. Convening community forums such as Jal Chaupals, provided spaces for interactions within the WIMC and between WIMCs and citizens, where issues related to water supply could be discussed openly.

These processes gradually enabled institutions and communities to develop greater ownership of systems and strengthened accountability between households and local institutions. They additionally helped to

1. Activate local institutions
2. Generate understanding of their roles and responsibilities
3. Socialise them within the community and,
4. Gradually stabilize them.

Participation in such processes is not a one-time activity but an ongoing practice that strengthens institutional capacity over time. Without these processes, institutions are likely to remain on paper and, over time, wither away.

## Box 2: Community-Led O&M In Bihar

A two-year engagement in Muzaffarpur district, Bihar worked with community institutions to strengthen O&M of piped water supply systems established by the Bihar government, through the Mukhya Mantri Grameen Peyjal Nishchay Yojana (MGPNY). The State-supported programme had a highly decentralised design, with schemes at the ward level (representing a level below villages, constituting a cluster of 100-150 households), with Ward Implementation and Management Committees responsible for the scheme. (For more details on the initiative, please refer to Annexure 1).



Jal Chaupal in progress to engage the community in water supply related matters

The initiative covered over 548 ward-level schemes across three blocks and engaged local institutions responsible for managing water services. At the heart of the Bihar intervention was the idea that communities are not only beneficiaries, but also stakeholders with ownership of piped water supply systems. KRSP(I), through engagements with the community, had already pioneered the concept of Jal Chaupals, a platform for community members to discuss water-related issues, share knowledge, and collectively find solutions. Through the activation of Ward Implementation and Management Committees (WIMCs), the practice of monthly Jal Chaupals facilitated by AKRSP(I) was initiated, and residents began participating actively in water supply governance. Regular platforms for dialogue reduced grievances and fostered a sense of collective responsibility. Importantly, a focused 10-day campaign model kickstarted action, demonstrating the power of structured, time-bound community mobilisation.

## 2.1.2. Institutional Capacity At Scale

A key challenge for large national programmes is how to build the capacities of thousands of local institutions across the country. Traditional training approaches often focus on procedural requirements such as record-keeping or reporting. While these are necessary, they are rarely sufficient to build the practical skills required to manage water systems in complex and constantly evolving environments.

Experiences from Bihar and other contexts suggest that continuous mentoring and support are often more effective than one-time training programmes. Local institutions benefit from opportunities to learn from experience, receive guidance when challenges arise, and gradually develop confidence in managing water systems. Scaling such institutional support systems remains an important challenge for rural water programmes.

### Box 3: Pivoting From Training To Continuous And Contextual Capacity Building

From the outset, capacity building was designed as a continuous process rather than a one-time training event, aligned with the rollout of programme activities and the evolving roles of stakeholders.

- Multiple doses, aligned to implementation**  
 Training was sequenced with programme rollout—starting with basic O&M modules and followed by sessions on digital tools and water quality, which were introduced when these components became operational.
- Blended and tech-enabled learning at scale**  
 A hybrid model combining in-person sessions with digital platforms, such as PDA and iECHO, enabled consistent training delivery at scale, supported by reusable audio-visual content.
- Peer learning and hands-on approaches**  
 Practical demonstrations and peer exchanges reinforced learning and built confidence in applying skills in real-world settings.
- Continuous field-level support**  
 Regular mentoring by Community Resource Persons (CRPs) ensured ongoing guidance, helping frontline workers use tools effectively and perform their roles.



Training Anurakshaks on the use of the Avni app for tracking tasks

## 2.1.3 Local Leadership, Social Capital And Institutional Continuity

Field experiences highlight the critical role of local leadership and social capital in the functioning and continuity of community institutions.

Given that committees such as VWSCs or WUCs are periodically reconstituted, changes in leadership are inevitable. These transitions can disrupt institutional processes unless there are mechanisms in place to retain continuity in knowledge, relationships, and practices.

A way in which this continuity is maintained is through the presence of respected community members who informally support institutional functioning. For instance, our work found that in several cases in Assam, experienced individuals—such as retired teachers, former government employees, or locally respected residents—played advisory roles during and beyond leadership transitions. Their involvement helped bridge gaps in capacity, provided guidance to newly formed committees, and reinforced community confidence in institutional processes.

Beyond transition periods, leveraging such social capital emerges as a sound and ongoing governance practice. These individuals often act as stabilising anchors within the system—supporting decision-making, resolving disputes, and enabling coordination with government functionaries. Their presence can complement formal institutional structures, especially in contexts where capacities are still evolving.



## Box 4: Leveraging Social Capital For O&M And Bookkeeping

In several water user committees across Assam (Hathimuria Galpharia, Monojuli, Khudra Sankara & Jagara Gyanpara), local institutions drew upon existing community capabilities to strengthen O&M:

- Retired professionals and experienced individuals supported record-keeping, financial management, and decision-making.
- The presence of trusted members ensured transparency and accountability, strengthening user confidence.
- Community advisors facilitated coordination with PHED and conflict resolution. During system breakdowns, the community members mobilised voluntary labour, small financial contributions, and led local problem-solving.
- Such utilisation of social capital reduced operational friction, enabled faster responses to challenges, and strengthened institutional credibility.

Community participation in water governance is also closely linked to service reliability. Where water supply is regular and predictable, households are more likely to engage in institutional processes and contribute financially. In contrast, unreliable service can weaken participation and reduce trust in local institutions.

This suggests that institutional strengthening and service reliability are mutually reinforcing processes. In the early stages of system handover, establishing a basic level of service reliability can be particularly important in building community confidence and encouraging participation. Over time, stronger institutions can in turn contribute to sustaining and improving service delivery.

## 2.1.4 Scale Of Decentralisation And Its Implications For O&M

Drawing from Arghyam's experiences of working across states suggests that the scale at which decentralisation is operationalised—whether at the ward or village level—has important implications for how rural water systems are governed and sustained.

In contexts such as Bihar, where decentralisation extends to the ward level, institutional arrangements are closer to users. This can strengthen accountability, enable quicker issue resolution, and improve tariff collection. However, it also places greater demands on local capacity and requires sustained support.

In contrast, systems managed at the village level, as seen in states such as Assam, benefit from linkages with the Gram Panchayat, greater administrative capacity and stronger links to formal governance structures. At the same time, ensuring consistent participation and accountability across habitations can be more challenging.

These differences reflect the principle of subsidiarity—that responsibilities should be assigned to the lowest appropriate level capable of performing them effectively. In practice, this requires balancing proximity and accountability with capacity and robust support systems.

From an O&M perspective, the effectiveness of decentralisation depends less on the level at which it is implemented and more on how well institutional design is aligned with local capacities and supported by appropriate technical, financial, and administrative systems.

## 2.2

### Theme 2: Frontline Workers And Human Systems

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While community institutions provide governance structures for water systems, the day-to-day functioning of rural water infrastructure depends heavily on frontline workers.

Across different states, a range of local actors perform operational tasks related to piped water supply systems. These include roles such as day-to-day operations by frontline workers (pump operators), *Jal Mitras*, *Anurakshaks* and others, as well as local technicians (plumbers and repair technicians) responsible for conducting repairs and responding to service interruptions. Arghyam's experience across states highlights the critical role that frontline workers play in sustaining rural water services.

#### 2.2.1 The Hidden Workforce Behind Rural Water Systems

In discussing rural water programmes, focus has been on expanding infrastructure and providing household tap connections. Less attention has been paid to the human systems required to keep these systems functioning. Despite their importance, the workforce responsible for operating rural water systems remains relatively invisible in policy discussions.

In practice, frontline workers perform a wide range of tasks that go beyond the daily technical operation of the water supply system. Their responsibilities often include detecting leaks, carrying out minor repairs,

coordinating with government engineers for major repairs, collecting tariffs and communicating with households about water supply schedules. In many villages, these workers act as the first point of contact when problems arise in the water system.

## Box 5: What Does A Frontline Water Worker Do?

Typical responsibilities include:

Daily tasks -

- Operating pumps in accordance with the electricity supply
- Managing valves
- Confirming with households if they've received water
- Cleaning of the premises

Periodic tasks -

- Chlorination and tank cleaning
- Repairing leakages and other minor work
- Monitoring repair work

Community tasks -

- Responding to complaints
- Reporting breakdowns to the VWSC or the department
- Collect or support tariff collection



Jal Mitra of Changmai Sasonial PWSS in Shivsagar, Assam doing a check before starting the water supply

## 2.2.2 Variation In Roles And Working Conditions

A cross-state study of pump operators conducted as part of Arghyam's research revealed significant variation across states in how the roles and responsibilities of frontline works are structured. In some states, pump operators are appointed through formal government processes. In others, they may be selected informally by local institutions or contractors. In yet others, the land donor for the infrastructure is the default pump operator.

Typically, the day for the frontline worker (known by different names, such as *Jal Mitra*, *Anurakshak*, pump operator, in different states) begins early in the morning around 6 a.m. and could continue until noon, depending on electricity availability. In many places, water is supplied twice a day, which requires them to be on the job in the evenings as well, although not for long hours. There is also variation in tasks from state to state, for instance, in Bihar, they do not have the responsibility of chlorination in the PRD wards, while in Assam, they do.

Remuneration levels also vary widely, with honorariums differing significantly across states, ranging from Rs. 2,000 in Bihar to Rs. 15,000 in Karnataka. Depending on state policy, in some states, if the pump operator is collecting tariffs, their honorariums can be topped up with a portion (10–50%) of the tariff collected. Payment sources include government programme funds, local government budgets, or community tariffs.

These variations suggest that the rural water workforce is still evolving, with different states experimenting with different institutional arrangements.



## Box 6: What Strengthens Frontline Performance In Practice

Field experiences suggest that certain practices can significantly strengthen the effectiveness of frontline workers (FLWs) in managing rural water systems:

- **Early engagement during construction**  
In contexts such as Assam, involving Jal Mitras during the construction phase helps build familiarity with system components and strengthens technical skills. This enables them to undertake minor repairs independently, reducing downtime and maintenance costs.
- **Embedding FLWs within local governance structures**  
Evidence from Bihar indicates that when frontline workers are also part of local governance (for instance, Ward Members acting as Anurakshaks), it can strengthen accountability and improve scheme functionality.
- **Encouraging inclusive participation**  
The presence of women frontline workers, such as Female Anurakshaks, has been associated with improved system functionality, highlighting the value of more inclusive workforce models.

Beyond these structural factors, despite challenging working conditions, many frontline workers demonstrate a strong sense of ownership and pride in their role, often viewing their work as a service to the community. Recognising and supporting this intrinsic motivation can play an important role in sustaining system performance.

### 2.2.3 From Volunteerism To Sustainable Livelihoods

Various studies, discussions and observations have highlighted an emerging issue: the expectation that community members will contribute voluntary labour to sustain water systems. While community participation is an important component of decentralised governance, many operational tasks required to maintain water infrastructure are regular, technically demanding, and time-intensive.

As rural economies evolve and livelihood opportunities change, relying primarily on voluntary labour may become increasingly difficult. Recognising water management as a form of skilled local work—and ensuring fair compensation for those who spend long hours performing it—is therefore important for sustaining water services over the long term.

#### Box 7: Strengthening The Water Workforce As A Livelihood Opportunity

Insights from studies by the Just Jobs Network on water-related livelihoods suggest that rural water management involves a wide range of tasks—system operation, minor repairs, water quality testing, record-keeping, tariff collection, and community coordination. These functions are often carried out by a mix of formal and informal workers, with significant variation across states in roles, time commitment, and remuneration.

Strengthening this workforce presents an opportunity to move from fragmented and often voluntary arrangements towards more stable and structured livelihood pathways. Clearly defined roles, appropriate remuneration, and regular capacity building can not only improve working conditions for frontline workers but also enhance accountability and service reliability.

As rural water systems expand under programmes such as the Jal Jeevan Mission, investing in the water workforce can create meaningful local employment opportunities, while ensuring that systems are operated and maintained effectively over time.

### 2.2.4 Dedicated Support Systems For Frontline Workers

Experiences from different state contexts suggest that frontline workers responsible for operating rural water systems benefit from having a clear and accessible point of contact within the institutional system when they encounter operational issues.

In many cases, pump operators or similar workers are the first to detect problems such as pump failures, electrical issues, leakages, or irregularities in water supply. However, without a clearly defined support mechanism, these workers may struggle to identify whom to approach for technical guidance or escalation.

Field engagements indicate that when such support systems exist, they significantly improve the

functioning of water systems. For instance, in Bihar, *Anurakshaks* responsible for operating water supply schemes, were able to reach out to Community Resource Persons (CRPs) associated with the implementing organisation, who served as the first point of support in troubleshooting operational challenges. Similarly, in Assam, *Jal Mitras* often relied on the section officer from the Public Health Engineering Department as their primary point of contact for reporting technical problems and seeking guidance.

These experiences highlight the importance of establishing formal institutional support- structures for frontline workers within government systems, rather than relying solely on project-based arrangements. Such structures could include clearly designated technical supervisors at the block or sub-division level, helplines linked to departmental offices, or structured reporting and escalation mechanisms integrated into monitoring systems.

Having a reliable point of contact serves several important functions. It provides frontline workers with the confidence that operational challenges will be addressed. It also reduces a sense of isolation that many operators experience while managing systems in remote locations. Additionally, it enables faster troubleshooting and escalation of technical issues, which can significantly reduce downtime of water supply systems. Over time, such arrangements contribute to building stronger feedback loops between frontline workers and the engineering and administrative systems responsible for maintaining rural water infrastructure.

Strengthening these support mechanisms can therefore play an important role in improving the reliability of rural water services and in recognising frontline workers as an integral part of the service delivery system.

## 2.3

### Theme 3: Financing Operation And Maintenance

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Reliable financing is essential for sustaining rural water systems. Routine operational expenses--such as electricity, operator honorariums, and minor repairs--must be covered regularly to ensure uninterrupted service delivery, which in turn has a direct bearing on households' willingness to pay tariffs for the water supply service.

Many rural water programmes envision a shared financing model in which communities contribute through user charges while governments support capital investments and major repairs. However, translating this model into practice remains challenging.

Multiple states are working to develop a clearer understanding of the financial requirements for sustaining rural water supply systems. As part of strengthening community ownership, policies increasingly envisage contributions through user tariffs. However, planning based on such assumptions requires a more grounded understanding of what is financially viable in practice. This calls for a systematic study of existing functional schemes that have been operating with some degree of financial independence— examining how tariffs have been set and collected, what institutional practices have enabled sustained contributions, and the time taken for such systems to stabilise. Insights from the Assam financial study

represent an initial step in this direction, highlighting the need for evidence-based approaches to designing sustainable financing models.

### 2.3.1 Institutional Maturity And Financial Sustainability

A key insight from the Assam study is the relationship between institutional maturity and financial and scheme performance.

The analysis reveals a stark dichotomy between new and retrofitted schemes, a journey from financial vulnerability to institutional maturity. Retrofitted schemes, with institutions operational for over five years, demonstrate robust financial management, formalised expenditure structures, and tariff collection rates that often exceed their O&M expenditures. In contrast, new schemes are characterised by a reactive approach to repairs, minimal administrative capacity, and heavy reliance on state funds, with tariff recovery covering less than half their expenditures.

Retrofitted schemes demonstrated financial institutionalisation. They incurred significantly higher total expenditure, but with a balanced spread across repair and maintenance (52%), administrative (19%), and additional HR costs (29%). Crucially, their tariff collections covered all their expenditures, generating a surplus and enabling savings.

New schemes, on the other hand, exhibited financial vulnerability, spending 94% of their limited funds on reactive repair and maintenance (R&M) expenditures. They operated with minimal administrative expenditure (5.7%) and negligible human resource overheads, indicating a lack of formalised governance. Their average recovery of tariff against expected tariff was found to be only 16%.

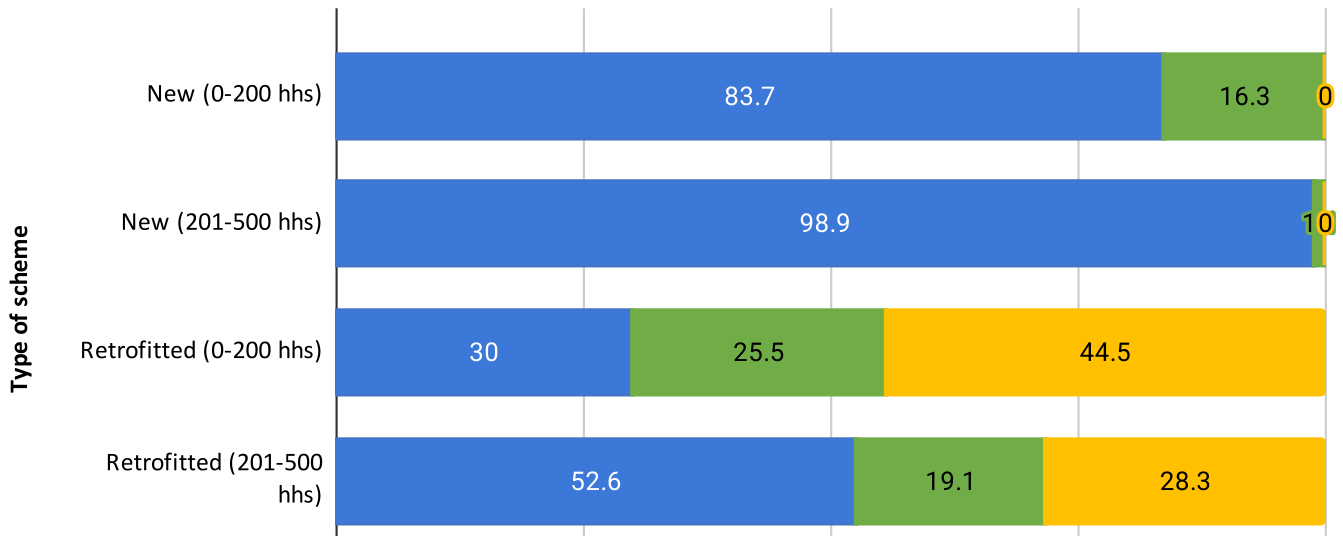


Figure 3: Share of expenditure on Repair and Maintenance (R&M), administrative costs and additional HR across scheme types

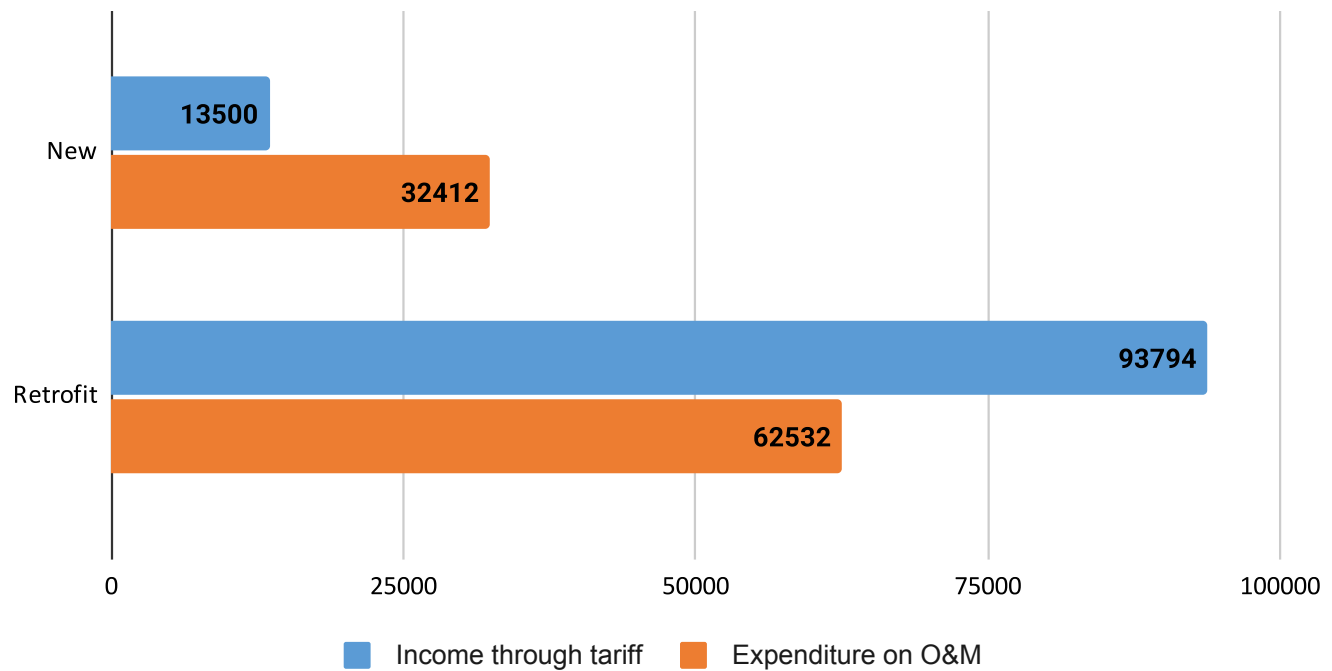


Figure 4: Average tariff income and expenditure on O&M (in INR)

## Box 8: Key Enablers Of Sustainability In Mature Wucs

- Dedicated revenue collection**  
 Institutionalising the role of a paid bill-collector significantly improves tariff compliance as observed in retrofitted schemes.
- Local resourcefulness**  
 Skills development among members and stockpiling spare parts reduce repair costs and downtime.
- Social capital and regulation**  
 Leveraging community relationships, particularly village elders as advisors, for voluntary work and enforcing local norms (e.g., punitive measures for non-payment), fosters accountability.
- Proactive community engagement**  
 Door-to-door campaigns increase household adoption of PWSS and build a broader revenue base.



Discussions with members of the WUC of Hathimuria Galpharia PWSS in Shivsagar, Assam

## 2.3.2 Financial Realities Of Community-Managed Systems

Evidence from field engagements suggests that while community tariffs can support routine operation and maintenance (O&M) expenses—such as minor repairs, basic upkeep and possibly some additional HR functions (e.g. paid bill collector)—they are often insufficient to cover major cost components. Particularly, electricity costs and high-value repairs tend to exceed what can be sustainably financed through user contributions alone.

Insights from the Assam financial study indicate that energy costs form a significant and recurring expenditure for many schemes, with variation depending on system design and usage patterns. As a result, most systems operate within a hybrid financing reality, where communities contribute towards day-to-day expenses, while government support remains critical for sustaining higher recurring and unpredictable costs.

But there is an emerging opportunity towards gradually increase the financial responsibility of communities, including exploring the transfer of electricity costs. While this can act as a trigger for improved tariff collection (as experienced in Bihar) and more prudent water use, it also has broader implications. Greater cost visibility at the user level can encourage more efficient consumption of treated water and, in water-secure areas, promote conjunctive use of local sources alongside piped supply.

These trends suggest the need for carefully designed blended financing models that balance local contexts and community ownership with affordability and system sustainability. Calibrating the extent and pace of cost-sharing, while ensuring service reliability, is thus critical to the long-term viability of community-managed systems.

## 2.3.3 From Stating Tariffs To Shaping Willingness To Pay

Experiences across states suggest that the sustainability of financial models for rural water systems depends not only on the level at which tariffs are set, but also on how they are communicated and understood by communities.

In some contexts, tariff provisions in policy are accompanied by clear and consistent messaging that frames user contributions in relation to the value of the service provided. For instance, in Bihar, the monthly tariff of Rs. 30 per household has been consistently communicated as being equivalent to approximately one rupee per day for access to reliable, safe, and adequate water. This framing helps translate an abstract policy provision into a relatable and tangible proposition for households, thereby strengthening their willingness to pay.

In contrast, where tariff provisions remain indicative or weakly communicated, without a clear articulation of the value of service, uptake and regular payment may remain limited. In such cases, tariff policy risks being perceived as a nominal or optional contribution, rather than a necessary component of sustaining the system.

In contrast, where tariff provisions remain indicative or weakly communicated, without a clear articulation of the value of service, uptake and regular payment may remain limited. In such cases, tariff policy risks being perceived as a nominal or optional contribution, rather than a necessary component of sustaining the system.

At the same time, it is important to recognise that state contexts differ in terms of the maturity of systems and the stage at which communities are engaged on questions of cost recovery. For example, in states where piped water systems have been recently handed over to communities, discussions around tariffs and cost-sharing may still be evolving. In such contexts, willingness to pay is likely to build gradually as service reliability improves and institutional arrangements stabilise.

These experiences suggest that tariff setting must be accompanied by deliberate expectation setting, where communities are engaged not only in how much they are expected to pay, but also in why such contributions are necessary and how they relate to the quality and reliability of service. Framing tariffs as a contribution towards sustaining a valued service—rather than as a standalone policy directive—can play an important role in strengthening financial sustainability.

## 2.4

### Theme 4: Technology And Data Systems

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Field experiences suggest that the use of digital tools can strengthen transparency and monitoring of rural water systems. However, their effectiveness depends on several factors, including digital literacy, access to devices, and connectivity.

Importantly, technology cannot replace well-functioning institutions. Digital systems work best when they support existing governance processes rather than attempting to substitute them.

Arghyam's work in Bihar experimented with the use of digital tools to support operation and maintenance activities at the scheme level. Applications, such as mGramseva and Avni, were used to record financial transactions, track operational tasks, and monitor system performance. In Assam, the effort has been towards monitoring daily supply through bulk flow metre readings, while setting up citizen satisfaction surveys. The two can, in turn corroborate to give a realistic, actionable picture of the quality of water supply service.

#### 2.4.1 Digital Tools Need To Be Intuitive And Need Handholding For Sustained Adoption

In Bihar, the deployment of AVNI and mGramSeva, open-source digital tools used for O&M task tracking and tariff collection, and expenses incurred for O&M, respectively, showed that simple digital systems, when paired with sustained handholding, can improve oversight of scheme functionality, transparency, and trust. Households were comfortable receiving bills via SMS, happy to respond to the SMS and pay bills on their own (instead of through the FLW going to their door to collect it) and happy to get e-receipts via SMS. Some households even asked for online payment options.

Both the digital tools were simple, offline-compatible, and embedded into the daily routines of frontline workers, i.e. Anurakshaks. Therefore, pitching their utility to Anurakshaks was not challenging. Once the tool had been set up, Anurakshaks were trained and WhatsApp groups at various levels--all the way from the ground (Anurakshak) level to the support team of the tool developers-- were established where queries could be raised, bugs reported, and if required, escalated. This enabled rapid resolution of problems as they were encountered.

These tools also enabled frontline workers and community institutions to maintain digital records of activities and provided programme teams with dashboards to monitor the status of water systems.



Vinod Sahni, Anurakshak, Ward 08, Pirapur Gram Panchayat, using the Avni app for tasks

In the pilot study conducted, adoption of digital tools was found to be uneven (close to 90%), constrained by digital literacy gaps, device access, perception of duplication between paper and digital records, amongst other reasons. Lack of a clear mandate from the government on the use of digital tools was found to be the primary barrier to the adoption of these tools. However, this challenge can be overcome if the government mandates the use of these tools and invests in the necessary handholding required for their adoption.

Another important aspect to the effective adoption of digital tools is a robust backend set-up, which requires the availability of basic data such as household registry, phone numbers of consumers, mapping to the correct schemes, etc. This data is either not available or fragmented across different agencies and needs integration. Clean, ground-truthed data is often missing and requires time and effort to create for the initial setup of the tool. Data collection is a one-time exercise, with scope for updation, and can be used across disparate digital tools, which makes it well worth the effort for governments to invest in.

## Box 9: Digital Bills And Receipts - Means To Building Trust

In the Bihar engagement, the digital tool, mGramSeva, enabled Anurakshaks to issue digital monthly water tariff bills and digital receipts when households paid water tariffs. Although this was a small technological feature, Anurakshaks felt that the tools reduced paperwork and generated trust among households by creating transparent records of payments.



*Sonu Kumar works as an Anurakshak for the piped water supply scheme of Ward 08 of Bishanpurbakhri Gram Panchayat. While he engages in agricultural activities and works as an electrician, as Anurakshak he has been actively involved in creating awareness within the community on water issues and diligently carries out his roles and responsibilities towards ensuring regular water supply in his ward. He says, "Before I go to collect the tariff, I generate the monthly bill on mGramSeva. An SMS gets sent to all households. Some people come to my house and pay the bill once they receive the SMS, I don't even have to go to their place."*

*Avinash Kumar is an energetic and highly motivated resident of Ward 12 of Majhauriya Gram Panchayat. For his livelihood, he engages in farming and has also worked in LPG refilling stations. As a social activist, Avinash is passionate about women's empowerment, childcare and education. He has been working as an Anurakshak of the piped water scheme since 2017 and has been instrumental in ensuring optimal functioning of the scheme. He says, "I don't have to carry the tariff collection registers anymore when I go for tariff collection. I simply carry my mobile phone, which is so much more convenient. It is also a matter of pride to use a smart phone and technology to do my work."*



*Sumintra Devi, consumer from Ward 08 of Pirapur Gram Panchayat displays the SMS receipt for payment of the water tariff*

## 2.4.2 Weak Integration Across Institutional Data Systems

An important observation from both implementation work in Bihar and analytical studies in Assam is the limited interoperability between data systems maintained by different stakeholders, such as PHED, Panchayati Raj Departments, and local committees. Critical datasets—including JJM's Integrated Management Information System (IMIS), 15th Finance Commission reports, departmental estimates for repairs, and local ledger records maintained by community institutions—often operate in isolation.

This fragmentation results in partial visibility into system performance, particularly in relation to O&M expenditure, scheme functionality, and financial sustainability. In the absence of integrated data flows, decision-making tends to remain segmented across departments, making it difficult to track resource use, identify emerging issues, or plan interventions in a coordinated manner.

The lack of data integration also reflects broader challenges of institutional convergence. Strengthening both vertical and horizontal data integration—such as linking scheme-level expenditure data with departmental MIS platforms—can enable more evidence-based planning, timely decision-making, and improved accountability. From a systems perspective, this points to the need for interoperable digital infrastructure that not only aggregates data but also supports coordination across actors involved in rural water service delivery.

## 2.4.3 Leveraging Digital Technologies: From Deployment To Effective Use

In several states, digital monitoring technologies such as SCADA systems and IoT-based devices are being deployed to improve the management of rural water supply schemes. These technologies have the potential to provide timely information on system performance—such as pump operations, water levels, and energy use—thereby enabling faster fault detection and more efficient system management.

However, early observations suggest that the potential of these technologies often remains underutilised. While infrastructure for digital monitoring is in place, the supporting systems required to make effective use of the data are not always fully developed. This includes gaps in clearly defined monitoring protocols, limited capacity for data interpretation, and weak integration of data into routine operational decision-making.

A common challenge across both SCADA and IoT deployments is the fragmentation of data systems, particularly where multiple vendors are involved. Differences in platforms and data formats make it difficult to aggregate information and generate a comprehensive view of system performance across administrative levels. In addition, practical constraints—such as network reliability, device maintenance, and environmental conditions—can affect the consistency and quality of data generated.

These challenges indicate that the effectiveness of digital technologies depends not only on their deployment, but on the ecosystem in which they operate. Without adequate attention to integration, standardisation, maintenance, and user capacity, even well-designed systems may not translate into improved outcomes.

More broadly, repeated instances of underutilisation of high-end monitoring technologies can lead to growing scepticism among stakeholders, where technology risks being perceived as a compliance requirement rather than a tool for improving service delivery. In some cases, this may result in data that

does not fully reflect field realities, further weakening trust in digital systems.

These insights suggest that the value of digital technologies lies in their ability to support decision-making, strengthen accountability, and improve service reliability. Achieving this requires moving beyond deployment to embedding these tools within institutional processes, operational workflows, and user practices.

#### 2.4.4 Consumer Satisfaction (Csat): Bringing Citizen Voice Into O&M Systems

As rural water infrastructure expands, understanding whether services are functioning reliably from the user's perspective becomes critical. While supply-side systems track parameters such as pump operations or water flow, they do not capture how households experience water delivery in terms of regularity, adequacy, and quality.

In Assam, the Citizen Satisfaction (CSAT) pilot sought to address this gap by systematically capturing citizen feedback at scale. Designed for rural contexts with limited smartphone access, the initiative used IVR calls to reach households directly and collect responses on key service parameters such as regularity, timing, quantity, quality, and overall satisfaction. This approach enabled households to share their experiences in a simple and accessible manner, without requiring digital literacy.

By generating structured, demand-side data, CSAT complements existing monitoring systems and creates a feedback loop between citizens and service providers. From an O&M perspective, such insights can help identify gaps that may not be visible through technical systems alone, timely and more responsive service delivery, strengthening accountability and over a course of time establish a seamless process to improve citizen satisfaction with services.

#### 2.4.5 Bulk Flow Monitoring (Bfm): Strengthening Supply-Side Visibility And Accountability

Bulk Flow Monitoring (BFM) systems aim to improve visibility into the performance of water supply systems by tracking the quantity of water supplied at key points in the network. By measuring water flows at source and distribution levels, BFM provides an objective view of system operations and helps monitor whether intended service levels are being met.

In practice, BFM can support frontline workers and system managers by enabling better tracking of supply patterns, identifying potential losses, and supporting more informed decision-making. When integrated into O&M processes, such data can help improve operational efficiency and provide a basis for performance monitoring.



Bulk Flow Meters to track the volume of daily water supply

Importantly, the value of BFM is enhanced when it is viewed alongside citizen-reported data such as CSAT. While BFM reflects what the system is supplying, CSAT captures what households are actually receiving and experiencing. Together, these approaches can provide a more complete picture of service delivery, enabling triangulation between system performance and user experience.

## 2.5

# Theme 5: Policy And System Design For Sustaining Rural Water Supply Services

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The sustainability of rural water supply systems depends not only on local institutions and technical infrastructure but also on the broader policy and administrative systems that support service delivery. Experiences from different states suggest that the design of policy frameworks plays a critical role in shaping how operation and maintenance responsibilities are distributed, supported, and monitored.

### 2.5.1 Support Systems For Institutional Development

One of the central principles of programmes such as the Jal Jeevan Mission is the decentralisation of service delivery responsibilities to village-level institutions such as Village Water and Sanitation Committees (VWSCs) or Water User Committees (WUCs). While this approach recognises the importance of community participation in managing water systems, the effectiveness of decentralised management depends heavily on the support systems provided by higher levels of government.

Field experiences and discussions at the national symposium on sustainability of piped water supply systems highlighted that the transition from government-managed infrastructure to community-managed service delivery is rarely a straightforward process. Programme guidelines often treat scheme handover as a discrete administrative event, where responsibility for operation and maintenance shifts from government departments to village institutions once infrastructure construction is completed. In practice, however, this transition is better understood as a gradual process of institutional development, during which village institutions require sustained technical and administrative support.

This insight suggests that policy frameworks should move beyond viewing community management as a simple transfer of responsibility. Instead, they should recognise the need for long-term support structures, including technical backstopping, capacity building, and institutional mentoring.

### 2.5.2 Role Clarity Across Different Actors In The System

Another important policy consideration relates to the clarity of roles across different actors in the system. Rural water service delivery involves multiple institutions—village committees, frontline workers, engineers, and government departments operating at block, district, and state levels. When responsibilities across these actors are not clearly defined, operational challenges can persist unresolved. For example, frontline workers responsible for operating systems may lack clear escalation pathways for addressing technical failures, leading to delays in resolving operational issues.

State-level institutional arrangements therefore play a crucial role in determining the reliability of water services. Experiences from states such as Assam indicate that when clear administrative linkages exist—for instance between frontline workers and designated technical officers within the Public Health Engineering Department—operational challenges can be addressed more efficiently. Strengthening such institutional linkages can help create more responsive support systems for managing rural water infrastructure.

### 2.5.3 Convergence Across Departments: Ensuring Continuity Of Responsibility And Service

Sustaining rural water services requires effective coordination across multiple government departments involved in infrastructure creation and long-term management. Typically, engineering departments are responsible for building systems, while operation and maintenance (O&M) is expected to be managed by Panchayati Raj Institutions, with financial resources routed through Gram Panchayats.

While this division of roles is clear in policy, ensuring seamless convergence in practice remains a challenge. The transition from infrastructure construction to service delivery is not just an administrative handover, but a process that requires alignment of institutional roles, operational models, and accountability structures.

Experiences from Bihar illustrate how differences in departmental approaches and shifts in institutional responsibility can create uncertainty on the ground. At one stage, the responsibility for all schemes, including those implemented under the Panchayati Raj Department (PRD), was proposed to be transferred to the Public Health Engineering Department (PHED). Given the differing operational models, community-managed systems under PRD and contractor-driven models under PHED, this transition led to a period of ambiguity for local institutions and frontline workers. Tensions emerged around roles and responsibilities, continuity of honorariums, tariff collection practices, and points of contact for operational issues.

At the same time, the receiving department sought to undertake assessments before assuming responsibility, further extending the transition period. It took significant time for roles, processes, and fund flows to be clarified and stabilised.

These experiences highlight that convergence is not only about transferring responsibilities, but also about harmonising institutional design choices—including the role of community institutions, workforce arrangements, and accountability relationships. Strengthening convergence mechanisms through better planning, clearer transition protocols, and alignment across departments will be critical to ensuring continuity and reliability in service delivery.



## Box 10: What Breaks During Departmental Handover?

The transition from infrastructure creation to operation and maintenance is often treated as an administrative step. In practice, several critical elements can weaken or get disrupted during this shift:

- **Accountability chains become unclear**  
Frontline workers may be accountable to contractors or public work departments rather than to local institutions.
- **Community institutions lose relevance**  
Committees such as VWSCs may become inactive if not meaningfully integrated into operational models.
- **Incentives and remuneration vary**  
Differences in compensation structures across similar roles in different operational models can affect motivation, expectations, and performance.
- **Knowledge and capacity gaps emerge**  
Local institutions may not be adequately prepared to take on new responsibilities at the time of handover.

These challenges highlight that effective handover is not a one-time event, but a process of aligning institutions, roles, and systems to ensure continuity of service delivery.

### 2.5.4 Addressing Financial Realities

Policy frameworks must address the financial realities of sustaining water systems. While community contributions through user tariffs are important for building ownership and supporting routine maintenance, expecting communities to bear the full cost of system management from the outset is not realistic. State policies that recognise the need for hybrid financing models—combining community contributions with public funding—are therefore critical, particularly in the early stages of system operation.

At the same time, financial sustainability can be considered as a progressive process, where community contributions increase to desired levels over time as institutions mature, service reliability stabilises, and trust in the system is built. Achieving this requires sustained efforts to strengthen local capacities, institutionalise tariff collection practices, and build user awareness around the value of reliable water services.

In this context, investments in information, education, and communication (IEC) play an important role. Allocating resources towards communication activities can support behaviour change, strengthen community ownership, and nudge households towards higher and more consistent tariff contributions. Such measures can help bridge the gap between initial dependence on public funding and the gradual strengthening of community-led financial sustainability.

## 2.5.5 Role Of Data And Technology

Policy design must recognise the growing role of data and technology in water system management. Monitoring platforms, digital reporting systems, and remote sensing technologies can improve transparency and enable more responsive system management. However, their effectiveness depends on how well they are integrated into institutional workflows and supported by trained personnel to ensure that the information generated is used in operational decision-making.

At present, many digital systems are designed primarily for upward reporting and aggregation of data. This supports oversight, but sustaining rural water services requires going beyond reporting to enabling action at multiple levels of the system. Frontline workers, local institutions such as VWSCs, and supervisory staff (from public departments) each play distinct roles in O&M, and require access to relevant, actionable information.

This calls for a shift in design approach, from systems that focus on data collection for higher-level visibility, to those that embed workflows, clarify responsibilities, and support decentralised decision-making. For instance, digital tools can help frontline workers track tasks and respond to issues, enable local committees to manage finances and monitor service delivery, and support supervisory staff in resolving operational challenges.

Designing for such decentralised functioning requires attention to role-based access, usability, and alignment with existing institutional processes. When designed in this way, data systems can move beyond reporting to become enablers of accountability, responsiveness, and reliable service delivery.

Taken together, these insights suggest that sustaining rural water services requires policy frameworks that move beyond infrastructure creation to focus on long-term service delivery systems. This includes strengthening institutional support structures, clarifying roles across actors, designing realistic financial models, and embedding technology within operational processes.

## 2.5.6 Emerging Policy Landscape For Sustaining Rural Water Services

The policy landscape for operation and maintenance (O&M) of rural water supply systems in India is evolving rapidly, reflecting a broader transition from infrastructure creation to long-term service delivery.

Across states, there has been a clear movement towards formalising O&M through dedicated policy frameworks. A review of eight state O&M policies (sourced from the Jal Jeevan Mission website) indicates growing recognition of key elements such as institutional roles for Gram Panchayats and Village Water and Sanitation Committees (VWSCs), tariff setting and cost recovery, provisions for repairs, and the need for capacity building at the local level. At the same time, the level of specificity and operational clarity varies considerably across states.

Some state policies—such as those of Karnataka and Gujarat—provide relatively greater clarity in distinguishing operational arrangements for single village schemes (SVS) and multi-village schemes (MVS), including delineation of responsibilities across tiers of institutions. In certain cases, policies also explicitly define roles for preventive maintenance, minor repairs, and escalation mechanisms for major repairs, helping reduce ambiguity in day-to-day operations. Under the institutional dimension, a few states go further in specifying the composition, tenure, and accountability of local committees, while

others remain more indicative in nature. Similarly, financial provisions range from broadly stated principles of cost recovery to more structured approaches that outline tariff norms, use of grants, and responsibilities for covering high-cost components such as electricity and capital maintenance. In some instances, policies also begin to acknowledge source sustainability and water security as integral to O&M, though the extent of integration with operational planning varies.

Overall, while there is convergence on the importance of key O&M components, state policies differ in the degree to which they translate intent into actionable guidance. These variations highlight the ongoing transition from policy articulation to operationalisation, and the need for greater clarity in linking roles, resources, and accountability across levels.

At the national level, the Government of India has introduced a detailed framework to guide states in developing or strengthening their O&M policies. Structured across a comprehensive set of 19 components, the framework moves beyond broad principles to outline expectations across institutional architecture, service delivery models, financial sustainability, water quality, source sustainability, asset and inventory management, and performance monitoring. It places particular emphasis on a utility-based approach to O&M—clearly distinguishing roles between local “micro-utilities” such as VWSCs and higher-level entities responsible for bulk infrastructure—while also introducing elements such as lifecycle asset management, non-revenue water reduction, grievance redressal mechanisms, and technology-enabled monitoring systems .

Given that several state policies predate these guidelines, there are likely to be gaps in alignment, particularly in areas requiring greater operational specificity and system-level integration. While many state policies address core elements such as institutional roles and user charges, fewer provide comparable clarity on asset lifecycle planning, performance monitoring systems, or structured approaches to reducing water losses—areas that are more explicitly articulated in the national framework. Going forward, the linkage of these parameters with funding flows may serve as an important lever for strengthening and harmonising state-level frameworks.

Complementing these policy directions, the Government of India has also developed a detailed operational manual for community-managed rural water supply systems, grounded in the principle of Jan Bhagidari. This manual translates policy intent into actionable guidance for Gram Panchayats, VWSCs, and community-based organisations, covering day-to-day operations, financial management, water quality monitoring, and community engagement . It reinforces the shift towards community-led management, while also recognising the continued role of government systems in providing technical and institutional support.

Taken together, these developments point to an emerging ecosystem for sustainable O&M—one that combines state policy frameworks, national guidance, and operational tools for local institutions. The effectiveness of this ecosystem will depend on how well these elements come together in practice. Aligning state policies with evolving national frameworks, strengthening institutional capacities at the frontline, and ensuring adequate and predictable financing will be critical to translating policy intent into reliable service delivery.

This evolving policy environment creates both an opportunity and a responsibility: to move beyond fragmented approaches towards a more coherent system where roles, resources, and accountability are clearly defined, and where communities are supported to sustain the water services they increasingly own.

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# 3. Synthesis And Way Forward

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This chapter synthesises the key lessons from the thematic discussions presented in the previous chapter and outlines possible directions for strengthening the sustainability of rural water supply systems.

## 3.1 Sustaining Water Services Requires A Systems Approach

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A key insight emerging from the various engagements described in this report is that operation and maintenance is not a single activity but a system of interdependent functions.

Ensuring that water flows reliably to households requires:

- Institutions capable of managing and governing systems
- Frontline workers who operate and maintain infrastructure
- Financial systems that support recurring expenses and repairs
- Technology systems that provide information for decision-making
- Policy frameworks that clarify roles and responsibilities.

Weakness in any one of these areas can affect the overall functioning of water systems. For example, well-designed infrastructure may fail to deliver reliable service if institutional arrangements for managing the system are weak. Similarly, even strong institutions may struggle if adequate financial resources or technical support systems are not available.

The thematic analysis in the previous chapter suggests that sustainable O&M emerges from the alignment of these multiple systems, rather than from improvements in any single dimension.

## 3.2 Community Institutions Are Central - But Require Sustained Support

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The Jal Jeevan Mission places village-level institutions—particularly Village Water and Sanitation Committees (VWSCs) and similar community bodies—at the centre of rural water service delivery.

Experiences from Arghyam’s work in Bihar and insights from other sector engagements suggest that community institutions can play an important role in managing local water systems. These institutions are often responsible for activities such as collecting tariffs, supervising system operation, resolving local disputes, and ensuring community participation in decision-making.

However, strengthening these institutions requires sustained effort. Institutional capacity does not develop automatically with the creation of committees. It evolves over time through repeated engagement, learning, and practice.

Two structural challenges often affect the functioning of local institutions.

First, institutional turnover is common. Changes in membership due to elections, migration, or shifting local dynamics can disrupt continuity in institutional functioning. This highlights the need for recurring capacity building mechanisms rather than one-time training programmes.

Second, the transition of responsibility from government departments to community institutions is rarely instantaneous. While programme guidelines often treat scheme handover as a discrete administrative event, in practice, local institutions require time to develop operational confidence and systems for managing water supply.

Recognising institutional strengthening as a continuous process rather than a one-time activity is therefore essential for sustaining water services.

## 3.3 Building A Supported Water Workforce - A Key To Reliable Service Delivery

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Behind every functioning water supply system is a group of individuals responsible for operating pumps, monitoring infrastructure, collecting tariffs, and responding to operational challenges.

Studies on water-related livelihoods and observations from field engagements suggest that this workforce—often comprising pump operators, technicians, or community-level workers—plays a critical role in sustaining water services.

Despite this central role, the institutional recognition of these workers varies widely across states. In some cases, frontline workers operate systems on a voluntary basis or receive irregular compensation.

In others, roles and responsibilities remain poorly defined.

This variability raises important questions about the long-term sustainability of relying on informal or semi-formal arrangements for operating essential infrastructure.

Strengthening rural water services may therefore require greater attention to the professionalisation and support of the water workforce, including – clearer role definitions, regular training, working conditions (hours on the job, protective gear) tools for repairs and digital tools for monitoring and record keeping, and more predictable remuneration systems.

## 3.4 Financing O&M Requires Realistic And Hybrid Approaches

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The sustainability of water supply systems also depends on the availability of financial resources for routine operation and maintenance.

Field observations suggest that while communities may be willing to contribute to water services through tariffs, expecting community contributions alone to cover the full costs of operation and maintenance may not always be realistic.

Evidence from financial analyses of village-level systems indicates that while community tariffs can cover certain routine expenses, other costs—such as major repairs, energy expenditures, or infrastructure replacement—may require continued public investment.

This suggests that sustainable O&M systems are likely to require hybrid financing arrangements, combining community contributions and government support with adequate attention and investments on community engagement and communication in the early stages of O&M for community contributions to be able to reach the required levels.

Designing such models requires a realistic understanding of the financial capacities of rural households as well as the cost structures of water systems.

## 3.5 Technology Can Strengthen Systems—But When Embedded In Institutions

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Technological tools have the potential to improve the monitoring and management of water supply systems. Digital platforms, sensors, and monitoring systems can help generate real-time information on system performance and support faster response to operational issues.

However, experiences from the sector suggest that technology investments alone do not

automatically translate into improved service delivery.

For example, digital monitoring systems such as SCADA, which are used in several multi-village schemes, have the potential to provide detailed operational data on system functioning. Yet in many cases, the information generated by such systems remains underutilised due to the absence of processes for analysing data and integrating it into routine operational decision-making.

These experiences highlight an important lesson: technology must be embedded within institutional processes and human systems to be effective.

Without trained personnel, clear response protocols, and integration into decision-making workflows, technological infrastructure risks becoming underutilised.

## 3.6 Policy And System Design Must Support Long-Term Service Delivery

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At the policy level, sustaining rural water services requires clarity in the distribution of roles and responsibilities across different actors.

Village institutions, frontline workers, local governments, and state departments all play important roles in managing water systems. Ensuring that these roles are clearly defined—and supported through appropriate technical and administrative systems—is critical for effective service delivery.

In addition, sustaining water services requires systems for technical backstopping, monitoring, and support. Village-level institutions may not always have the capacity to address complex technical challenges independently. State-level institutions therefore continue to play an important role in providing technical assistance and oversight.

The design of water programmes must therefore balance community participation with institutional support systems, ensuring that responsibilities are aligned with capacities.

## 3.7 Areas For Action

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The experiences discussed in this report suggest several areas where targeted investments and policy attention could strengthen the sustainability of rural water supply systems.

These areas are relevant for multiple actors within the water sector.

## 3.7.1 For State Governments

State governments play a central role in implementing rural water supply programmes and supporting local institutions responsible for service delivery. Key priorities may include:

- **Strengthening institutional support systems**  
State departments can strengthen institutional support by making existing platforms such as DWSMs and SWSMs more functional and outcome oriented. This includes regularising meetings with clear agendas, focusing on periodic review of service delivery, and ensuring follow-through through training, technical guidance, and support to village-level institutions.
- **Investing in workforce development**  
Developing clear frameworks for training, certification, and remuneration of frontline workers could help strengthen the human infrastructure required for operating water systems.
- **Designing sustainable financial models**  
State-level policies can help define the balance between government support and community contributions to help establish hybrid financial models based on realistic expectations.
- **Integrating technology with operational systems**  
Digital tools should be integrated with operational processes and institutional workflows to ensure that the information generated contributes to decision-making.



## 3.7.2 For The Central Government

At the national level, programmes such as the Jal Jeevan Mission provide an important platform for strengthening sustainable service delivery systems. Key areas for continued attention include:

- **Strengthening O&M frameworks within national programmes**  
Operational guidelines can continue to emphasise the importance of sustained support for village institutions and frontline workers.
- **Encouraging data-driven monitoring systems**  
Establishing national-level systems for monitoring not just infrastructure and expenditure, but to track service through customer voices and aid lead to improvement in service delivery, increased transparency and enable better decision-making across states.
- **Supporting cross-state learning**  
Platforms for knowledge exchange between states can help accelerate learning on sustainable O&M models.
- This calls for a shift in design approach—from systems that focus on data collection for higher-level visibility, to those that embed workflows, clarify responsibilities, and support decentralised decision-making. For instance, digital tools can help frontline workers track tasks and respond to issues, enable local committees to manage finances and monitor service delivery, and support supervisory staff in resolving operational challenges.
- Designing for such decentralised functioning requires attention to role-based access, usability, and alignment with existing institutional processes. When designed in this way, data systems can move beyond reporting to become enablers of reliable service delivery via enhancing observability, responsiveness and accountability.

## 3.7.3 For Civil Society Organisations

Civil society organisations (CSOs) have played a foundational role in shaping India's water sector over the past several decades, through their work in community mobilisation, capacity building, piloting innovative approaches, and generating field-based evidence. These contributions are widely recognised and have, in many cases, informed policy and influenced government programme design.

Much of this work has followed a demonstrate–pilot–advocate model, where solutions are developed and tested in specific geographies and subsequently taken up by government systems for scaling. As the sector enters a phase characterised by large-scale public investment and increasing use of technology, there is an opportunity for CSOs to reimagine and expand their role. In addition to their continued contributions in strengthening community institutions and facilitating participation, CSOs can play a critical role in:

- **Designing for scale from the outset**  
Moving beyond pilots designed for proof of concept and limited geographies to developing solutions that are inherently scalable, considering the operational realities of government systems.
- **Integrating technology with community processes**  
Building on their deep understanding of community contexts, CSOs are uniquely positioned to design and test how digital tools can strengthen processes such as monitoring, grievance redressal, citizen satisfaction, capacity building, and citizen engagement—at scale and with speed.
- **Bridging the gap between innovation and adoption**  
A key challenge in the sector has been the limited adoption of well-performing innovations. CSOs can play a role in ensuring that solutions are co-designed with government stakeholders, increasing the likelihood of uptake and sustained implementation.

This evolving role calls for a shift from being primarily implementers and innovators at the margins to becoming architects of solutions within public systems.

By combining their strengths in community engagement with new capabilities in systems thinking and technology integration, CSOs can help shape the next phase of the water sector—one that is not only participatory, but also capable of delivering reliable services at scale.

### 3.7.4 For Donors And Philanthropic Organisations

Philanthropic organisations can play a catalytic role in strengthening water sector systems by supporting experimentation, research, and innovation.

Potential areas of investment include:

- In their initiatives, consider how digital tools can enable scale while strengthening FLWs and local
- Governance, beyond enhancing monitoring
- Strengthening training systems for the rural water workforce
- Supporting research on sustainable O&M models
- Enabling knowledge platforms and cross-sector collaboration.

Such investments can complement public programmes and help accelerate innovation in the sector.

### 3.7.5 For Arghyam

Building on its experience over the past two decades, Arghyam is well positioned to continue contributing to the water sector in several ways. These include:

- Supporting system-level innovation through targeted pilots with a technology play
- Generating evidence and learning, particularly on leveraging technology tools and solutions
- Through field engagements and analytical work, Arghyam can continue to generate insights that inform policy and programme design.
- Convening sector actors - government institutions, civil society organisations, technology partners, and researchers - to facilitate collaboration and collective problem-solving.
- Developing the DPI for the water sector and tools that strengthen coordination and transparency across water service delivery systems.
- Strengthening public discourse



## 4. Conclusions

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The expansion of rural piped water supply under the Jal Jeevan Mission marks a significant shift in India's water sector. As access to infrastructure improves, the focus is increasingly moving towards ensuring that systems continue to function reliably over time.

This report highlights that sustaining rural water services is not a discrete technical or administrative task. It depends on the functioning and alignment of multiple elements, including local institutions, frontline workers, financing arrangements, data systems, and policy frameworks. The effectiveness of O&M is shaped by how these elements come together in practice.

Field experiences suggest that decentralised service delivery requires sustained support systems. Community institutions and frontline workers play central roles in managing day-to-day operations, but their effectiveness depends on clarity of roles, access to technical support, and continued engagement over time. In many contexts, institutional capacity develops gradually and requires ongoing reinforcement rather than one-time interventions.

Financial sustainability remains a key consideration. While user contributions can support routine expenses and strengthen local ownership, they are often insufficient to meet the full costs of system operation. In practice, most systems function through a combination of community contributions and public financing. Strengthening financial sustainability will therefore require calibrated approaches that reflect local contexts and allow for gradual strengthening of cost recovery over time.

The increasing use of digital tools and monitoring systems presents opportunities to improve visibility and coordination. However, their effectiveness depends on how well they are integrated into institutional processes and whether they are usable by those responsible for day-to-day system management. Fragmented data systems and limited interoperability continue to constrain their potential.

The report also points to the importance of coordination across departments and levels of government. Transitions between infrastructure creation and long-term system management require careful planning, particularly in clarifying roles, aligning operational approaches, and ensuring continuity in support systems.

Overall, sustaining rural water services requires a shift in emphasis—from infrastructure delivery to ongoing service management. This involves recognising water supply as a continuous function that requires sustained institutional, financial, and administrative attention.

The expansion of infrastructure has created the foundation for universal access to rural water supply. The next phase will depend on whether the systems required to sustain these services are strengthened with equal attention. Ensuring reliability over time will require consistent focus on institutions, people, financing, and coordination—areas that are less visible than infrastructure, but critical to its long-term functionality.

# 5. Annexures

## Annexure 1 Overview Of Arghyam's Operation And Maintenance Related Initiatives

Arghyam has undertaken several initiatives over the past four years to understand and strengthen operation and maintenance (O&M) systems for rural water supply across different states and contexts in India. These initiatives include field demonstrations, policy research, sector studies, and partnerships with academic and research institutions.

These initiatives include:



## 1

**Community-led O&M Demonstration in Bihar**

One of Arghyam's most significant engagements on operation and maintenance of decentralised piped water supply systems has been a multi-year intervention in Muzaffarpur district in Bihar. Implemented in partnership with the Aga Khan Rural Support Programme (India) and Water For People, the initiative focused on strengthening community-led management of piped water supply systems.

The programme worked with Ward Implementation and Management Committees (WIMCs) responsible for managing ward-level water supply schemes under the state's rural drinking water programme. The intervention combined institutional strengthening, capacity building of frontline workers, community mobilisation, and the introduction of digital tools to improve monitoring and financial transparency.

The engagement covered over 500 water supply schemes across three blocks, reaching tens of thousands of households. Activities included strengthening the functioning of WIMCs, facilitating community meetings such as Jal Chaupals, training frontline workers (Anurakshaks), and introducing digital tools for recording operational and financial activities.

The initiative demonstrated that with sustained support and community engagement, local institutions can play an effective role in managing rural water systems. It also highlighted the importance of strengthening institutional processes alongside technical infrastructure.

Aspect	Description
Partners	Aga Khan Rural Support Programme (India), Water For People
Location	3 blocks of Muzaffarpur district in Bihar, with extension to select schemes in Vaishali, Sitmarhi, Sheohar, Nalanda districts
Scale	548 ward-level piped water supply schemes
Objective	Demonstrate a scalable model for participatory O&M of rural piped water supply systems
Key Focus areas	Strengthening Ward Implementation and Management Committees (WIMCs), training frontline workers (Anurakshaks), improving tariff collection systems, and piloting digital tools for monitoring and financial management
Key outputs	Institutional strengthening model for WIMCs, digital monitoring tools (Avni, mGramseva), improved scheme functionality (from 76% to 91%) and tariff collection

## 2

### Understanding the Financial Sustainability and the Ecosystem of O&M in Assam

Arghyam undertook a series of analytical studies in Assam to better understand the financial and institutional realities of operating rural water supply systems.

The core study examined the ability of Water User Committees (WUCs) to manage the financial aspects of the operation and maintenance of piped water supply schemes. The research involved detailed field visits to a sample of schemes where financial records maintained by WUCs were analysed to understand expenditure patterns and revenue flows.

The study explored questions such as:

- What are the best examples of community-operated and managed piped water supply schemes?
- What operational expenses are typically incurred by village-level water systems?
- Where do financial gaps emerge, and what forms of public support are required?

In addition to the financial study, Arghyam also undertook a broader O&M landscape analysis in Assam. This involved consultations with frontline workers such as Jal Mitras, engineers from the Public Health Engineering Department, and members of Water User Committees. The research also examined operational data from thousands of water supply schemes, including electricity usage patterns.

Together, these studies provided insights into the institutional and financial challenges faced by community-managed water systems and highlighted the need for hybrid financing models that combine community contributions with government support.

Aspect	Description
Partner	Public Health Engineering Department, Government of Assam
Focus	Financial sustainability of rural piped water supply schemes Overall ecosystem and stakeholders of O&M in Assam
Objectives	Estimate the actual costs of operating water supply schemes incurred by WUCs and assess the financial gap between available funds and O&M requirements
Methodology	Mixed-method study combining financial data analysis, field visits, and consultations with water user committees
Key Insights	Community contributions can support some routine expenses, but government financing remains essential for sustainable O&M

### 3

#### JustJobs Network - Jal Kaushal Studies

Arghyam partnered with JustJobs Network to examine the range of roles, tasks, and livelihoods associated with water management in rural India. The research explored how different water-related programmes create employment opportunities and responsibilities across states.

The study mapped the types of work associated with water management, including system operation, water quality monitoring, infrastructure maintenance, and community engagement. Detailed state-level studies in several states provided insights into how water management roles are structured, the skills required for these roles, and the remuneration received by workers.

This research highlighted the important but often under-recognised workforce that supports water management in rural areas and raised questions about how water sector programmes can create more stable and well-supported livelihoods.

Aspect	Description
Partner	Just Jobs Network
Focus	Skills and employment in the water sector
Objectives	Understand workforce needs and employment opportunities associated with the expansion of rural water supply infrastructure
Key Areas	Skills required for installation, operation, and maintenance of water infrastructure
Key Insights	The rural water sector has emerging employment opportunities, but there are gaps in training, certification, and career pathways for workers involved in water service deliver

## 4

### Telephonic Survey of Pump Operators Across Nine States

To better understand the experiences of frontline workers responsible for operating rural water systems, Arghyam conducted a cross-state study of pump operators.

The study gathered information through telephonic interviews with operators working in different states. It explored how operators are selected, the tasks they perform, the challenges they face in their daily work, and the remuneration they receive.

Although the study covered a small sample, it revealed significant variation in the roles, responsibilities, and payment structures of pump operators across states. The findings highlighted the critical role these workers play in sustaining water services and pointed to the need for clearer institutional arrangements and support systems for the rural water workforce.

Aspect	Description
Focus	Role and working conditions of pump operators in rural water supply systems
Scope	Multi-state study of frontline workers responsible for operating water supply infrastructure
Key themes	Training, incentives, working conditions, operational challenges
Key Insights	Pump operators play a critical role in sustaining water supply services but often face delayed payments, lack of training, and inadequate institutional support

## 5

### National Symposium on Sustainability of Piped Water Systems

In November 2023, Arghyam organised a national symposium on the sustainability of piped water supply systems in collaboration with the Indian Institute of Management Bangalore and the eGov Foundation. The symposium brought together practitioners, researchers, policymakers, and sector organisations to reflect on the emerging challenges of sustaining rural water services in the context of the Jal Jeevan Mission.

Discussions at the symposium were structured around a framework that examined the physical, operational, financial, and institutional dimensions of water service delivery. Participants discussed issues such as the functioning of village-level institutions, the role of frontline workers, financing mechanisms for O&M, and the potential of digital tools to improve monitoring and accountability.

The symposium provided an opportunity to consolidate insights from different parts of the sector and contributed to the broader thinking on sustainable rural water services.

Aspect	Description
Partner	Indian Institute of Management Bangalore
Focus	Knowledge exchange and sector dialogue
Activities	Symposiums, workshops, and research discussions on strengthening rural water service delivery
Objective	Bring together practitioners, researchers, and policymakers to discuss emerging challenges and opportunities in sustaining water supply systems

Aspect	Description
Focus	Comparative analysis of state-level policies for operation and maintenance of rural water supply schemes
States covered	Multiple states including Assam, Karnataka, Gujarat and others
Key Themes	Institutional arrangements, financing mechanisms, monitoring systems
Key insights	Effective O&M systems require clear institutional roles, reliable financing mechanisms, and strong monitoring frameworks



**Arghyam** is an Indian philanthropic organisation working on water security and sustainable water management. It supports initiatives across the water lifecycle, from source sustainability and water quality to service delivery and governance through research, partnerships and technology-enabled solutions. Arghyam works closely with governments, communities and civil society organisations to strengthen water systems and enable safe, sustainable access to water for all.



**Madhavi Purohit** is an independent development sector professional with over 20 years of experience in decentralised rural water supply systems. Her work focuses on strengthening the sustainability of rural drinking water services, particularly the operation and maintenance (O&M) of piped water schemes.

She was previously a Senior Manager at Arghyam, where she led work on sustainable O&M, partnerships with government and nonprofit programmes, and efforts to scale water governance solutions. Her work brought together digital technology and institutional systems—not only to enhance transparency and accountability, but to enable coordination across actors for improved service delivery. She also anchored Arghyam’s work on communication and behaviour change.

Earlier, she worked with the Water and Sanitation Management Organisation (WASMO), Gujarat, where she contributed to decentralised village water supply initiatives and communication strategies.

She holds a Master’s degree in Development Communication and brings a blend of field experience, policy engagement, and programme design to her work.