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FOREWORD

It is with great pride and deep appreciation that I present the As-Is Study Report on State IT Systems of **PHED Rajasthan**. It is prepared under the Jal Jeevan Mission (JJM) as part of a national effort to assess, document, and strengthen the digital capabilities of rural drinking water departments across India. This report has been prepared in collaboration between SPM Niwas and Arghyam. It helped in bringing together institutional expertise in rural water governance and philanthropic commitment to water security. A partnership that reflects the shared conviction that data-driven decision-making is fundamental to achieving universal and sustainable access to safe drinking water.

Rajasthan's Public Health Engineering Department (PHED) stands as a strong example of policy-driven digital adoption and systematic institutional development. Operating within one of the most mature state-level e-governance ecosystems in the country, the department has aligned its digital evolution with broader initiatives such as the Rajasthan E-Governance IT & ITeS Policy and the state's unified SSO platform. Through applications like RajNeer, integration with platforms such as e-Mitra and Rajasthan Sampark, and the use of MIS dashboards and SCADA systems in key urban projects, PHED has steadily built a technology-enabled framework for improving service delivery, monitoring, and operational efficiency. This approach reflects not just the deployment of individual tools, but a broader institutional commitment to leveraging digital systems for transparency, accountability, and scale.

This report is organised around a comprehensive Digital Maturity Model for Rural Drinking Water. It is a structured framework developed to systematically measure the state IT capabilities across five layers of key stakeholders along the guiding principles of Citizen Centricity, Frontline Workers Empowerment, Agencies Efficiency, Departments Effectiveness and State Functionaries Interoperability. There are additional two layers for Technology Foundation and Infrastructure. Together, these capabilities provide a holistic picture of where Rajasthan stands today, and where it must go next.

I extend my sincere appreciation to the PHED Rajasthan team, the field functionaries, and all stakeholders who contributed their time, knowledge, and institutional experience to this study.

I also place on record my gratitude to **Arghyam** for their partnership, intellectual contribution, and steadfast commitment to the mission of universal water access. Their collaboration has meaningfully strengthened both the depth and the credibility of this report. I acknowledge as well the dedication of the technical team whose rigorous field interactions and analytical work have made this assessment possible.

It is my earnest hope that this report serves not merely as a record of the present, but as a compass for the future. This will help in guiding Rajasthan towards a fully digital, equitable, and sustainable rural drinking water system where every citizen has access to safe water, and every decision is driven by data.



Priyatu Mandal, IAS,
Director SPM-NIWAS

MESSAGE

Water is not merely a resource; it is a right. And the ability to govern it well, to monitor it transparently, and to deliver it reliably to every household is one of the most meaningful tests of a state's institutional commitment to its people. It is in this spirit that Arghyam is proud to have partnered with SPM NIWAS in the preparation of this As-Is Study Report on State IT Systems — PHED Rajasthan.

At Arghyam, our work has always been rooted in the belief that lasting change in the water sector requires more than infrastructure. It requires knowledge, accountability, and the systems to sustain both. This collaboration with SPM NIWAS is a natural expression of that belief. By bringing together the programmatic depth of SPM Niwas and Arghyam's long-standing engagement with water governance, this study offers something that neither institution could have produced alone. That includes a credible, field-grounded, and analytically rigorous picture of where Rajasthan stands in its digital journey, and what it will take to go further.

What stands out most about PHED Rajasthan is not any single application or platform, but the policy-led institutional approach that has enabled their adoption at scale. Operating within a strong state-wide e-governance ecosystem, the department has leveraged platforms such as SSO integration, e-procurement systems, MIS dashboards, and SCADA-enabled monitoring to improve service delivery and operational efficiency. This is not a system built on isolated innovations, but one shaped by structured governance, alignment with state IT policies, and a clear focus on transparency and accountability. That strength of institutional alignment is a critical foundation for sustained digital transformation. The path forward is therefore one of thoughtful consolidation—building greater cohesion and intelligence into existing systems while continuing to reinforce efficiency, transparency, and service delivery outcomes.

This is precisely where studies like this one matter. Understanding the current state with clarity and without defensiveness is the prerequisite for purposeful transformation. We hope this report gives PHED Rajasthan, its leadership, and its partners the shared language and common baseline needed to prioritise investments, align efforts, and move with intention.

I am grateful to the PHED Rajasthan team for their openness and engagement throughout this process, and to the SPM-NIWAS team for their partnership and rigour. I also wish to acknowledge the technical team whose field interactions, institutional conversations, and analytical work gave this report its texture and credibility.

Arghyam remains committed to walking this journey alongside the states and institutions working to make safe water a lived reality for every Indian. We hope this report is a useful step on that path.



Anuj Sharma
CEO Arghyam

PREFACE

India's rural drinking water sector is undergoing a profound transformation. The Jal Jeevan Mission (JJM), launched in 2019, marked a decisive shift by committing to providing safe and adequate drinking water to every rural household. As the Mission transitions from its initial phase of rapid infrastructure creation to a phase focused on assured and sustained service delivery, the role of digital systems becomes increasingly critical. Ensuring reliability, quality, and accountability at scale requires a strong foundation of data-driven governance.

While flagship initiatives such as the Jal Jeevan Mission (JJM) have substantially expanded rural drinking water infrastructure across the country, ensuring equitable, reliable, and measurable service delivery at scale now requires a fundamentally stronger digital foundation. The next phase of transformation depends not merely on asset creation, but on building an interoperable, intelligent, secure, and scalable digital ecosystem capable of enabling data-driven governance, service monitoring, institutional coordination, and citizen-centric delivery.

In this context, the need for a sectoral Digital Public Infrastructure (DPI) for rural drinking water has emerged as a strategic national requirement. To support this objective, SPM-NIWAS and Arghyam jointly undertake a baseline assessment of existing digital solutions, platforms, and governance practices in the rural drinking water sector across selected states. The study aims to evaluate current digital maturity, identify interoperability gaps and sectoral challenges, and recommend appropriate DPI principles, characteristics, and architectural considerations to inform the sector's future vision, approach, and strategic roadmap.

India's experience with foundational and sectoral DPIs such as Aadhaar, Unified Payments Interface (UPI), and emerging digital ecosystems in health and agriculture demonstrates the transformative potential of federated, open, and interoperable digital architectures. In the rural drinking water sector, a DPI can enable seamless data exchange, improved coordination, and informed decision-making across stakeholders ranging from water sources and household taps to frontline functionaries and national institutions.

However, such a DPI must evolve from existing operational realities rather than be designed in isolation. It should build upon effective systems, address fragmentation, and strengthen areas that are inadequate. Accordingly, the As-Is Study of State IT Systems was undertaken as a foundational step toward developing a robust and contextually relevant DPI architecture for the sector.

This As-Is Study is conceived not as an audit, but as a diagnostic and collaborative exercise. The study seeks to identify existing gaps, assess institutional capacities, and understand operational realities across the sector. It adopts a multi-pronged approach comprising structured questionnaires across States and Union Territories, virtual consultations for broader stakeholder engagement, and in-person visits to selected states for deeper field-level insights.

To support a comprehensive assessment, a customized Digital Maturity Model for the rural drinking water sector has been developed. The model evaluates digital capabilities across multiple stakeholder layers, including citizens, frontline workers, implementing agencies, departments, and state-level functionaries, thereby enabling a holistic understanding of the ecosystem and informing future digital transformation strategies.

Among the states studied, Rajasthan was identified for an in-depth assessment due to the breadth of its digital ecosystem, its strong alignment with statewide e-governance initiatives, and its early adoption of an IT-first approach to public service delivery. The Public Health Engineering Department (PHED), Rajasthan, operates within a mature digital governance environment supported by a wide range of state-level platforms such as RajKaj, e-Mitra, RajSSO, IFMS, and the Sampark portal. With over 200 applications integrated through a unified SSO framework and a clear policy push under the Rajasthan E-Governance IT & ITeS Policy, the state has built a comprehensive foundation for digital service delivery. PHED's systems, supporting thousands of Jal Jeevan Mission schemes, reflect a structured approach toward improving efficiency, transparency, and monitoring through tools such as MIS dashboards, SCADA deployments in major urban systems, and digitized financial and procurement processes.

At the same time, Rajasthan's experience highlights an important and widely relevant reality: as digital ecosystems expand across multiple platforms and departments, there is a growing opportunity to strengthen integration, data consistency, and system coherence. While several robust applications exist across G2C, G2E, and G2B segments, enabling stronger interoperability, improving real-time data exchange, and enhancing analytics capabilities can further amplify their collective impact. These are natural evolution pathways for a system that has already achieved significant scale and functional coverage and they offer valuable insights for other states working toward integrated digital architectures in the water sector.

This report presents a comprehensive understanding of the existing digital ecosystem of PHED, Rajasthan, based on stakeholder consultations, field interactions, system demonstrations, and analysis of available documentation. The findings recognize the state's significant progress in establishing a wide-ranging, policy-aligned, and technology-enabled governance framework that supports water service delivery across urban and rural contexts. At the same time, they point to opportunities for strengthening integration, expanding data-driven decision-making, and enhancing citizen-facing transparency mechanisms, including water quality access and grievance systems, to further build on Rajasthan's strong digital foundation.

It is hoped that the insights and recommendations presented in this report will support the department in its ongoing digital transformation efforts and serve as a reference for other states undertaking similar journeys. More broadly, this study aims to contribute meaningfully to the design and development of a unified, resilient, and scalable Rural Drinking Water DPI, one that builds on existing strengths, addresses systemic gaps, and advances the long-term goal of ensuring safe, reliable, and sustainable drinking water for every rural household.

ACKNOWLEDGEMENT

The successful completion of this As-Is Study has been made possible through the invaluable support, cooperation, and openness of the Public Health Engineering Department (PHED), Rajasthan. The department's willingness to engage deeply and share insights into its existing IT systems, processes, and institutional practices has been instrumental in enabling a comprehensive and meaningful assessment.

The openness in sharing detailed information on digital applications, operational workflows, and implementation experiences greatly contributed to the depth and quality of this study. The opportunity to engage in in-person discussions and interactions with departmental leadership and technical teams enabled a comprehensive understanding of the digital ecosystem and its role in strengthening water service delivery across the state.

Special acknowledgement is due to **Shri Akhil Arora, IAS, Additional Chief Secretary to Government**, PHED Rajasthan, for his leadership and guidance. Sincere appreciation is extended to **Dr. Ravindra Goswami, IAS** (Joint Secretary to Government, PHED and Mission Director, Jal Jeevan Mission, Rajasthan), **Dr. Suneet Sethi** (Senior State Consultant, HRD & IEC, WSSO), **Shri Himanshu Meel** (Superintending Engineer, PHED Rajasthan), **Shri Sanjay Sharma** (Executive Engineer, PHED Rajasthan), **Ms. Poonam Rijwani** (ACP, IT Division, Jaipur), and **Shri Dushyant** (IT Division, Jaipur) for their valuable inputs and technical insights during the study.

The department extended full support in facilitating structured interactions, system walkthroughs, and detailed discussions throughout the engagement. Their openness and responsiveness enabled seamless access to systems and teams, which proved essential in developing an evidence-based understanding of the state's digital landscape.

This collaboration reflects the department's strong commitment towards advancing digital transformation and strengthening water service delivery systems. Their insights and cooperation have significantly enriched this study and contributed to shaping a grounded and forward-looking assessment.

TECHNICAL NOTE

Towards Making a Drinking Water Digital Public Infrastructure (DW-DPI): Conceptualising the Digital Water Ecosystem of India

India's rural drinking water sector stands at a transformative juncture. Following the rapid expansion of infrastructure under the Jal Jeevan Mission (JJM), the sector's focus is now shifting toward long-term sustainability, operational efficiency, water quality assurance, and citizen-centric service delivery. This transition requires not only physical assets but also a robust digital foundation capable of enabling real-time governance, interoperability, accountability, and innovation across the ecosystem.

In this context, the need for a sectoral Digital Public Infrastructure (DPI) for rural drinking water has emerged as both a strategic and operational imperative. To inform this transition, these studies were undertaken to assess the sector's current digital maturity, identify interoperability gaps, understand operational and institutional challenges, and define key principles, architectural considerations, and building blocks required for a future-ready ecosystem.

Accordingly, detailed field studies and stakeholder consultations were conducted across multiple states. Comprehensive "As-Is Study Reports" were developed for Assam, West Bengal, Punjab, Gujarat, and Rajasthan, along with a consolidated national report. These studies document existing digital systems, institutional processes, data flows, governance mechanisms, and technological maturity within the sector. The insights derived from these reports serve as foundational inputs for shaping the strategic vision, implementation roadmap, and policy framework for a National Drinking Water Digital Public Infrastructure (DW-DPI).

The findings indicate that the next phase of sectoral transformation must be anchored in a federated, interoperable, and standards-driven digital ecosystem. The objective is not to build another centralized platform, but to establish common digital rails that connect schemes, assets, laboratories, institutions, field functionaries, and citizens. Such an approach enables seamless data exchange, reduces fragmentation, and fosters innovation across states and ecosystem participants.

A key priority in this journey is the creation of authoritative digital registries for water assets, schemes, laboratories, service entities, and sources. These registries will act as trusted “single sources of truth,” enabling lifecycle management, traceability, and data consistency across administrative and technological boundaries. Complementing this, the sector must adopt common metadata standards, open APIs, device interoperability specifications, and shared vocabularies to ensure seamless collaboration.

The integration of emerging technologies—including IoT-enabled monitoring, GIS-based asset mapping, SCADA systems, AI-driven analytics, and advanced water quality surveillance—will further strengthen operational resilience and enable proactive decision-making. However, technology adoption must remain aligned with field realities, sustainability considerations, and long-term maintainability.

Equally critical is the need for strong data governance, cybersecurity, and trust frameworks. As digital systems and operational technologies converge, ensuring secure, reliable, and privacy-aware data exchange becomes essential. Robust mechanisms for access control, auditability, and authentication will be key to building confidence across stakeholders.

The transformation must also prioritize the empowerment of frontline institutions. Village Water and Sanitation Committees, Gram Panchayats, engineers, and field operators form the backbone of service delivery. Providing them with mobile-first, multilingual, and user-friendly tools—supported by capacity building and institutional strengthening—will be central to success.

Finally, an open and interoperable DPI ecosystem can catalyze participation from innovators, startups, research institutions, and civil society, enabling scalable solutions without fragmentation or vendor lock-in.

The journey toward DW-DPI is ultimately a governance transformation—shifting the sector from reactive operations to proactive, data-driven service delivery. By building trusted digital foundations today, India can ensure safe, reliable, and sustainable drinking water for all.

“Think Federated, Build Trusted, Scale Sustainably.”

The Technical Team consisting of Mr. C.K. Dhar, Chief Technology Officer, SPM-NIWAS; Mr. Manu Srivastava, COO, Arghyam; Mr. Deepak Gupta, Director Digital Infrastructure, Arghyam, Dr. Purna Pandey, Consultant Arghyam, which undertook this study under the active guidance of Mr. Ashok Kumar Meena , Secretary; Mr. Kamal Kishore Soan, Additional Secretary & Mission Director; Ms. Swati Meena, Joint Secretary (JJM); Pradeep Singh, Director; Ms. Ankita Chakravarty, Deputy Secretary, Department of Drinking Water and Sanitation (DDWS) extends its sincere gratitude to the officers of DDWS, Mr. Mohammad Ishfaq , Advisor, SPM-NIWAS, Mr. Prasenjit Paul, Consultant, SPM-NIWAS and all participating individuals, institutions and State officials who actively contributed to the study through their valuable insights, experiences and continuous support during the process.

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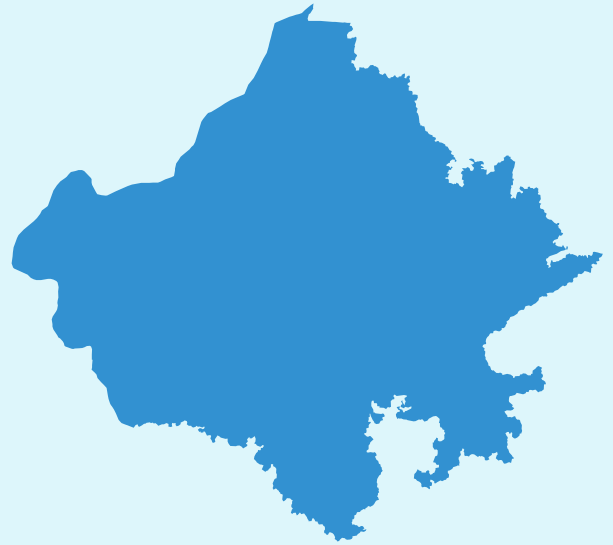
Glossary

| | | |
|--------------|---|--|
| JJM | - | Jal Jeevan Mission |
| NJJM | - | National Jal Jeevan Mission |
| FHTC | - | Functional Household Tap Connection |
| G2C | - | Government to Citizens |
| G2B | - | Government to Business |
| G2E | - | Government to Employee |
| ISAs | - | Implementation Support Agencies |
| IMIS | - | Integrated Management Information System |
| WQMIS | - | Water Quality Management Information System |
| DPI | - | Digital Public Infrastructure |
| PHED | - | Public Health Engineering Department |
| ISA | - | Implementation Support Agency |
| FTK | - | Field Test Kit |
| GIS | - | Geographic Information System |
| NABL | - | National Accreditation Board for Testing and Calibration Laboratories |
| GPS | - | Global Positioning System |
| VWSC | - | Village Water and Sanitation Committee |
| DWSM | - | District Water and Sanitation Mission |
| SOP | - | Standard Operating Procedure |
| RO | - | Reverse Osmosis |
| DFU | - | Defluoridation Unit |

Executive Summary



The Public Health Engineering Department (PHED), Government of Rajasthan, is responsible for ensuring safe drinking water and sanitation services across the state. Its core functions include planning, implementing, and managing water supply infrastructure while ensuring reliable service delivery to citizens across both rural and urban areas of the largest state (by area) of the country. With the launch of the **Jal Jeevan Mission (JJM)**, the department has accelerated its efforts to provide Functional Household Tap Connections (FHTCs) to every rural household.



In line with the Government of India's Digital India initiatives, Rajasthan state has a plethora of digital applications/tools in all three - **G2C**, **G2E**, and **G2B** segments. Some prominent sector-agnostic applications are **RajKaj**, **RajMail**, **Sampark**, **e-Mitra**, **IFMS 3.0**, **RajSIMS**, **RajSSO-AMS**, **SSO Raj**, etc. The state has adopted an **IT-first policy** to improve efficiency, transparency, and citizen engagement.

Figure 1 below shows a partial snapshot of the State's SSO platform landing page, which contains **200+ SSO-enabled** application links.



Figure 1: Snapshot of SSO portal home page

PHED's IT evolution aligns with broader Rajasthan government e-governance goals, such as the **Rajasthan E-Governance IT & ITeS Policy**, which promotes digital ecosystems for public utilities. Key objectives include real-time monitoring of water resources, streamlined service delivery, and data-driven decision-making. As of now, PHED's systems support over **9,766 sanctioned schemes** under the Jal Jeevan Mission, with a focus on urban and rural water supply.

This As-Is Study provides a snapshot of the current IT systems landscape within PHED Rajasthan, highlighting existing strengths, challenges, and areas for strategic improvement. PHED Rajasthan operates a portfolio of IT applications, both department-owned and integrated with state/national platforms. The major categories are:



PROJECT MONITORING & MANAGEMENT

ProMIS (Project Monitoring Information System):

- Core application for tracking project progress.
- Captures both physical and financial milestones.
- Mobile app available for site engineers to upload geo-tagged photos of project execution.
- Used to prepare reports for JJM and state-level reviews.

This application has been discontinued; however, in the initial phases of JJM, it was a core application for monitoring project progress.



WATER QUALITY MONITORING

- **Laboratory Information Systems** are used in state/district labs to capture test results.
- Data entry is not fully automated; manual uploads delay real-time reporting.
- No citizen-facing access to local water quality results.

ASSET & SCHEME MANAGEMENT

- Partial digital records of schemes, pipelines, overhead tanks, pump houses, and other water infrastructure.
- Limited GIS integration for mapping assets.
- District-level variations in the completeness of data.



FINANCE & PROCUREMENT

- **E-Procurement:** Linked with the state procurement portal for tendering.
- **Treasury Integration:** Ensures payment processing and financial transparency.

MIS & REPORTING

- Standard dashboards for internal monitoring of JJM progress.
- Periodic reports are generated manually for submission to state and central agencies.

MONITORING AND CONTROL SYSTEMS

PHED employs Supervisory Control and Data Acquisition (SCADA) systems in critical infrastructure projects, such as the Bisalpur Water Supply Project for Jaipur. SCADA enables real-time control of water flow rates, chlorine levels, and alkalinity, ensuring a high-quality supply comparable to bottled water. It allows quick fault detection and resolution, reducing downtime in urban networks covering 222 towns.

While SCADA is operational in select areas, its statewide rollout appears limited to major pipelines and treatment plants, with no public details on integration with IoT sensors for broader rural monitoring.



CITIZEN GRIEVANCE REDRESSAL

181 Toll-Free Helpline:

- A 24x7 call centre for citizens to log complaints related to water supply disruptions, leakage, or quality issues.
- Complaint registration generates an SMS acknowledgement and a tracking ID.
- Escalation to regional/zonal officers if unresolved.

Integration with the **Rajasthan Sampark Portal** for broader grievance management.



PUBLIC PORTALS

There are multiple citizen-facing portals like:

- **RajNEER** (<https://rajneer.rajasthan.gov.in/>) offers citizen services, water bill payment, application for new connection (both domestic and non-domestic), reporting a grievance, and laboratory services (not yet live).
- **PHED Water Portal** (<https://phedwater.rajasthan.gov.in/>) offers citizen services like water bill payment, application for new connection (both domestic and non-domestic), water supply schedules, and high-level information on water quality.
- **PHED Portal** (<https://phed.rajasthan.gov.in/>) seems to offer department-facing services like weekly reporting, material management, water quality monitoring, and personnel management.
- **PHED WMS Portal** (<https://phedwms.rajasthan.gov.in/>).

Highlights

PHED's IT systems promote efficiency, with RajNeer reducing paperwork and enabling 24/7 access. SCADA enhances reliability in urban areas, and award-winning initiatives demonstrate strong digital maturity. Cloud-based architecture supports scalability, while SSO integration minimizes user friction.



Strategic improvement area



1. Lack of Interoperability with Centre IT Systems

- **Issue:** API integration with JJM-IMIS and WQMIS is currently non-functional; data entry is still manual.
- **Impact:** Causes reconciliation delays for over 44,000 villages and increases the risk of data mismatch.
- **Recommendation:** Revive and stabilize API integration with proper backend mapping and validation checks to ensure real-time data syncing with IMIS.

2. Fragmented Applications (Siloed Systems)

- **Issue:** Grievance redressal, Jal Mitra, WIMS, and WMS applications function in silos.
- **Impact:** Leads to duplicated entries, poor coordination, and fragmented scheme monitoring.
- **Recommendation:** Develop a middleware or shared services layer to enable data interoperability and task coordination across all apps.

3. Manual Water Quality Monitoring

- **Issue:** Water quality data is collected and entered manually by facilitators and lab staff.
- **Impact:** Delays in reporting, increased risk of errors, and poor integration with WQMIS.
- **Recommendation:** Digitize FTK test reporting, automate lab data upload, and ensure real-time linkage with WQMIS using unique household identifiers (UTIDs/QR codes).

4. Advanced Analytics & AI

- **Issue:** Limited use of predictive analytics for demand forecasting, leak detection, or scheme performance monitoring.
- **Impact:** Reactive management continues, with missed opportunities for early intervention and optimization.
- **Recommendation:** Introduce **AI/ML models** for **demand forecasting, anomaly detection, and predictive maintenance**, integrated with ERP and IoT systems.

5. Water Quality Transparency

- **Issue:** While labs and FTKs test water, citizens cannot easily access real-time local water quality results.
- **Impact:** Communities remain unaware of water safety, reducing confidence in service delivery.
- **Recommendation:** Publish **village-level water quality results** on public dashboards and mobile apps, updated directly from LIMS/WQMIS.

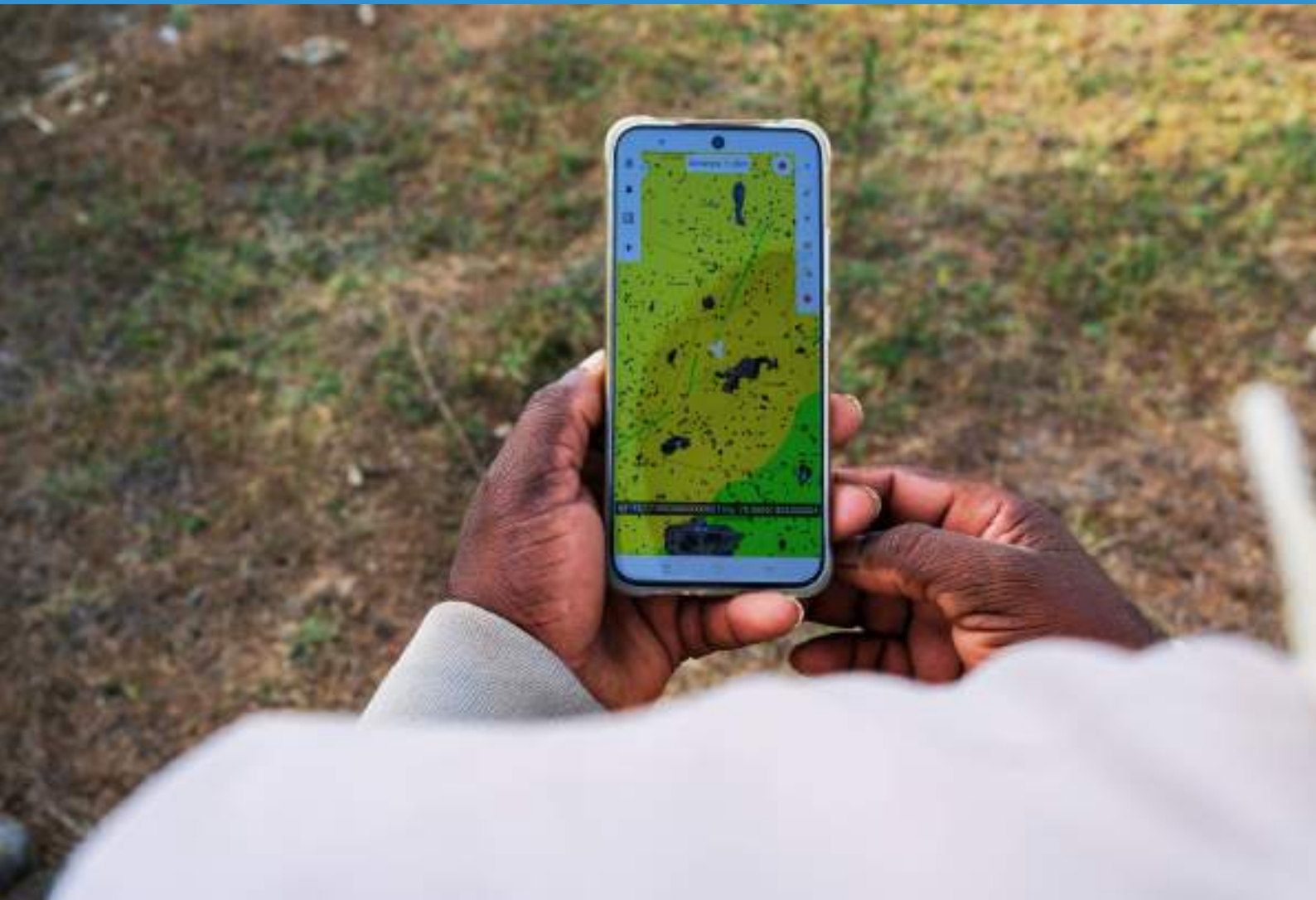
6. Enhancing Mobile Applications

- **Issue:** Existing apps are primarily staff-facing and limited in scope.
- **Impact:** Citizens, contractors, and many frontline workers lack mobile tools for reporting and engagement.
- **Recommendation:** Expand the mobile application ecosystem with role-specific apps for citizens, contractors, pump operators, and supervisors, integrated with ERP and grievance systems.

7. Data-driven Decision Making

- **Issue:** Although data is collected, analytics and modelling are underutilized in decision-making.
- **Impact:** Resource allocation and supply chain management remain sub-optimal.
- **Recommendation:** Institutionalize data-driven governance, using analytics to predict demand, plan schemes, and optimize O&M, with insights fed into management dashboards and review processes.

Measurement of IT Advancement Capabilities



The development of IT applications in the rural drinking water sector across India is a mixed bag, with some States/UTs showcasing robust digital ecosystems, while others are yet to fully embrace the use of digital technology. Therefore, a State's Information Systems **Digital Maturity Model (DMM)** has been developed to systematically measure, improve, and manage the States/UTs' IT capabilities in the rural drinking water sector over time. The DMM is a structured framework for assessing the maturity of advancements in IT systems & applications in the States' Rural Drinking Water Management. The model would provide structured inputs in IT governance and strategic digital transformation planning for States/UTs.

The model adopts a holistic, stakeholder-centric view of the rural water supply ecosystem, organizing stakeholders into five layers, with citizens at the core: **Citizens, Frontline Workers, Agencies, Departments, and State Functionaries**.

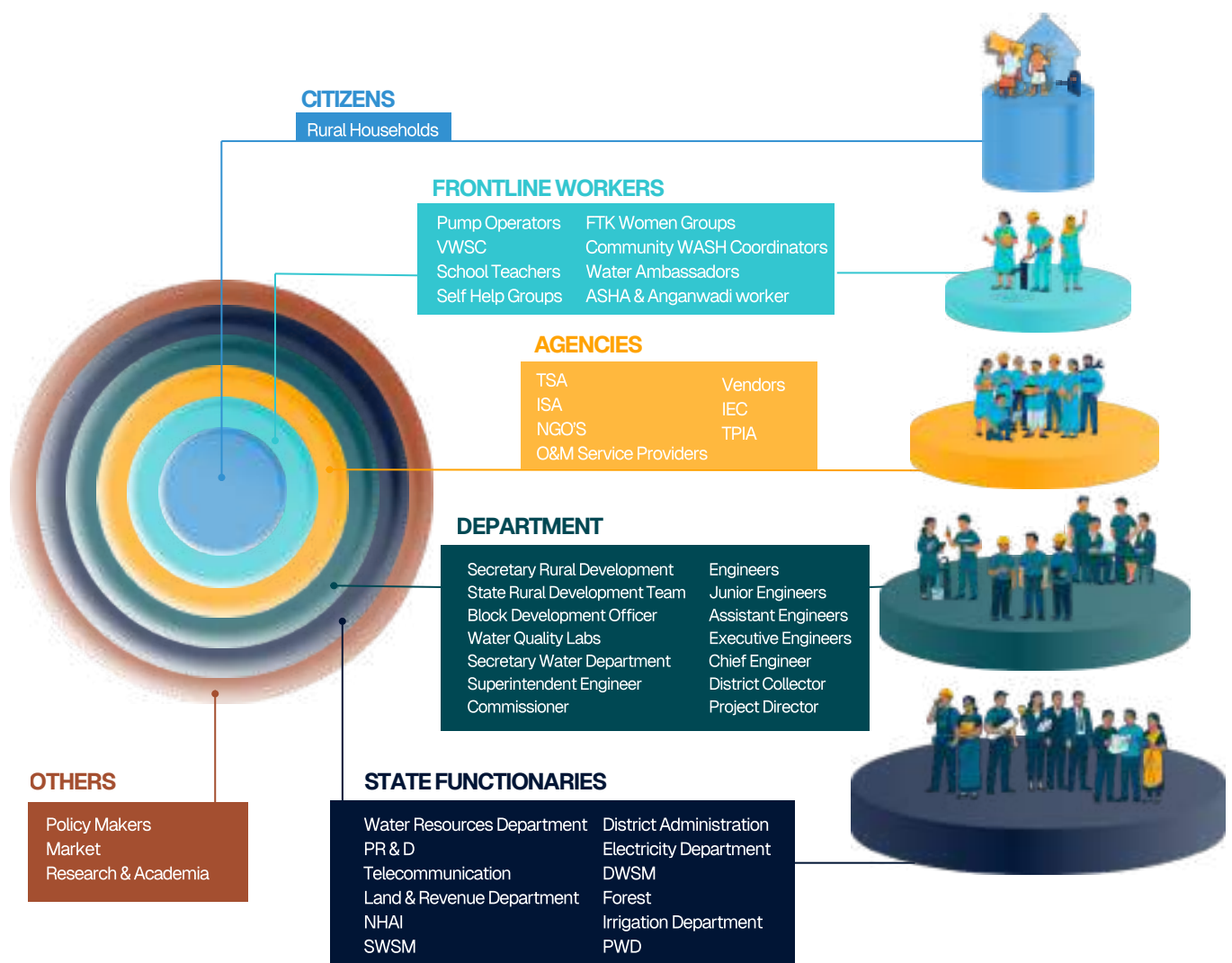


Figure 2: Stakeholders Mapping - State IT Systems

Based on a comprehensive analysis of water departments across several states, the above figure illustrates a holistic view of stakeholders involved in the rural water management ecosystem. While the specific names and number of stakeholders may vary by state, this representation broadly captures the full spectrum of actors typically engaged in the system.

Guiding Principles

The **Digital Maturity Model (DMM)** is built on six foundational principles that ensure digital transformation efforts in the rural drinking water sector under the Jal Jeevan Mission (JJM) are effective, inclusive, and sustainable.



Figure 3: DMM Guiding Principles

These guiding principles ensure that digital maturity assessment under the DMM remains not just technically robust but also socially relevant and mission-aligned. The model defines seven distinct capability areas per layer—except for the Department, which has fourteen distinct capabilities—resulting in forty-two unique capabilities system-wide. In addition, seven common capability areas, applicable across the eco-system, are grouped under a separate **Common Capabilities** layer to avoid duplication. Two foundational layers further support this model: the **Technology Foundation** layer, covering seven core application-related capabilities, and the **Infrastructure** layer, which includes seven capabilities related to hardware and connectivity.

In total, the model defines sixty-three capabilities across eight layers, with each capability evaluated against four maturity levels: **Not Assessed, Aspiring, Performing, and Leading**.





|  NOT ASSESSED |  ASPIRING |  PERFORMING |  LEADING |
|--|--|---|---|
| <p>Information not available</p> <ul style="list-style-type: none"> • No data or documentation available to evaluate the status of this capability. • Capability has not been explicitly reviewed, implemented, or reported on. • Further inquiry or stakeholder engagement is needed to assess this area. | <p>Early-stage Maturity</p> <ul style="list-style-type: none"> • The capability is either non-existent or in plot stage, with limited institutional adoption • Processes are manual or partially digitized, lacking standardization and consistency • Ownership, governance, and user awareness around the capability are low or informal. | <p>Operational Maturity</p> <ul style="list-style-type: none"> • The capability is functioning at scale with documented processes and routine usage by intended stakeholders • Systems or tools supporting this capability are integrated into workflows, and data is used for monitoring and reporting. | <p>Strategic Maturity</p> <ul style="list-style-type: none"> • The capability is interoperable, scalable, and aligned with open standards or DPI principles • Data-driven insights, automation, or innovation are embedded in the capability's functioning. • The state actively shares learnings, tools, or assets with other regions. |

Figure 4: DMM Maturity Levels

Digital Maturity Model (DMM)

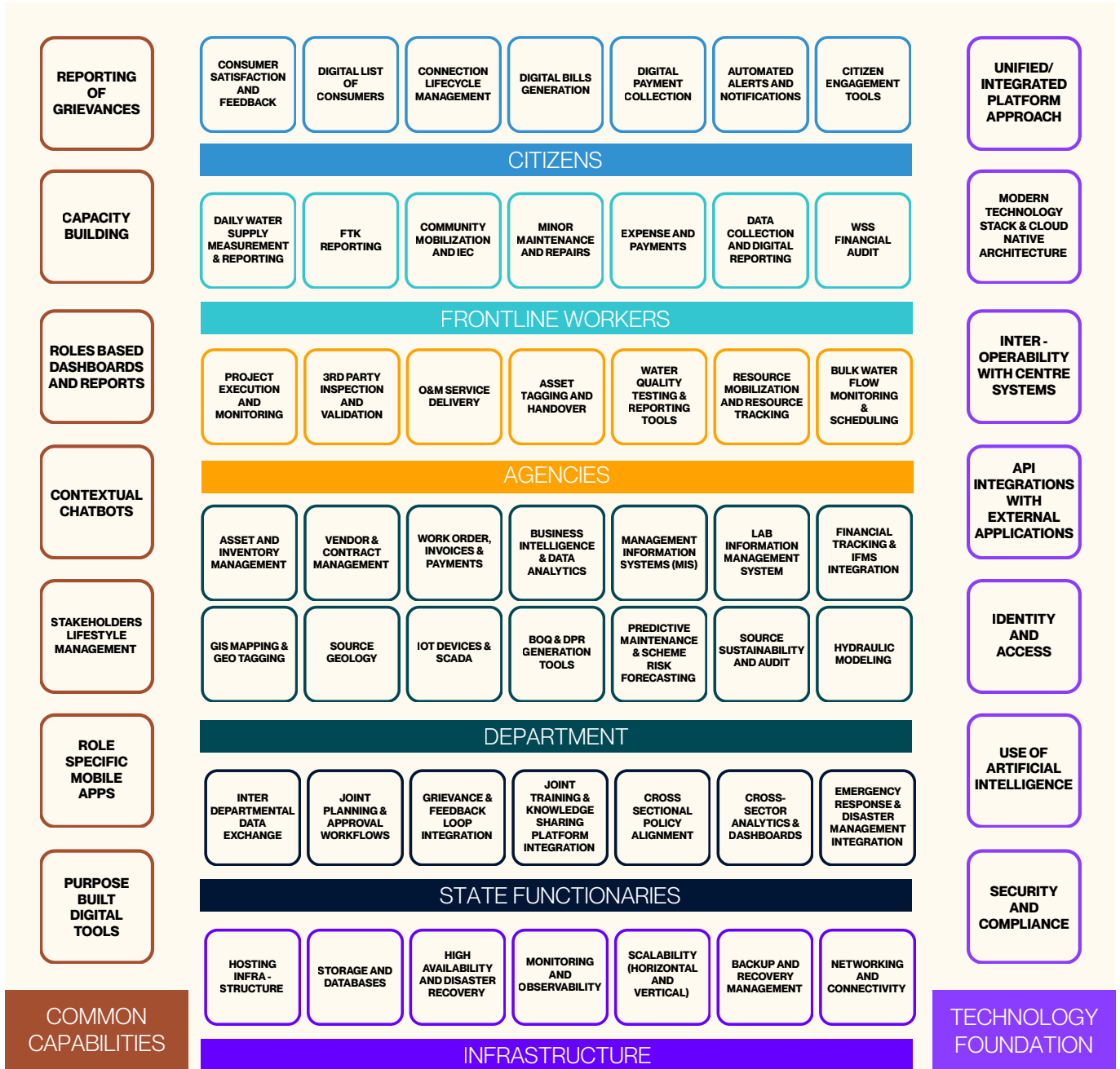


Figure 5: State IT Systems- Digital Maturity Model (DMM)

Rajasthan IT Capabilities Mapping

Based on a two-day onsite As-Is Study visit to PHED, this report attempts to map the capabilities of Rajasthan's PHED IT systems using dMM framework.

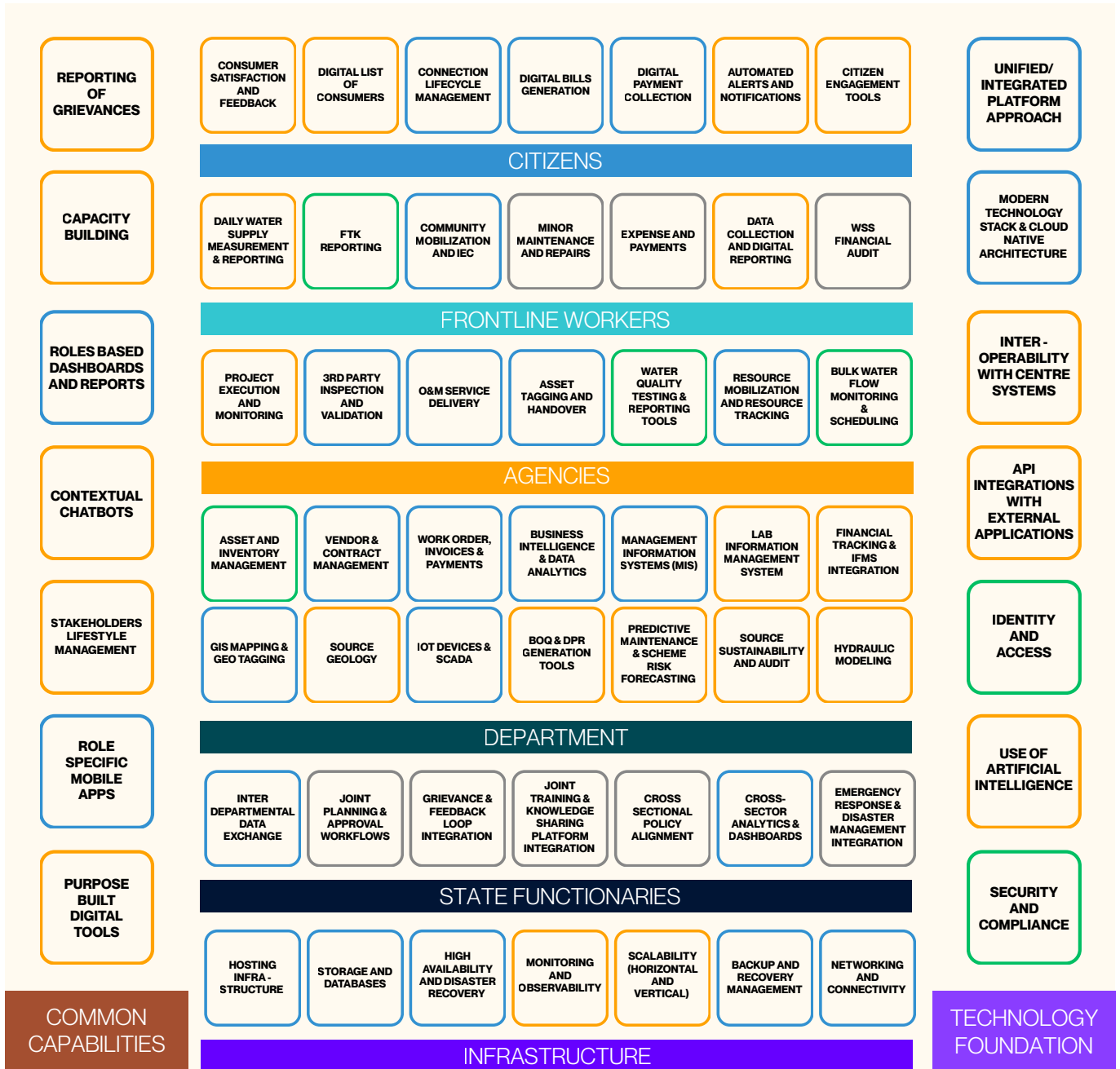


Figure 6: State IT Systems- Rajasthan's PHED IT Capabilities Scorecard

Citizens Applications



Capability Matrix

Below table outlines the mapping of a Capability from DMM to the Rajasthan IT systems for consumers/citizens.

| | |
|--|--|
| CONSUMER SATISFACTION SURVEY/FEEDBACK | <p>No structured consumer satisfaction surveys or digital feedback mechanisms are currently in place. Feedback remains informal and dependent on field officers.</p> |
| DIGITAL LIST OF CONSUMERS | <p>A comprehensive digital database of consumers does not exist at present.</p> |
| CONNECTION LIFECYCLE MANAGEMENT | <p>Digital capability to manage the lifecycle of water connections—from application to approval, activation, and closure—exists. However, usage and effectiveness of the same are not clear in rural areas.</p> |
| DIGITAL BILLS GENERATION | <p>Digital bill generation capability exists in the department's IT systems; however, tariff is waived off in most rural areas, therefore it is not being used by rural citizens.</p> |
| DIGITAL PAYMENT COLLECTION | <p>Digital payment collection capability exists in the department's IT systems; however, tariff is waived off in most rural areas, therefore it is not being used by rural citizens.</p> |
| AUTOMATED ALERTS AND NOTIFICATIONS | <p>There are no systematic digital channels for automated alerts and notifications. Pump and valve operators notify the community of any planned water supply disruptions on WhatsApp groups.</p> |
| CITIZEN ENGAGEMENT TOOLS | <p>No citizen-specific engagement tool is available.</p> |
| REPORTING OF GRIEVANCES | <p>There exists a multi-channel grievance reporting system – via a helpline number, WhatsApp, and the web. The State has established Rajasthan Sampark (Also called as the number 181) as a centralized platform for grievance redressal.</p> |
| CAPACITY BUILDING | <p>Sufficient information is not available in this area.</p> |

| | |
|---|---|
| ROLE- BASED DASHBOARDS AND REPORTS | <p>The citizen-facing WMS dashboard provides real-time insights into Rajasthan's Jal Jeevan Mission progress, showing district-wise household tap water coverage and Har Ghar Jal certification status. It tracks connections achieved since the mission's launch and highlights the remaining gaps to ensure universal coverage. However, local water quality data is not accessible to citizens.</p> |
| CONTEXTUAL CHATBOTS | <p>A WhatsApp-based chatbot is available for raising grievances.</p> |
| STAKEHOLDER LIFECYCLE MANAGEMENT | <p>In the context of citizens, there exists consumer lifecycle management via connection lifecycle management.</p> |
| ROLE-SPECIFIC MOBILE APPS | <p>Rajasthan Sampark mobile app is available for citizens to register complaints related to water supply, track the status of their grievances, and receive timely updates. e-Mitra and the water bill payment app are also present.</p> |
| PURPOSE-BUILT DIGITAL TOOLS | <p>No information is available on additional purpose-built digital tools.</p> |

Reporting of Grievances

Channels & Accessibility

- **Toll-Free Call Centre (181):** Citizens can call 181 (24x7 free of cost) to file grievances
- **Web Portal:** Complaints can also be submitted online via the Rajasthan Sampark portal.
- **Mobile App:** A native mobile app (available for Android & iOS) allows registration and tracking of complaints.
- **e-Mitra & Sampark Centres:** Citizens lacking internet access can visit Sampark Centres or e-Mitra kiosks (at Gram Panchayat, Panchayat Samiti, district levels).
- **WhatsApp:** Citizens can file grievances via an official WhatsApp number: 91160 49898.

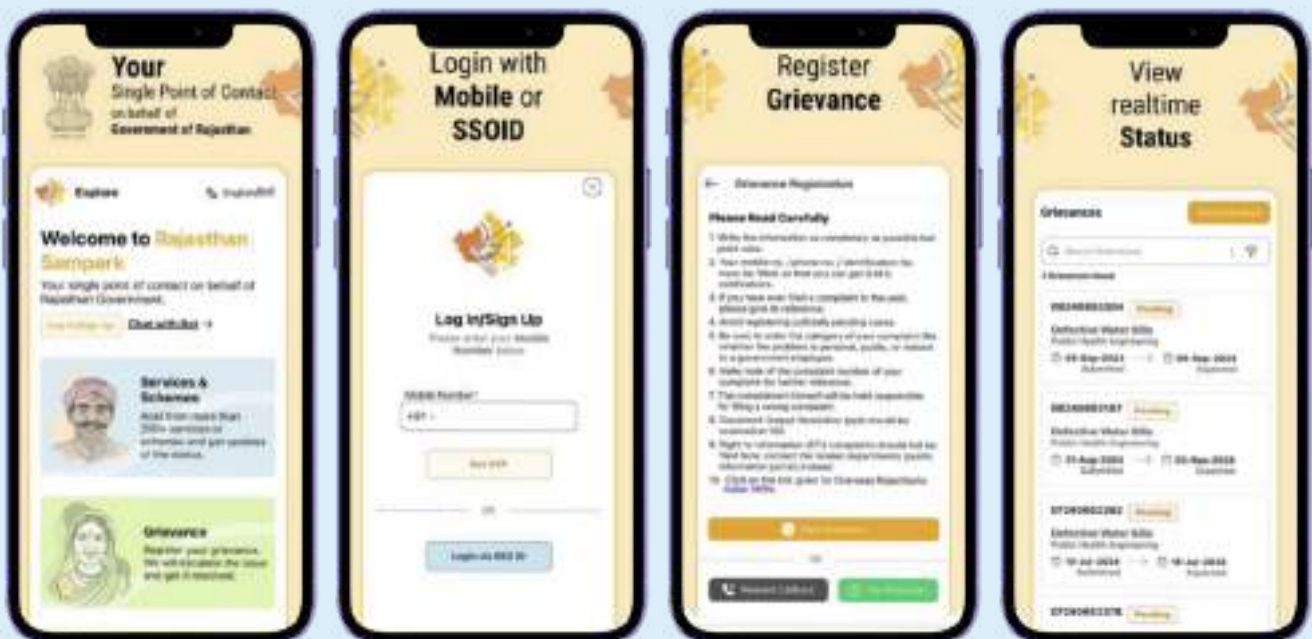


Figure 7 - Screenshots of Sampark iOS Mobile App

Key Features & Benefits

- **Centralized Grievance Platform:** Multiple access points—call, web, app, and WhatsApp—offer citizens flexibility to register complaints.
- **Time-Bound Resolution:** Grievances are routed to the relevant department for resolution, with status tracking available.
- **Re-opening & Feedback:** Citizens can provide feedback and re-open complaints if unsatisfied.
- **Transparency & Accountability:** Citizens receive complaint IDs, tracking capabilities, and notifications—fostering accountability.

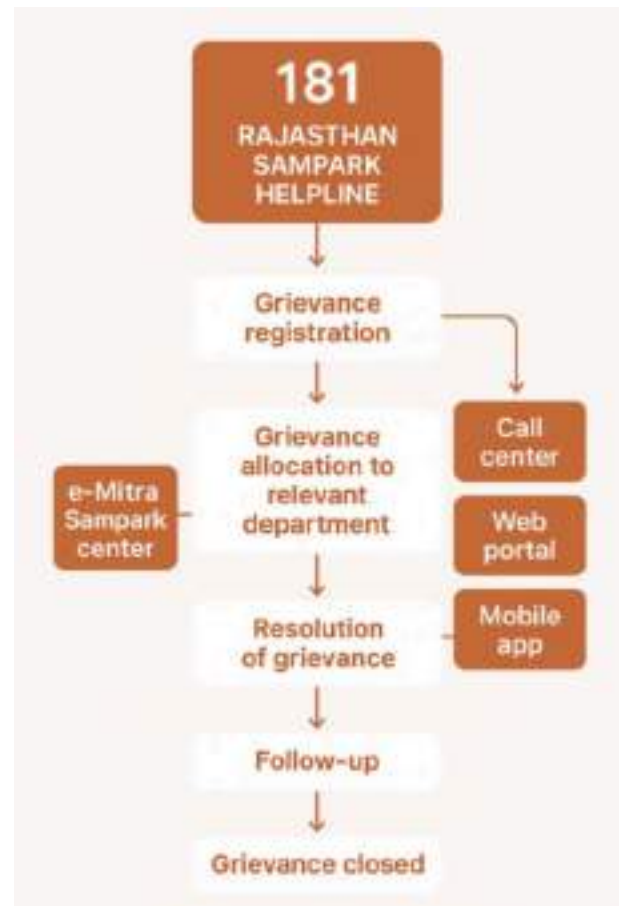


Figure 8: Workflow of Grievance under Sampark System

In addition to the State-level Sampark Grievance system, the department seems to be planning to have its own web-based grievance system under the RajNeer portal. However, at present, the system does not seem to be working.

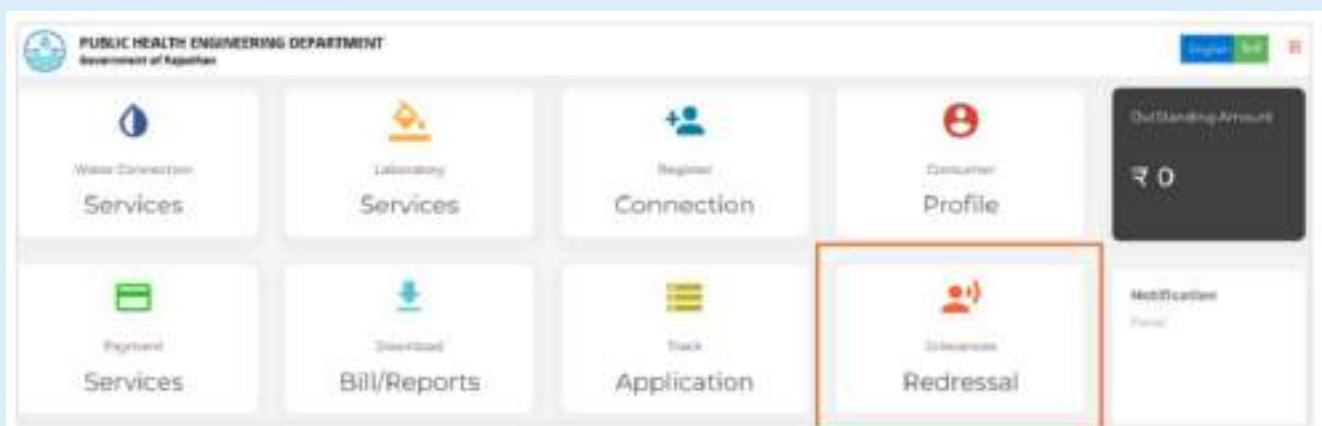


Figure 9: Interface of the RajNeer citizen service portal

Jal Mitra

The **Jal Mitra app** in Rajasthan is basically used for applying for new connections. The **app** is accessible through the Rajasthan government's Single Sign-On (SSO) system, enabling citizens to apply for new water connections with ease, both online and offline, and is especially useful for rural areas where field access may be limited:



1. SSO-Based Access

Citizens log in to the online portal using their **Rajasthan SSO ID and password**, ensuring secure and authenticated access.

2. Navigate to Citizen Services

From the SSO dashboard, users proceed to the **“Citizen Services”** section and select the **Jal Mitra app** icon to launch the water connection service.

3. Application Submission

Within the Jal Mitra app, applicants can initiate a **new water connection request** by entering details like consumer type (domestic or non-domestic), property location, and uploading necessary supporting documents.

4. Service Accessibility for Rural Citizens

This digital workflow significantly benefits residents in rural areas by eliminating travel to PHED offices, reducing paperwork, and enabling smoother access through mobile or kiosk interfaces—even in areas with limited connectivity.

5. Streamlined Process

The portal also supports features like:

- Step-by-step guidance on required documentation.
- Form auto-fill capabilities using SSO-linked citizen data.
- In-app tracking of application status.



Figure 10: Interface of Jal Mitra Application used for new connection registration



Figure 11: Interface of Jal Mitra for showing regular updates on connection, works, bill and grievance

Citizen-Facing Dashboard

The Work Management System (WMS) provides a citizen portal at <https://www.phedwms.rajasthan.gov.in/>

Currently, the dashboard displays the following information;

1. District-wise FHTC Connections
2. MP & OTMP-wise data bifurcations
3. Scheme stages-wise Village analytics
4. Scheme-wise FHTC Analytics (Planned v/s Provided)
5. Graphical Representation
6. Colour-coding-based data visualization
7. Drill-Down reports to narrow down data
8. Scheme-wise progress dashboard

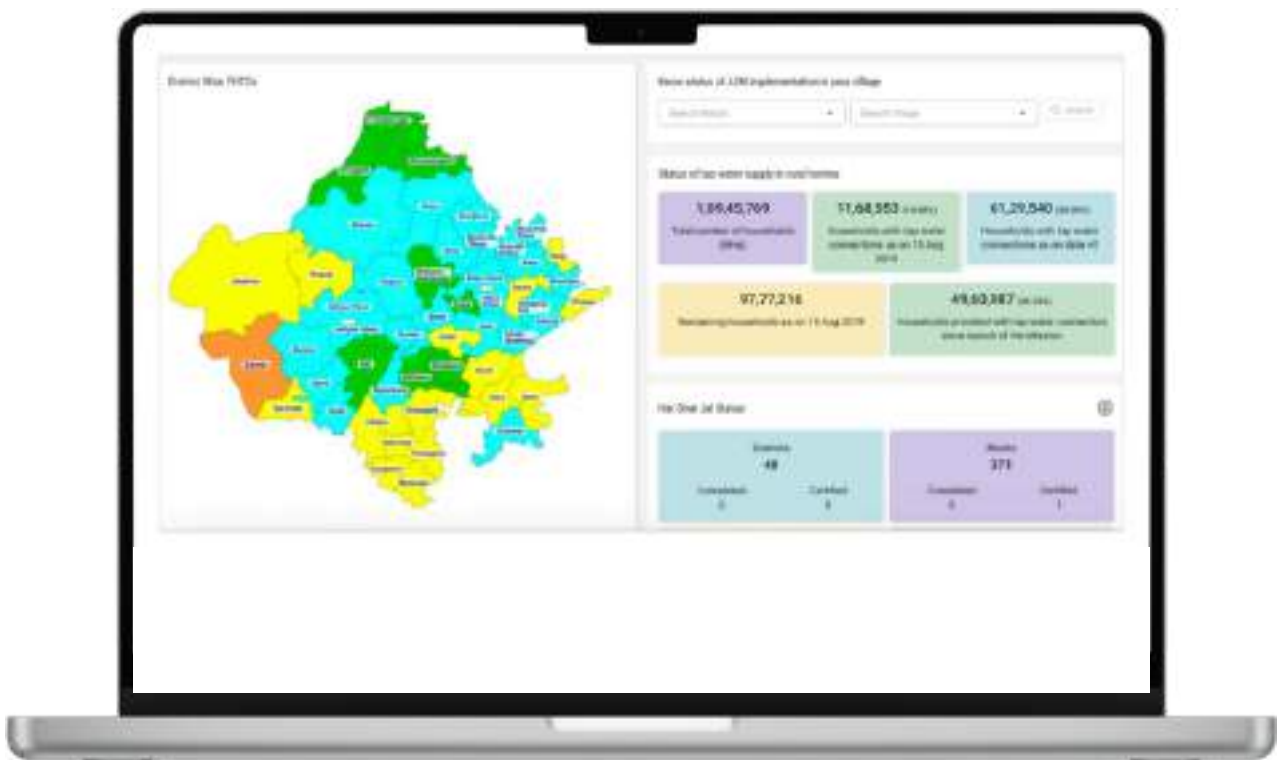


Figure 12: Citizen- centric dashboard for knowing project progress on FHTC

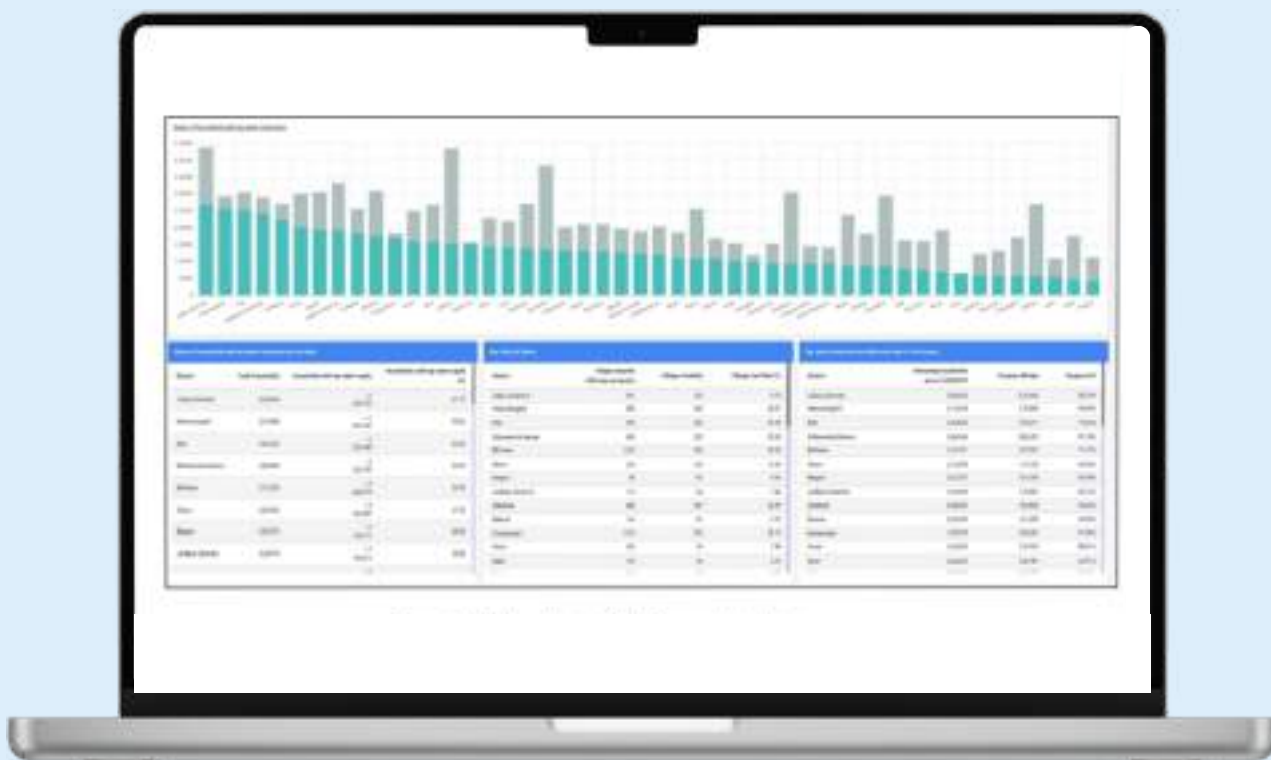


Figure 13: Daily monitoring of FHTC Progress district wise

At present, the Work Management System (WMS) is primarily being used as a dashboard to display progress under the Jal Jeevan Mission. However, its full-scale development as a comprehensive project management and monitoring tool is still pending. The system is yet to integrate critical functionalities such as end-to-end work tracking, GIS mapping, mobile-based reporting, and seamless linkage with financial and consumer service modules.



e-Mitra

The e-Mitra app is primarily used to **fetch and pay water bills**. Consumers enter their **consumer ID and mobile number**, after which their bill is generated and can be paid through multiple digital payment options (net banking, debit/credit cards, UPI).

The **e-Mitra** stands out as the **most widely used and citizen-friendly application**. It is a flagship e-governance initiative of the Government of Rajasthan and functions as a **front-end service delivery platform** across the state.



For Rural Citizens: e-Mitra operates through a vast network of **Common Service Centers (CSCs)**, set up in villages and small towns, bridging the digital divide where internet penetration and smartphone usage are low.

Modes of Access: Citizens can use e-Mitra via kiosks, the web portal, or the mobile app.

Services Offered:

- Utility bill payments (including PHED water bills, electricity, mobile recharge, and DTH, etc.).
- Applications for certificates, licenses, and welfare schemes.
- Payment and tracking of government services.

In areas with **limited internet access**, the **physical e-Mitra kiosks** act as lifelines for rural households, allowing them to manage water-related payments and services without visiting PHED offices. In addition to bill payments, kiosks also help citizens with **new connection applications, document uploads, and grievance submissions**, though these often redirect back to PHED's core portals.

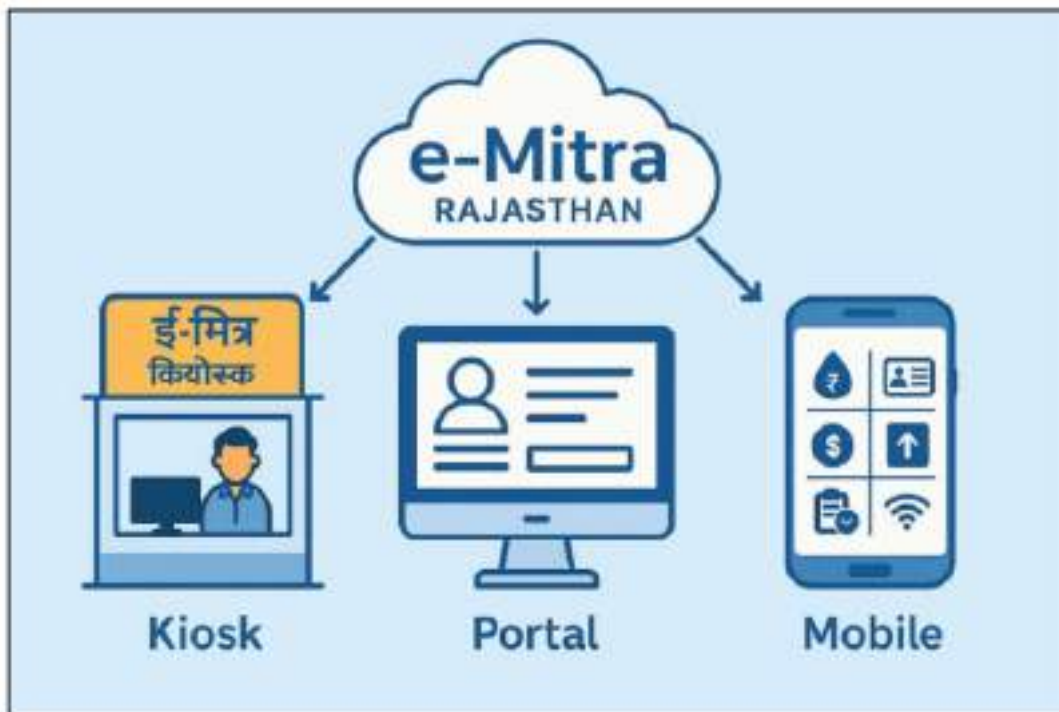


Figure 14: Multi-channels of e-Mitra

Frontline Workers Applications



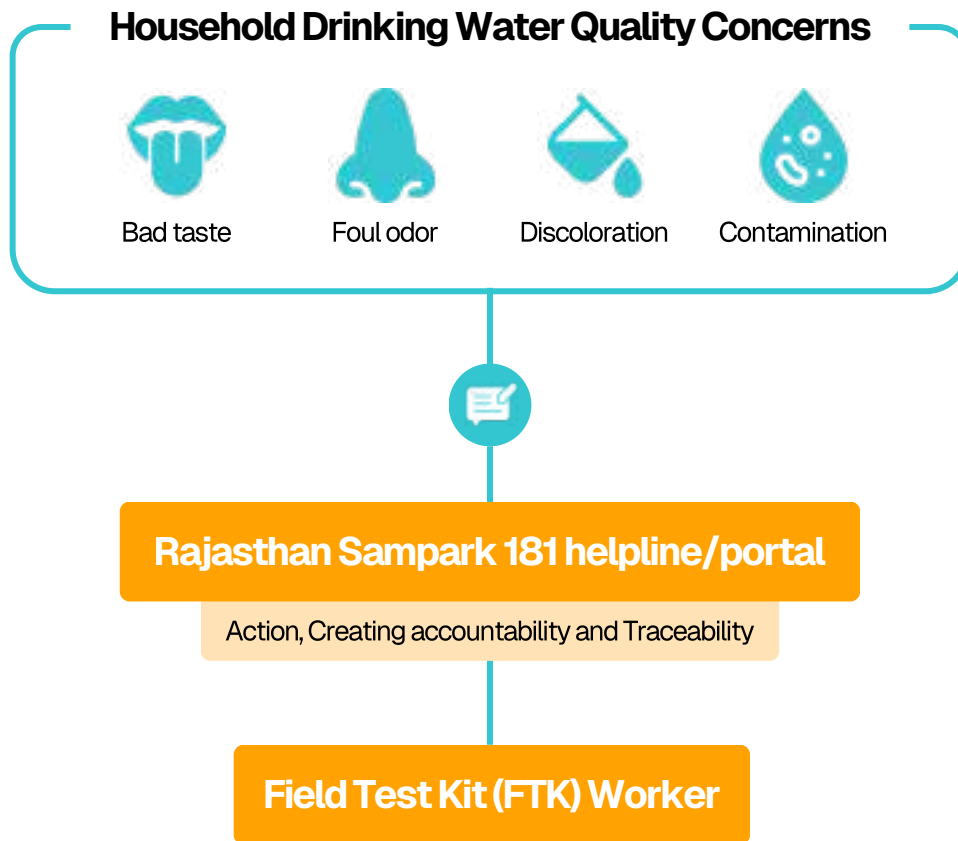
Capability Matrix

Below table outlines the mapping of a Capability from DMM to the Rajasthan IT systems for frontline workers.

| | |
|--|---|
|  <p>DAILY WATER SUPPLY MEASUREMENT & REPORTING</p> | <p>Water supply is fixed for a certain number of hours, and the pump operator and valve operator keep track of it.</p> <p>However, reporting of this information on any application or dashboard has not yet been implemented.</p> |
| <p>FTK REPORTING (FIELD TEST KIT REPORTING)</p> | <p>FTK workers are adequately trained. When a consumer registers a complaint about bad taste or poor water quality, the water is first tested using an FTK kit. The sample is then sent to the district-level laboratory for verification of the results.</p> |
| <p>COMMUNITY MOBILIZATION & IEC</p> | <p>IEC is happening through mass media, outdoor campaigns, and community engagement. They focus on promoting Har Ghar Jal, the wise use of water, and water conservation to drive lasting behavioral change in society.</p> |
| <p>MINOR MAINTENANCE & REPAIRS</p> | <p>No information is available.</p> |
| <p>EXPENSE AND PAYMENT MANAGEMENT</p> | <p>No information is available.</p> |
| <p>DATA COLLECTION AND DIGITAL REPORTING</p> | <p>The data is getting collected, but there is no digital reporting happening yet.</p> |
| <p>WSS FINANCIAL AUDIT</p> | <p>No information is available.</p> |
| <p>REPORTING OF GRIEVANCES</p> | <p>Rajasthan has established Rajasthan Sampark (accessible through the toll-free number 181) as a centralized platform for grievance redressal.</p> |

| | |
|--|---|
| CAPACITY BUILDING | Capacity-building training is organized to equip FTK users with the necessary skills for effective water quality testing. |
| ROLE BASED DASHBOARDS AND REPORTS | Not available. |
| CONTEXTUAL CHATBOTS | Not present. |
| STAKEHOLDER LIFECYCLE MANAGEMENT | Not available. |
| ROLE SPECIFIC MOBILE APPS | There are no specific mobile apps for frontline workers. |
| PURPOSE BUILT DIGITAL TOOLS | Not available |

FTK Reporting (Field Test Kit Reporting)



These FTK workers carry out on-site preliminary tests of the water supply, enabling quick detection of common contaminants such as **fluoride, nitrate, arsenic, salinity, and Total Dissolved Solids (TDS)**, all of which are particularly prevalent in Rajasthan due to its challenging hydro-geological and climatic conditions. If the FTK test suggests contamination or abnormal readings, the water sample is escalated to the district-level laboratory for confirmatory analysis.

40,524 VILLAGES (95.7%) IN RAJASTHAN NOW HAVE WOMEN TRAINED TO TEST DRINKING WATER USING FTKS.

95.7%
FTK COVERAGE

Laboratory testing provides accurate results using advanced instruments, which validate FTK findings and help PHED determine corrective measures. Based on these reports, interventions may include **source substitution, blending of water from different sources, installation of treatment units such as defluoridation plants, or stricter monitoring of vulnerable sources.**

This **two-tier testing mechanism**—community-level FTK screening followed by **laboratory validation**—delivers multiple benefits. It ensures quick response at the village level, empowers local communities (particularly women) to actively participate in water quality surveillance, and provides scientific validation through laboratories for decision-making. Importantly, it enables PHED to respond more effectively to Rajasthan’s widespread water quality challenges, such as **high fluoride in Nagaur, Ajmer, and parts of Udaipur; arsenic contamination in Bharatpur and Dholpur; salinity and high TDS in western desert districts such as Barmer and Jaisalmer; and nitrate contamination in several over-exploited groundwater blocks.**



Information, Education and Communication (IEC) Activities

As part of the Annual Action Plan, significant emphasis has been placed on **Information, Education, and Communication (IEC)** activities to raise awareness about water and the Jal Jeevan Mission across Rajasthan.



A diverse range of communication channels is proposed to ensure maximum outreach and impact, including:

- **Electronic media displays** and **video spots** for urban and rural audiences.
- **Audio broadcasts at bus stands** to engage daily commuters.
- **Vinyl wraps on railway coaches** to spread the message across long distances.
- **Outdoor media** such as hoardings, sunboards, flex banners, and wall paintings to capture attention in public spaces.

These initiatives aim not only to **propagate the Jal Jeevan Mission** but also to inspire **behavioral change in society** around the wise and sustainable use of drinking water. Approval of this annual action plan is currently awaited from the Government of India.

The core messages of the IEC campaign include:

- **Har Ghar Jal** – Ensuring every household has access to safe tap water.
- **Wise and Responsible Water Use** – Encouraging communities to adopt efficient water practices.
- **Water Conservation** – Promoting collective responsibility in protecting and preserving water resources.

Through these well-rounded IEC efforts, the mission seeks to foster a culture of **awareness, responsibility, and conservation**, ensuring that water security becomes a shared societal priority.



Agencies Applications

Capability Matrix

Below table outlines the mapping of a Capability from DMM to the Rajasthan IT systems for Agencies.

| | |
|--|--|
| PROJECT EXECUTION & MONITORING | While project execution and monitoring are not being carried out digitally at present, provisions have been made to enable these functions through future system development. |
| THIRD-PARTY INSPECTION & VALIDATION | Third-party inspection is taken care of by the State Water and Sanitation Mission (SWSM) department in Rajasthan. |
| O & M SERVICE DELIVERY | At most places the O&M services are being taken care of by the Gram Panchayat, or PHED junior engineer/staff. |
| ASSET TAGGING AND HANDOVER | Asset geo-tagging is carried out through the Rajdharaa platform. |
| WATER QUALITY TESTING & REPORTING TOOLS | Water Quality Testing & Reporting Tools enable real-time monitoring of key parameters such as pH, TDS, turbidity, and fluoride through FTKs, IoT sensors, and laboratories. The results are geo-tagged, digitally reported, and consolidated into dashboards for timely decision-making and remedial action. |
| RESOURCE MOBILIZATION AND RESOURCE TRACKING | ISA plays a big role in mobilizing the community. |
| BULK WATER FLOW MONITORING & SCHEDULING | SCADA systems and IoT devices are being installed at the bulk meter lines. IoT devices are used to measure the flow rate, pressure, and level. The data from the same can be seen in the WIMS application. |
| CAPACITY BUILDING | No information is available. |
| REPORTING OF GRIEVANCES | No grievance reporting application or portal is available for the agencies. |

| | |
|--|---|
| ROLE-BASED DASHBOARDS AND REPORTS | No agency-specific dashboards are available; however, agencies can access the WMS portal to view the FHTC status and the financial status of projects. |
| CONTEXTUAL CHATBOTS | No chatbot is available. |
| STAKEHOLDER LIFECYCLE MANAGEMENT | The ERP system is currently under development, and provisions have been made to include details of agency-specific stakeholders within the platform. |
| ROLE-SPECIFIC MOBILE APPS | Agencies can use WIMS to monitor the operational status of RO plants, DFUs, solar borewells, and SCADA sites in real time. The platform also helps track inspections, geo-tagged assets, and water quality data for improved oversight and decision-making. |
| PURPOSE-BUILT DIGITAL TOOLS | No information available. |

Water quality testing and reporting

Ensuring the supply of **safe, potable, and standardized water** to every household remains one of the most critical objectives of Rajasthan's water sector. The state faces **serious water quality challenges**, with widespread issues of **high fluoride, arsenic, salinity, nitrate, and elevated Total Dissolved Solids (TDS)** across many districts. These contaminants not only affect the taste and usability of water but also pose severe health risks, including fluorosis and water-borne diseases.



To address these challenges, the **Water Quality Monitoring Module**, anchored by the **Jal Dhara Command Centre (JCC)**, is designed to strengthen surveillance and accountability by integrating field data, laboratory testing, and digital tools into a unified system.

The following figure shows the way the SCADA data acquisition happens in the system, as well as the dashboard where the water quality data is showcased in order to monitor it at the state level.

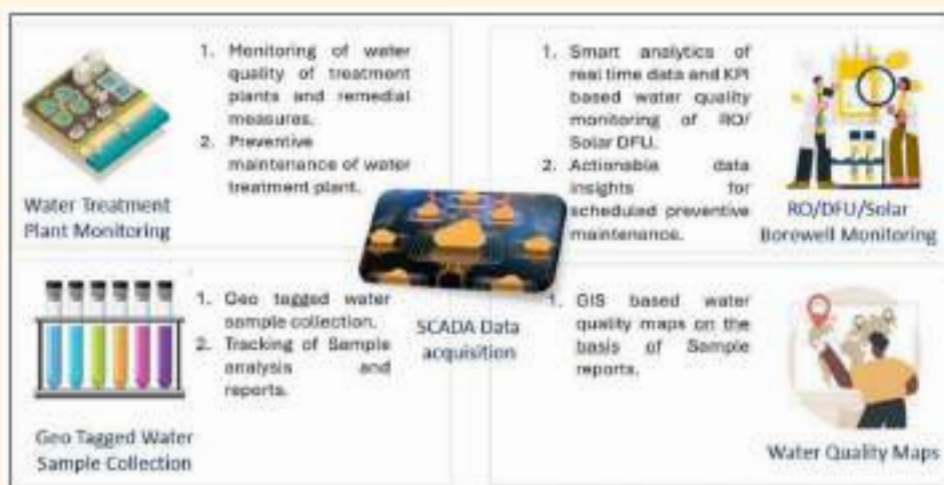


Figure 15: SCADA Data Acquisition



Figure 16: Lab Dashboard for monitoring of Water Quality related incidents

The system (JCC monitoring system) is built around a robust **data acquisition (DAQ) framework**, which collects inputs from treatment plants, SCADA systems, remote terminal units (RTUs), programmable logic controllers (PLCs), and APIs linked to RO and DFU plants. This setup enables **real-time monitoring** of key water quality parameters such as **TDS, pH, colour, turbidity, and bacterial contamination**. Alongside this, **RO plants, DFU units, and solar borewells** are continuously tracked to ensure the **early detection of contamination** and prompt reporting of issues.

Furthermore, **geo-tagged water sample collection** through mobile applications ensures that laboratory test results are accurately tied to specific habitations and water sources. The data is then visualized through **GIS-based water quality maps**, which provide a clear spatial representation of contamination hotspots and long-term water quality trends across the state and provide delivery points for forecasting and decision-making.

The module is complemented by **smart analytics**, leveraging IoT devices and advanced sensors to provide continuous, remote monitoring of water quality. The **Water Quality Assurance Lab Dashboard** further supports decision-making by capturing which quality parameters fall within or exceed defined thresholds, based on categories such as **raw water, filtered water, and treated water** across multiple projects. Over time, the accumulation of water quality data will enable predictive analysis and more accurate GIS-based mapping, thereby strengthening long-term surveillance.



Figure 17: Water Quality Trend Analysis of Sources & Forecasting



Figure 18: Realtime RO/DFU/Solar Quality Tracking

The system delivers multiple benefits:

- **Real-time tracking** of reservoir cleaning, treatment plant performance, and distribution quality, ensuring accountability down to the **Local Control Centre (LCC)**.
- A **decision support system** that helps the government take timely remedial measures in quality-affected habitations.
- **Reduction of water-borne diseases**, as alerts for contaminated water are sent instantly to authorities.
- Use of a **Spatial Decision Support System (SDSS)** to guide planning, prioritization, and interventions.
- Consolidation of data from diverse sites into a **Centralized Water Information Hub**, monitored through the JCC, creating a transparent and efficient surveillance ecosystem.

In essence, the Water Quality Monitoring Module acts as the backbone of safe water service delivery, ensuring that issues are identified promptly, remedial action is taken effectively, and water supplied to citizens meets the prescribed health and safety standards. By integrating field data, IoT devices, GIS platforms, and laboratory verification, the system strengthens technical and operational efficiency, while also building trust and confidence among citizens.

The Public Health Engineering Department (PHED) of Rajasthan has taken several commendable measures to address the state's acute water quality challenges. Among them, three initiatives stand out for their scale, innovation, and direct benefit to citizens—**Reverse Osmosis Units (ROs), Solar Borewells, and Defluoridation Units (DFUs).**

1. Reverse Osmosis (RO) Units

To address widespread issues of salinity, high TDS, and poor taste of groundwater, PHED has installed **2,527 Reverse Osmosis Units** across rural areas. These units improve drinking water quality by removing dissolved salts, excess minerals, and microbial impurities. Citizens can collect water directly from these units, usually through a token-based or minimal charge system, which ensures affordability while covering operational costs.

While this requires people to travel to the nearest RO unit, it has significantly improved access to safe drinking water in habitations severely affected by poor groundwater quality.



Figure 19: Women using the RO Unit



Figure 20: RO Unit Plant



Figure 21: Realtime RO Dashboard

2. Defluoridation Units (DFUs)

Rajasthan faces one of the highest burdens of **fluoride contamination** in India, leading to widespread dental and skeletal fluorosis in districts such as Nagaur, Ajmer, and Udaipur. To tackle this, PHED has installed **3,200 Defluoridation Units (DFUs)**. A DFU works by passing water through specially designed **adsorption or ion-exchange filters** that selectively remove fluoride ions from groundwater. Common methods include the use of **activated alumina, the Nalgonda technique (alum + lime precipitation), or advanced filter media**.

These units reduce fluoride concentration to permissible levels, making the water safe for human consumption. DFUs have thus become a critical intervention in fluoride-affected villages, protecting communities from long-term health risks.

Following figures depict the onsite installation of the DFU and its analytics at the lab.



Figure 22: DFU Units

3. Solar Borewell Systems

Recognizing Rajasthan's immense potential for solar energy, PHED has installed **1,108 solar-powered borewell systems**. These systems harness abundant **sunlight to operate water pumps**, reducing dependency on grid electricity or diesel. By shifting to solar energy, the state not only ensures **savings on electricity costs** but also contributes to its **sustainability and climate goals**. Similar to the RO units, citizens collect water directly from these borewell points. This initiative represents an excellent example of combining renewable energy with water service delivery, particularly valuable in Rajasthan's hot and arid regions.

The following figure depicts the on-site installation of the solar panels and the smart analytics dashboard.



Figure 24: Solar Borewell System



Figure 25: Solar Borewells Dashboard

Community Mobilization

To strengthen community participation and ensure sustainability under the **Jal Jeevan Mission (JJM)**, the Public Health Engineering Department (PHED), Jaipur, has temporarily reorganized its structure by creating a dedicated office of the **Additional Chief Engineer (Supporting Activity)**. This office oversees the implementation of supporting activities through **Implementation Support Agencies (ISAs)**, which have been engaged across all districts of the state.





ISAs play a **key partnership role** by mobilizing and empowering rural communities for the planning, designing, implementation, management, and maintenance of **intra-village water supply infrastructure**. For new schemes, each ISA is entrusted with the responsibility of managing the entire **project cycle of up to 18 months**, typically covering **50–60 villages** at a time. Their mandate extends beyond physical infrastructure creation to include critical social and institutional aspects of service delivery.

The core functions of ISAs include:

- Facilitating the **formation of Village Water and Sanitation Committees (VWSCs)**.
- Building the capacity of VWSC members and workers.
- Assisting in the **opening of VWSC bank accounts** and mobilizing community contributions.
- Organizing **Gram Sabhas** and securing approval of **Village Action Plans (VAPs)**.
- Supporting the operation and maintenance of village-level water supply systems.

The scale of work undertaken so far is noteworthy. Out of **42,066 villages in Rajasthan**, ISAs have facilitated the formation of **VWSCs in 41,890 villages**, and **41,880 Village Action Plans have been prepared**. With the **pre-planning and planning phases now completed**, ISAs are actively supporting the **implementation phase** of JJM works on the ground.

At the district level, **District Action Plans (DAPs)** for all districts have also been prepared and approved by the **District Water and Sanitation Committees (DWSCs)**.

By bridging the gap between PHED and rural communities, ISAs ensure that water supply schemes are not only implemented effectively but also **owned, managed, and sustained at the village level**—thereby strengthening the long-term success of the Jal Jeevan Mission in Rajasthan.

Bulk Water Flow Monitoring & Scheduling

The deployment of **SCADA systems** is currently concentrated at the **bulk water supply level**, particularly along large-diameter transmission mains, water treatment plants (WTPs), and pumping stations. These installations allow real-time tracking of flow, pressure, energy consumption, and system performance at key nodes of the supply network.



However, SCADA coverage does not extend to **smaller diameter distribution pipelines**, limiting visibility at the last-mile supply level.

Similarly, **IoT devices and water quality sensors** have been installed primarily at **treatment plants, pumping stations, and select bulk supply points**. These devices capture data on flow, pressure, and water quality parameters (such as pH, TDS, turbidity, and fluoride) and transmit it to centralized dashboards for monitoring. While this provides valuable insights into the performance of bulk systems, the absence of IoT-based monitoring in smaller village pipelines and household-level connections creates gaps in measuring **non-revenue water (NRW)**, distribution losses, and localized quality issues.

Department Applications



Capability Matrix

Below table outlines the mapping of a Capability from DMM to the Rajasthan IT systems for Department.

| | |
|---|---|
| ASSET & INVENTORY MANAGEMENT | Asset management is currently happening at the RajKaj portal. It is considered to be the older version of the PM Gatishakti. Inventory management happens through the e-procurement portals. |
| VENDOR & CONTRACT MANAGEMENT | E-procurement is being used for vendor selection; however, records of vendors and contracts are not yet being systematically maintained. |
| WORK ORDER, INVOICES & PAYMENTS | Work order management is currently being carried out through the ERP portal. |
| BUSINESS INTELLIGENCE & DATA ANALYTICS | No analytics are happening currently in terms of water supply data. However, analytics are happening in terms of electricity data. Electricity forecasting takes place at the ERP portal. |
| MANAGEMENT INFORMATION SYSTEMS (MIS) | Water Information Hub (within the SCADA/WIMS ecosystem) provides MIS reporting for online monitoring, trends, historical reporting, daily/monthly aggregations, and exception reports. |
| LAB INFORMATION MANAGEMENT SYSTEM | The water quality data is not getting pushed to any of the state homegrown portals. The data is visible on the internal dashboards, prepared for the departmental staff. |
| FINANCIAL TRACKING & IFMS INTEGRATION | Financial tracking is not in place currently. However, the Work Management System (WMS), will help in tracking the financial aspects of the project, including budget allocation, expenditure, and funding sources in the future. |
| GIS MAPPING & GEO TAGGING | Urban and some rural assets have been geo-tagged using the RajKaj portal. There are plans to integrate this data with the PM Gati Shakti platform, while geo-tagged assets are also visible through the WIMS application. |
| SOURCE GEOLOGY | No data is maintained for this. |
| CONTEXTUAL CHATBOTS | Not available. |

| | |
|---|---|
| IOT DEVICES & SCADA | <p>SCADA systems and IoT devices are mainly deployed at bulk water supply points such as treatment plants, pumping stations, and transmission mains. These enable real-time monitoring of flow, pressure, and water quality parameters, though coverage in smaller distribution pipelines is still limited.</p> |
| BOQ & DPR GENERATION TOOLS | <p>No tools are available for BOQ and DPR generation.</p> |
| PREDICTIVE MAINTENANCE & SCHEME RISK FORECASTING | <p>This is not happening at the department level.</p> |
| SOURCE SUSTAINABILITY AND AUDIT | <p>There is no provision for source sustainability and audit.</p> |
| HYDRAULIC MODELING | <p>Hydraulic modelling is not in place right now, however there is a plan to build it in the near future.</p> |
| CAPACITY BUILDING | <p>Training for department engineers happens from time to time.</p> |
| REPORTING OF GRIEVANCES | <p>Not available at the departmental level.</p> |
| ROLE BASED DASHBOARDS AND REPORTS | <p>Every PHED engineer has access to the departmental dashboard to monitor the system. It includes the flow and pressure data of the system, water quality and any other operational details.</p> |
| STAKEHOLDER LIFECYCLE MANAGEMENT | <p>The ERP has provisions to maintain data of engineers; however, the portal has not yet been made public. The e-MB (electronic Master Book) is an application built to record employee information digitally.</p> |
| ROLE-SPECIFIC MOBILE APPS | <p>There are several applications built for the department. Some are used by the PHED engineers on a regular basis while some remain unused for several years. Applications such as WIMS for project monitoring, IFMS 3.0 for financial monitoring, RajSSO-AMS for attendance are actively used.</p> |
| PURPOSE-BUILT DIGITAL TOOLS | <p>These are;</p> <ul style="list-style-type: none"> • SCADA systems • IoT-enabled sensors and telemetry <p>WIMS mobile application (for asset and quality monitoring).</p> |

Work management system (WMS)

The “PHED Work Management System” aims to provide a safe and sustainable drinking water supply to rural households in Rajasthan. The project includes various modules to manage different aspects of the project lifecycle, including scheme details, contractor management, and progress reporting.



It has been developed to overcome recent shortcomings like the manual process, lack of documentation and approval mechanism, absence of GIS tracking, and lack of asset tagging at the construction stage, etc.

The system is designed to ensure the efficient management of project resources and timelines, while also facilitating transparent communication and collaboration among stakeholders. By doing so, it supports the timely completion of water supply schemes with adherence to quality standards.

A central objective of WMS is to enable real-time monitoring and reporting of project progress. This helps decision-makers track the status of work, identify bottlenecks, and take corrective measures promptly. The platform also fosters stakeholder engagement by ensuring that contractors, engineers, and departmental officials work collaboratively within a unified digital ecosystem.

To improve operational efficiency, WMS emphasizes automation of repetitive tasks, reducing delays and minimizing manual errors. Integration with GIS platforms allows for spatial mapping of schemes, enabling location-based tracking and better resource planning. The inclusion of a mobile application interface further ensures that field-level updates, such as site photographs and milestone reporting, are captured instantly and seamlessly.

In addition, WMS incorporates robust governance mechanisms such as approval workflows, audit trails, and transparent reporting structures. These features ensure accountability and integrity throughout the lifecycle of a project, from planning and procurement to execution and closure.

ERP Module

This is a centralized water information management system for PHED to monitor the supply of safe, potable water to every person. It monitors both the quantity and quality of water. This also helps to increase the efficiency of water supply through technical and operational improvements, resulting in energy, water and monetary savings. The entire data from various sites is being collected at a single central site (State Data Centre), which leads to the creation of the centralized Water Information Hub of the State, which is monitored from the **Jal Dhara Command Centre (JCC)**.



Figure 26: Functional View of ERP System

This product sets up a centralized monitoring system for the state's potable water delivery system, monitoring and collecting data readings at the water transmission, treatment, and distribution points to increase system productivity, improve service levels, and reduce losses.

The key highlights of the module are shown in the image below:



Figure 27: Key Highlights of ERP system

The following two modules are not functional yet;

Hydraulic Simulation

At present, hydraulic simulation of water supply networks is not being carried out within Rajasthan's PHED systems. The absence of digital modelling tools limits the ability to simulate existing or proposed water distribution networks for planning and decision-making. However, provisions have been identified to introduce simulation models in the future.



Once implemented, these tools will allow engineers to virtually test network performance under different demand scenarios, optimize pipeline sizing, and improve efficiency in water supply planning. This forward-looking provision is expected to strengthen evidence-based decision-making and improve the long-term sustainability of water supply schemes.

Non-Revenue Water (NRW) Monitoring

Currently, structured monitoring of **non-revenue water (NRW)** is not happening in Rajasthan's water supply systems. Despite high levels of physical and commercial losses in the network, systematic NRW detection—through methods such as district metered area (DMA) management, water loss calculation, and leakage detection—has not yet been operationalized.



Future provisions aim to introduce digital tools and metering systems that will calculate losses more accurately and identify leakage hotspots. Effective NRW monitoring will not only enhance the efficiency of distribution networks but also ensure better utilization of Rajasthan's scarce water resources, directly benefiting service delivery to citizens.

The **proposed digital water management framework** integrates multiple modules designed to strengthen monitoring, planning, and operational efficiency. **Data Acquisition (DAQ)** forms the foundation, using sensors and measuring instruments to collect real-time information on key parameters. Building on this, **Water Transmission Monitoring** employs integrated sensor technologies to track dynamic hydraulic conditions, while **Water Distribution Monitoring** allows users to observe and manage water flow across the pipeline network. **Asset Management** ensures that all project assets—such as pumping stations, reservoirs, and pipelines—are efficiently tracked and maintained.

Complementing these functions, the **GIS module** provides a spatial view of all geo-tagged water resources, pipeline networks, and real-time asset performance, supporting better planning and oversight. **Water Losses Monitoring** enhances the ability to calculate distribution losses and ensures timely data delivery for corrective action. **Smart Analytics** leverages continuous data collection from sensor networks to provide actionable insights into water quality, consumption trends, and infrastructure performance. At the same time, **Energy Efficiency** monitoring enables optimization of energy utilization, particularly in pump operations.

One of the best features that is mentioned in the ERP module is the energy efficiency forecast.

Energy consumption forecasting

The system includes a feature for **forecasting daily energy consumption** up to one year in advance. Using historical data and dynamic filtering options, users can configure the forecast duration by adjusting a time slider. This allows them to visualize and estimate the amount of energy that will likely be consumed at specific sites, such as the **Bisalpur Dam**, over the coming year. Such forecasting helps PHED and DISCOMs plan for electricity demand more efficiently, optimize pumping schedules, and ensure cost-effective energy use in water supply operations. The following figure shows the forecasting trend of electricity.



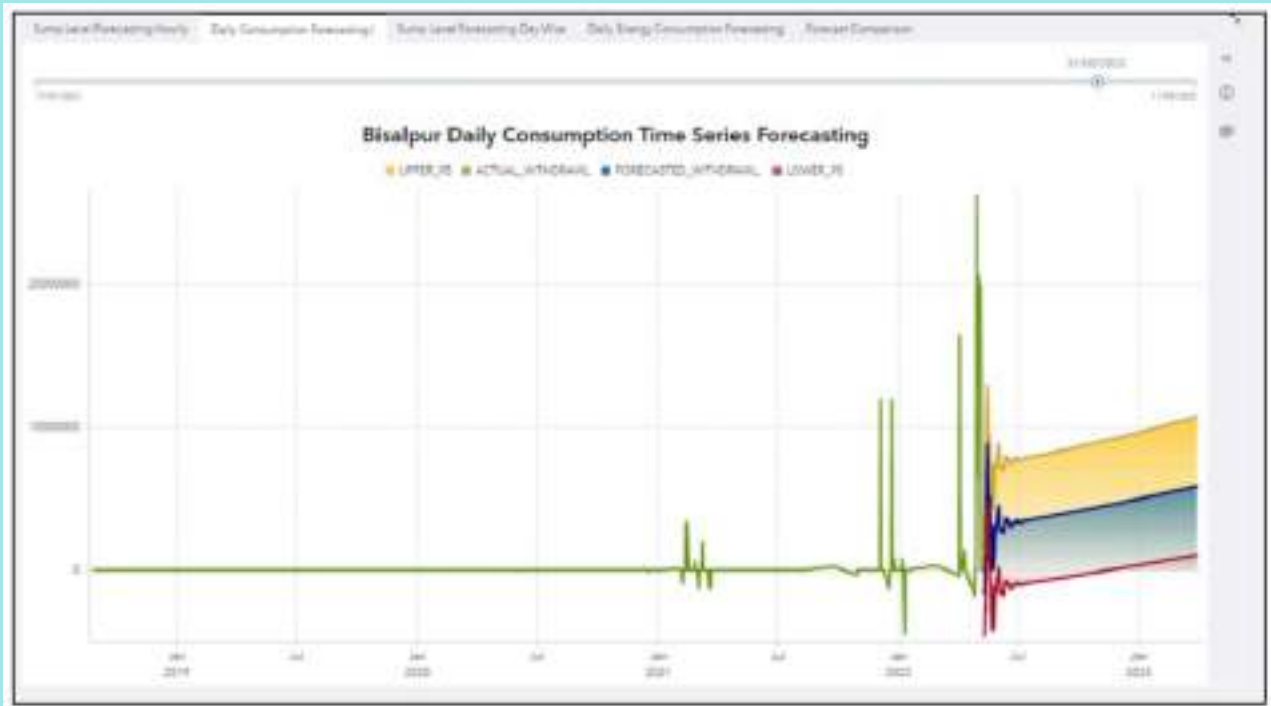


Figure 28: Forecasting trend of electricity demand

Breakdown Voltage (BDV) Analysis

The **Breakdown Voltage (BDV) analysis** provides detailed reports on the performance of **transformers** installed at pumping stations across different projects. By monitoring BDV-related Key Performance Indicators (KPIs), the system helps track whether transformer performance is improving or deteriorating over time. This continuous monitoring enables PHED engineers to schedule **preventive maintenance**, reduce the risk of transformer failures, and extend equipment life. In essence, BDV analysis acts as an early-warning system, ensuring that the pumping stations—critical for water transmission—remain reliable and efficient.

The ERP module, which has evolved into the WIMS mobile application, provides real-time information on RO (Reverse Osmosis) plants, DFUs (Defluoridation Units), solar borewells, SCADA sites, IoT-enabled infrastructure, and geo-tagged assets. In addition, it facilitates monitoring of water sample collection, reservoir cleaning, and inspection activities across the state.

WIMS - Water Information Management System

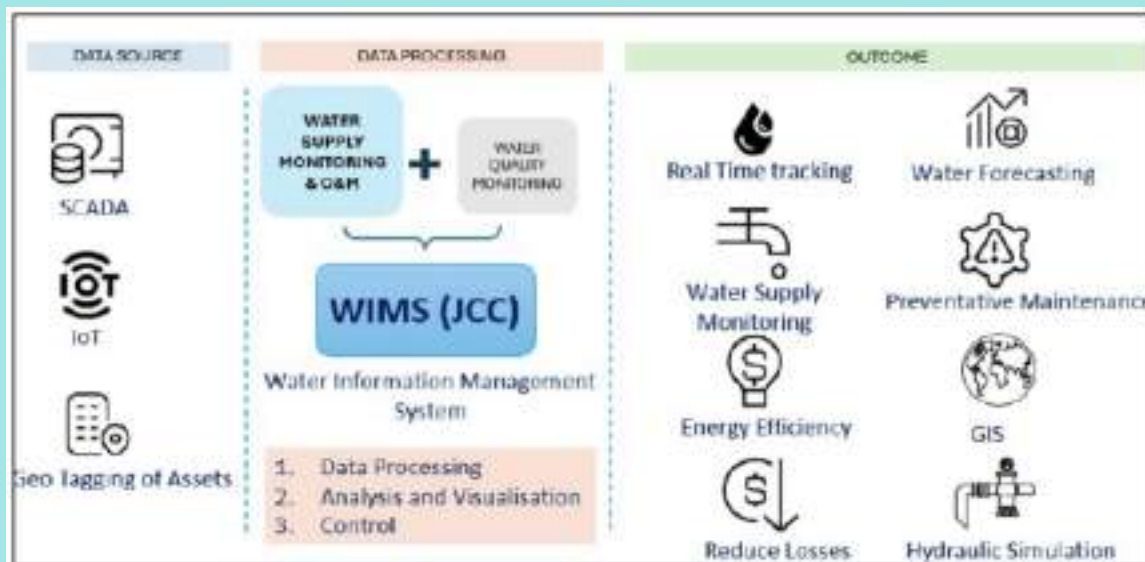


Figure 29: Water Information Management System

The Water Information Management System (WIMS) mobile app, developed by the Department of Information Technology & Communication (DoIT&C), Government of Rajasthan, is designed to bring real-time operational monitoring of critical water infrastructure directly to the hands of officials and field engineers.

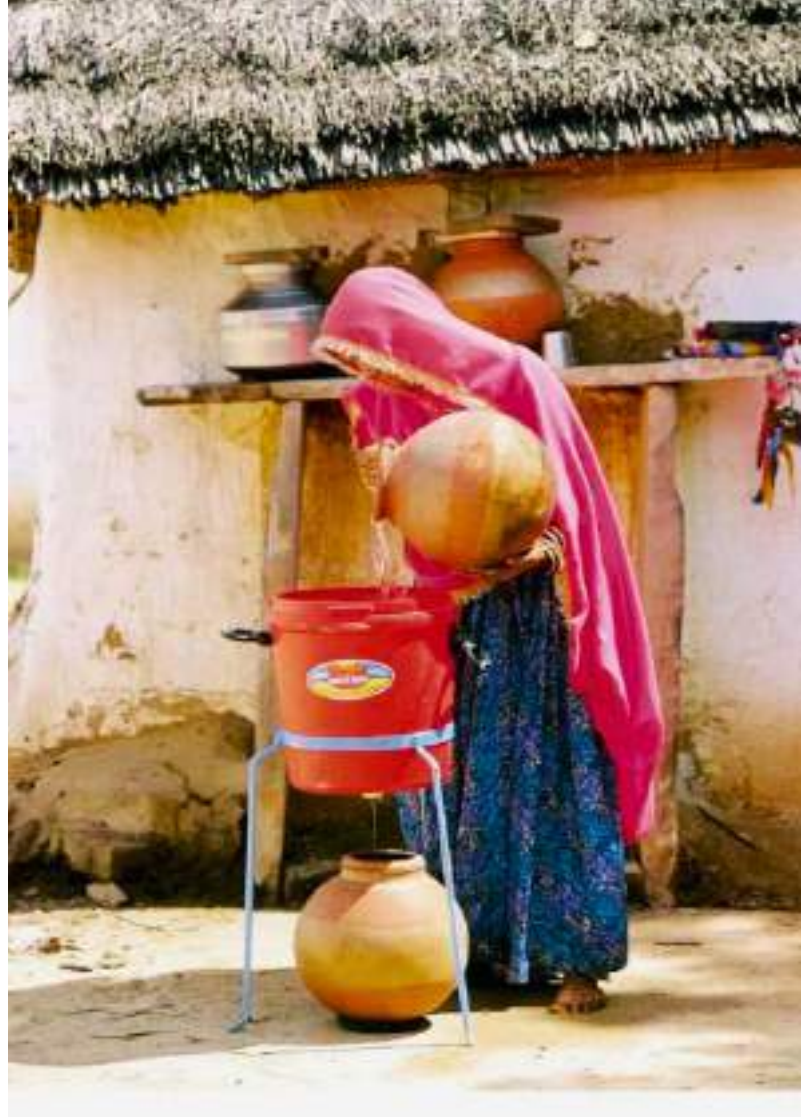
The key features of the app are as follows:

1. RO Units (Reverse Osmosis Plants)

- Rajasthan relies heavily on RO treatment plants because large parts of the state suffer from **high salinity, fluoride, and Total Dissolved Solids (TDS) in groundwater**.
- The app displays how many RO units are operational vs. non-operational in real time.
- This enables PHED staff to **quickly identify breakdowns or downtime**, prioritize repairs, and ensure that communities dependent on treated water are not left without supply.

2. DFUs (Defluoridation Units)

- **Fluoride contamination** is one of Rajasthan's most severe drinking water quality problems, causing dental and skeletal fluorosis in several districts (Nagaur, Ajmer, Udaipur, Dungarpur).
- The app tracks the operational status of **Defluoridation Units (DFUs)** installed at the village level or as part of treatment systems.
- By monitoring DFUs in real time, officials can ensure fluoride removal technologies are functional and address failures before they pose health risks.



3. Solar Water Plants

- Rajasthan has a high potential for **solar energy** use in decentralized water supply, particularly for pumping groundwater in remote, off-grid rural areas.
- The app displays the status of **solar-powered pumping systems**, including how many are operational at any given time.
- This helps the department evaluate the performance of renewable-powered infrastructure and reduces reliance on conventional grid electricity or diesel generators.

4. SCADA Sites (Supervisory Control and Data Acquisition)

- Large-scale water supply schemes (multi-village pipelines, treatment plants, pumping stations) in Rajasthan are increasingly monitored using **SCADA systems**.
- The WIMS app integrates data from SCADA dashboards, showing **flow rates, pumping hours, reservoir levels, and supply coverage**.
- Field staff can access this operational data without needing to log into complex SCADA terminals, improving **on-the-go monitoring and decision-making**.



5. IoT Device

- The “**IoT**” button in the WIMS app opens a section that displays **IoT device status** across Rajasthan.
- It shows how many IoT devices are connected, active, or non-functional.
- Field engineers and officers can quickly check real-time operational data without needing to log into multiple platforms.



Figure 30: WIMS Mobile Application

e-Procurement

The state also leverages the **Rajasthan e-Procurement system** (hosted on eproc.rajasthan.gov.in) for tendering and vendor onboarding. All procurement activities for PHED projects—including JJM schemes—are mandated to be processed through this platform.



The e-Procurement system enables:

- **Transparent vendor onboarding** through online registration.
- **Electronic tendering (e-tendering)** for works, goods, and services.
- **Competitive bidding (L1 selection)** in line with state finance and procurement guidelines.
- **Digital documentation and audit trails** to ensure accountability.

In the context of water supply schemes, the e-Procurement system has become the backbone for purchasing critical materials and services needed to implement and operate projects. All major inputs—such as pipes, pumps, valves, meters, solar pumping systems, SCADA and automation equipment, chemicals for water treatment, and construction services for reservoirs, pumping stations, and distribution networks—are tendered and awarded through the state's online platform.

This digital procurement process minimizes human intervention and reduces risks of bias or manipulation in awarding contracts. It also makes information such as tender notices, corrigenda, bid submissions, and award decisions publicly accessible, increasing accountability. For suppliers, including those located in smaller towns and rural areas, the system simplifies participation by eliminating the need to travel to Jaipur or district headquarters to submit paper bids.

Moreover, e-Procurement in the water sector is closely linked to project execution: once work orders are generated, these contracts feed into PHED's work management processes. In practice, this covers everything from the purchase of pipes for rural distribution networks to meters for household connections, to SCADA systems for monitoring bulk water supply.

Rajneer

Launched and maintained by PHED and developed by the Department of Information Technology & Communication (DoIT&C), the **RajNeer portal** serves as a one-stop digital gateway to **water-related citizen services, information, and project updates** across Rajasthan. It was designed to tackle the state's unique challenges—such as scarce water resources, unpredictable rainfall, and extensive livestock reliance—by improving accessibility, transparency, and public engagement.



Key Features & Functions

- **Citizen Services:** Enables users to apply for new water connections, make bill payments, lodge complaints, and track their application status—all in a bilingual (English/Hindi) interface.
- **Project Transparency:** Features details of major water infrastructure initiatives like the **Chambal–Bhilwara** and **Nagaur Lift Canal** projects, including progress updates, budgets, and service reach. This ensures that citizens have visibility into state-led scheme implementation.
- **Educational & Informational Content:** Provides water safety guidance (e.g., use of RO filters, boiling practices) and awareness materials to engage citizens on safe water usage.
- **Policy & Governance Updates:** Hosts important notices tied to policy changes, tenders, recruitment, and departmental news, helping residents stay informed about PHED's operations and governance framework.

For availing services, the **RajNeer portal** automatically redirects users to the **Rajasthan Single Sign-On (SSO)** page for secure login and authentication.



Figure 31: Rajneer Portal

GIS Mapping and Geo Tagging

Rajdharaa

The Government of Rajasthan has developed **Rajdharaa**, a state-wide, web-based **geoportal** designed to acquire, process, store, and distribute geospatial data. Built on **OGC standards**, Rajdharaa acts as a centralized **Data Clearing House** for spatial data generated by various departments and agencies. Its primary objective is to establish a unified **GIS infrastructure** that supports good governance, sustainable development, and citizen empowerment.

Rajdharaa plays a vital role in **geotagging water infrastructure** such as pipelines, pumping stations, reservoirs, treatment plants, and village-level supply systems. The geospatial data captured through this platform ensures that every asset in the water distribution network is **digitally mapped, stored, and maintained**.

This geotagged information enables PHED to:

- Monitor the physical location and condition of water infrastructure.
- Overlay water assets with other spatial data (habitations, groundwater levels, quality-affected areas) for **better planning and resource allocation.**
- Enhance transparency and accountability in infrastructure creation under programmes like the **Jal Jeevan Mission.**



Beyond mapping, Rajdharaa supports the creation of **multi-dimensional decision support systems**, integrating spatial and non-spatial datasets. This allows departments such as **Water Resources, PHED, and Urban Development** to carry out planning, modelling, and impact assessment of water schemes. The government is also developing **3D GIS models** of infrastructure, which will integrate with Rajdharaa, providing immersive views for **large-scale water network planning and monitoring**. This will further extend to hydraulic analysis and real-time leakage detection in the system.

By offering a **single-window GIS service**, Rajdharaa ensures that water infrastructure data is not just collected, but actively used to improve **policy planning, execution, and monitoring**—helping Rajasthan move towards a more **resilient, transparent, and efficient water supply system**.

In the rural water supply scheme, geotagging is limited to the asset only. There is no geo-tagging or geo-mapping happening for the water pipeline.

Following are the demonstrations of the Rajdhaara and GIS based web portal.



Figure 32: Rajdhaara and GIS based web portal

IoT Devices & SCADA

Water transmission mains transport raw water from multiple surface and underground sources—such as rivers, lakes, reservoirs, and aquifers—to treatment plants. Once treated, the same mains carry water onward to storage reservoirs for distribution. Along these transmission lines, a range of instruments, including **flow meters, pressure sensors, level sensors, energy meters and quality sensors** are installed. The data captured by these devices is continuously transmitted in real time to the local master **SCADA system**, enabling centralized monitoring and control of water conveyance operations.

In Rajasthan, the SCADA systems are mainly integrated only at the bulk water supply lines, and not at smaller-diameter pipes. Even the IoT devices and quality sensors are installed either near the water treatment plants or the pumping stations. In the case of the Single Village Scheme (SVS) and Multi-Village Scheme (MVS), the quality of the supply is measured by FTK.

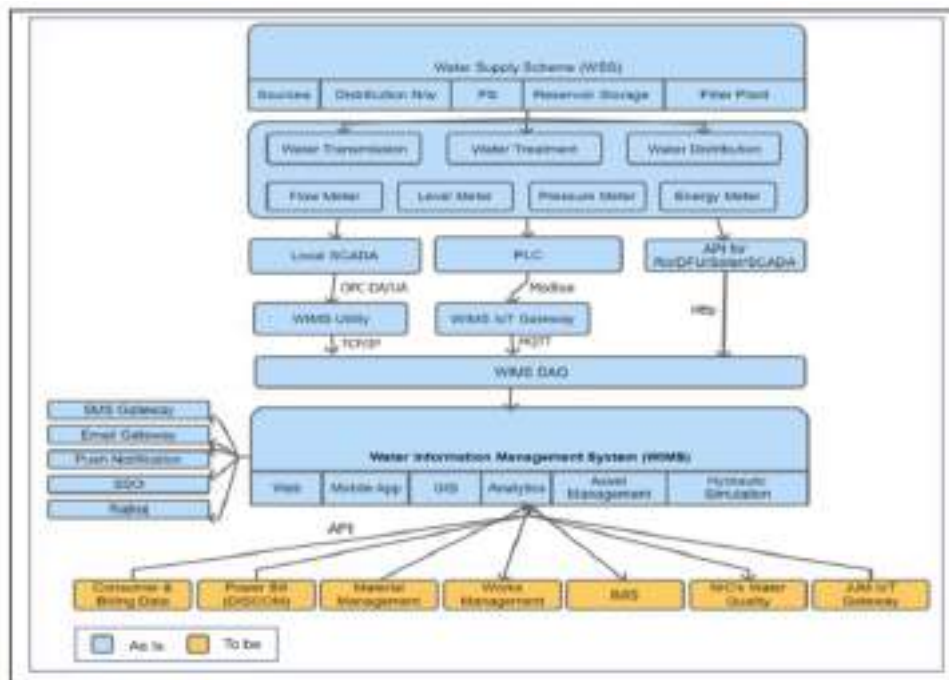


Figure 33: SCADA System Workflow

The system functions as a **centralized Water Information Hub** that continuously collects and manages data from field devices. Readings from instruments such as **flow meters, pressure sensors, level meters, and pH sensors** are captured and sent to the **central server located at the State Data Centre**. These readings are transmitted at regular intervals, with the frequency configurable as per the requirements of **RISL (RajCOMP Info Services Ltd.)** and **PHED (Public Health Engineering Department)**. Data is collected on a **near real-time basis**, ensuring that there is no lag beyond the defined periodicity and no data loss during transfer from the **local SCADA system** to the central site.

The **Water Information Hub**, built on top of this system, provides powerful **web-based MIS reporting** capabilities. It enables **online monitoring, trend analysis, historical data reporting**, and aggregation of information by **daily, monthly, and peak-hour intervals**. It also supports **exception reporting**, which helps in quickly identifying and addressing abnormal conditions.

For communication, the system uses multiple channels such as **GPRS, RF, MPLS, broadband, or optical fiber**, ensuring flexibility and reliability in transmitting data. The synchronization between the **local SCADA system** and the **central server** is managed through **periodic updates using OPC/UA protocols** over secure **VPN/WAN networks**, ensuring both accuracy and security of data transfer.

In essence, this setup creates a robust **state-level water data ecosystem** where field-level sensor readings are seamlessly captured, transmitted, stored, and analyzed—enabling better **decision-making, transparency, and proactive management** of water supply systems.

However, as seen in the above workflow, APIs for integrating WIMS with consumer and billing data, power bills, material management, work management, IMIS, NIC's water quality system, and the JJM IoT gateway are yet to be developed. The processes are currently in progress, and once API integration is implemented, data will flow directly and be visible in real time.



State Functionaries



Capability Matrix

Below table outlines the mapping of a Capability from DMM to the Rajasthan IT systems for State Functionaries.

| | |
|--|---|
| INTER DEPARTMENTAL DATA EXCHANGE | PHED exchanges data with the state electricity board (DISCOM), which enables power demand forecasting and helps in planning energy requirements for water supply operations. |
| JOINT PLANNING & APPROVAL WORKFLOWS | Sufficient information is not available in this area. |
| GRIEVANCE & FEEDBACK LOOP INTEGRATION | Sufficient information is not available in this area. |
| JOINT TRAINING & KNOWLEDGE SHARING PLATFORM INTEGRATION | Sufficient information is not available in this area. |
| CROSS-SECTORAL POLICY ALIGNMENT | Sufficient information is not available in this area. |
| CROSS-SECTOR ANALYTICS & DASHBOARDS | Electricity consumption forecasting, carried out in coordination with DISCOM, is integrated into the ERP dashboard. This allows PHED to visualize future power demand and plan pumping schedules. |
| EMERGENCY RESPONSE & DISASTER MANAGEMENT INTEGRATION | Sufficient information is not available in this area. |



Technology Foundation

Capability Matrix

Below table outlines the mapping of a Capability from DMM to the Rajasthan IT systems for Technology Foundation.

| | |
|--|--|
| UNIFIED / INTEGRATED PLATFORM APPROACH | <p>ERP/WMS is an integrated platform that is being built by the PHED Rajasthan. However, the portal is yet to be made public.</p> |
| MODERN TECHNOLOGY STACK & CLOUD-NATIVE ARCHITECTURE | <p>Java, PostgreSQL, Drools, Kafka.</p> |
| INTEROPERABILITY WITH CENTRE SYSTEMS | <p>Limited interoperability with centre systems via APIs.</p> |
| API INTEGRATIONS WITH EXTERNAL APPLICATIONS | <p>Limited integration with other states' applications via APIs. The ERP system is linked to the DISCOM for electricity tracking.</p> |
| IDENTITY & ACCESS | <p>PHED IT systems are SSO-enabled using the state-level SSO framework, which provides a unified digital identity—known as the SSO ID—for accessing a wide spectrum of government services across the state. It supports various user categories, including citizens, businesses, employees, and e-Mitra kiosks.</p> |
| USE OF ARTIFICIAL INTELLIGENCE | <p>At present, AI is not used, however, the department is seriously planning to develop in this area for predictive analytics and forecasting.</p> |
| SECURITY AND COMPLIANCE | <p>Employs robust security mechanisms including OTPs, Aadhaar authentication, and multi-factor options.</p> |



Infrastructure

Capability Matrix

Below table outlines the mapping of a Capability from DMM to the Rajasthan IT systems for Infrastructure.

| | |
|--|--|
| HOSTING INFRASTRUCTURE | Since the applications are hosted at the State Data Centre, this is taken care of as per State Data Centre policies. |
| STORAGE AND DATABASES | Since the applications are hosted at the State Data Centre, this is taken care of as per State Data Centre policies. |
| HIGH AVAILABILITY & DISASTER RECOVERY | Since the applications are hosted at the State Data Centre, this is taken care of as per State Data Centre policies. |
| MONITORING & OBSERVABILITY | Being a fragmented IT ecosystem, centralized monitoring and observability is not available. |
| SCALABILITY (HORIZONTAL & VERTICAL) | Applications do not seem to be built using cloud-native microservices-based architecture and therefore have limited horizontal scalability. Applications should scale vertically by adding more hardware resources at the data centre. |
| BACKUP AND RECOVERY MANAGEMENT | Since the applications are hosted at the State Data Centre, this is taken care of as per State Data Centre policies. |
| NETWORKING AND CONNECTIVITY | Since the applications are hosted at the State Data Centre, this is taken care of as per State Data Centre policies. |

Conclusion

The "As-Is" study of the Public Health Engineering Department (PHED) in Rajasthan reveals a digital landscape marked by both significant achievements and crucial opportunities for future development. In alignment with the Government of India's "Digital India" initiatives, the state has adopted an "IT first" policy to enhance efficiency, transparency, and citizen engagement. The current IT ecosystem supports a wide range of functions, from project monitoring to citizen grievance redressal, demonstrating a clear commitment to leveraging technology for improved water service delivery.

The report identifies several key strengths of the existing systems. The state's centralized Single Sign-On (SSO) platform provides a unified digital identity for citizens and employees, minimizing user friction. Applications like e-Mitra have proven to be highly successful, functioning as a user-friendly, multi-channel platform for bill payments and other government services, particularly in rural areas, where it bridges the digital divide through a vast network of kiosks.



Furthermore, the deployment of Supervisory Control and Data Acquisition (SCADA) systems in critical infrastructure projects, such as the Bisalpur Water Supply Project, has enabled real-time monitoring and control of water flow, enhancing the reliability of urban water networks. The multi-channel grievance redressal system through Rajasthan Sampark (181) and the Jal Mitra app for new connections further underscore the department's progress in creating accessible digital services for citizens. In addition, they have also developed WMS for project monitoring, WIMS/JCC for real-time infrastructure status, and Rajdharaa for asset geo-tagging. These initiatives show the department's commitment to improving transparency, efficiency, and accountability through IT.

Despite these commendable achievements, the study highlights several key areas where strategic improvements are necessary to achieve a "Leading" maturity level, as defined by the Capability Maturity Model (CMM). The current IT infrastructure is characterized by siloed applications such as Grievance Redressal, Jal Mitra, and the Work Management System (WMS), which lead to duplicated data entry and fragmented scheme monitoring. The lack of interoperability with central IT systems like the Jal Jeevan Mission—Integrated Management Information System (JJM-IMIS) and the Water Quality Management Information System (WQMIS) is a significant concern, as it necessitates manual data entry and causes delays in reconciliation. This manual process also extends to water quality monitoring, where data is collected and entered manually by field workers and lab staff, increasing the risk of errors and delays. Multiple portals with overlapping information and functionality create confusion among citizens. A crucial gap is the limited use of advanced analytics and Artificial Intelligence (AI) for predictive maintenance, demand forecasting, and leak detection, which keeps management in a reactive mode.

Moving forward, the strategic path for PHED Rajasthan should focus on integrating its existing digital assets into a cohesive, interoperable ecosystem. The primary objective must be to transition from a collection of siloed applications to a unified and data-driven platform.

This requires a concerted effort to:

- **Establish a Middleware/Shared Services Layer:** Developing a middleware layer will enable seamless data exchange and task coordination across all applications, eliminating duplication and improving overall efficiency.
- **Enhance API Integration:** Stabilising and reviving API integrations with central systems like JJM-IMIS and WQMIS is critical to ensure real-time data synchronization and accuracy, which will directly impact project monitoring and resource allocation.
- **Digitize Field Operations:** Automating data collection, particularly for water quality, through the use of unique household identifiers (UTIDs/QR codes) and automated lab uploads will significantly reduce errors and delays.
- **Empower Citizens with Data:** Implementing public dashboards and mobile applications that provide real-time, village-level water quality results will increase transparency and build public trust.
- **Embrace Advanced Analytics:** The introduction of AI/ML models for demand forecasting and predictive maintenance will allow for proactive and optimized resource management, moving the department from a reactive to a strategic posture.
- **Expand Mobile Ecosystem:** Developing role-specific mobile applications for citizens, contractors, and frontline workers will enhance engagement and provide essential tools for reporting and managing water-related issues.
- **Establish a shared data platform:** Implement master data management and near-real-time pipelines from SCADA/IoT/LIMS/Sampark/e-Mitra; publish secure APIs to IMIS/WQMIS.

In conclusion, PHED Rajasthan has a strong foundation of digital tools and a clear vision for e-governance. By addressing the identified gaps and focusing on interoperability, automation, and data-driven decision-making, the department can transform its IT systems from an administrative support function into a strategic asset. The ultimate goal is to create a digital infrastructure that not only meets but exceeds the needs of its stakeholders, ensuring the reliable, transparent, and sustainable delivery of water to every household in the state.

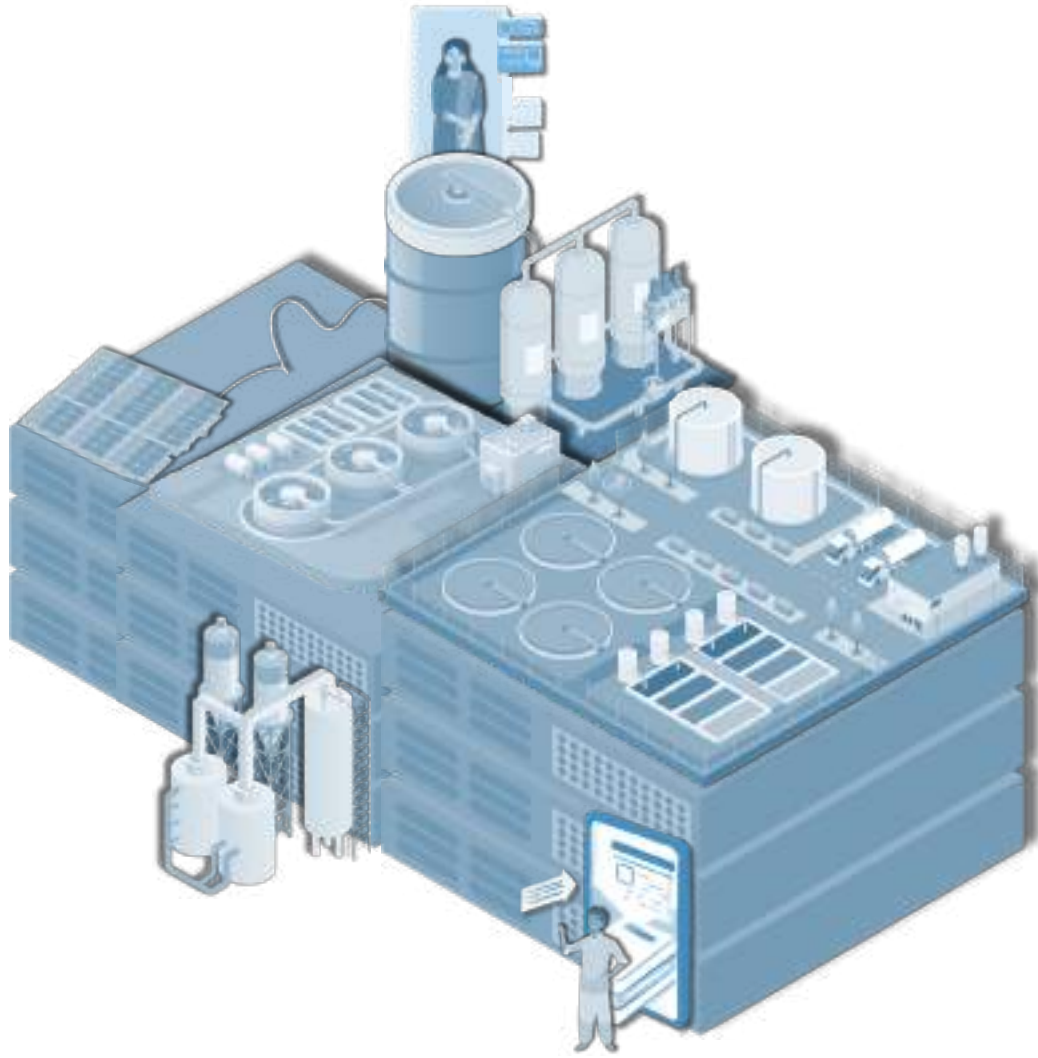


In the context of Rajasthan, **Digital Public Infrastructure (DPI)** offers the most practical and powerful use case. With frequent challenges of scarcity, quality, and service reliability, DPI provides a way to **connect all layers of the system—citizens, frontline workers, laboratories, engineers, and decision-makers—on a single interoperable platform**. It ensures that data on water availability, scheme progress, and water quality flows **in real time** from the field to the state level, while citizens gain transparent access to services and grievance redressal. Frontline workers can record and share field activities instantly, and policymakers can rely on accurate dashboards to take timely action. For a geography like Rajasthan, where resources are scarce, and service delivery is complex, DPI creates a **scalable, integrated, and future-ready digital backbone** that directly supports the goal of providing safe and reliable drinking water to every household.



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