Enabling policy considerations for Digital Public Infrastructure for Drinking water Security

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Background: About Jal Jeevan Mission

The **Jal Jeevan Mission (JJM)** is a flagship initiative launched by the Government of India in 2019 with the goal of providing safe and adequate drinking water through individual household tap connections to every rural household in the country much ahead of SDG-6.1 target of 2030.. The mission seeks to address the critical challenges of water accessibility, quality, and sustainability, aiming to improve rural water supply infrastructure and ensure that water is available in sufficient quantity and quality for every family. By reducing the need to travel long distances for water, JJM particularly benefits rural women and girls, who traditionally bear the burden of water collection, allowing them more time for education, employment, and other productive activities. Additionally, access to clean drinking water significantly reduces the risk of waterborne diseases, improving overall health and quality of life in rural communities. JJM promotes community-based approaches and emphasizes the involvement of local institutions, such as Panchayati Raj Institutions and Village Water and Sanitation Committees, to ensure effective management and maintenance of water resources. By focusing on long-term sustainability and equity, JJM aims to make safe water a reality for rural communities across India.

The Mission has improved the coverage from 16.7% in 2019 to over 78% in just a span of over 5 years. Over 9 states and Union Territories have achieved 100% coverage. Nobel Laureate Michael Kramer reported that universal saturation after JJM will prevent around 1,36,000 child deaths annually and will cause a 25% reduction in under 5 children mortality.

The mission is also supported by a digital infrastructure, which includes monitoring and quality management systems, to track progress and enhance transparency and accountability at all levels of implementation.

Current JJM Technology Infrastructure

NJJM has developed a centralized technology platform to support states in tracking and monitoring key program components. JJM MIS tracks beneficiaries and the physical and financial progress of water supply schemes, while JJM WQMIS captures water quality tests conducted by Water Quality Labs and village women along with subsequent remedial actions taken. The system offers village-specific data and numerous reports for users.

The department has ensured common master data for the water supply schemes for both JJM MIS and WQMIS. Both these systems along with Swachh Bharat Mission (SBM) systems are now based on the common Local Directory Codes by the Govt of India. This is important as this can enable a common unified view of a village for all the 3 systems.

The current system is structured as shown below:
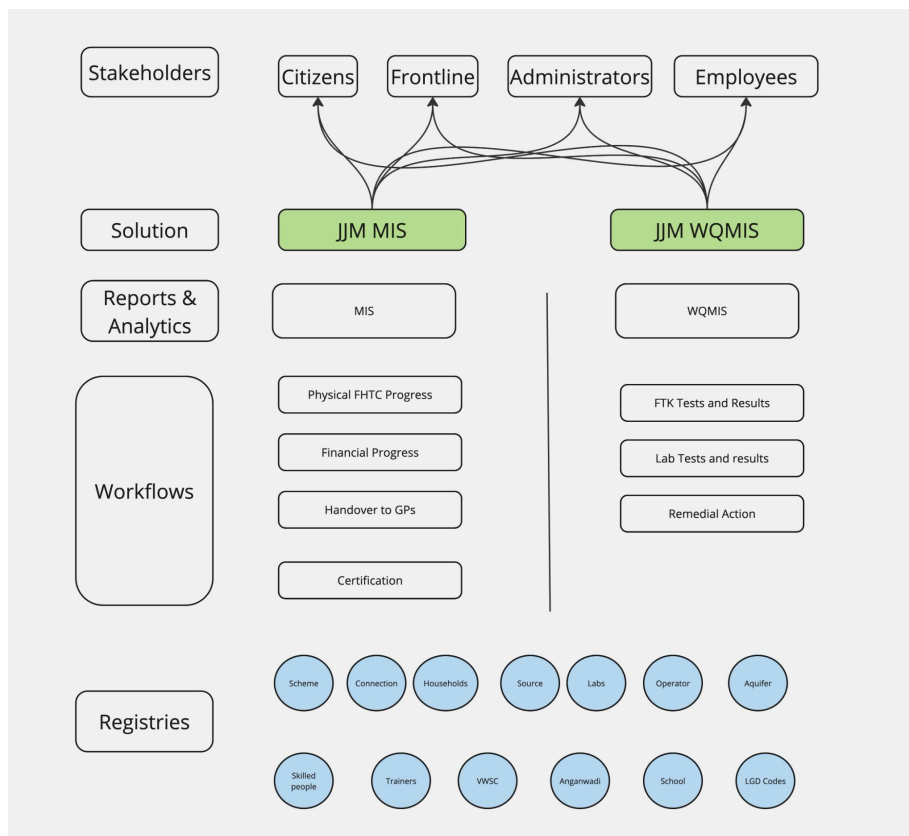
As can be seen from the figure, the system has been thoughtfully designed and layered with registries at the core and on top of them, workflows that provide various services to the verified users and citizens, The verified users such as department staff, contracted frontline workers, and registered volunteers can perform services like updating the physical and financial progress, update Lab and FTK test results and the remedial actions etc. In the spirit of transparent open data, the system has made a significant number of reports available to the public. Citizen Corner is a special initiative of the department to present a unified view of the scheme to the citizens.

The system also has open APIs which are made available to the states through the JJM Web API portal. This enables the states to get and push the information from the MIS and WQMIS systems to their respective state systems. States like Maharashtra and West Bengal have their own Water Quality systems and they push the data to WQMIS systems directly through their own systems. Similarly, Assam has its own JJM platform called JJM Brain which pulls scheme related information, the beneficiaries and Water Quality (WQ) related data from the MIS and WQMIS systems.

From Infrastructure to Sustainability- Need for Digital Public Infrastructure

As the program nears 100% coverage, the focus of the program is shifting from laying the infrastructure to the long term sustainability of the functional household tap connections. In the infrastructure phase, success was measured by coverage and connections. The sustainability phase shifts the focus to the consistent delivery of adequate, quality water to every household.

Over 6 Lakh schemes need to run like a utility everyday to service 19.34 crore households for the design life of the scheme (20-30 years). This means reliable predictable water supply at prescribed times, potable water quality every single time while ensuring long term source, institutional and financial sustainability.

As the program undergoes this transition, here are some of the major shifts that will be needed:.

1. Diversity of Schemes and Contexts
   India's rural water supply schemes vary widely, from Single Village Schemes (SVS) to Multi Village Schemes (MVS), with states facing unique challenges in water availability, quality issues, and governance structures. As JJM transitions to the sustainability phase, a DPI can provide tailored tools to address this diversity while maintaining a unified national framework.

2. Shift to Long-Term Maintenance
   In the infrastructure phase, the focus was on creating functional household tap connections. The sustainability phase requires robust mechanisms for operating, maintaining, monitoring and repairing infrastructure over a 20-30 year lifespan.

3. Increased Need for Local Empowerment and Collaboration
   While infrastructure development relied heavily on central and state efforts, the sustainability phase emphasizes local institutions and community participation. There is an increasing role of Panchayati Raj Institutions (PRIs), Village Water and Sanitation Committees (VWSCs), and frontline workers to manage water resources effectively while fostering collaboration with other stakeholders.

4. Focus on Service Reliability and Equity
   In the infrastructure phase, success was measured by coverage and connections. The sustainability phase shifts the focus to the consistent delivery of adequate, quality water to every household.

It is amply evident that the underlying technology needs of the states that will enable this shift will be very different. We need a very large number of different solutions to cater to this diversity.

A single entity will not be able to develop and provide all the solutions. We need the participation of a very diverse set of actors from states, markets, civil society organizations, local institutions, research and academia to solve for the long term sustainability of the functional household tap connections.

Therefore, the Department of Drinking Water and Sanitation is pivoting from offering individual solutions towards building a Digital Public Infrastructure for JJM by providing the core building blocks and registries through open APIs that will enable the ecosystem of states, markets, CSOs, and research and academia to build context specific solutions based on their needs.

At a very high level, the unified system architecture being proposed involves a new outlook. It offers a federated approach to catalyse the ecosystem: A high level view of the JJM DPI is illustrated below:
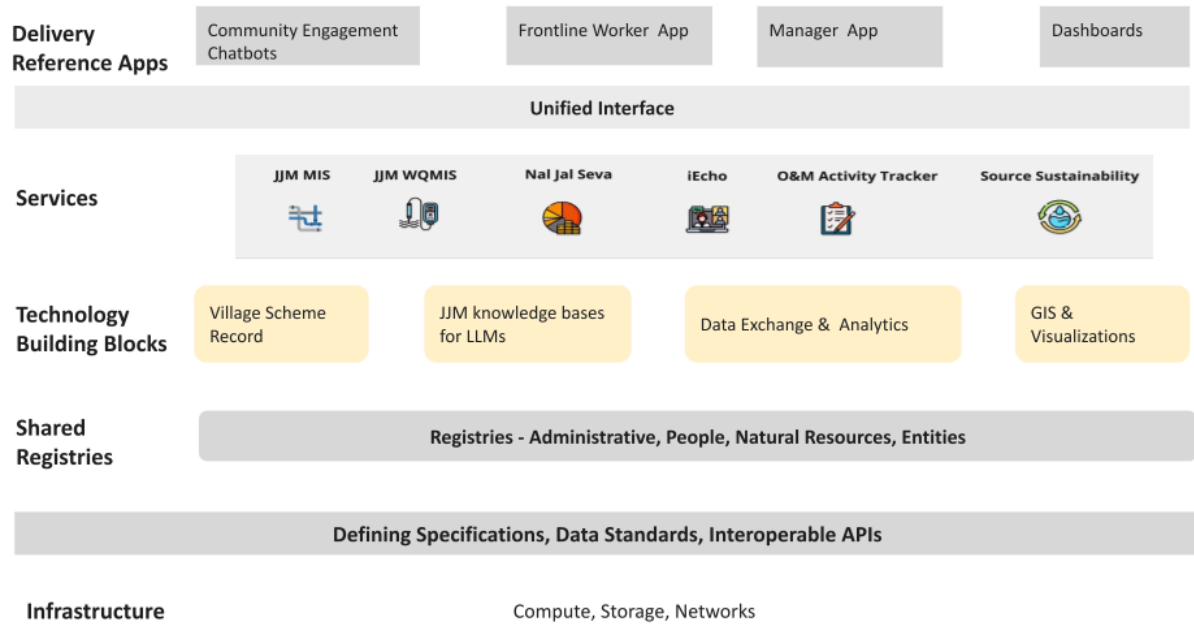
Developing such a Digital Public Infrastructure for JJM will require a considerable focus on technology choices. Foundational work from a technology perspective will essentially involve:

- Defining the standards and interoperable APIs
- Designing and building the core registries for administration, people, entities, assets and natural resources
- Provide the building blocks to reduce the efforts and friction for the ecosystem to build new innovative solutions on
- Build specific solutions for a few use cases as reference solutions to catalyse the ecosystem's imagination.

Beyond the Technology

The technology perspective is only one element of the Digital Public Infrastructure. Besides building with the right technology, the success of the JJM DPI will depend on onboarding the states and the innovation ecosystem.

This paper draws attention to a few key considerations for fostering a collaborative environment throughout the JJM DPI journey. Specifically, the pointers discussed here cover the role of the Central Government in building and maintaining the DPI, the governance structure for the DPI, and data sharing between different entities. These will form the fundamental pillars as the country embarks on the journey to build the JJM DPI.

Role of the central government

The central government will play a foundational role in creating and maintaining the **Jal Jeevan Mission (JJM) Digital Public Infrastructure (DPI)**, developing overarching standards, policies, and frameworks to ensure a consistent, interoperable, and data-driven approach across all states. This structure can provide states with essential tools and core building blocks, allowing them to onboard easily, enhance, and adapt the platform based on their unique needs while contributing to a unified national system. Through this federated model, the centre can respect each state's autonomy while focusing on enabling and supporting states in leveraging technology to address their specific challenges. Here are the key roles envisaged for the central government in the JJM DPI besides building the JJM DPI:

1. Building standards through Ecosystem Collaboration: Bringing together stakeholders across states, the private sector, and civil society, the centre needs to collaborate on unified protocols, standards, and shared data registries that are essential for interoperable systems. This collaboration will ensure that all ecosystem players align with common goals, enhancing coordination and effectiveness.

2. Capacity Building and Technical Support: To equip states and other ecosystem actors with the skills to adopt the DPI, the centre could provide training and technical support. By building capacity at the state and local levels, the centre can ensure the DPI is utilized effectively and meets mission goals.

3. Driving Innovation and Research: The centre can promote innovation by facilitating access to data for research, publishing standards & APIs, providing sandboxes for testing and fostering partnerships with the private sector. This collaboration will enable states to explore cutting-edge solutions, such as AI-driven analytics, that enhance water management.

4. Monitoring, Compliance, and Sustainability: Ensuring compliance with standards is critical for consistency across states. The centre can also focus on long-term sustainability by updating technology systems, maintaining data privacy, and adapting to technological advancements, ensuring that the JJM DPI remains resilient and responsive.

Collaborative Governance of the DPI

Effective governance of the **Jal Jeevan Mission (JJM) Digital Public Infrastructure (DPI)** is crucial to ensure that the platform serves national, state, markets and other ecosystem actor's needs while promoting transparency, accountability, and long-term sustainability. The central government, in collaboration with the stakeholders, will need to oversee the governance framework to maintain the integrity and adaptability of the DPI.

1. Framework for Collaborative Governance: The DPI governance framework needs to be built with collaboration among various stakeholders, including central and state governments, local authorities, technology partners, and civil society organizations. By establishing joint committees or task forces on DPI governance, all the stakeholders can effectively contribute to the decision-making process. This balanced approach will ensure local needs are met within a unified national vision.

2. Stakeholder Involvement and Consensus-Building: The DPI governance structure needs regular engagement with diverse stakeholders to build agreement on policies, protocols, standards, and data registries. This approach not only will foster mutual agreement on governance principles but also strengthen the commitment to the DPI's goals. Engaging stakeholders in regular policy and technical discussions will help align all parties with the mission's objectives and maintain operational consistency.

3. Transparency and Accountability: Transparency is a core principle of DPI governance, ensuring that all decisions, protocols, and data management practices are open to stakeholders. A transparent governance structure will build trust among states and other stakeholders, fostering greater data sharing and collaboration.

The governance structure of JJM's DPI needs to combine stakeholder collaboration, rigorous oversight, and an adaptive approach to build a resilient infrastructure that addresses both current and future water management needs. This balanced governance model can help create a sustainable and equitable digital infrastructure, supporting India's vision for universal and safe water access across rural areas.

Leveraging Public-Private Partnership (PPP) Models for Innovation

As the Jal Jeevan Mission (JJM) moves towards ensuring long-term sustainability of functional household tap connections, the diverse challenges across states require localized, innovative solutions developed in collaboration between government, private enterprises, and civil society. The need for Public-Private Partnership (PPP)-driven innovation becomes crucial

The central government can play a pivotal role in fostering PPP-driven innovation by implementing several key measures. First, it can incentivize innovation by providing support, regulatory flexibility, and infrastructure access, encouraging private sector involvement in developing innovative water management solutions. Additionally, the government can facilitate creating a collaborative ecosystem that brings together stakeholders from both the public and private sectors, enabling the design of scalable and sustainable solutions tailored to regional needs. Lastly, while offering access to national-level innovations, the central government can ensure flexibility to states, allowing them to adopt and adapt these solutions according to their specific challenges and requirements.

Open Data plays a critical role in fostering PPP-driven innovation by making valuable information accessible while safeguarding privacy and security. To enable private enterprises

and researchers to innovate, the central government can implement robust data governance frameworks that prioritize **anonymization and data privacy.** By anonymizing sensitive data, states can share aggregated, non-identifiable information that protects individual privacy while still allowing stakeholders to access meaningful datasets for analysis and innovation. Open data policies encourage transparency, enabling public and private sectors to collaborate on developing AI-driven solutions, predictive models, and real-time monitoring systems tailored to regional challenges.

By providing access to standardized and anonymized data via open APIs, the government allows private sector players, civil society, and academic institutions to design interoperable tools that can be scaled across different states. These tools can address local needs such as water quality monitoring, resource optimization, and infrastructure maintenance. As a result, **PPP-driven innovation** flourishes in an ecosystem where data is openly accessible, yet secure, leading to the creation of advanced solutions that enhance water management and support the long-term sustainability goals of the Jal Jeevan Mission.

Expected Benefits

The proposed approach aims to leverage the transformative potential of a shared Digital Public Infrastructure (DPI) to drive systemic change across key sectors, including water management under JJM. By fostering collaboration and interoperability, this approach unlocks a wide range of benefits—from economic efficiency and innovation democratization to social inclusion and resilience. Such a model not only enhances service delivery but also catalyzes exponential value creation, adaptability, and entrepreneurship, paving the way for sustainable, scalable, and inclusive growth.

The benefits that are expected to accrue with this approach are:

- **Network Effect Advantages:** Exponential value creation with each new participant as in the case of UPI.
- **Economic Efficiency:** Shared infrastructure reducing duplication of infrastructure and lower transaction costs. Eg: India Stack: Reduced KYC costs by 85%
- **Innovation Democratization:** Lowering of barriers to entry for innovators
- **Market Creation:** Enable new business models and create entrepreneurship opportunities eg: Account Aggregator framework
- **Social Inclusion:** Reduce access barriers to enable universal service delivery. Eg: Digital ID enabling financial inclusion
- **Resilience & Scalability:** Distributed architecture enabling resilience.
- **Evolutionary Growth:** Enable adapting to changing needs resulting in continuous innovation. Eg: Evolution of UPI features.

Conclusion

The Jal Jeevan Mission (JJM) has transformed rural water access in India, providing over 78% of rural households with functional tap connections. As JJM progresses toward full coverage, the focus shifts from infrastructure development to long-term sustainability, emphasizing local empowerment and adaptability to meet diverse state-level needs. Central to this shift is the development of the JJM Digital Public Infrastructure (DPI), which fosters a collaborative ecosystem where data-driven decision-making supports both national and state-level efforts.

The central government can play a critical enabling role by establishing standards, building capacity, and promoting innovation through decentralized data ownership and open APIs. A well-governed DPI ensures transparency, accountability, and adaptability, addressing both immediate water needs and future challenges, all while balancing state flexibility with national coordination.

Success will hinge on not only making the right technology choices but also fostering a collaborative environment involving the central government, states, civil society, local institutions, and market entities. Open data—protected by strong privacy and security measures—will empower private enterprises, researchers, and innovators to create advanced technologies like AI-driven solutions and real-time monitoring systems. By leveraging PPP-driven innovation and open data, JJM aims to ensure sustainable, equitable water access for rural communities, offering a model for other public service sectors across India.