As-Is Study Report

On State IT Systems

PHED

ASSAM

Arghyam

Disclaimer: This As-Is Study Report has been prepared based on information, documents, and inputs made available by the concerned stakeholders, as well as field interactions and secondary research. The analysis, findings, and observations presented herein are intended solely for informational and decision-support purposes. While due care has been taken in compiling the report, the authors and contributing organizations do not assume responsibility for errors, omissions, or subsequent changes to the underlying information. The report reflects the current situation which may be subject to change. Neither the department nor the authors shall be liable for any direct, indirect, or consequential loss arising from reliance on this report. The report does not, in any way, constitute a legally binding commitment from the department or the authors.

FOREWORD

It is with great pride and deep appreciation that I present the As-Is Study Report on State IT Systems of **PHED Assam**. 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.

Assam's water sector under the Jal Jeevan Mission stands as a compelling example of institutional commitment and purposeful digital innovation. The state has embraced technology as a core enabler of program implementation, building a comprehensive and integrated platform in the form of JJM BRAIN that supports end-to-end scheme management, real-time monitoring, and data-driven decision-making. Through initiatives such as QR-based scheme tracking (Jalkosh), mobile applications for frontline workers, multimodal grievance redressal systems, and GIS-based infrastructure mapping, Assam has created a digitally connected ecosystem that links administrators, engineers, field staff, and citizens. This spirit of structured innovation and execution has positioned Assam as a leading example of how digital platforms can be effectively leveraged to transform rural water service delivery in India.

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 Assam stands today, and where it must go next.

I extend my sincere appreciation to the PHED Assam 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 Assam 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 Assam.

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 West Bengal stands in its digital journey, and what it will take to go further.

What stands out most about Assam's approach under the JJM is not any single application or platform, but the clarity of vision with which technology has been embedded into program delivery. The development of JJM BRAIN as a unified platform, along with innovations such as QR-based scheme tracking, mobile-first tools for frontline workers, chatbot-enabled engagement, and integrated grievance systems, reflects an institutional mindset that prioritizes visibility, accountability, and inclusivity. This is not an ecosystem built around isolated solutions, but one that has been designed to connect stakeholders across levels—from state administrators to village communities. That clarity of intent and execution is a defining strength and a critical foundation for sustained digital transformation. The path forward is therefore one of thoughtful enhancement—building on existing strengths while enabling greater agility, resilience, and insight across the ecosystem.

This is precisely where studies such as this one become valuable. A clear and grounded understanding of the current landscape enables institutions to evolve with purpose and alignment. It provides a shared baseline for stakeholders to identify priorities, streamline efforts, and guide future investments.

It is hoped that this report supports that journey by offering a structured perspective on Assam's digital ecosystem and contributing to its continued advancement as a leading example of technology-enabled governance in the water sector.

I am grateful to the PHED Assam 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, Assam was identified for an in-depth assessment due to its strong emphasis on leveraging digital tools to enhance transparency, efficiency, and community engagement in water service delivery. Under the Jal Jeevan Mission, Assam has demonstrated a forward-looking approach by integrating technology across citizen engagement, frontline workforce enablement, monitoring, and reporting. The state's flagship platform, JJM BRAIN, represents a comprehensive digital ecosystem that enables end-to-end visibility of schemes, real-time monitoring, and data-driven decision-making. Its integration of tools such as Jalkosh QR codes, mobile applications for field users, multimodal grievance redressal systems, chatbot-based engagement, GIS-based tracking, and litholog databases reflects a mature and thoughtfully designed digital landscape.

At the same time, Assam's experience highlights an important and encouraging reality: as digital ecosystems expand in scale and functionality, there exists a valuable opportunity to further strengthen architectural coherence, scalability, and advanced analytics capabilities.

Enhancing aspects such as system modularity, offline functionality for field environments, predictive intelligence, and deeper integration with external systems can help amplify the effectiveness of an already robust platform. These represent the natural next steps in the evolution of a system that has rapidly achieved breadth and operational depth, and offer important learnings for similar initiatives across the country.

This report presents a comprehensive understanding of the existing digital ecosystem of Assam's water sector, based on stakeholder consultations, field interactions, system demonstrations, and analysis of available documentation. The findings recognize the state's significant progress in building an integrated, citizen-centric, and data-driven platform that connects administrators, engineers, frontline workers, and communities. At the same time, they point to opportunities for further strengthening interoperability, advanced analytics, and system resilience, enabling Assam to build upon its strong foundation and continue advancing as a leading example of technology-enabled governance in the rural water sector.

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, Assam, and the team of Jal Jeevan Mission, Assam. 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 insights into digital platforms such as JJM BRAIN, along with operational workflows, field-level practices, 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, technical teams, and program functionaries enabled a comprehensive understanding of the digital ecosystem and its role in strengthening rural water service delivery across the state.

Special acknowledgement is due to **Shri Kailash Karthik N, IAS**, Secretary to the Government of Assam, Public Health Engineering Department and Mission Director, Jal Jeevan Mission, Assam, for his leadership and guidance. Sincere appreciation is extended to **Smt. Preeti Kumari, IAS** (Joint Secretary to the Government of Assam, General Administration Department cum Additional Mission Director, Jal Jeevan Mission, Assam), **Shri Biraj Boruah, ACS** (Deputy Mission Director, JJM Assam), **Shri Arnav Kumar Baruah, ALRS** (Assistant Mission Director, JJM Assam), **Shri Hemanta Kumar Sharma** (SPS – Monitoring, IMIS & Knowledge Management), **Shri Sarangapani Sarma** (State Coordinator and Software Developer), **Shri Jyotishman Sarma** (Software Developer), **Shri Manoj Saharia** (Software Developer), and **Shri Abdul Wahab Azad** (Software Developer) for their valuable inputs and technical insights.

The department extended full support in facilitating structured interactions, system walkthroughs, and detailed discussions throughout the study. 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. Prerna 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

AI/ML	-	Artificial Intelligence / Machine Learning
APDCL	-	Assam Power Distribution Company Limited
API	-	Application Programming Interface
ASHA	-	Accredited Social Health Activists
BFM	-	Bulk Flow Meter
FHTC	-	Functional Household Tap Connection
FTK	-	Field Testing Kit
GIS	-	Geographic Information System
IMIS	-	Integrated Management Information System
IoT	-	Internet of Things
ISA	-	Implementation Support Agency
IT	-	Information Technology
JJM	-	Jal Jeevan Mission
JJM BRAIN	-	Jal Jeevan Mission Building Real & Analytical Information Network
JM	-	Jal Mitra
O&M	-	Operation and Maintenance
P&RD	-	Panchayat and Rural Development
PG	-	Performance Guarantee
PGRS	-	Public Grievance Redressal System
PHED	-	Public Health Engineering Department
PWD	-	Public Works Department
PWSS	-	Piped Water Supply Scheme
RPO	-	Recovery Point Objective
RTO	-	Recovery Time Objective
SMT	-	Scheme Monitoring Tool
SO	-	Section Officer
TPIA	-	Third-Party Inspection Agencies
VPN	-	Virtual Private Network
WQMIS	-	Water Quality Management and Information System
WUC	-	Water User Committee

Executive Summary

With a targeted saturation date of **March 31, 2026**, the state has successfully increased household tap water coverage from **2% (1,11,311 households)** in **August 2019** to an impressive **81.3% (58,75,505 households)** today, out of a total of **72,25,380 households.**

The Jal Jeevan Mission (JJM) Assam has demonstrated remarkable progress in strengthening water supply systems through the innovative use of the digital platform JJM BRAIN. This comprehensive system has enabled end-to-end visibility, efficient scheme management, and real-time monitoring of water infrastructure projects across the state. Assam's integration of tools such as **Jal Kosh QR codes, the Jal Mitra mobile app, the Contractor mobile app, the NHM mobile app, the WUC mobile app, Multimodal Grievance Redressal, the Jaldoot chatbot, Pipeline Distribution Tracking, GIS & Geo tagging and the LithoLog database** reflects a forward-thinking approach to transparency, accountability, and community engagement. The collaboration among field-level users, engineers, administrators, and citizens through digital platforms stands as a commendable model for other states, showcasing how technology can enhance service delivery in the rural water supply sector.

The JJM BRAIN (Building Real & Analytical Information Network) platform is a comprehensive water management system that centralizes and streamlines the management of various components, such as performance guarantees, public grievance monitoring, material procurement, and project progress tracking. It is the backbone of JJM Schemes in Assam, designed as a monolithic yet highly modular three-tier web application. This is a custom-built G2C (Government to Citizen Services) and G2E (Government to Employees) web application conceptualized, developed, run and maintained by Jal Jeevan Mission (JJM) Assam. **Multiple Dashboards** provide real-time analytics for performance tracking of schemes at the state, district, and village levels.

Figure 1: A digital platform for monitoring and managing key aspects of JJM projects.

With robust governance, innovative digital strategies, and community-centric implementation, Assam's Jal Jeevan Mission exemplifies effective rural water management. Continued emphasis on technological integration, transparency, community participation, and adaptive infrastructure will ensure sustained long-term success and universal coverage.

The department has utilized technology for citizen engagement, empowering frontline workers, data collection, monitoring, risk management, and reporting to execute the mission more efficiently and transparently, ensuring that its goals are met within the designated time frame. Leveraging digital tools has allowed the state to improve infrastructure monitoring, enhance transparency, and optimize resource utilization.

Highlights

1. Unified Digital Governance Platform

Single Source of Truth: JJM BRAIN acts as a centralized platform integrating multiple modules such as schemes, work orders, WUCs, grievances, lab data, GIS networks, and more.
Real-Time Monitoring: Live dashboards and GIS-based updates ensure transparency and accountability across all implementation levels—from state to panchayat.

2. Field-First Mobile Architecture

- **Contractor App:** Facilitates real-time pipe-laying tracking using GPS, FHTC tagging, and task monitoring.
- **WUC App:** Enables Water User Committee members to log O&M data, access bylaws, and update expenditure on their mobiles.
- **Jal Mitra App:** Field functionaries can input flow meter readings, sample test data, and report scheme issues instantly.

3. Jal Kosh ID & Community Engagement

- **QR-Based Scheme Tracking:** Jal Kosh provides each scheme with a unique QR code for citizens to access scheme data.
- **Citizen Feedback & Grievance Integration:** Citizens can rate schemes, raise issues, and submit evaluations—ensuring bottom-up feedback loops.

4. Water Quality Surveillance & Lab Management

- **Lab Data Module:** Tracks inventory, test results, and field sample collection.
- **Impact Analysis & Re-testing Triggers:** Automatically notifies field teams when test results are outside permissible limits, prompting resampling.

5. Strong Grievance Redressal System

- **Multi-Channel Capture:** Grievances received via WhatsApp, web forms, media, or calls are tracked.
- **Automated Routing & PDF Closure Reports:** Issues are auto-assigned and documented with resolution reports approved by engineers.

6. Scheme Lifecycle Digitization

- **Full Lifecycle Coverage:** From scheme sanction in SMT to handover to PNRD with WUC assignment and O&M tracking.
- **Validation & Approval Workflows:** Each stage—from WUC creation to scheme handover—is role-based and subject to validation.

7. Asset Tracking & GIS Network Visualization

- **Pipe Network Digitization:** Geo-tagged pipe installation using contractor apps, with distance tracking and KML export for correction in QGIS.
- **Categorized Pipe Attributes:** Tracks material, diameter, and installation timelines for quality and inventory control.

8. Flood Impact Monitoring

- **Disaster Preparedness:** Special module to assess flood impacts, categorize severity, and track inundation for assets.

9. Capacity Building and Community Engagement

- Extensive community involvement demonstrated by training over 1.14 lakh women in water-quality testing, promoting local awareness, empowerment, and sustainability.
- Focused IEC campaigns and capacity-building initiatives drive behavioural change, hygiene awareness, and sustainable water usage practices among rural populations.

10. Custom Campaign and Outreach Tools

- **Glific WhatsApp Bot Integration:** For engaging school students under the Jaldoot programme using educational nudges.
- **Campaign Builder:** Allows for questionnaire design, public outreach, and data collection for behaviour-change initiatives.

11. Strong Panchayat & WUC Empowerment

- **PNRD Portal Integration:** Panchayat users can log O&M expenses, approve scheme handover, and monitor WUC activity.
- **WUC Dashboard:** Real-time stats on scheme ownership, bank status, and committee functioning, empowering local ownership.

13. Visual Dashboards & Role-Based Insights

- **Data-Driven Decisions:** Every module includes detailed dashboards (e.g., lab stock, WUC status, pipe installation progress) that allow easy tracking and action planning.
- **CSV Exports:** Enables granular data analysis and offline reporting for various administrative units.

14. Transparency, Accountability, and Inclusivity

- **Audit Trails & Activity Logs:** Every action in the system is logged, creating a complete audit trail.
- **Multi-Language Support:** Most end user interfaces support English, Hindi, Bengali and Assamese, ensuring inclusive access.

Strategic improvement area

1. Monolithic Application

- **Issue:** JJM BRAIN is not a cloud-native microservices architecture-based application
- **Impact:** This limits the scalability of the application and is a potential barrier to taking certain modules of this application to the open source community and eventually publishing as DPGs.
- **Recommendation:** Start migrating towards a cloud-native microservices architecture-based application.

2. Technology Stack

- **Issue:** JJM BRAIN is built in PHP and the Laravel framework, which is not considered to be a modern technology stack.
- **Impact:** While there is no immediate impact and several world-class applications are using PHP currently, it can hinder the migration of the application to modern architectures in the long term.
- **Recommendation:** With a microservices architecture in place, there would be an opportunity to build new modules in modern programming languages like Java, Python, etc. The state should grab this opportunity and build new modules using a modern technology stack.

3. Application Resilience and Reliability

- **Issue:** The application has not been tested for its resilience and reliability, with no well-defined RPO and RTO metrics.
- **Impact:** In abnormal conditions or cases of system failure, business continuity may be affected significantly.
- **Recommendation:** Define RPO and RTO metrics and build a process to routinely conduct mock drills of disaster recovery. Conduct performance and load testing to measure the scalability of the application.

4. Limited Offline Functionality

- **Issue:** Many field apps (Contractor, Jal Mitra, WUC) are heavily dependent on continuous internet connectivity.
- **Impact:** Field users in remote or flood-prone areas with poor mobile network coverage face challenges in uploading pipeline data, lab readings, and monthly reports.
- **Recommendation:** Introduce offline-first data capture with later synchronization capabilities.

5. Lack of Centralized Error Flagging System

- **Issue:** While individual modules allow data corrections (like pipe geotagging), there is no centralized dashboard to flag errors across schemes (e.g., duplicate WUCs, missing Jal Mitras, and unverified FHTCs).
- **Impact:** Errors can remain unresolved or unnoticed across departments.
- **Recommendation:** Add a "Data Health Dashboard" or "Error Summary" section for each district or division.

6. Grievance Module Lacks Smart Escalation

- **Issue:** There is no Service-Level Agreement (SLA) or automatic escalation mechanism if a grievance remains unresolved for a defined period.
- **Impact:** Some grievances may remain pending without accountability.
- **Recommendation:** Introduce escalation tiers (SO → EE → HQ) based on time thresholds.

7. No Predictive or Analytical Intelligence

- **Issue:** While JJM BRAIN is rich in operational data, it lacks predictive alerts (e.g., an alert for a scheme likely to fail due to poor FHTC coverage or irregular lab testing).
- **Impact:** Proactive decision-making is limited; most actions are reactive.
- **Recommendation:** Introduce AI/ML-driven alerts for O&M, water quality, and asset degradation.

8. Integration with External Utilities Is Partial

- **Issue:** Electricity (APDCL) and Land Record (Sewa Setu) integrations are not two-way or automated.
- **Impact:** Frequent manual intervention is needed, slowing workflows.
- **Recommendation:** Move toward full automation of APDCL billing verification, land ownership validation, and subsidy mapping.

9. Lack of Real-Time Water Quality Analytics

- **Issue:** Water testing is mostly manual with periodic sample updates; no live sensors or IoT-based analytics are available.
- **Impact:** Delays in detecting contamination or ensuring consistent quality.
- **Recommendation:** Pilot real-time sensor-based water quality modules (for turbidity, pH, etc.) with API integration into the lab dashboard.

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 have yet to fully embrace the use of digital technology. Therefore a States Information Systems Digital Maturity Model (DMM) has been developed to systematically measure, improve, and manage the States/UTs IT Capabilities in rural drinking water sector over time. DMM is a structured framework for assessing the maturity of advancements in IT systems & applications in States Rural Drinking Water Management. The model would provide structured inputs in IT governance and strategic digital transformation planning of 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.**

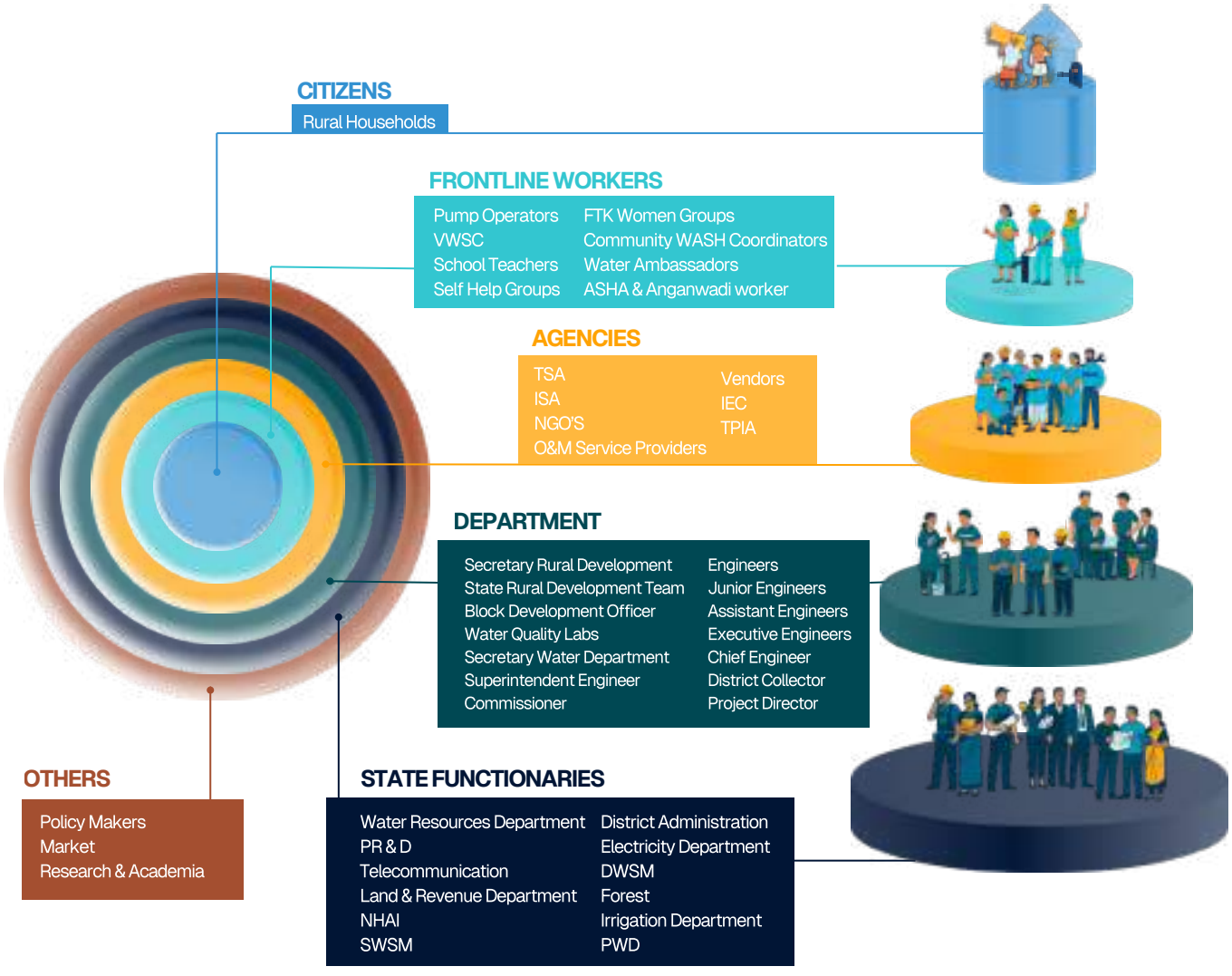


Figure 2: Stakeholders Mapping - State IT Systems

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.

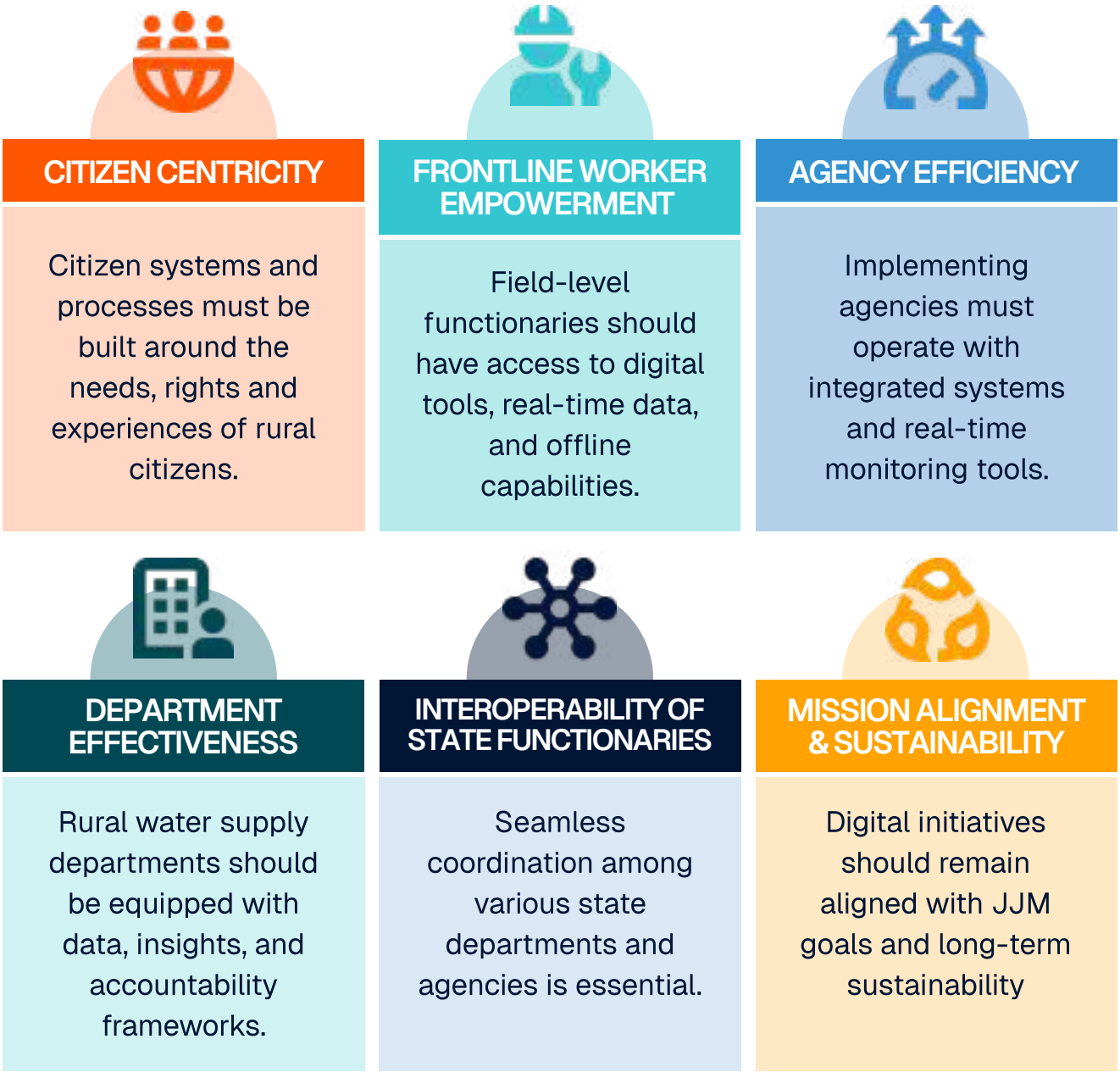


Figure 3: DMM Guiding Principles

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, resulting in forty-two unique capabilities system-wide. In addition, seven common capability areas, applicable across the ecosystem, are grouped under a separate layer of **Common Capabilities** 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. Departments have fourteen distinct capabilities and are excluded from this enumeration.

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.**

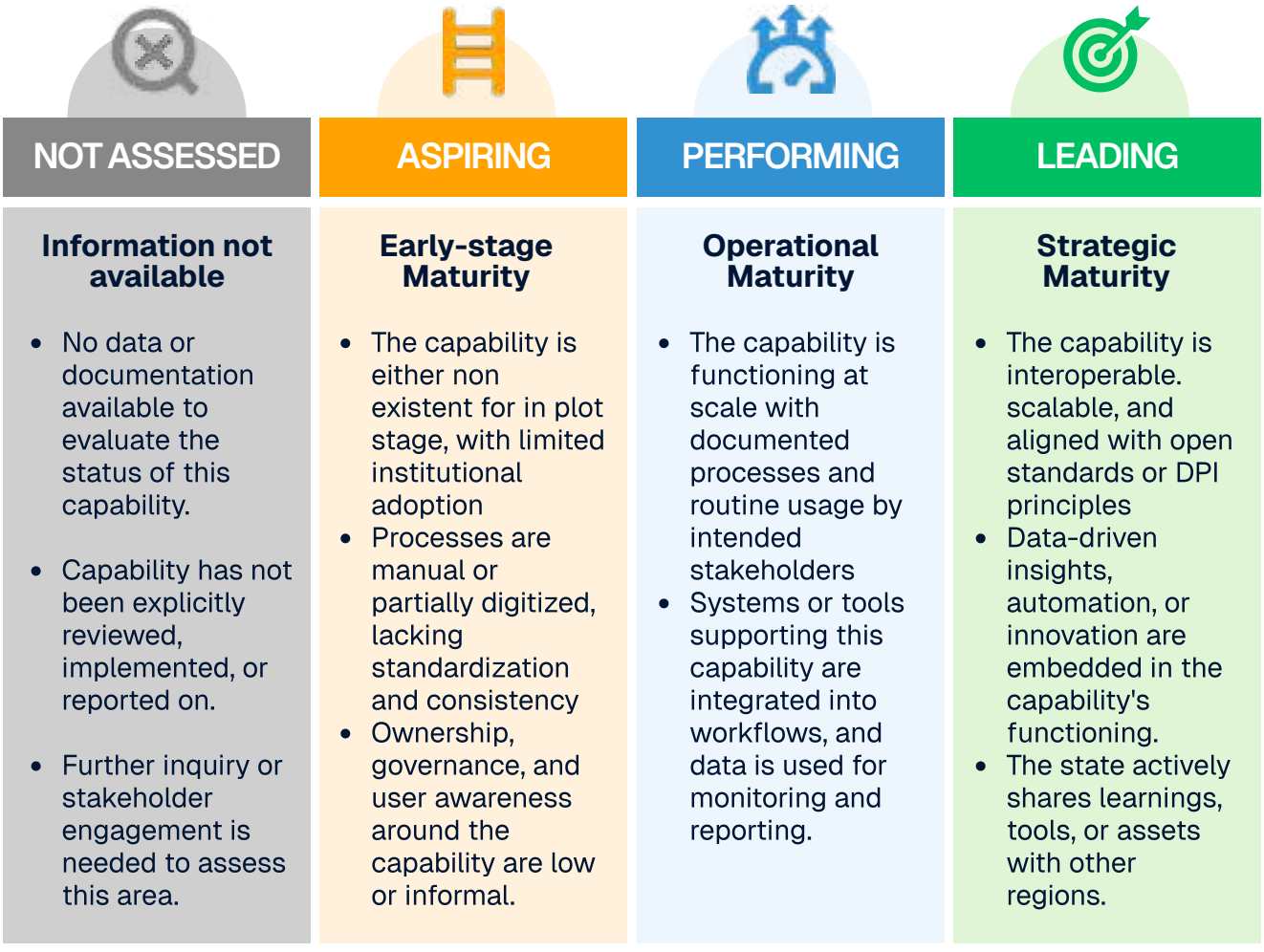


Figure 4: DMM Maturity Levels

Digital Maturity Model (DMM)

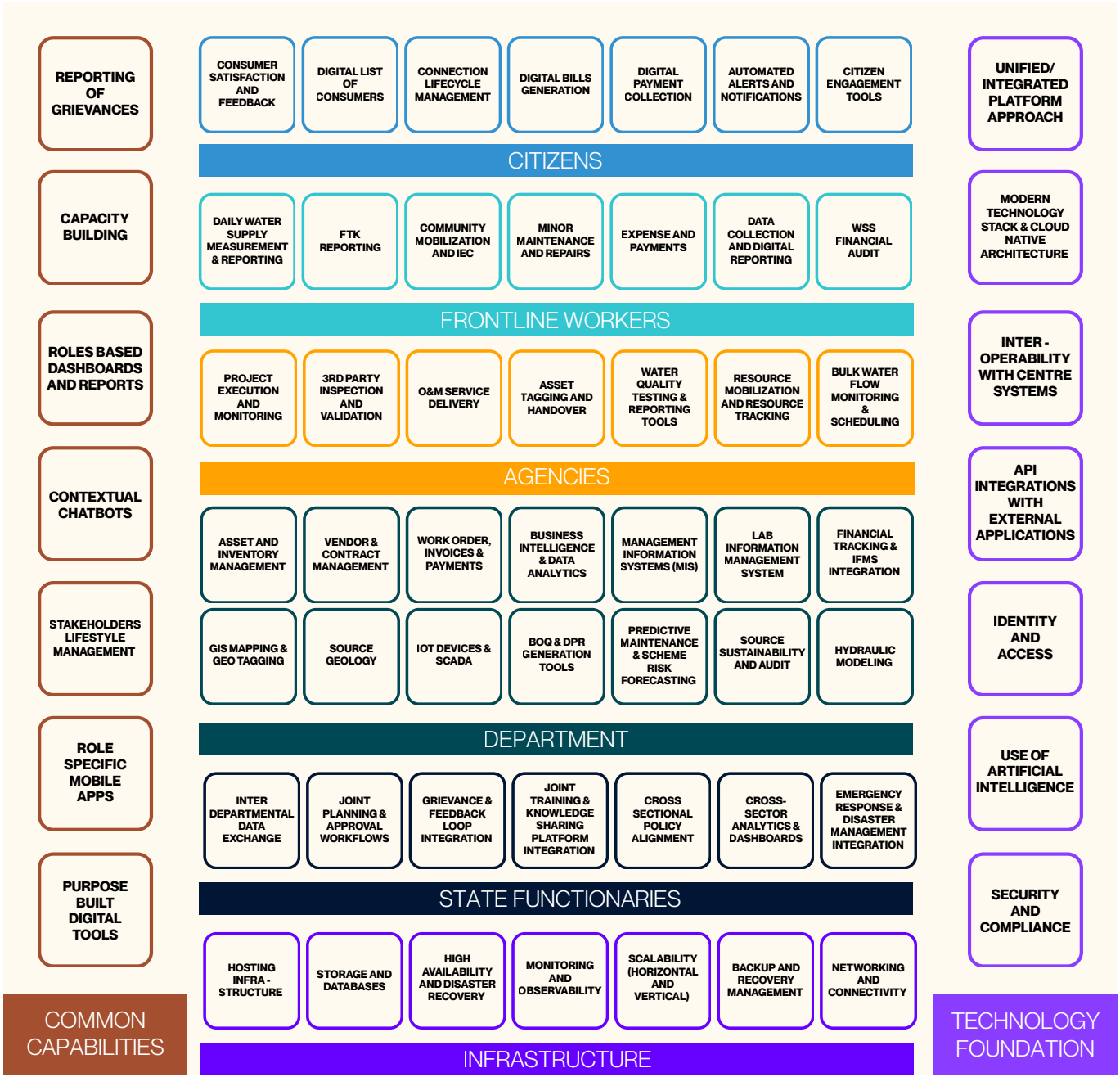


Figure 5: State IT Systems- Digital Maturity Model (DMM)

Assam IT Capabilities Mapping

Based on two days of onsite As-Is study visits to PHED, this report attempts to map the capabilities of Assam's PHED IT systems on DMM framework.

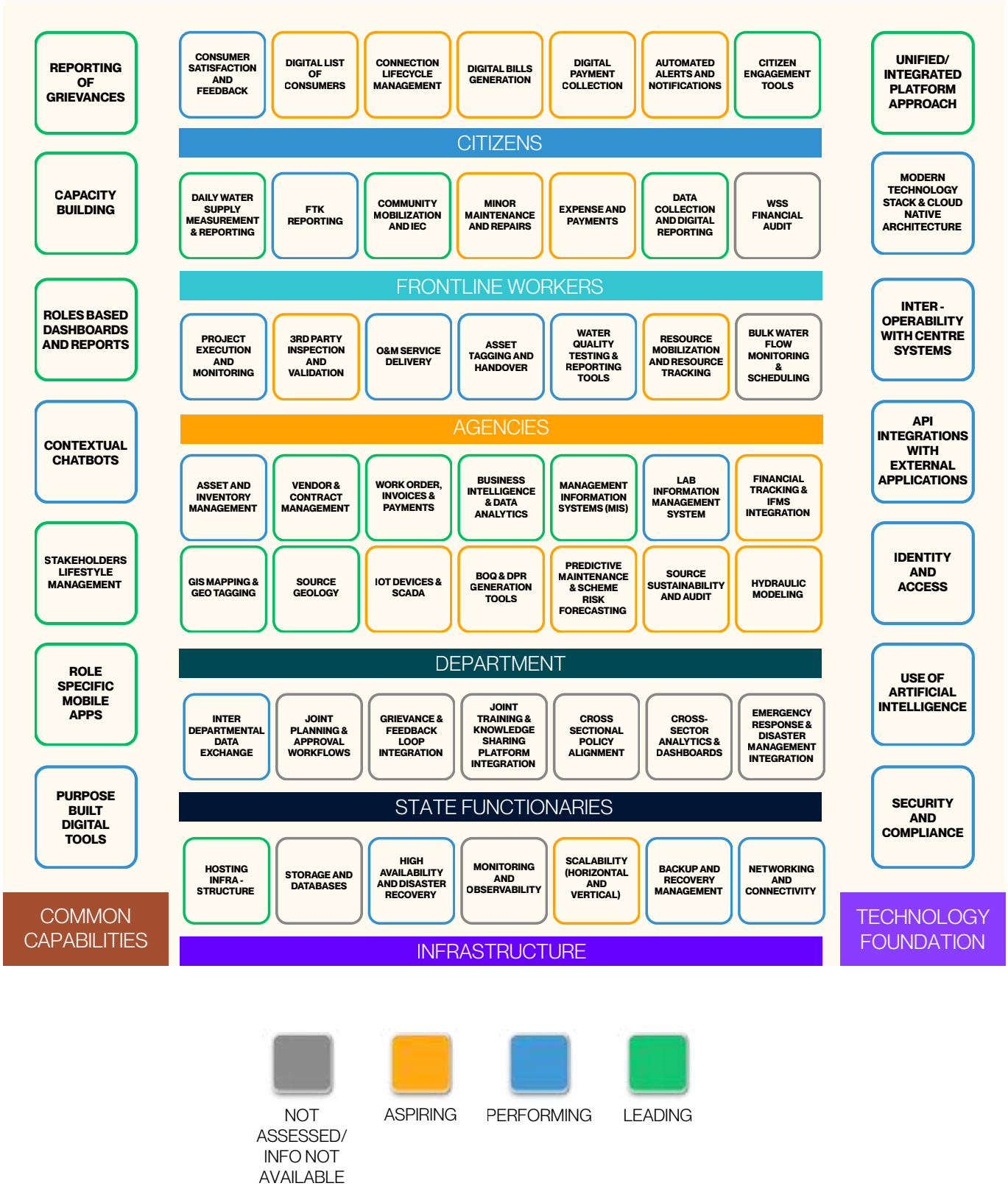


Figure 6: State IT Systems- Assam's PHED IT Capabilities Scorecard

Citizens Applications

Capability Matrix

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

 CONSUMER SATISFACTION AND FEEDBACK	A dedicated voice helpline exists for consumers to submit their feedback. Dedicated call center staff also proactively reach out to consumers for their feedback. The department is at an advanced stage of rolling out an IVR-based customer satisfaction tool and post-survey analytics. A pilot study is underway for an AI-enabled voice bot to provide human-like voice interface for collecting users' feedback, providing support for language localization and advanced analytics. The plan is to integrate this tool with grievance reporting tool, so that grievances can be automatically raised based on user feedback.
DIGITAL LIST OF CONSUMERS	JJM BRAIN application has been designed to maintain a digital list of consumers, however there does not seem to be a comprehensive process to maintain such a list at present.
DIGITAL PAYMENT COLLECTION	Bills are not generated in a majority of the schemes. In some schemes, tariffs are collected at a flat rate from consumers. PHED Assam attempted to use the Nal Jal Seva Application for managing the bills lifecycle, however this was discontinued due to certain operational issues.
CONNECTION LIFECYCLE MANAGEMENT	Information not available.
DIGITAL BILLS GENERATION	Bills are not generated in a majority of the schemes. In some schemes, tariffs are collected at a flat rate from consumers. PHED Assam attempted to use the Nal Jal Seva Application for managing the bills lifecycle, however this was discontinued due to certain operational issues.
AUTOMATED ALERTS AND NOTIFICATIONS	No alerts and notification system is available for the consumers.
PURPOSE BUILT DIGITAL TOOLS	No information on the additional purpose built digital tools for citizens.

CITIZEN ENGAGEMENT TOOLS

Every water supply scheme has a unique QR code. Consumers can scan the QR code on their mobiles to access information about the scheme such as capacity, date of installation, mobile number of the pump operator, and details of WUC members along with general content like awareness audios and videos. This tool is called Jal Kosh and is a great example of a citizen engagement tool. Consumers can also raise their grievances by scanning the QR code.

CONTEXTUAL CHATBOTS

For consumers there is a contextual chatbot available for grievance reporting.

ROLE SPECIFIC MOBILE APPS

At present there are no native mobile apps available for consumers. Jalkosh provides QR code enabled web mobile interface to consumers for getting the scheme information, accessing citizen facing dashboards and raising grievances.

REPORTING OF GRIEVANCES

A multi-channel grievance reporting and tracking system is available through a dedicated helpline number, WhatsApp bot and web interface.

ROLE BASED DASHBOARDS AND REPORTS

Public dashboards summarizing scheme performance, coverage, and water quality are being proposed for transparency.

STAKEHOLDER LIFECYCLE MANAGEMENT

As of now there does not exist a well defined process and automation for managing the life-cycle of consumers.

CAPACITY BUILDING

There are several awareness programs being run at different levels -

- **Awareness generation:** Educating communities about the importance of safe drinking water, water conservation, and judicious use.
- **Promoting ownership:** Encouraging villagers to take responsibility for their water supply infrastructure.
- **Behavior Change Communication (BCC):** Fostering hygiene practices and the regular payment of water tariffs.
- **Jaldoot program:** Under this program school students are trained to promote WASH practices and assist with community awareness and FHTC assessment.

Jal Kosh Module

Jal Kosh is an innovative feature in JJM BRAIN that promotes transparency and community engagement by assigning a unique QR code (Jal Kosh ID) to each scheme. By scanning the code, users can instantly access detailed scheme information on their mobile devices. This digital identifier enhances public awareness and enables easy monitoring of scheme status and progress by citizens and stakeholders alike.

Figure 7: Jal Kosh

- **System-Generated Code:** When a scheme is retrieved from SMT, a unique QR code (Jal Kosh ID) is automatically generated and displayed on its JJM BRAIN page, serving as a digital identifier for quick access and monitoring.
- **Installation Status:** A PVC card displaying the Jal Kosh ID is installed at the scheme site. Users update the installation status in the portal, ensuring visibility and physical access to scheme data for local stakeholders.
- **User Experience:** By scanning the Jal Kosh ID, users and citizens can view basic scheme details—such as the responsible SO, Jal Mitra, and operational status—promoting transparency and public engagement.
- **Grievance Submission:** For handed-over schemes, citizens can report issues directly through the scanned Jal Kosh link. This grievance option is enabled only after handover to the local authority.
- **Rating System:** Citizens can respond to a predefined questionnaire with scored responses to generate a scheme rating out of five, reflecting user satisfaction.
- **Scheme Evaluation:** Site administrators can create scored questionnaires in the Review Section. Responses are scored and accessible under the 'Inspections' tab of the scheme page for evaluation and monitoring.

Public Grievance Management Module

The grievance management module in JJM BRAIN is a key tool for capturing, tracking, and resolving complaints related to the operational status of JJM schemes. It provides a centralized platform where grievances from water consumers or users are logged, categorized, and addressed. Accessible via WhatsApp bots, phone calls, and online forms, the module ensures a responsive and inclusive mechanism for issue reporting. By enabling timely resolution, it helps uphold the quality and reliability of services under the Jal Jeevan Mission.

Figure 8: Grievance reporting dashboard window

The grievance management module offers a comprehensive, multi-channel system for handling complaints with a strong emphasis on transparency, accountability, and timely resolution. Grievances are systematically categorized into predefined categories and sub-categories to streamline prioritization, reporting, and root-cause analysis. The module features a real-time dashboard displaying complaint data by channel, status, and location, along with detailed information on issues, including scheme ID, contact details, and issue type.

Complaints can originate from diverse sources such as WhatsApp, newspapers, and social media, all of which are tracked. Once logged, a system bot auto-assigns each issue to the responsible Section Officer (SO). Executive Engineers input resolution details, which are compiled into PDF reports for approval by the Chief Engineer, creating a formal audit trail. The module also logs all related inbound/outbound calls and allows for manual closure of grievances only after verbal confirmation from the complainant—ensuring that each issue is not just resolved, but resolved to the citizen's satisfaction.

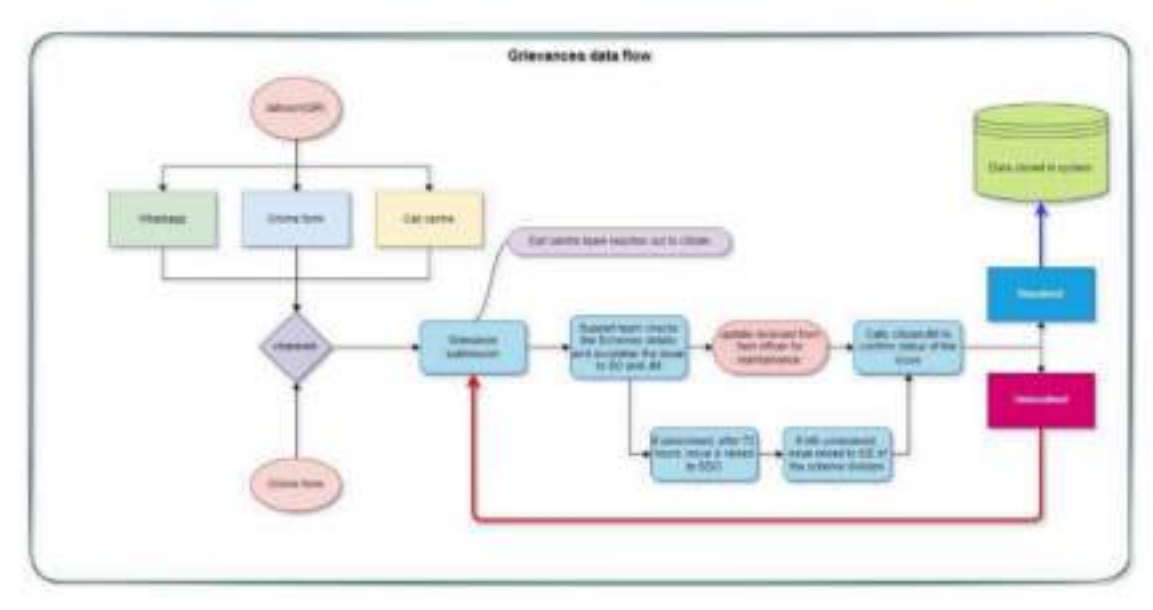


Figure 9: Grievance data flow

Citizen Facing Dashboards

Public dashboards summarizing scheme performance, coverage, and water quality are being proposed for transparency.

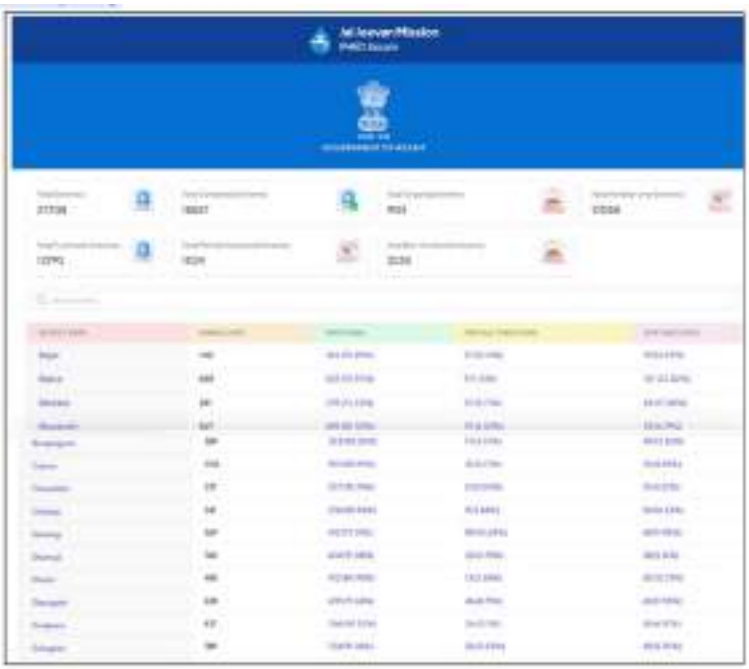


Figure 10: Citizen Facing Scheme Progress Dashboard

Figure 11: Citizen Facing ISA Activities Dashboard

Frontline Workers Applications

Capability Matrix

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

 **DAILY WATER SUPPLY MEASUREMENT & REPORTING**	Jal Mitras use the Jal Mitra mobile app to record daily BFM readings from the scheme, which reflect water supplied to households. However, out of 27K schemes, only 6K Jal Mitras are updating BFM readings. The department is in the process of rolling out a user-friendly, AI-enabled solution to provide reliable BFM readings supported by nudges.
COMMUNITY MOBILIZATION & IEC	Awareness programs are conducted in schools and communities to promote water conservation and hygiene through Jaldoot campaigns, Jalshalas, and ISA-led activities. Dashboards track the activities undertaken.
MINOR MAINTENANCE & REPAIRS	Jal Mitras presently report minor damages (e.g., valve issues, pipeline leaks) directly to Section Officers without any IT application. There are discussions in progress to extend the capabilities of Jal Mitra mobile app to enable Jal Mitras to report and manage minor repairs directly through the mobile app.
DATA COLLECTION AND DIGITAL REPORTING	All frontline activities (FTK tests, water supply, reporting of grievances, and collection of WUC data) are digitally captured in real-time via Jal Mitra, Contractor, and WUC apps among others.
EXPENSE AND PAYMENT MANAGEMENT	Water User Committees (WUCs) record monthly expenditures, such as Jal Mitra honorarium and electricity bills, using the WUC mobile app.
FTK REPORTING (FIELD TEST KIT REPORTING)	FTK women's groups conduct water quality tests using Field Test Kits (FTKs) and upload the data directly into the central WQMIS. The use of Optical Magnetic Reader (OMR) based Field Tests Kits is being discussed under the 'Jal Virangana' program. The plan is to have a WhatsApp-based chatbot that will use OCR (Optical Character Reader) technology to directly read the FTK test report and upload it to the desired systems without human intervention.
WSS FINANCIAL AUDIT	No information available.

CAPACITY BUILDING

Trainings are imparted regularly in the following areas:

Training of Village Water & Sanitation Committees (VWSCs)

- **Technical aspects:** Basic O&M of pumps, pipelines, and taps, and minor repair identification.
- **Financial management:** Collection of user charges, maintaining accounts, and budgeting for O&M.
- **Water quality surveillance:** Understanding the importance of safe water, using Field Test Kits (FTKs), and reporting contamination.
- **Roles and responsibilities:** Defining their mandate in planning, implementation, and sustainable management.

Training of frontline workers (Jal Mitras, plumbers, electricians, fitters): These individuals are the backbone of daily operations. Their training programs focus on:

- **Skill development:** Practical training in plumbing, electrical work, pump operation, and troubleshooting common issues.

Training of FTK women's groups on

- **Water quality testing:** Detailed training on using FTKs, understanding parameters, and accurate data reporting.

STAKEHOLDER LIFECYCLE MANAGEMENT

JJM BRAIN has a well-defined lifecycle for key frontline workers like Jal Mitras, and WUCs etc.

PURPOSE BUILT DIGITAL TOOLS

All purpose-built digital tools are covered in this table, including multiple chatbots, mobile apps and dashboards.

CONTEXTUAL CHATBOTS

There are multiple contextual chatbots available for:

1. Grievance reporting
2. Jaldoot programme nudges
3. BFM reading-based daily water supply measurement & reporting (in pilot).
4. FTK results reporting (under planning)

ROLE SPECIFIC MOBILE APPS

There are dedicated mobile apps for

- Jalmitras
- WUC

ROLE BASED DASHBOARDS AND REPORTS

Several role based reports are available for frontline workers.

REPORTING OF GRIEVANCES

Jal Mitras can raise grievances directly from the Jal Mitra mobile app. Additionally, a multi-channel grievance reporting and tracking system is available through a dedicated helpline number, WhatsApp bot, and web interface.

Jal Mitra Module

The Jal Mitra module is a part of the JJM BRAIN application that manages and maintains handed-over schemes by designated Jal Mitra users. Jal Mitras are responsible for the upkeep of scheme assets and the periodic updating of scheme-related data through a mobile application. The module functions as a centralized repository where all maintenance-related data is stored and managed. Data entry and updates must align with predefined standards to ensure consistency and reliability in scheme maintenance.

Functional workflow is as follows:

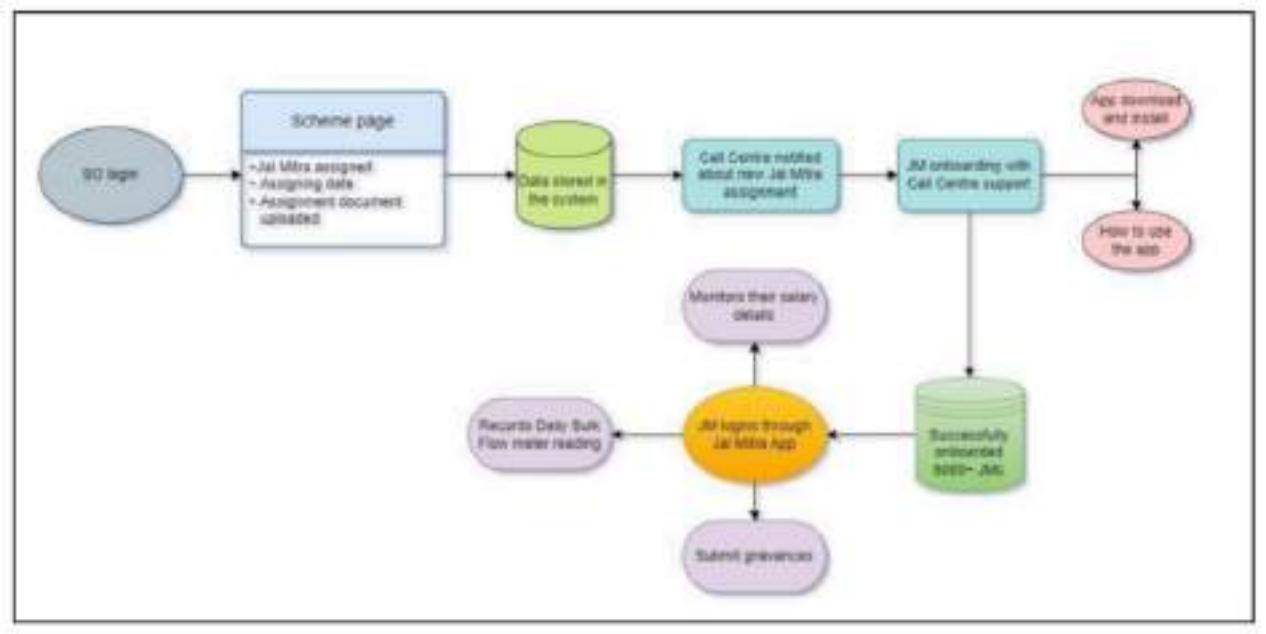


Figure 12: Process flow Jal Mitra feature in JJM BRAIN

Jal Mitras access the module through a dedicated **Jal Mitra mobile application.**

Jal Mitra Application

Upon login through a secure two-factor authentication using an OTP, the Jal Mitra is enabled to:

- Access assigned scheme details, ensuring clarity on their designated area of responsibility.
- Submit monthly salary status updates through the mobile interface. These updates are reflected on a salary monitoring dashboard, categorized by division for ease of review by relevant authorities.
- Upload daily flow meter readings in bulk, which are directly displayed on the corresponding scheme page and within the Jal Kosh system. The bulk upload feature ensures efficient data capture and supports accurate performance tracking.
- Submit grievances related to salary, scheme functionality, or other operational concerns through an in-built grievance redressal mechanism. These are automatically routed to the appropriate stakeholders for timely resolution.
- Maintain a unique association, as only one Jal Mitra can be assigned per scheme to avoid redundancy and ensure accountability.
- Enter cumulative flow meter readings, supported via the mobile app, allowing streamlined reporting and historical tracking of water supply metrics. This comprehensive functionality empowers Jal Mitras to play a crucial role in scheme monitoring, field-level data reporting, and grievance resolution.

Water quality test results conducted by laboratories are made accessible through the Jal Mitra mobile application, ensuring that frontline users and local communities stay informed about the quality of their drinking water supply. This transparency not only builds trust in the system but also empowers stakeholders at the grassroots level to take timely action if any quality issues are detected, thereby enhancing public health awareness and accountability.

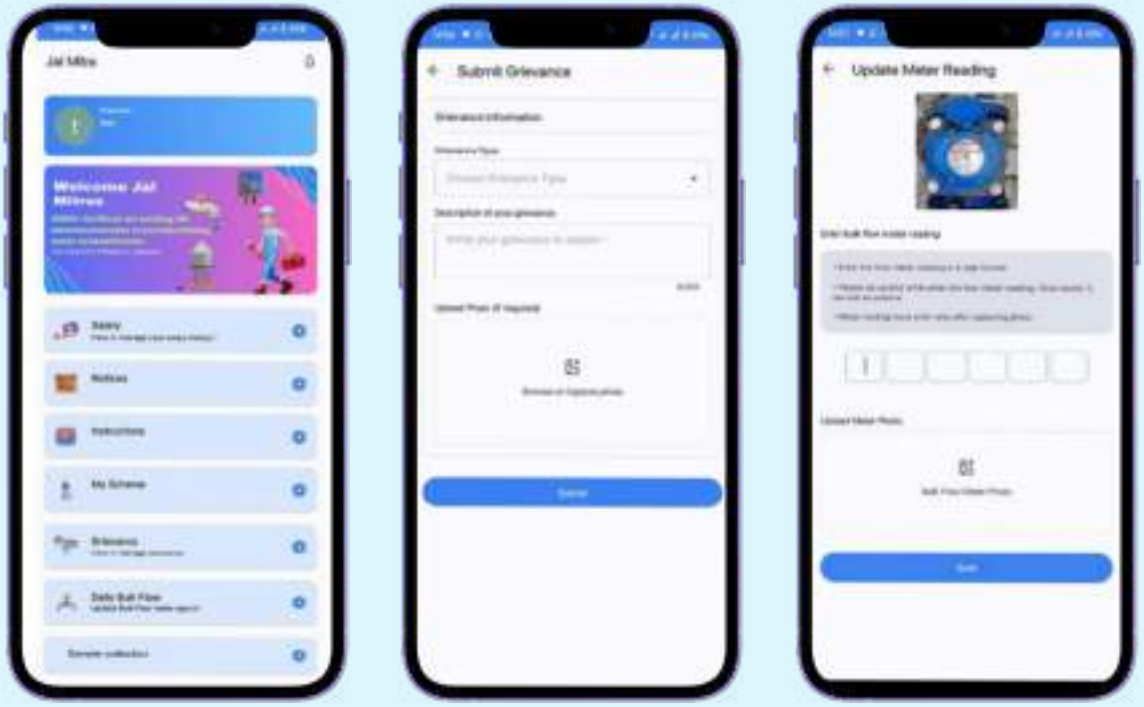


Figure 13: Jal Mitra Application interface

IEC Management (Information, Education & Communication)

The Campaign Management module in JJM BRAIN is a dynamic tool designed to support the planning, execution, and monitoring of outreach campaigns targeting key stakeholders of the Jal Jeevan Mission. These campaigns are instrumental in promoting community awareness, encouraging participation, and collecting valuable feedback from beneficiaries. The module offers a centralized platform for creating and managing campaigns, developing customized questionnaires, and analyzing response data. It enhances the mission's ability to engage effectively with rural communities, evaluate program impact, and continuously refine implementation strategies based on real-time insights.

Jal Shala Programme

School students serve as **"Jal doots"**, playing a key role in raising awareness about water conservation and responsible usage within their schools and communities. Parents and local community members actively participate in activities organized under **Jal Shalas**, fostering a sense of collective responsibility and promoting behavioral change towards sustainable water management at the grassroots level.

The Jal Shala Management System is a specialized module within JJM BRAIN, designed to capture and monitor data related to the Jal doot programme of the Jal Jeevan Mission, Assam. The Jal doot programme is a community outreach initiative that focuses on engaging school students and local communities in water conservation and management activities. The Jal Shala Management System provides a centralized platform for managing all aspects of the programme, including the organization of Jal Shalas (water education sessions), the collection of data on Jal doots (student water ambassadors), and the monitoring of activities at the district and state levels. This module is critical for ensuring the success of the Jal doot programme as it provides a structured and organized approach to managing the programme activities and outcomes.

The Jal Shala Management System under the Jal doot programme is designed to capture detailed event-level data in a structured and phased manner. District Jal doot Cell users are responsible for entering pre- and post-event data, including scheme details, school and venue information, attendance, photographs, and participant feedback.

For each participating school, separate forms are created to document Jal doot-specific attributes such as age, gender, and grade, which are filled by school coordinators. This two-stage data collection ensures accurate documentation and enables tracking of Jal doot participation over time, supporting program evaluation and resource planning.

The system is mapped to Assam's educational blocks, reflecting the community-centric programme design. School data—sourced from UDISE—is integrated into the system backend, providing a district-wise, block-level view of participating institutions. A comprehensive dashboard supports real-time monitoring by state and district users, offering downloadable statistics to track progress, assess impact, and guide decisions on outreach and support. Together, these features form a robust digital framework for the effective implementation and evaluation of the Jal doot programme.

Jal doot Programme

The Glific API Integration Module within JJM BRAIN serves as a strategic digital interface to drive student engagement in the Jal doot programme through an interactive WhatsApp bot. The Jal doot initiative focuses on fostering awareness and behavioral change around water conservation and management among school students. Leveraging the Glific platform, the module enables the automated dissemination of structured content, quizzes, and interactive messages directly to students, enhancing outreach and learning outcomes.

This integration acts as a centralized bridge between JJM scheme data and Glific's conversational platform, allowing the development team to fetch real-time, scheme-specific data and tailor educational content accordingly. By ensuring the timely and accurate flow of information, the module significantly amplifies the programme's impact—transforming passive awareness campaigns into dynamic, two-way engagement channels.

Water User Committee (WUC) Module

The WUC module is primarily focused on managing the water user committee of a village, which is interlinked with the PNRD module and Jal Mitra management. This system allows a WUC to monitor its monthly expenditure and handed-over scheme management. A web interface in the JJM BRAIN portal and a mobile app have been developed to facilitate this.

The WUC module in JJM BRAIN empowers ISA and ASRLM block users to create and manage Water User Committees, which are essential for sustaining handed-over schemes. Each WUC, composed of panchayat or village members, can include secretaries, presidents, and volunteers—added with designations and engagement dates. Supporting documents such as approval letters, constitutions, and bank details can also be uploaded for reference.

WUC members use the dedicated mobile app to log monthly expenditure, view scheme details, member lists, and access bilingual bylaws in English and Assamese. The app supports OTP-based login for secure access. Simultaneously, web app users—categorized as state, district, and block-level ISA coordinators—can create, manage, and assign WUCs to schemes in their jurisdiction.

A comprehensive dashboard offers insights into WUC statistics, including total WUCs, those missing bank details, and schemes with multiple WUCs, ensuring effective oversight and decision-making.

WUC Mobile Application

- Built for Water User Committees (WUCs) to help them manage Operation and Maintenance (O&M) expenses efficiently.
- Record O&M payments, including electricity bills and Jal Mitra salaries.
- Maintain financial records for transparency and accountability.

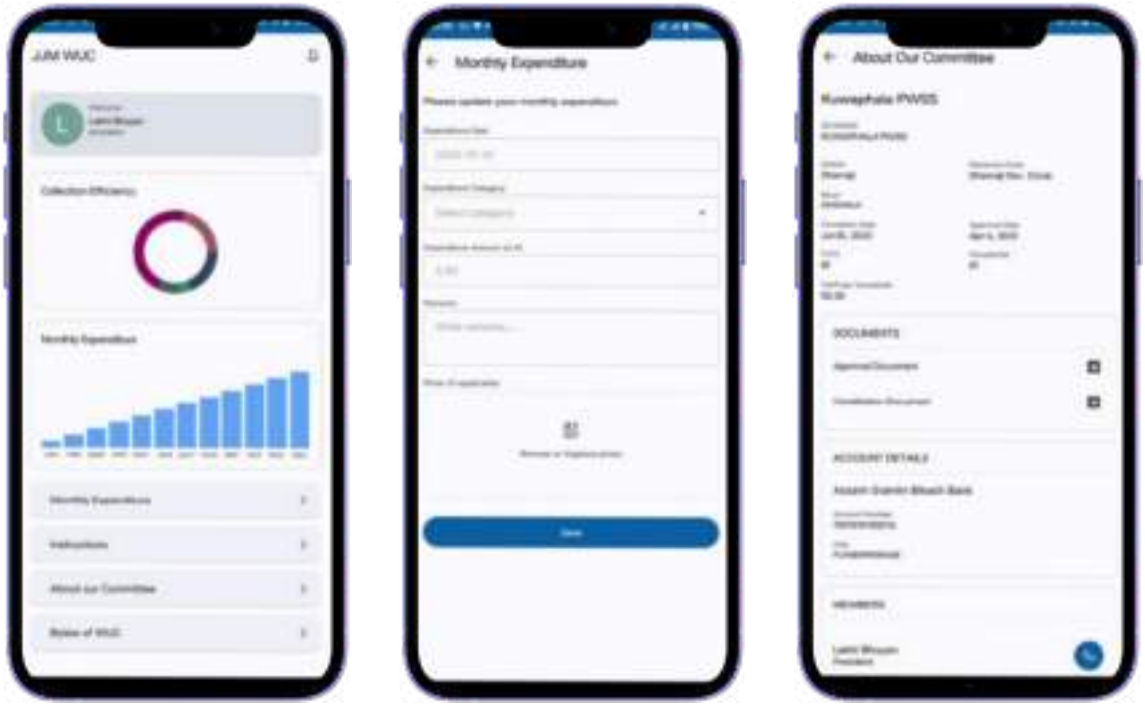


Figure 14: WUC Application Interface

Agencies Applications

Capability Matrix

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

 **PROJECT EXECUTION & MONITORING**	The Contractor module has been developed for contractors to capture and monitor scheme installation progress with real-time updates. • Track pipeline distribution networks and add FHTC for respective schemes. • Update assigned task objectives using photos and data entry. • Monitor project milestones to ensure timely execution.
ASSET TAGGING AND HANDOVER	Contractors use **GPS-enabled smartphones** to map pipeline installations and **upload geotagged Functional Household Tap Connection (FHTC)** details.
3RD PARTY INSPECTION & VALIDATION	There is no dedicated app or module for third-party inspection and validation at the moment.
WATER QUALITY TESTING & REPORTING TOOLS	The Water Sample Collection and Testing System, integrated within JJM BRAIN, enables efficient tracking and analysis of water quality across Assam. It centralizes the process of sample collection, testing, and reporting to ensure that water supplied under the Jal Jeevan Mission meets safety standards. This system plays a critical role in maintaining the reliability and transparency of water quality data.
 **O & M SERVICE DELIVERY**	The JJM Assam App is designed for officers to view and manage multiple schemes under JJM, and to track work, tasks, and progress. This includes functionalities related to: • **Work Progress Monitoring:** Officers can track the progress of ongoing construction activities (e.g., pipeline laying, OHT construction) against planned schedules. • **Task Management:** Assigning and tracking specific tasks related to scheme implementation. • **Geo-tagged Photo Uploads:** Field officers can upload geo-tagged photos from site visits as evidence of work completion or issues, which serve as a crucial audit trail.
BULK WATER FLOW MONITORING & SCHEDULING	Sufficient information not available on this area.
CONTEXTUAL CHATBOTS	There are contextual chatbots for agencies.

CAPACITY BUILDING

ISA & TPIA Training Programs

- **ISA engagement by TERI** across four divisions—including Silchar and Karimganj—to support scheme design, monitoring, and management. Participants were trained in FHTC delivery, water quality testing, and community mobilization.
- **TPIA /consulting agency empanelment** under JJM Assam via structured tenders, to ensure that they meet technical and institutional standards.

Contractor & Vendor Skill Development

- **Regular workshops and refresher trainings** for contractors engaged under JJM, enhancing technical capacity and timely execution.
- **Clear empanelment guidelines and SOPs** for contractor selection—including turnover criteria and performance benchmarks—to ensure quality and accountability.
- **Empanelment of lab equipment and chemical suppliers** through statewide tenders ensures vendors are qualified to manage water testing labs

Technical Support & Quality Assurance

- Tenders are being opened for **third-party inspection agencies**, enabling external oversight and technical validation of construction quality.
- TSA-backed **laboratory strengthening**, including empanelment of agencies for supplying water testing reagents and instruments under WQMIS and JJM frameworks.

ROLE SPECIFIC MOBILE APPS

There is a dedicated Contractor mobile app -

- Track pipeline distribution networks and add FHTC for respective schemes.
- Update assigned task objectives using photos and data entry.
- Monitor project milestones to ensure timely execution.

REPORTING OF GRIEVANCES

There is no separate grievance reporting tool for agencies. Agencies can use the existing multi-channel grievance reporting and tracking system available for everyone.

RESOURCE MOBILIZATION AND RESOURCE TRACKING

Dedicated digital tools or application modules for resource mobilization and resource tracking were not found.

ROLE BASED DASHBOARDS AND REPORTS

There are role-based reports and a public-facing dashboard ‘ISA Performance Evaluation Tool (I-PET)’ exists.

STAKEHOLDER LIFECYCLE MANAGEMENT

JJM BRAIN has a well-defined lifecycle of key Agency Actors like ISAs, Contractors etc. via their respective modules in JJM BRAIN.

PURPOSE BUILT DIGITAL TOOLS

The public-facing dashboard, ‘ISA Performance Evaluation Tool (I-PET)’ is a good example of a purpose-built digital tool. Custom ISA, the Contractor module and the PG Module are purpose built digital tools.

Contractor Module

The Contractor module is a specialized tool within JJM BRAIN, designed to facilitate the management of contractors who are responsible for tracking distribution pipelines and geotagging beneficiaries of schemes. Contractors play a crucial role in the implementation of schemes under the Jal Jeevan Mission, as they are responsible for carrying out the physical work required to install and maintain the infrastructure.

The Contractor module provides a centralized platform where all data related to contractor activities is stored and managed, ensuring that all relevant information is accurately captured and that the work is carried out efficiently and effectively. This module is essential for ensuring that the mission's objectives are met and that all infrastructure is installed and maintained to the highest standards.

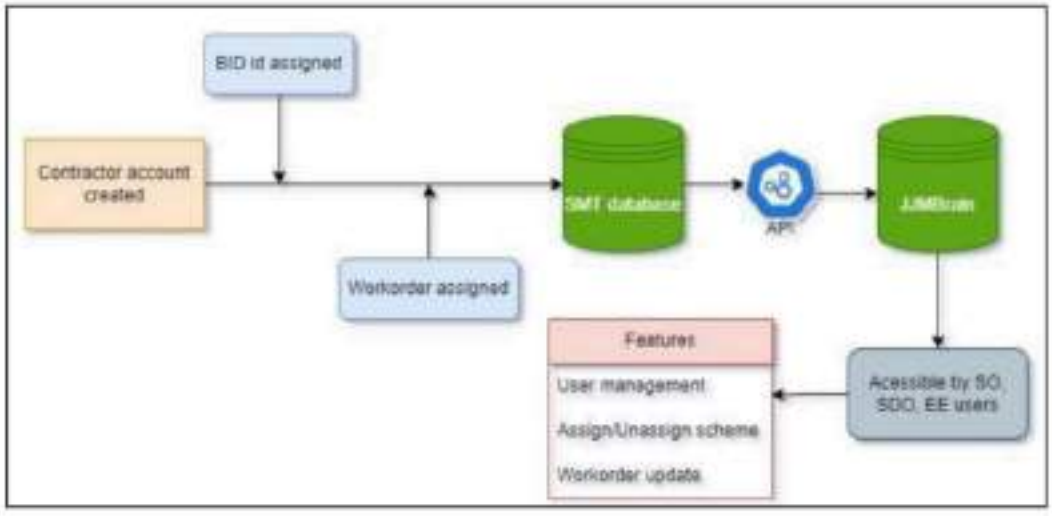


Figure 15: Process flow for the task assignment to contractor

1. Unique Login Credentials

- Each contractor is linked to schemes via work orders with unique BID IDs.
- Contractors receive distinct login credentials to ensure their activities are traceable and securely recorded.
- This promotes accountability and enables accurate monitoring of contractor performance.

2. Task Management

- Section Officers (SO) assign specific tasks to contractors via the module.
- Tasks are reflected in the JJM Contractor app, ensuring clarity in deliverables.
- It enables coordinated and efficient execution of work under each scheme.

3. GIS Data Upload

Contractors use **GPS-enabled smartphones** to map pipeline installations and upload **geotagged Functional Household Tap Connection (FHTC)** details. This ensures real-time visibility of the infrastructure created and supports quality verification.

4. Work Order Details Access

- Contractors can access **comprehensive details** of their assigned work orders and schemes through both mobile and web platforms. This facilitates planning, progress tracking, and timely execution.

5. User Management

- SO users can manage contractor profiles, including contact details, bank information, and contractor classification.
- Contractor data is **fetched from the SMT system via API**, ensuring consistency and completeness in profile records.

Contractor Mobile App

The Contractor mobile app has been developed for contractors to capture and monitor scheme installation progress with real-time updates. This allows them to:

- Track pipeline distribution networks and add FHTC for respective schemes.
- Update assigned task objectives using photos and data entry.
- Monitor project milestones to ensure timely execution.

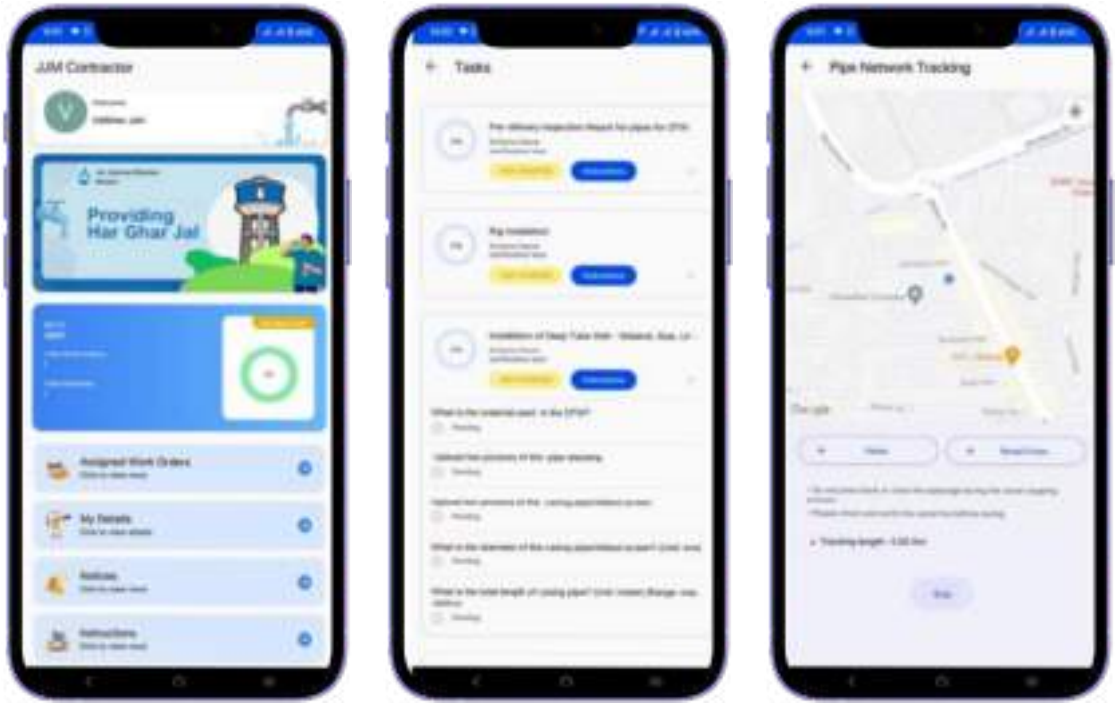


Figure 16: Contractor application interface

Performance Guarantee (PG) Module

The Performance Guarantee (PG) module under the Jal Jeevan Mission is a critical digital tool designed to streamline the management and monitoring of performance guarantees submitted by contractors. It ensures transparency, accountability, and compliance across JJM projects by securely storing all related documents and enabling easy retrieval for verification and audit purposes.

Key Features:

- **Document Management:** Links performance guarantees directly to work orders, allowing for structured documentation and traceability.
- **Secure Data Storage:** Captures essential details such as contractor names, PG amounts, bid IDs, and expiry dates in a protected environment.
- **Automated Notifications:** Sends alerts before PG expiry to relevant users, ensuring timely renewals or releases.
- **Instrument Withdrawal:** Enables systematic processing and documentation of PG releases upon project completion.

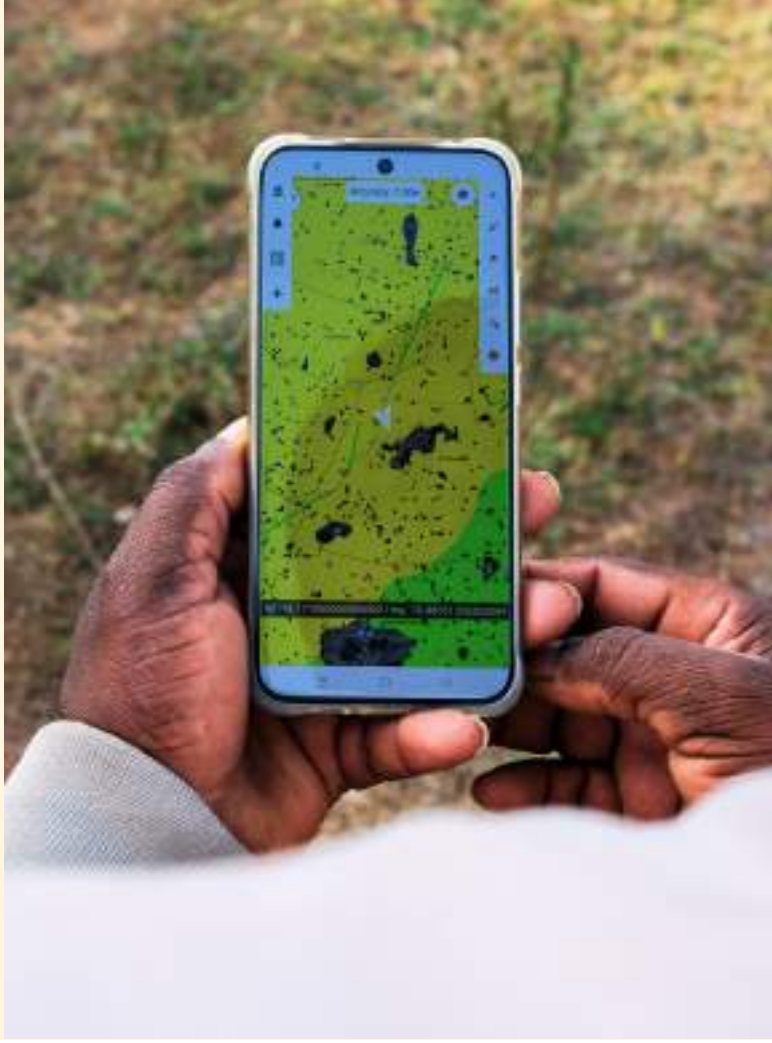
ISA Module

The ISA (Implementing Support Agency) module in the JJM BRAIN application is designed to capture and store data related to ISA activities organized in villages. These activities are a key component of the Jal Jeevan Mission's community engagement and outreach efforts, as they involve direct interaction with local communities to promote water conservation, hygiene, and sustainable water management practices. The ISA activity module provides a centralized platform for managing the planning, execution, and monitoring of ISA activities, such as WUC creation. This module is essential for ensuring that all ISA activities are accurately documented, that their impact is assessed, and that the mission's outreach efforts are effectively coordinated and managed.

The ISA Management module in JJM BRAIN categorizes Implementing Support Agencies (ISAs) into NGOs and Community-Led Facilities (CLFs) to streamline classification, coordination, and impact assessment. Users can input detailed information about ISA activities—including type, implementation phase, panchayat mapping, and financial details—ensuring comprehensive documentation for monitoring and planning. The module also enables WUC (Water User Committee) management, allowing district coordinators to register committee details and track monthly expenditure through a mobile app. Additionally, the system supports uploading supporting documents (PDFs, images) to maintain organized, verifiable records of each ISA activity.

GIS Mapping Module

JJM BRAIN incorporates advanced GIS mapping technology, allowing users to visualize Piped Water Supply Scheme (PWSS) projects and related data on a map interface. This enables better spatial understanding, identification of patterns, and informed decision-making based on the geographical context. GIS mapping enhances data accessibility and analysis, providing valuable insights for project planning and execution.



This feature in JJM BRAIN facilitates the tracking and management of pipeline installations from source to FHTCs. Used by contractors and supervised by Section and Sub-Divisional Officers, the module ensures accurate documentation of network layouts and progress. It enables real-time monitoring, issue identification, and compliance with technical standards—supporting efficient and accountable scheme implementation.

The Pipe-Distribution Network module enables end-to-end monitoring of pipeline installation through a suite of integrated features:

- **GPS-Based Data Collection:** Contractors use the JJM Contractor mobile app to geotag pipeline routes in real-time, ensuring accurate field mapping and automated uploads to JJM BRAIN for visualization and validation.
- **Pipe Attributes & Categorization:** The system tracks key specifications such as pipe diameter, material, and type, supporting quality assurance, inventory control, and performance monitoring.

- **Live Tracking & Distance Visibility:** Real-time pipeline progress is displayed within the system, helping supervisors identify delays, coordinate teams, and maintain adherence to project timelines.
- **Web Access & Role-Based Controls:** Pipe network data is accessible via the JJM BRAIN portal. Designated users like SO, SDO, GIS experts can correct or delete errors, ensuring data integrity across the network.
- **KML Download & Correction Workflow:** Field data can be downloaded in KML format for editing in GIS software and re-uploaded in JSON format, with an in-built approval system where SDOs review and finalize any updates—providing transparency and an audit trail for every correction.

Litholog Module

The Litholog module in JJM BRAIN is specifically designed to manage geological data for schemes dependent on groundwater sources. It allows users to record, store, and analyze information on lithology and aquifer characteristics at scheme locations. This data is essential for assessing subsurface conditions—such as rock types, aquifer depth, and recharge potential—ensuring that groundwater extraction is both technically sound and environmentally sustainable. The module supports informed decision-making and contributes to the long-term viability of groundwater-based water supply schemes.

The key feature and process flow are as shown below:

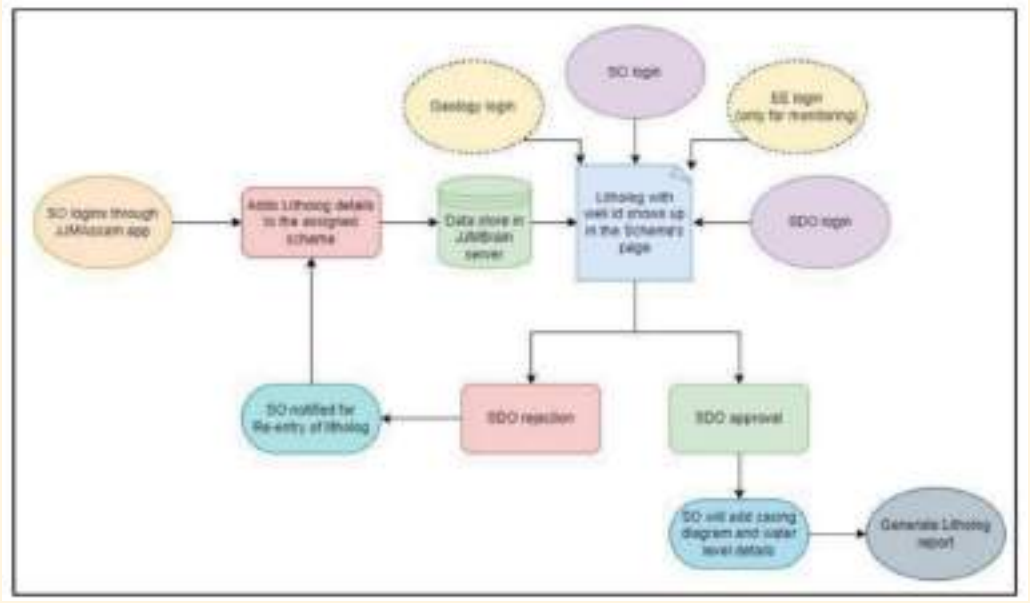


Figure 17: Process flow of Lithilog feature of JJM BRAIN

Internet of Things (IoT) Framework

The integration of IoT devices in JJM Assam has been implemented in a phased and functional manner to support real-time monitoring, operational efficiency, and transparency in rural water supply schemes. It enables real-time monitoring of water supply, ensures accurate measurement of water flow and quality, and facilitates automated data collection to reduce manual errors, thereby supporting data-driven decision-making by field engineers and administrators.

Type of IoT devices used

DEVICE TYPE	FUNCTION
Flow Meters	Measures the quantity of water supplied daily at key points in the system.
Pressure Sensors	Monitors pressure at pumping stations or near elevated storage reservoirs.
Residual Chlorine Sensors	Tracks chlorine levels to ensure water safety and potability.
Smart Water Meters (Pilot)	Installed in households in select areas to measure consumption.
Data Loggers / GPRS Units	Transmit data to JJM BRAIN in real time using GSM or internet connectivity.

The data from these IoT devices are directly linked with the JJM BRAIN platform, where:

- Flow meter readings are displayed on the scheme's dashboard and also reflected in the Jalkosh QR system.
- Some dashboards show alerts, graphical trends, and threshold violations (e.g., low flow or zero pressure) for timely action.

Water Sample Collection and Testing Module

The Water Sample Collection and Testing System, integrated within JJM BRAIN, enables efficient tracking and analysis of water quality across Assam. It centralizes the process of sample collection, testing, and reporting to ensure that water supplied under the Jal Jeevan Mission meets safety standards. This system plays a critical role in maintaining the reliability and transparency of water quality data.

1. **Collection of field data:** Jal Mitra app users are responsible for collecting water samples and entering the sample details into their app login. The app allows users to record logistical details regarding the shipping of the samples from the Jal Mitra to the laboratory by the CWC (Central Water Commission). This feature ensures that all relevant information about the sample collection process is accurately captured and stored in the system, providing a clear and organized record of the sample's journey from the field to the laboratory.

2. **Testing and management of the sample:** Once the water sample is received, the Lab Nodal Officer assigns it to the relevant technician and specifies the parameters for testing. The results are then uploaded and linked to the source in the system, ensuring accurate documentation. This centralized approach improves the efficiency, reliability, and traceability of the water testing process. There is a provision for entering the temperature and humidity on the platform to monitor the environment of the testing labs. This helps in understanding the accuracy of the test results.

3. **Real-Time Alerts and Impact Assessment for Water Quality Management:** The module incorporates an automated alert system that notifies field sample collectors in the event of non-compliant or unsafe water quality test results, triggering the process for immediate sample recollection. Test results are simultaneously integrated into the Jal Kosh and Jal Mitra applications, ensuring real-time visibility for relevant stakeholders. This functionality supports continuous impact assessment, enabling rapid detection, analysis, and resolution of water quality issues to maintain a safe and reliable rural water supply.

Department Applications

Capability Matrix

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

ASSET & INVENTORY MANAGEMENT	For water quality labs, the inventory management system is part of the Lab module. Scheme assets are tagged and stored in the scheme master database. However it cannot be confidently stated that there is a full-fledged asset management system in the PHED Assam.
BUSINESS INTELLIGENCE & DATA ANALYTICS	There are several role-based reports and dashboards available, such as the state dashboard, division dashboard, district dashboard and multiple reports.
VENDOR & CONTRACT MANAGEMENT	With the Contractor and PG modules, JJM Assam has well-defined vendor and contract management systems in place.
MANAGEMENT INFORMATION SYSTEMS (MIS)	The SMT application along with the Scheme module of JJM BRAIN forms the core of MIS. The scheme is the central entity in the overall information map, tying up multiple facets of the water supply management system, including financial budgeting & tracking, scheme progress tracking, asset tagging, frontline worker assignment, FHTC assignment, contractors, work orders, and water sample testing etc. All this information is managed via this MIS system.
HYDRAULIC MODELING	Hydraulic modelling is not happening in the department.
WORK ORDER, INVOICES & PAYMENTS	The Contractor module has functionalities to manage work order, invoice and payments to vendors.
 **LAB INFORMATION MANAGEMENT SYSTEM**	The Lab Management module is a comprehensive tool within JJM BRAIN, designed to facilitate the recording, monitoring, and management of laboratory inventory and stock data. However it still lacks the advanced capabilities of a Lab Information Management System (LIMS), which provides end to end automation of Lab operations and integration with test machines.
FINANCIAL TRACKING & IFMS INTEGRATION	The SMT application update is in progress which will provide Integrated Financial Management System (IFMS) integration.

GIS MAPPING & GEO TAGGING	JJM BRAIN incorporates advanced GIS mapping technology, allowing users to visualize PWSS projects and related data on a map interface. This enables better spatial understanding, identification of patterns, and informed decision-making based on the geographical context. GIS mapping enhances data accessibility and analysis, providing valuable insights for project planning and execution. Contractor mobile app is used to upload the GIS mapped data to the system. Assets are also geotagged.
SOURCE SUSTAINABILITY AND AUDIT	This action is not taking place currently, but the department has future plans for the same.
IOT DEVICES & SCADA	The department has been actively exploring and implementing IoT (Internet of Things) solutions to bring real-time, data-driven insights into rural drinking water supply schemes. While full-scale deployment is an ongoing process, JJM Assam piloted the IoT deployment with thirteen schemes. However as of now, most of the IoT systems are not in working condition.
REPORTING OF GRIEVANCES	Sufficient information not available on this area.
SOURCE GEOLOGY	The Litholog module in JJM BRAIN is specifically designed to manage geological data for schemes dependent on groundwater sources. It allows users to record, store, and analyze information on lithology and aquifer characteristics at scheme locations. JJM Assam mobile app is used to upload litholog data into the system.
BOQ & DPR GENERATION TOOLS	No digital tools are currently available for this area.
PREDICTIVE MAINTENANCE & SCHEME RISK FORECASTING	This action is not taking place currently, but the department has future plans for the same.
ROLE BASED DASHBOARDS AND REPORTS	No digital tools are currently available for this area.
CONTEXTUAL CHATBOTS	As of now there are no contextual chatbots for department officials. However the department is considering building a chatbot 'Jal Saathi', which will use AI to provide answers to frequently asked questions for staff members.

CAPACITY BUILDING

Engineers and Technical Staff Training: PHED engineers and technical staff (Assistant Engineers, Junior Engineers, Executive Engineers) receive training on:

- **Scheme Design & Planning:** Adherence to JJM guidelines, new technologies, and sustainable water source development.
- **Project Management:** Efficient execution, monitoring progress, and ensuring quality infrastructure.
- **Data Analysis & Utilization:** How to interpret data from JJM BRAIN and other IT systems for informed decision-making.
- **Contract Management and Procurement:** Ensuring transparency and efficiency in project implementation.

Water Quality Laboratory Personnel Training: Staff at district and state water quality testing laboratories are trained to:

- **Advanced Testing Protocols:** Using sophisticated lab equipment for accurate chemical and bacteriological analysis.
- **Quality Assurance/Quality Control (QA/QC):** Ensuring the reliability and validity of test results.
- **Data Upload to WQMIS:** Proper procedures for entering and synchronizing lab results with the central WQMIS (which integrates with JJM BRAIN).

ROLE SPECIFIC MOBILE APPS

There is a JJM Assam mobile app for field officers to

- Upload QR installation updates for assigned schemes.
- Monitor individual task statuses and update scheme locations.
- Create lithologs to document geological data.

STAKEHOLDER LIFECYCLE MANAGEMENT

JJM BRAIN has a well-defined lifecycle of department officials and is managed through the User Management module of the application. However, JJM BRAIN is not integrated with the department's authentication system for onboarding officials. This mandates the officials to remember separate usernames and passwords for the JJM BRAIN application. Moreover in the absence of a Single Sign On (SSO), other applications like SMT have different usernames and passwords, impacting the adoption of these applications.

PURPOSE - BUILT DIGITAL TOOLS

1) The Flood Monitoring module is a good example of a purpose-built digital tool. It provides a centralized platform where all data related to flood-affected schemes is stored and managed, ensuring that the impact of floods is accurately assessed and necessary mitigation measures are taken. This module is critical for maintaining the resilience and sustainability of the mission as it ensures that all flood-affected schemes are promptly identified and addressed.

2) The PNRD (Panchayat & Rural Development) Module within JJM BRAIN is another good example of a purpose-built digital tool that supports the management of handed-over water supply schemes by PNRD officials, including panchayat users, block administrators, and panchayat commissioners.

Role - Based Dashboards

State Dashboards

Provides a comprehensive overview of key statewide statistics, accessible to Head Office users.

Figure 18 : State Dashboard

Division Dashboard

Designed for district-level users such as Deputy Commissioners (DC) and Chief Executive Officers (CEO-ZP) to monitor statistics within their jurisdiction.

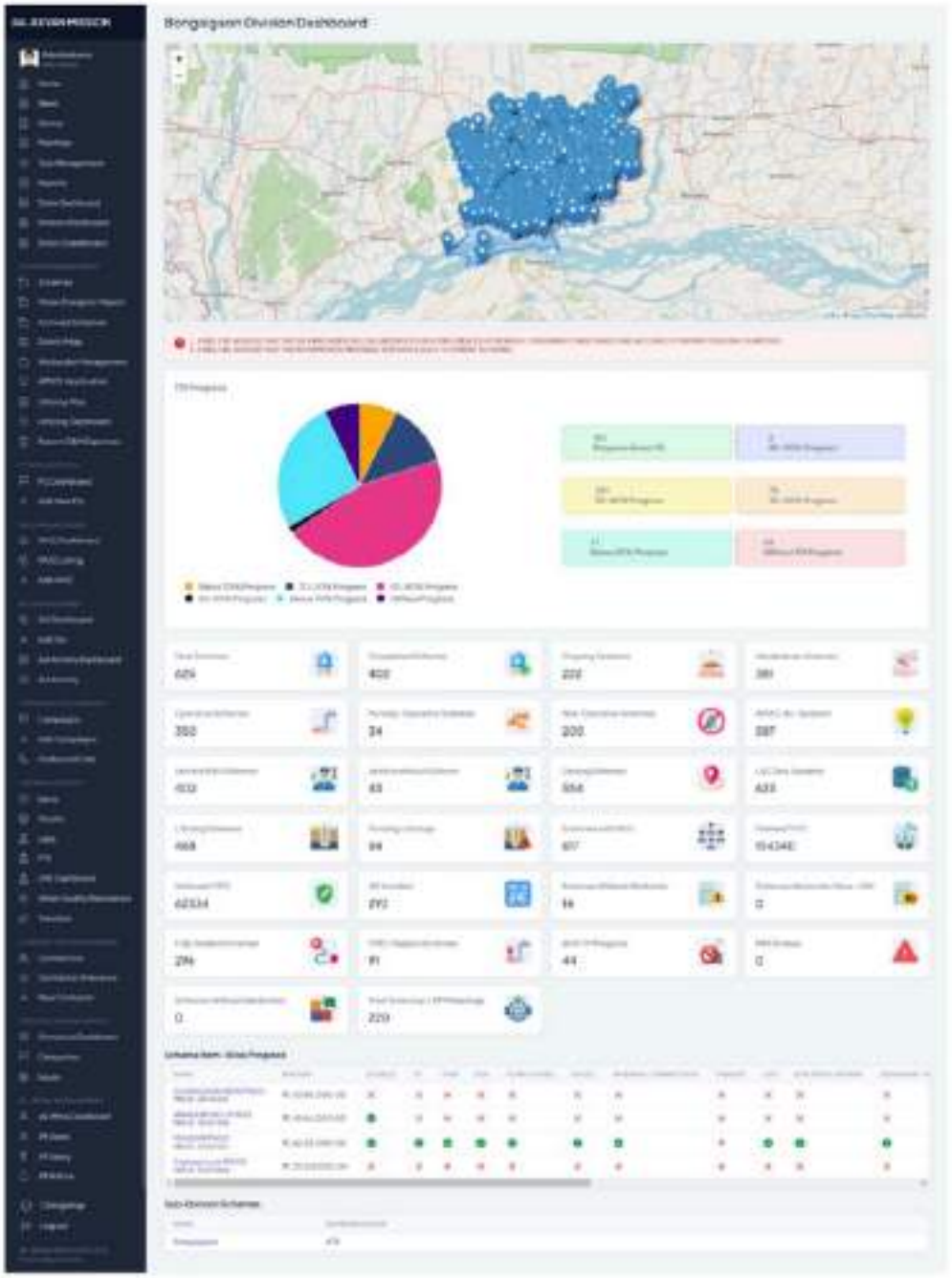


Figure 19: District Dashboard

Division Dashboard

Designed for district-level users such as Deputy Commissioners (DC) and Chief Executive Officers (CEO-ZP) to monitor statistics within their jurisdiction.

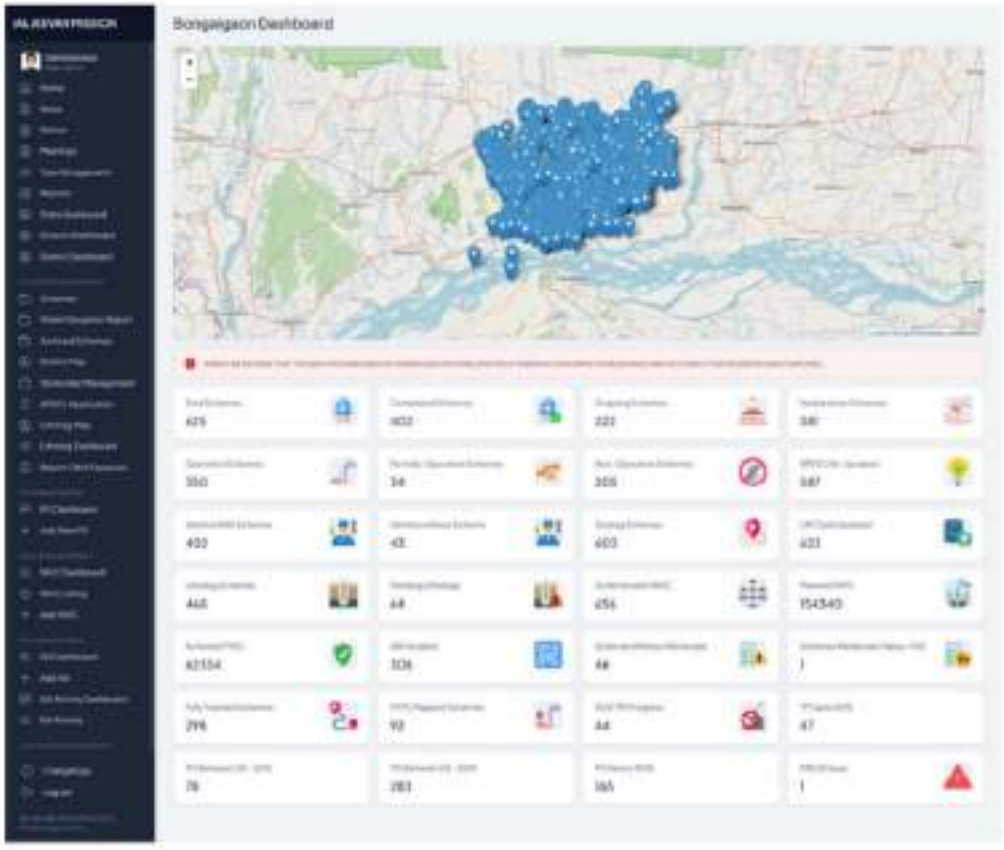


Figure 20: District Dashboard

Administrator Dashboard

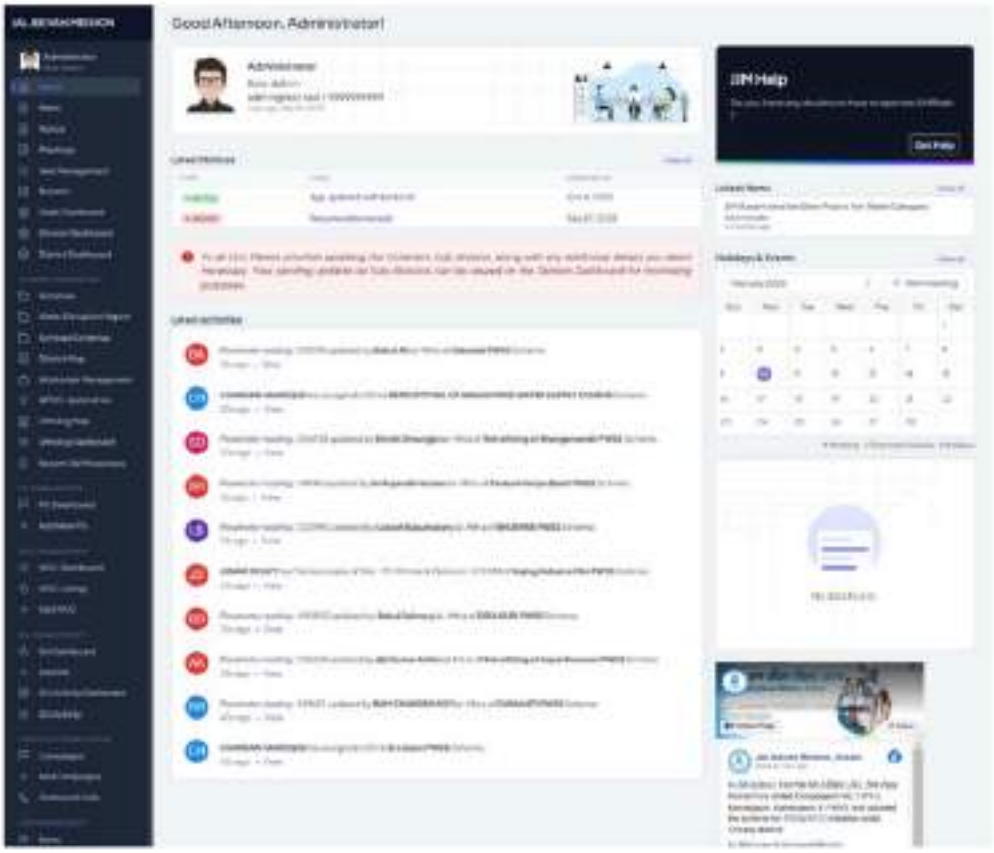


Figure 21: Administrator Dashboard

Reports

The Reports section allows users of the system to access downloadable reports for data related to various modules and users. The list of reports is included in the table below:

REPORT TYPE	DESCRIPTION
Schemes	Division- wise details of all schemes
Division Summary	Division-summary of schemes, JM, handover schemes, APDCL consumer
PG Summary	Issuing authority- wise aerformance guarantee summary
User's Report	Role-based user's list
FTK Report	Division-wise FTK report for Villages
ISA Report	District-wise ISA report for Villages
Jalshala Summary	District-wise Jalshala and Jaldoot summary
SO Task Summary	Division-wise section-officer task assignment summary
SO Task Report	Section-officer's task assignment completion report
Schemes W/O SO's	List of schemes without section-officers assigned
Contractor's Tasks	List of contractor's completed task report
Schemes Without IMIS	List of schemes without or wrong IMIS-Id
District Summary	District-wise summary of villages, schemes & WUCs
W/Os Without PG	List of work orders without performance guarantee
WUC Report	District-wise WUC report

REPORT TYPE	DESCRIPTION
Villages without ISA	Villages where ISA is not assigned
Scheme without WUC	District- wise schemes where WUC is not uploaded
Schemes without ISA	Schemes having WUC without ISA
Litholog Data	Division-wise lithologs report
Handover Summary	Division-wise ready to handover summary (parent schemes)
Schemes - WUCs	Schemes having multiple WUCs
Distribution Network Report	Division-wise distribution network report
PG Report	PG detailed report
Latest Flowmeter Report	Scheme-wise Jal-Mitra reporting of flowmeter reading
School Report	District-wise school's report
Meter Reading	Meter reading report
Water Disruption	Water disruption report

Schemes Management Module

Schemes form the backbone of JJM BRAIN, with every feature, user, and module either directly or indirectly linked to a scheme—underscoring their central importance in the mission's operational framework. The mapping of schemes within JJM BRAIN is undertaken to provide a comprehensive and organized view of all mission-related schemes, ensuring that each scheme's data is accurately captured, regularly updated, and readily accessible to all stakeholders involved.

Scheme Database: The lifecycle of a JJM scheme begins within the Scheme Monitoring Tool (SMT), where the scheme is initially defined and configured. Once established, the scheme is seamlessly integrated into JJM BRAIN through a secure and automated API-based data exchange mechanism. This integration ensures that key scheme metadata—including origin, objectives, administrative hierarchy, and operational status—are accurately and systematically transferred into JJM BRAIN. As a result, users can monitor, manage, and analyze each scheme within a unified, mission-aligned digital ecosystem, reinforcing transparency and efficiency across the implementation lifecycle.

Integration of Schemes with IMIS: Schemes possessing a valid IMIS (Integrated Management Information System) ID are periodically synchronized with the IMIS database through a secure API integration, enabling automatic population of detailed scheme attributes within JJM BRAIN.

This interoperability ensures data consistency between platforms, minimizes discrepancies, and provides stakeholders with a unified and reliable source of truth. Conversely, for scheme records lacking a valid IMIS ID, manual data entry and verification by the respective PHED office is required to maintain completeness and integrity within the system.

The administrative mapping of schemes is then carried out using the SMT database. The mapping was originally designed following the administrative structure used by the Public Health Department of Assam. This feature ensures that each scheme is correctly mapped to its corresponding administrative unit, facilitating better coordination and management of resources at the district and state levels.

Operational details of the Scheme: Each scheme is associated with multiple defining attributes, including the year of approval by the State Level Scheme Sanctioning Committee (SLSCC), its operational status (e.g., operative or non-operative), water source type, energy source, APDCL (Assam Power Distribution Company Limited) consumer number, estimated financial outlay, and the number of Functional Household Tap Connections (FHTCs), among others. These attributes are systematically retrieved from the Scheme Monitoring Tool (SMT) during integration and are crucial for planning, monitoring, and reporting. Together, they provide a comprehensive scheme profile, enabling stakeholders to quickly assess its scope, financial commitments, and current operational standing.

Activity Tracking: The activity tracker offers a detailed log of all actions and updates related to a scheme, aggregated from multiple sources. It creates a complete audit trail, enabling project managers and auditors to trace the scheme's history, verify changes, and identify implementation issues with clarity and accountability.

Asset Monitoring: The module features an asset-based progression tracker that visually captures the physical progress of each scheme by monitoring key infrastructure components like pipelines and treatment units. This tool enables users to assess completion status, identify delays, and make data-driven decisions to support timely and efficient project execution.

Bulk Flow Metering: Each scheme is fitted with a flow meter to track real-time water supply volumes, with data recorded by Jal Mitra users via a mobile app and accessible through the web portal. This information is vital for verifying service delivery, detecting distribution issues like leaks or blockages, and supporting timely operational interventions.

Archive System: Division users can initiate archive requests for dropped or duplicate schemes, often resulting from merges or SMT-based API entries. Once submitted, these requests are reviewed and approved by HQ users before archiving. This process ensures that only active schemes remain visible, while historical data are securely retained—helping to maintain a clean, organized, and efficient system for data management and retrieval.

Work Order Module

The Work Order module in JJM BRAIN facilitates the centralized creation, tracking, and management of work orders linked to each scheme. Originating from the Scheme Monitoring Tool (SMT) and integrated via API, these work orders define tasks assigned to contractors and stakeholders. The module ensures seamless execution and alignment of on-ground activities with the broader objectives of the Jal Jeevan Mission.

The Work Order Management module captures comprehensive work order attributes such as value, issuing authority, type, status, and performance guarantee details, providing a clear view of each work order's scope and financial implications. It also includes a task management feature that allows users to define, assign, and monitor individual tasks within each work order—tracking start and end dates, responsible personnel, and progress. This integrated approach ensures detailed oversight, enhances coordination among stakeholders, and supports timely, budget-compliant execution of scheme activities.

Lab Module

The Lab module in JJM BRAIN is a centralized tool for recording and managing laboratory inventory, stock levels, and testing data. Given the critical role of labs in ensuring water quality under the Jal Jeevan Mission, this module supports efficient operations by tracking supplies and enabling timely, accurate testing. It helps maintain readiness across labs, ensuring consistent monitoring of water standards.

The Lab Management module in JJM BRAIN supports detailed inventory and stock management to ensure efficient laboratory operations. State Lab Admins and Lab HO users can add both consumable and non-consumable items, maintaining real-time records of quantities, locations, and usage history. District users and Lab Nodal Officers update stock levels and consumption data, enabling accurate monitoring of resource availability. Each item includes detailed attributes—such as type, category, manufacturing date, and expiry date—ensuring traceability, timely replenishment, and the removal of expired materials. Together, these features support effective planning, prevent shortages, and maintain testing readiness.

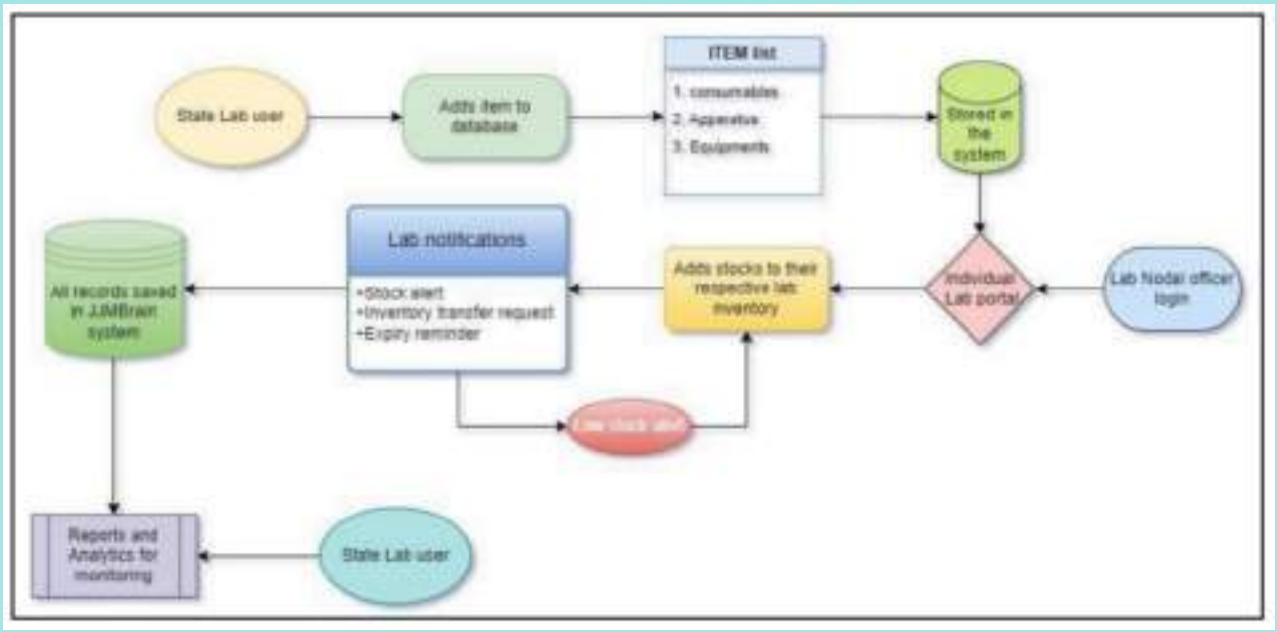


Figure 22: Lab management process flow diagram

JJM-Assam Mobile Application

A specialized app for Section Officers and Sub-Divisional Officers (SDOs) of PHED to manage and track scheme data.

- Upload QR installation updates for assigned schemes.
- Monitor individual task statuses and update scheme locations.
- Create lithologs to document geological data.

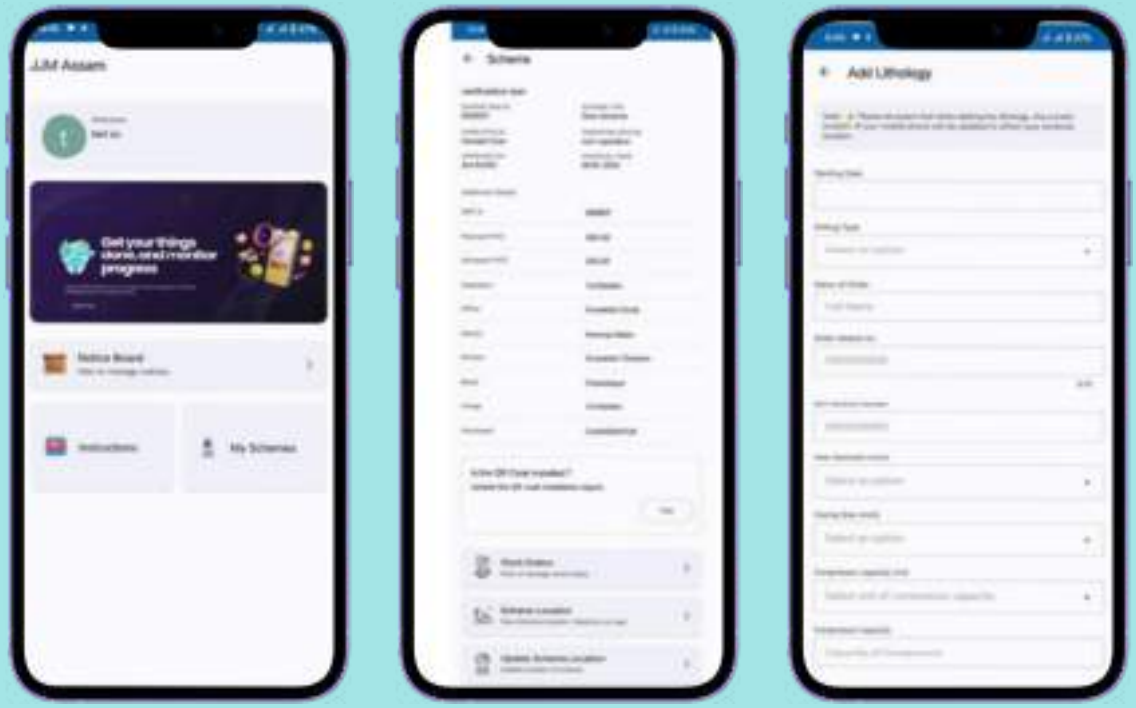


Figure 23: User application interface

Flood Monitoring Module

The Flood Monitoring Module in JJM BRAIN is a crucial system component designed to capture, manage, and analyze data related to flood-affected schemes under the Jal Jeevan Mission –particularly important given Assam's frequent flood events. The module provides a centralized platform to assess the impact of flooding on infrastructure and assets, enabling timely mitigation and recovery measures. It plays a vital role in enhancing the resilience and sustainability of mission activities by ensuring that damaged schemes are accurately tracked and addressed.

Key features include Categorized Severity, where flood damage is classified as high, medium, or low—helping to prioritize resource allocation based on impact. Additionally, scheme-wise data entry by Section Officers (SOs) enables the periodic uploading of detailed information such as affected components, inundation levels, and stagnation periods. This structured and detailed data collection ensures informed decision-making for recovery planning and long-term risk reduction.

This module requires the following inputs from users:

- Users will add flood data to a scheme
- Users will select the severity of the flood-affected scheme
- Users will select which assets of a scheme are affected
- Users will be able to delete flood-related information for a scheme
- Flood-related data can only be added to a scheme and not otherwise
- Multiple options of assets when adding flood data
- Unit for measuring the stagnation period will be days, and the inundation height will be metres.

PNRD Module

The PNRD (Panchayat & Rural Development) Module within JJM BRAIN is a dedicated platform that supports the management of handed-over water supply schemes by PNRD officials, including panchayat users, block administrators, and panchayat commissioners. Since PNRD is responsible for the operation and maintenance of schemes post-handover, this module plays a crucial role in ensuring their long-term sustainability.

This tool ensures that local governance structures can effectively manage the schemes and preserve the integrity of Jal Jeevan Mission assets at the grassroots level.

Key components of the feature are:

- **Data Validation Check:** Before a scheme is marked as handed over, the system verifies key data parameters through a validation process. This ensures all essential information is complete and accurate, establishing a reliable basis for proper post-handover management.
- **Approval Mechanism:** The handing-over status becomes active only after approval by the respective panchayat. This step ensures transparency and formal consent from local authorities, reinforcing accountability in scheme transition.
- **WUC Formation:** GPs, ISAs and block-level officials can facilitate the formation and assignment of Water User Committees (WUCs) to specific water supply schemes. This participatory model ensures that local communities are actively involved in the operation and maintenance of handed-over assets.

- **O&M Payment Tracking:** Panchayat users can record Operation & Maintenance (O&M) expenditures, including costs like Jal Mitra salaries and electricity bills. This feature supports financial transparency and sustainability of the scheme post-handover.

Outcome

- Users will be able to verify handing over status of a scheme
- Users will be able to upload O&M payment details of schemes
- Users will be able to download O&M payment report month wise
- A dashboard that will be accessible by both district and state users
- Access grievances in the schemes in their respective jurisdiction.
- Payment categorized into different types such as Jal Mitra salary, maintenance, chemical, etc.
- Only one entry of Jal Mitra salary per scheme per month allowed.

State Functionaries

Capability Matrix

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

 **INTER DEPARTMENTAL DATA EXCHANGE**	• The APDCL (Assam Power Distribution Company Limited) Integration Module is a specialized tool within JJM BRAIN, designed to facilitate the tracking of APDCL bill payments and power consumption for schemes under the Jal Jeevan Mission. Data is also exchanged between JJM BRAIN and the Land & Revenue Department. • Integration with National Health Mission (NHM) is enabled by the NHM module of JJM BRAIN.
JOINT PLANNING & APPROVAL WORKFLOWS	There is insufficient information in this area. There is partial involvement. Approvals are required from Panchayats for WUC formation and scheme handover. However, broader joint planning with other departments is not institutionalized.
CROSS-SECTOR ANALYTICS & DASHBOARDS	Not sufficient information on this area.
JOINT TRAINING & KNOWLEDGE SHARING PLATFORM INTEGRATION	Not sufficient information on this area.
GRIEVANCE & FEEDBACK LOOP INTEGRATION	Not sufficient information on this area.
CROSS SECTORAL POLICY ALIGNMENT	Dashboards exist (JJM BRAIN), but they are only focused on PHED-specific data (e.g., scheme progress, flow data, and WUC formation).
EMERGENCY RESPONSE & DISASTER MANAGEMENT INTEGRATION	No integration with the Assam State Disaster Response Fund, disaster dashboards, or contingency alert systems in case of drought/flood affecting water supply.

Assam's JJM has developed a strong internal digital ecosystem through the JJM BRAIN platform and related apps, but inter-departmental and cross-sectoral integration is minimal or absent. This presents a major opportunity for future **DPI evolution**, where joint planning, shared analytics, grievance integration, and disaster responsiveness can be embedded into the next phase of platform development.

Technology Foundation

Capability Matrix

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

UNIFIED / INTEGRATED PLATFORM APPROACH	JJM BRAIN is a unified platform integrating several modules for scheme monitoring, grievance tracking, project management, GIS mapping, and community engagement to ensure transparency and efficiency.
SECURITY AND COMPLIANCE	Secure authentication, encryption, role-based controls, AWS security features, vulnerability management, and audit logging for compliance.
MODERN TECHNOLOGY STACK & CLOUD NATIVE ARCHITECTURE	The system is built on the LEMP stack with Laravel, Node.js, MySQL, Redis, AWS/Digital ocean, and Elasticsearch for scalability, performance, and modern DevOps practices.
IDENTITY & ACCESS	Role-Based Access Control (RBAC) for predefined roles like Jal Mitras, WUC members, engineers, and administrators. Role changes and account management are handled by the backend IT team, with no in-app role control. User accounts are created, updated, and deactivated as needed. Authentication uses username and password, but multi-factor authentication is absent, limiting protection for sensitive data. Single Sign-On (SSO) is not present.
INTEROPERABILITY WITH CENTRE SYSTEMS	There is a provision for API-based integration with IMIS and WQMIS for real-time schemes, however it exists only at a primitive level.
USE OF ARTIFICIAL INTELLIGENCE	Pilots include AI vision-based WhatsApp chatbot for meter readings and AI-powered customer satisfaction tool.
API INTEGRATIONS WITH EXTERNAL APPLICATIONS	The system is linked with the APDCL for electricity tracking and the NHM for sanitation data collection, enabling cross-sectoral coordination.

JJM BRAIN Platform

The platform integrates mobile applications and modules to enable real-time monitoring of PWSS status and water quantity, facilitate grievance reporting and tracking, and promote community awareness on responsible water usage. It uses GIS tools and a meticulously created litholog data repository to drive its source sustainability activities.

JJM BRAIN serves as a centralized platform where the Department/Mission, contractors, and stakeholders can efficiently monitor and manage PWSS projects. It provides real-time updates on project timelines, progress updates, material procurement, labour allocation, and financial aspects of the scheme. By collocating this data, JJM BRAIN enables effective project management, ensuring that scheme implementation proceeds smoothly and efficiently. The incorporation of GIS mapping adds another layer of sophistication, enabling better spatial understanding and informed decision-making.

This holistic approach ensures improved service delivery, greater transparency, and active community participation in water management across Assam. Below is the functional architecture diagram that represents how JJM BRAIN interacts with various external systems, modules, and stakeholders.

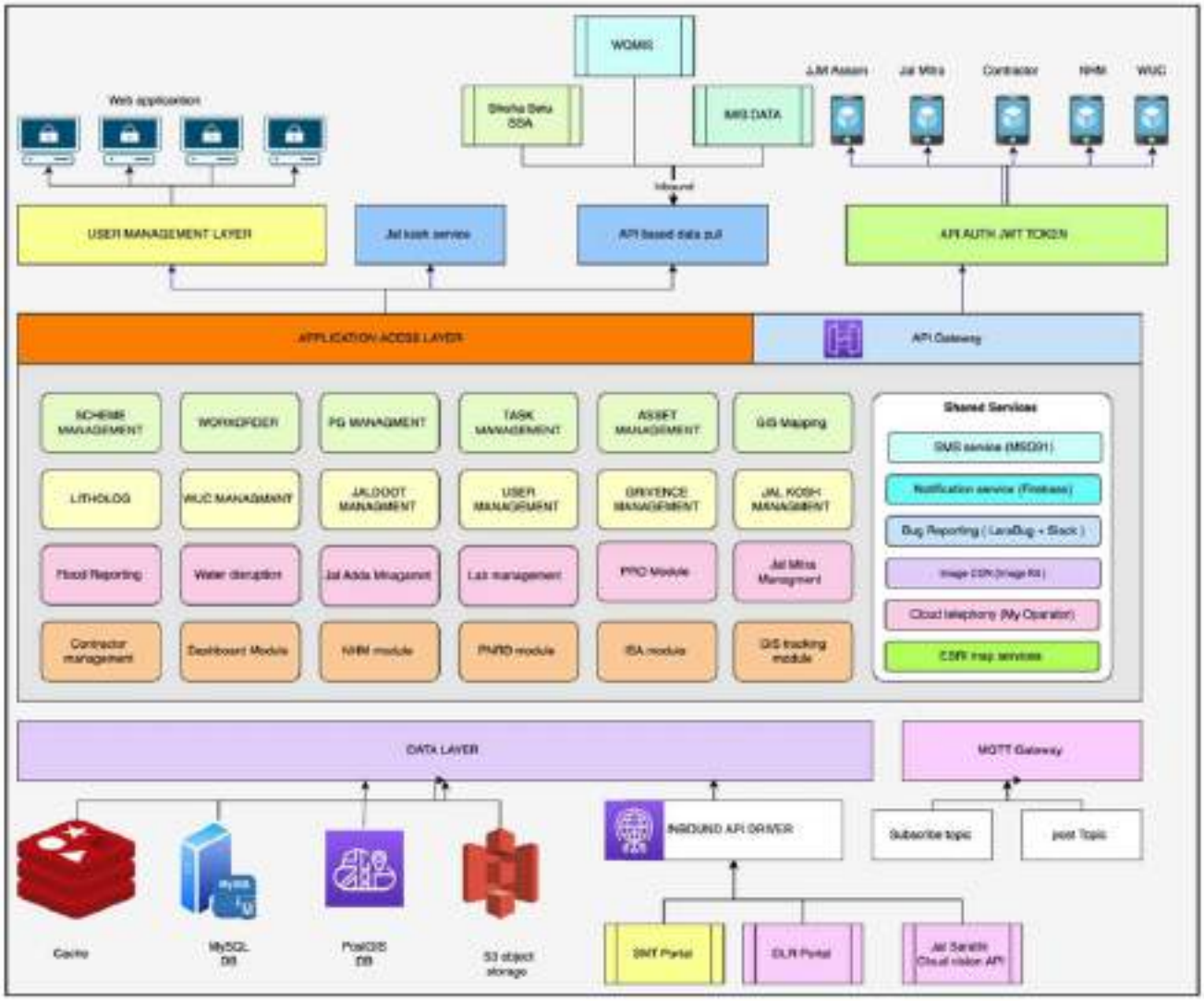


Figure 24: JJM BRAIN Functional Architecture

Technology Stack

LAYER	TECHNOLOGY /TOOL	DETAILS/USAGE
Frontend	HTML, CSS, JavaScript	Used for building the user interface and client-side interactions.
	Vue.js/React.js (optional)	If employed, used for dynamic and responsive UI components.
Backend	Laravel v 10.9	PHP-based framework for building the application backend and APIs.
	Node.js 18	Used for handling non-blocking server-side operations and additional APIs or microservices.
Database	MySQL 8	Relational database for structured data storage and management.
Server	LEMP Stack	Combines Linux, Nginx, MySQL 8 , and PHP 8.1 to serve the application and process backend logic.
REST API	Laravel REST API	Built-in Laravel capabilities used to expose application services to the frontend or external systems.
Authentication	JWT (JSON Web Tokens)	Ensures secure user authentication and session management across the application.
DevOps & Hosting	Nginx	Used as a web server and reverse proxy.
Operating System	Ubuntu/Linux	Operating system for hosting the LEMP stack.

LAYER	TECHNOLOGY /TOOL	DETAILS/USAGE
Cloud	AWS/ Digital Ocean	Cloud hosting platform for scalability, storage, and additional services.
Cache/Queue Management	Redis	Handles session storage, caching, or background job queues.
Version Control	Git	Tracks source code changes for collaborative development.
Development Tools	VSCode/PhpStorm/Web Storm	IDEs for efficient coding and debugging.
Search	Elastic search	An indimaped self hosted Elastic search is working with MongoDB for auto sync
Testing	PHPUnit	Framework for testing Laravel code.
	Mocha/Chai (Node.js)	Framework for testing Node.js services.
Monitoring	New Relic	Used to monitor performance and identify bottlenecks.
CDN	S3 CDN	Speeds up content delivery and provides DDoS protection.

Interoperability with Centre Systems

IMIS Integration Module

The IMIS Integration Module in JJM BRAIN uses API integration to fetch and synchronize scheme data from the IMIS system, ensuring accurate, real-time information transfer. This integration maintains data consistency across platforms by validating scheme details using a valid IMIS ID and displaying matching fields for verification. The module supports reliable planning, monitoring, and reporting by ensuring that all stakeholders have access to uniform and up-to-date scheme information.

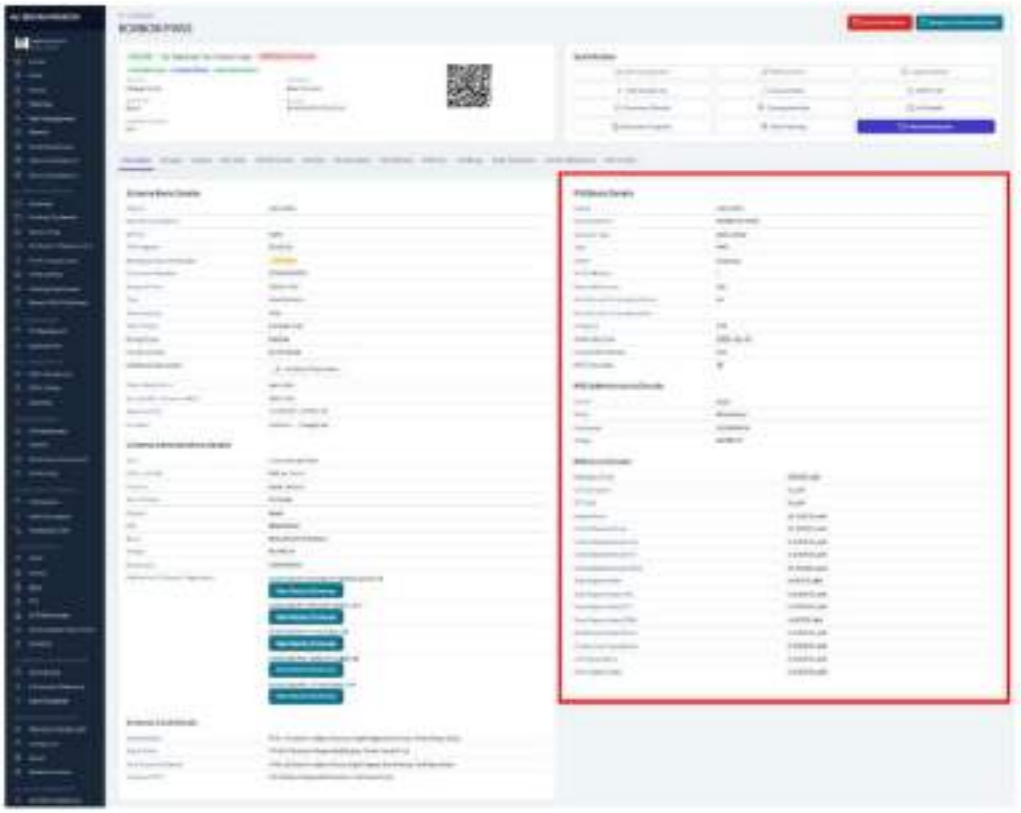


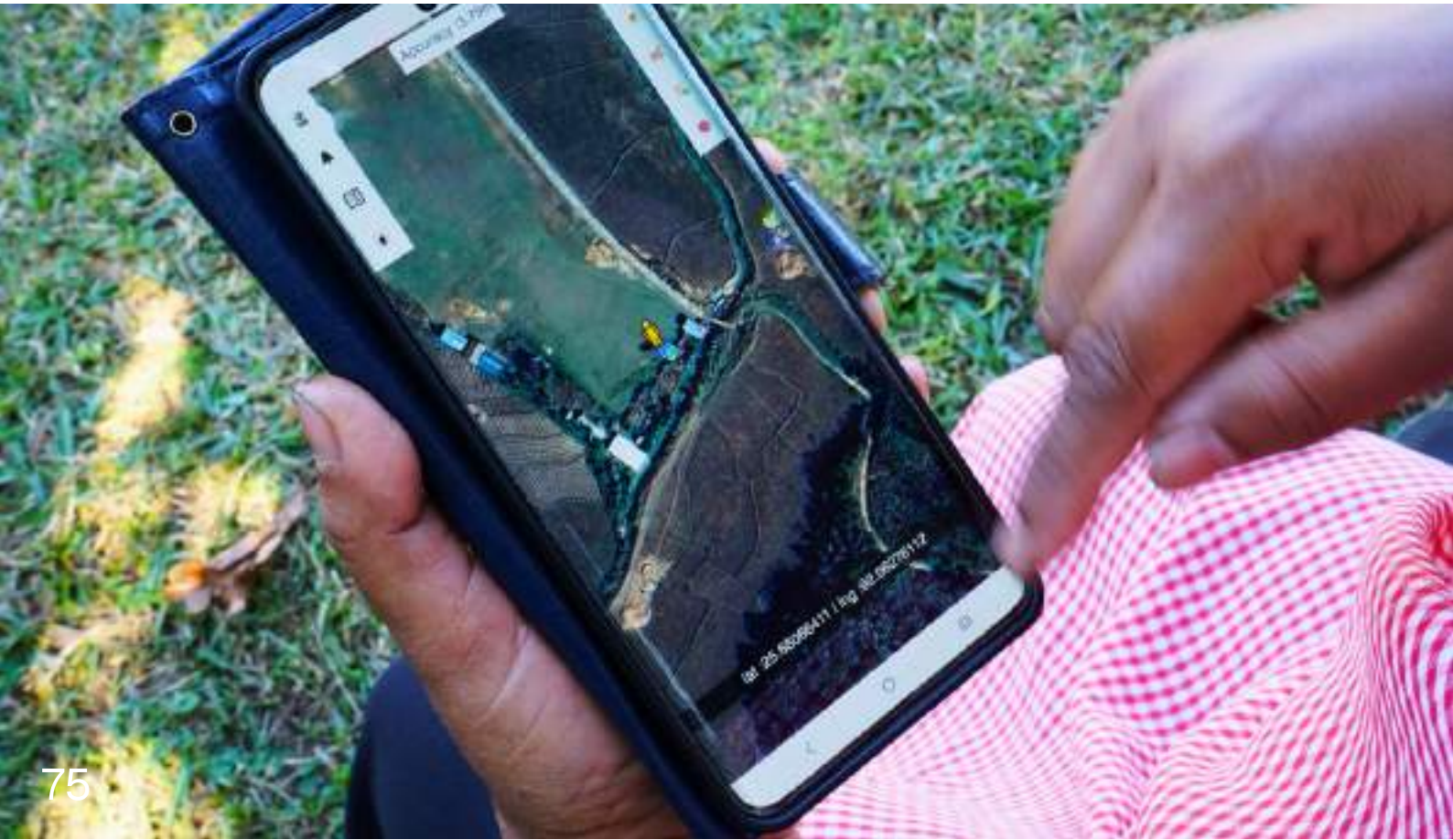
Figure 25: Centre's IMIS Interoperability

Key Features:

API Integration: The module includes API (Application Programming Interface) integration that enables the sharing of scheme details from IMIS to JJM BRAIN. This integration ensures that all relevant data related to each scheme is accurately transferred from IMIS to JJM BRAIN, providing a reliable basis for decision-making. The API integration is essential for maintaining data consistency across platforms, ensuring that all stakeholders have access to the same information and are accurately tracking and reporting the mission's activities.

Data Consistency: The IMIS Integration Module plays a critical role in ensuring data consistency across different platforms. By cross-verifying scheme data with IMIS, the module ensures that all relevant information is accurately captured, stored, and updated in JJMBrain. This consistency is essential for supporting better planning, monitoring, and reporting of the mission's activities, as it ensures that all stakeholders have access to accurate and reliable information.

- Matching fields or attributes of a scheme will be visible
- Scheme data will only be fetched from IMIS upon valid scheme IMIS ID



WQMIS Integration Module

JJM BRAIN is in the process of being integrated with the Water Quality Management Information System (WQMIS). This integration is vital for ensuring the safety and reliability of piped water supply schemes across the state.

Through this seamless linkage, water quality test results, whether from field test kits (FTKs) used by community-level workers (Jal Mitras) or detailed laboratory analyses, are directly uploaded and synchronized with the JJM BRAIN application. This eliminates manual data entry, reduces errors, and provides real-time insight into water quality status at various points, from source to household tap. The integration allows for immediate identification of contaminated samples, providing crucial alerts and enabling prompt remedial actions to be initiated. Furthermore, citizens can access water quality information through the JJM BRAIN's "Citizen Corner" tool, fostering transparency and building confidence in the water supply system. This holistic approach, powered by WQMIS data feeding into the overarching JJM BRAIN platform, streamlines water quality surveillance, strengthens accountability, and ultimately contributes significantly to the mission's objective of providing safe drinking water to every rural household in Assam.

API Integrations with External Applications

Assam Power Distribution Company Limited (APDCL) Integration Module

The APDCL (Assam Power Distribution Company Limited) Integration Module is a specialized tool within JJM BRAIN, designed to facilitate the tracking of APDCL bill payments and power consumption for schemes under the Jal Jeevan Mission. Electricity is a critical component of many schemes, particularly those involving water treatment and distribution. The APDCL Integration Module provides a centralized platform where all data related to electricity consumption and bill payments are stored and managed, ensuring that all schemes have access to reliable and affordable electricity. This module is essential for the financial sustainability of the mission, as it ensures that all electricity-related expenses are accurately tracked and managed.

- **Consumer Number Update:** Users such as SO, SDO, EE, and Admin can update the APDCL-assigned consumer number for each scheme, ensuring accurate tracking of electricity consumption and billing.
- **Electricity Consumption Details:** The module displays key details like application status, units consumed, bill status, and settlement history, enabling users to monitor energy usage and manage costs effectively.
- **Financial Monitoring:** By linking scheme electricity data with billing records, the module supports the financial sustainability of operations and ensures that all electricity-related expenses are properly tracked and reported.

NHM Module

The NHM JJM Monitoring System Module is an integrated mobile and web-based tool within JJM BRAIN, designed to monitor and track the progress of soak pit installations and VDVC (Village Development Committee) meetings. Developed under an MoU between the National Health Mission (NHM) and the Jal Jeevan Mission (JJM), this module enables ASHA workers, ASHA supervisors, and block, district, and state-level administrators to collect and verify data. Through the mobile application, ASHA workers can submit data on VDVC meetings and soak pit installations, while the web application allows administrators to monitor and analyze the collected information. This system aims to ensure accurate data collection and reporting to support the health and sanitation goals of the mission.

NHM Application designed for ASHA workers and ASHA Supervisors under the National Health Mission (NHM) to support sanitation-related data collection.

- Capture soak pit and platform data in their assigned jurisdiction.
- Log meetings organized by ASHA workers for reporting and coordination.

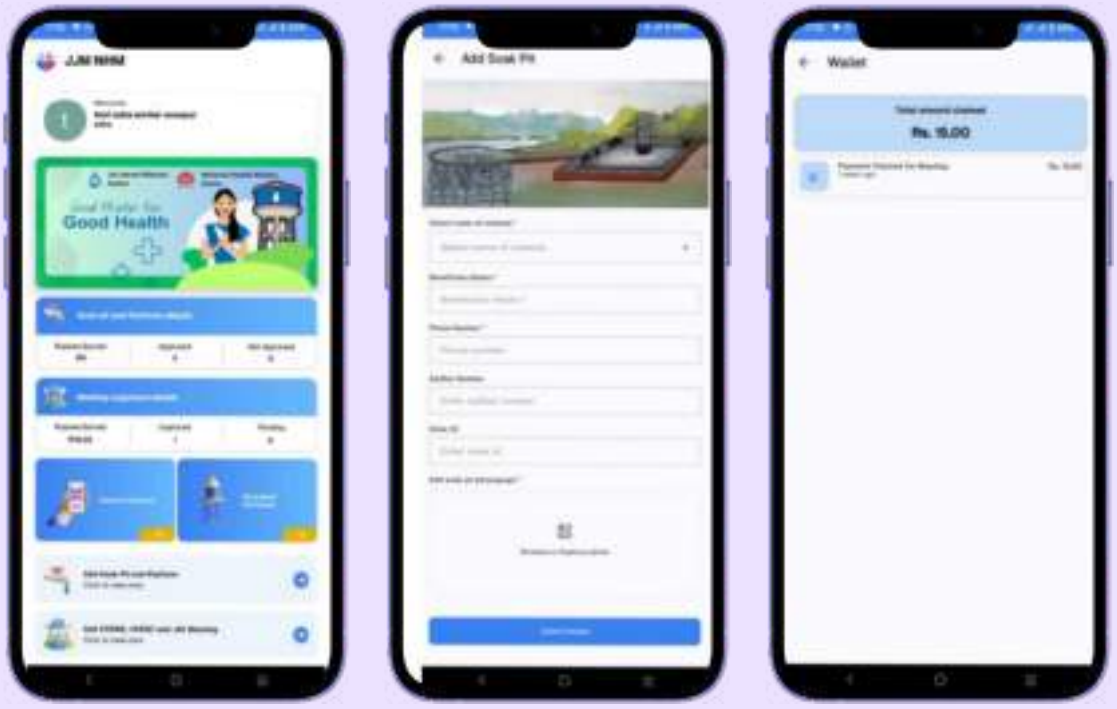


Figure 26: NHM-JJM application interface

Identity and Access

Identity and Access Management (IAM) is a crucial backbone for the JJM BRAIN application and other IT systems within PHED Assam, ensuring that the right people have the right access to the right resources at the right time. Its key aspects are as follows:

- **Role-Based Access Control (RBAC):** Access to the JJM BRAIN is meticulously governed by predefined roles, such as Jal Mitras, Water User Committee (WUC) members, field engineers, laboratory technicians, block-level officials, and state administrators. Each role has specific permissions, ensuring data security and integrity. However, role management is dependent on the backend IT team, and there is no interface in the application to manage these roles.
- **User Lifecycle Management:** The system manages the entire lifecycle of a user account, from provisioning new users (e.g., when a new Jal Mitra is trained) to modifying their permissions as roles change, and ultimately de-provisioning accounts when individuals leave their roles.
- **Authentication Mechanisms:** Secure authentication methods are in place to verify user identities. This currently involves username and password combinations. However, multi-factor authentication (MFA) is absent, missing out on another possible layer of security, especially for sensitive data.

Use of Artificial Intelligence

PHED Assam is at the forefront of using AI-based interventions. The department has already piloted an AI vision-based WhatsApp chatbot that reads BFM readings. The department is also piloting an AI-enabled Customer Satisfaction application.

Security and Compliance

- **Authentication:** The system uses secure authentication mechanisms to protect user accounts.
- **Authorization:** The system restricts access to resources based on user roles and permissions.
- **Data Protection:** The system protects sensitive data from unauthorized access or modification. This includes encryption in transit and at rest in MySQL, PostgreSQL, Redis, and Object Storage.
- **Vulnerability Management:** Regular security testing and patching to address vulnerabilities.
- **Platform Security:** The system employs AWS security features, including IAM roles, security groups, and VPC configurations, to protect against unauthorized access.
- **Access Control:** Use role-based access control at every level, including the Redis cache, to enforce strict access policies.
- **Audit Logging:** Track changes in sensitive data across the databases for compliance and debugging.

Infrastructure

Capability Matrix

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

HOSTING INFRASTRUCTURE

AWS + Digital Ocean (public cloud) is being used as hosting infrastructure of JJM BRAIN application. Google Play Store is being used as a distribution channel for all the mobile apps.

1. Main Application Layer (JJM Brain - Monolith)
Server: AWS
- RAM: 8 GB
- CPU: 2 dedicated cores

Database: Managed MySQL
- RAM: 16 GB
- CPU: 4 cores
- Storage: 512 GB SSD

Purpose: Core business logic and operations.
In memory database: Redis for database caching

2. Elastic Server
Server: A separate server
- RAM: 2 GB
- CPU: 2 cores

Database: MongoDB
Purpose: Handles dynamic data indexing and search functionalities.

3. JJM NHM Application Layer (Monolith)
Server: A separate monolith server
- RAM: 4 GB
- CPU : 2 Core

Database Connection: Remotely connects to the JJM Brain database.
Purpose: Specific functionality dedicated to NHM processes, leveraging the JJM Brain data infrastructure.

4. API Gateway Layer
Functionality:
- Monitors API consumption and operational status.
- Handles all external API calls and ensures usage tracking and security.

Purpose: Centralized management of API interactions for both internal and external integrations.

Key Features of the Architecture
- **Scalability**: Layers can be independently scaled based on load.
- **Separation of Concerns:** Each layer focuses on specific responsibilities, improving maintainability and performance.
- **Centralized Monitoring:** API Gateway ensures operational visibility for all API interactions.
- **Performance:** Dedicated resources for the database and elastic server ensure optimized query handling and search operations.
- **Interoperability:** The JJM NHM application leverages the JJM Brain database seamlessly, ensuring data consistency.

STORAGE AND DATABASES

To develop a solid database architecture strategy for the JJM BRAIN application, various factors including scalability, data integrity, security, and interoperability with other applications like Panchayat and NHM_JJM initiative are taken into account. Given the use of multiple databases and caching mechanisms, a multi-tiered approach will help optimize data handling across the entire system.

- **Separation of Concerns:** Use specific databases for different purposes (MySQL for relational data, PostgreSQL with PostGIS for spatial data, Redis for caching). This aligns with the different data types you're managing.
- **Data Integrity:** Use foreign key constraints in MySQL (InnoDB) to ensure relational integrity for interrelated tables, such as tracking various tasks and work items under JJM.
- **Scalability:** Employ a modular design where data relatedto different applications (e.g., Panchayat and NHM_JJM) are separated but accessible via database links to prevent tight coupling.

Given the application's requirements, here's a strategic data-based architecture design that accommodates the different components, integrates GIS data, manages cache, and ensures scalability and performance.

Primary Database (MySQL with InnoDB Engine)

- **Database Type:** MySQL (Managed, DigitalOcean)
- **Engine:** InnoDB (for transaction-safe tables and foreign key support)
- **Purpose:** Main storage for core application data, transactional data, reports, and core application entities such as user information, work records, monitoring metrics, reports, and other structured data.
- **Features:** Optimized for high read/write performance, ACID compliance for reliability.
- **Structure:**
    - Core Tables: Tables for users, projects, work_items, reports, work_progress, status_logs, etc.
    - Indexing: Optimize indexing based on frequently accessed fields (e.g., project_id, status, user_id) to improve performance.
    - Data Access Layer: Implement a data access layer with Stored Procedures for complex queries, ensuring better maintainability and performance.
- **Primary Entities:**
    - Users and Roles: Manages application users, roles, and permissions.
    - Projects and Work Data: Stores data about different projects and ongoing work under the JJM initiative.
    - Monitoring and Reports: Holds monitoring logs, progress reports, and other key performance indicators.
    - Interconnection Data: Stores pointers or identifiers for connections with Panchayat and NHM_JJM Initiative applications.
- **Partitioning Strategy:**
    - Range or List Partitioning for large tables based on districts, project type, or date to improve performance and make backups manageable.

Cache Database (Redis)
Database Type: Redis
Purpose: Cache frequently accessed data to minimize direct database queries and enhance performance.
Use Cases:

- Session Management: Fast, secure storage of user sessions for quicker authentication.
- Frequently Accessed Data: Cache reports and other data that are frequently accessed but rarely updated.
- Data Replication: Cached copies of commonly accessed data across NHM_JJM and Panchayat apps to reduce query load on MySQL.

Data Expiration Policies: Implement TTL (Time-to-Live) on session data and other transient cached information to optimize memory usage.

- **Implementation**
    - Cache recently accessed data, such as **user sessions, recent work items, and high-demand reports.**
    - **Cache Expiration Policies:** Set Redis to expire cache keys based on the frequency of data change; for example, 5-10 minutes for high-update data or 1 hour for static data.
    - Use **Redis for locking mechanisms** when multiple applications (like Panchayat and NHM_JJM) access the same data, ensuring data consistency.

GIS Database (PostgreSQL with PostGIS Extension)

- **Database Type: PostgreSQL with PostGIS**
- **Purpose:** Stores and processes GIS data related to locations, pipelines, water sources, and other geospatial data enabling spatial queries and mapping.
- **Features:**
    - **Geospatial Queries:** Use PostGIS for location-based queries, such as finding nearby infrastructure, planning routes, or area-based reporting.
    - **Data Storage:** Store GIS data separately to optimize performance and avoid loading non-spatial data unnecessarily.
- **Data Sync and Transformation:**
    - **ETL Process:** Periodically extract and transform data from GIS tables into MySQL (for high-level summaries) if required for broader reporting.
- **Structure:**
    - **Core Tables:** Define tables for geolocations pipeline_routes, source_locations, and any spatially-referenced attributes.
    - **Spatial Indexing:** Use GIST indexing on PostGIS tables for faster spatial queries.
    - **Data Sync:** Regularly sync GIS-related data with Redis cache for quick access on commonly queried locations.

Document and Media Storage (S3-compatible Object Storage)

- **Storage Type:** Document Block object storage with S3
- **Purpose:** Store all non-relational assets like documents, images, reports, and files.
- **Integration:**
    - **Reference by URL:** Store file URLs or identifiers in the MySQL database for easy reference.
    - **Access Control:** Manage access to S3-stored files based on user roles and permissions, ensuring secure access to sensitive documents.
- **Structure:**
    - **S3 Keying Strategy:** Implement an S3 bucket structure based on entity types (e.g., work_items, reports) and date/time for easy retrieval.
    - **Metadata Table in MySQL:** Maintain a metadata table in MySQL to store information on each file in S3 (e.g., file_id, s3_url, associated_work_item_id).

Cross-Application Database Links and Integrations

Purpose: Allow cross-application data sharing while keeping each application's database distinct.

- **Database Links (ORM):**
    - **OMR (Object Relation Management)** for MySQL Database Links: Use DB links within OMR to read data from

Interconnected Applications:

- Panchayat and NHM_JJM Initiative: Both are interconnected within JJM Brain via DB links through the OMR.

Data Exchange:

- DB Links: Use secure DB links to allow direct querying from JJM Brain into Panchayat and NHM_JJM Initiative databases without duplicating data.
- APIs: Implement REST or GraphQL APIs for structured data access and interoperability between the systems, which can help with scalability and future integrations.

Data Sync Strategy:

- For frequently accessed cross-application data, sync essential parts into Redis to reduce real-time DB link load.

SCALABILITY (HORIZONTAL & VERTICAL)	JJM BRAIN is not a cloud native application based on microservices architecture. It is a monolith. Though deployed on public cloud AWS, the application will face horizontal scaling issues beyond a point. Redis cache has been used, but detailed review of the application puts the question mark on the usage of the same. Application should scale vertically owing to decent use of PHP Laravel framework and database strategies used. • **Load Balancing:** Use a load balancer for MySQL queries, directing read-heavy workloads to read replicas. • **Indexing Strategy:** Implement advanced indexing (spatial indexes for GIS, compound indexes for frequently joined MySQL tables) for fast querying. • **Query Optimization:** Optimize queries with caching, partitioning, and selective fetching techniques to minimize database load. • **Sharding (Future Scalability):** Consider sharding largetables by geographic regions if data volume grows significantly. This architecture design leverages the strengths of each database component while ensuring scalability, performance, and data integrity across JJM Brain and interconnected systems. By following this structure, JJM Brain can efficiently handle reporting, monitoring, and geospatial queries while providing a seamless user experience.
MONITORING & OBSERVABILITY	Not Sufficient Information available on this area.
BACKUP AND RECOVERY MANAGEMENT	Database backup is taken every 24 hours and is stored at separate machines other than the production. However recovery from the backup is never tried out. • **Managed MySQL:** DigitalOcean managed MySQL provides automated backups; configure daily and weekly backups with a secure retention policy. • **Redis Backup:** Periodic snapshotting of Redis for disaster recovery; ensure session data can be gracefully degraded or rebuilt. • **GIS Data:** PostgreSQL and PostGIS data should be backed up weekly due to lower write frequencies but significant importance. • **Object Storage:** Enable versioning for document storage to allow recovery of previous versions.
HIGH AVAILABILITY & DISASTER RECOVERY	The production instance of JJM BRAIN is hosted on AWS and the DR site is hosted on the State Data Centre, theoretically providing good coverage on high availability and disaster recovery. However, mock drills of disaster recovery have not been done even once. Also RPO and RTOs are not well defined.
NETWORKING AND CONNECTIVITY	Sufficient information is not available on this area.

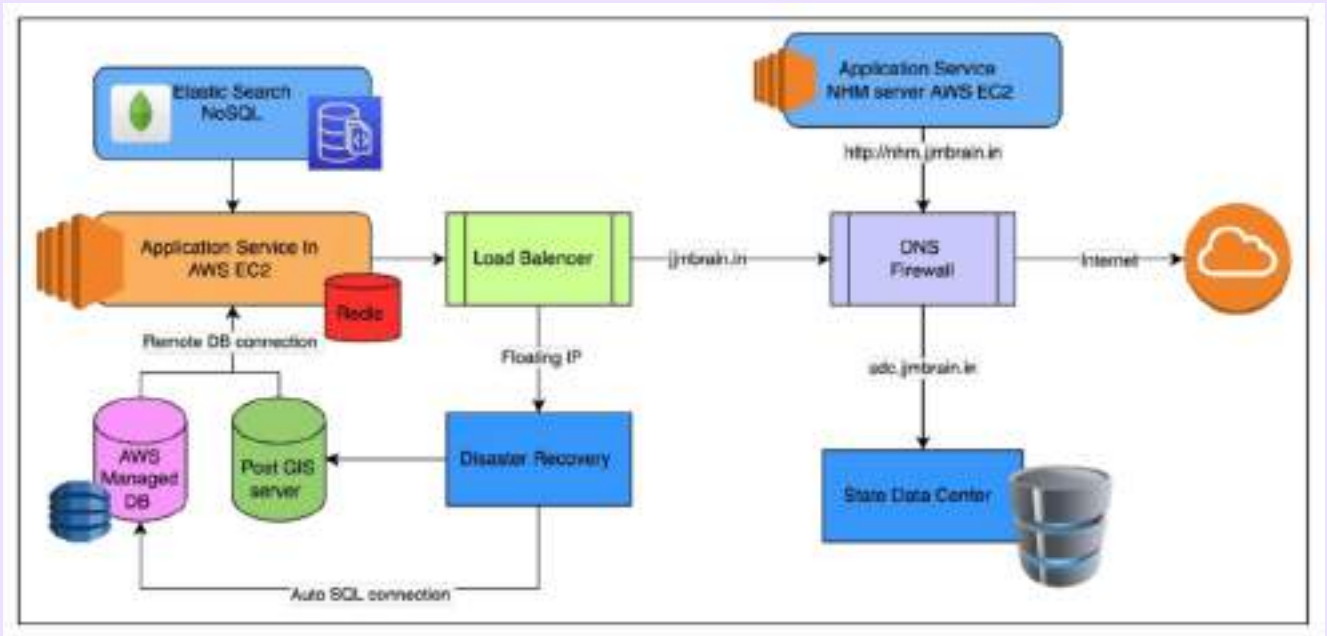


Figure 27: Deployment architecture of JJM BRAIN

Conclusion

The "As-Is Study Report" on the Public Health Engineering Department (PHED) of Assam presents a compelling narrative of significant progress and technological innovation under the Jal Jeevan Mission (JJM). JJM Assam stands out as a remarkable example of how digital innovation and community-driven governance can converge to transform public service delivery. The backbone of this success is the JJM BRAIN platform, a comprehensive digital ecosystem that has revolutionized rural water supply management through end-to-end visibility, real-time monitoring, and enhanced community engagement. By building the JJM BRAIN digital platform, the state has streamlined complex processes like scheme monitoring, asset mapping, water quality tracking, grievance redressal, and citizens & frontline worker engagement under a unified system. The integration of real-time data, mobile applications, dashboards, and geospatial technologies has significantly improved transparency, accountability, and responsiveness in the mission's execution.

Highlights of Achievement

One of the most notable strengths of JJM Assam lies in its emphasis on citizen participation and grassroots engagement. Initiatives like the Jal Mitra program, Jal Kosh QR code system, and the Jaldoot school awareness campaigns have brought the mission closer to rural communities. These efforts not only promote ownership and awareness but also ensure that the schemes remain functional, monitored, and sustainable beyond the initial implementation phase. The use of IoT devices, flow meter tracking, and mobile reporting further highlights Assam's commitment to adopting scalable, tech-enabled models to improve rural water access.

The JJM BRAIN platform stands as a single source of truth, integrating multiple modules—from scheme management and grievances to GIS mapping and lab data—thereby ensuring transparency and accountability across all levels of implementation. The system's "field-first" mobile architecture, including applications for contractors, Water User Committees (WUC), and Jal Mitras, has enabled real-time data capture, from tracking pipe laying with GPS to updating flow meter readings instantly. A standout innovation is the Jal Kosh QR code, which provides citizens with direct access to scheme information and a seamless channel for submitting feedback and grievances, creating a crucial bottom-up feedback loop. The multi-channel grievance redressal system, which captures complaints via WhatsApp, web forms, and calls, ensures systematic tracking and resolution, complete with automated routing and PDF closure reports for an official audit trail. Furthermore, the digitization of the entire scheme lifecycle—from sanction to handover—with role-based validation and approval workflows, has streamlined operations and improved efficiency.

The mission has also demonstrated a strong commitment to asset tracking and network visualization through GIS and geo-tagging, which provides a detailed, digital representation of the water infrastructure. Capacity building and community engagement are deeply embedded in the mission, with over 1.14 lakh women trained in water quality testing and extensive IEC campaigns fostering behavioral change and local ownership. This comprehensive digital framework positions Assam's Jal Jeevan Mission as a commendable model for effective and transparent rural water management.

Strategic Areas for Improvement

While the report highlights significant achievements, it also identifies critical strategic areas for improvement to ensure long-term sustainability and scalability. A primary concern is the monolithic architecture of JJM BRAIN, which limits its scalability and poses a long-term barrier to adopting a more modern, cloud-native microservices approach. The current technology stack, based on PHP and the Laravel framework, is also noted as a potential hindrance to future modernization.

Application resilience and reliability are other key areas of focus. The report notes that the system has not been tested for resilience, with no defined Recovery Point Objective (RPO) and Recovery Time Objective (RTO), which could severely impact business continuity in the event of a system failure. Furthermore, many of the field applications have limited offline functionality, creating challenges for users in remote areas with poor internet connectivity.

Other critical recommendations include:

- **Data Health and Governance:** The report identifies a lack of a centralized system to flag data errors, such as duplicate WUCs or unverified connections, leading to potential data gaps and reduced reliability of analytics.
- **User Adoption and Experience:** Inconsistent user adoption across districts, coupled with inadequate mobile app user experience (UX) design, leads to data gaps and difficulties for non-tech-savvy users.
- **Predictive Intelligence:** The system is rich in operational data but lacks predictive or analytical intelligence to proactively identify potential scheme failures or O&M issues.
- **Interoperability:** While integrations with external utilities like APDCL exist, they are often partial and require manual intervention, slowing down workflows and limiting automation.
- **Training and Feedback:** There is a need for structured onboarding and refresher training for users to ensure proper data entry and module usage. Additionally, beneficiary feedback is not prominently highlighted, which buries community voices under operational data.

In conclusion, the Jal Jeevan Mission in Assam, through its innovative JJM BRAIN platform, has made remarkable strides in expanding tap water access and enhancing transparency. The strategic areas for improvement outlined in this report are not a critique of the program's success, but a roadmap for its continued evolution. By addressing the identified challenges—from modernizing the technological foundation and strengthening application resilience to enhancing data governance and user experience—Assam can ensure that its digital framework remains robust, scalable, and capable of delivering sustainable, reliable, and inclusive water services for the long term.

This report provides a clear blueprint for transforming to a "Leading" state in the rural drinking water sector, setting a new benchmark for digital-first governance. The way forward is clear: to transition from application-centric solutions towards an integrated DPI approach, aligning with India’s broader digital public goods strategy, and ensuring that every household in Assam not only has a tap connection but also benefits from transparent, reliable, and citizen-friendly digital services.

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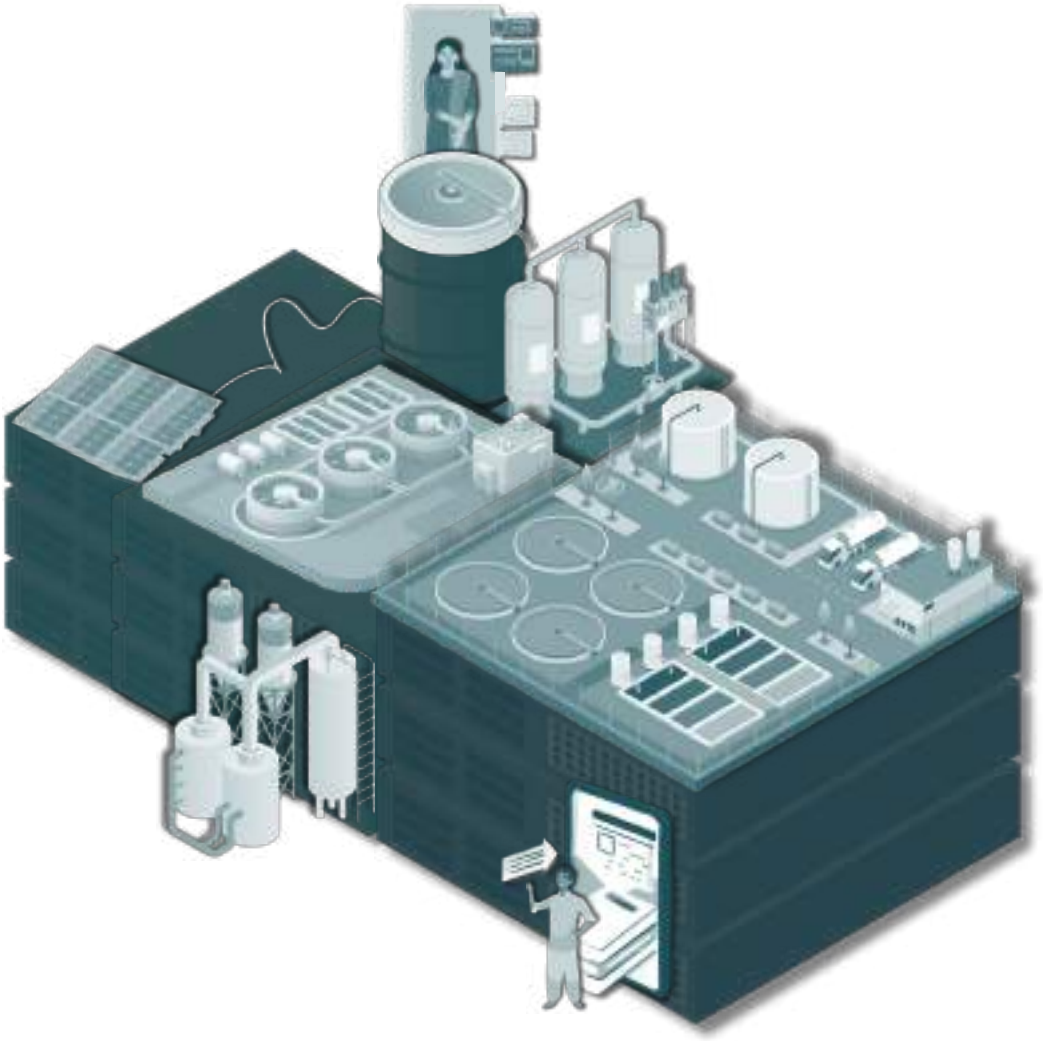

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