



Har Ghar Jal
Jal Jeevan Mission

POLICY SUGGESTIONS FOR ENHANCING SUSTAINABILITY OF JAL JEEVAN MISSION SCHEMES

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Abbreviations

AE	Assistant Engineer
AKRSP(I)	Aga Khan Rural Support Programme (India)
CGWB	Central Ground Water Board
CHC	Community Health Centre
CLART	Composite Land Assessment and Restoration Tool
CSS	Central Sector Scheme
CWPP	Community Water Purification Plants
DDWS	Department of Drinking Water and Sanitation
DLP	Defect Liability Period
DPR	Detailed Project Report
DWSM	District Water and Sanitation Mission
EE	Executive Engineer
FC	Finance Commission
FHTC	Functional Household Tap Connection
FTK	Field Test Kits
GIS	Geographic Information System
GP	Gram Panchayat
GPDP	Gram Panchayat Development Plan
I&E	Income & Expenses
IEC	Information, Education, and Communication
IIMB	Indian Institute of Management Bangalore
IoT	Internet of Things
IMIS	Integrated Management Information System
ISA	Implementation Support Agency
ISRA	Implementation Support Resource Agency
IT	Information Technology

ITI	Industrial Training Institute
JJM	Jal Jeevan Mission
KPI	Key Performance Indicator
KRC	Key Resource Centre
lpcd	Liters per capita per day
MGNREGA	Mahatma Gandhi National Rural Employment Guarantee Act
MoJS	Ministry of Jal Shakti
MoPR	Ministry of Panchayati Raj
MSDE	Ministry of Skill Development and Entrepreneurship
MVS	Multi Village Scheme
NABL	National Accreditation Board for Testing and Calibration Laboratories
NGO	Non-Governmental Organisation
NSDC	National Skill Development Corporation
ODF	Open Defecation Free
O&M	Operation and Maintenance
PMU	Project Management Unit
PRD	Panchayati Raj Department
PRI	Panchayati Raj Institution
PHC	Primary Health Centre
PHED	Public Health Engineering Department
PWD	Public Works Department
R&M	Repair and Maintenance
R&P	Receipt and Payment
RLB	Rural Local Body
RO	Reverse Osmosis
RWSS	Rural Water Supply and Sanitation
SBM	Swachh Bharat Mission
SHG	Self-Help Group

SOP	Standard Operating Procedure
SVS	Single Village System
SWSM	State Water and Sanitation Mission
UT	Union Territory
VAP	Village Action Plan
VWSC	Village Water and Sanitation Committee
WASH	Water, Sanitation, and Hygiene
WIMC	Ward Implementation Management Committee
WMPSC	Water Management and Plumbing Skill Council
WQMIS	Water Quality Management Information System

1 Introduction

This note provides policy recommendations for enhancing the sustainability of piped water schemes under the Jal Jeevan Mission (JJM) derived from a national symposium held at the Indian Institute of Management Bangalore (IIMB) on 2 November 2023 and consultations with various stakeholders. It combines secondary research with field observations across states.

The Four Domain (4-D) Framework for analysis of water utilities (A.K. Biswas et al, 2021)¹ has been used to assess the sustainability of rural piped water assets. The four domains are as follows:

1. Physical Domain: Sustainability of water sources and their quality.
2. Financial Domain: Financial sustainability.
3. Operational Domain: Operational mechanisms and sustainability.
4. Institutional Domain: Roles played by different institutional actors and their mutual collaboration.

The discussion on each of the four domains is further structured into four sub-parts:

- a. The definition and context of the domain.
- b. The key guiding principles as per the JJM programme design for the domain.
- c. Encouraging and challenging experiences on the ground.
- d. Key recommendations for various stakeholders.

Policy suggestions presented in the following chapters can be implemented by various stakeholders at the central, state, district and village levels.

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¹ Biswas, A.K., Sachdeva P.K., & Tortajada C. (2020). Phnom Penh Water Story. Springer.

2 Delving into the four domains

2.1 Physical domain

The physical domain focuses on ensuring the availability of sufficient quantities of raw water that meet national quality standards to fulfil current and future drinking and domestic water needs while minimising adverse environmental and social impacts. It also addresses the adequacy of raw water sources to meet the non-household water needs of institutions such as schools, healthcare facilities, and commercial establishments, as well as non-human consumption. This domain encompasses rainwater harvesting and the safe disposal of wastewater and explores opportunities for recycling and reusing greywater.

2.1.1 Key design elements for the physical domain

- JJM recognises that one of the key challenges in the rural drinking water sector is source sustainability. It highlights the need for measures such as aquifer recharge, rainwater harvesting, increased storage capacity of water bodies, reservoirs, desilting and similar activities to improve the lifespan of water supply systems.
- The Village Action Plan (VAP) sets out the roadmap for the sustainability of water supply systems through the development of reliable drinking water sources and/or the augmentation of existing sources. The VAP is required to consolidate information on the current availability of water in the identified water source (based on measurement of yield) and its long-term sustainability. For Single Village Schemes (SVS), the VAP should include estimates for source sustainability. JJM recommends different measures for SVS and Multi-Village Schemes (MVS) for achieving source sustainability which can be taken up through convergence of different government schemes. Greywater management is also recognised as a key component under JJM and the VAP must include a plan for the collection, treatment and reuse of the same.
- The District Water Sanitation Mission (DWSM) must ensure the availability of funds for source sustainability works and greywater management in villages. Projects are to be cleared only if these components are part of the Detailed Project Report (DPR). Implementation Support Agencies (ISAs) are to build awareness of source

sustainability measures such as rainwater harvesting, artificial recharge, water quality, waterborne diseases, water saving practices, water handling, and drinking water source augmentation/sustainability aspects, etc.

- The JJM guidelines mention that Central and State Finance Commission (FC) grants can be used for taking up source sustainability and greywater management activities.
- The JJM strategy recommends various innovative solutions and technologies to address challenges in terms of terrain, quality and quantity of water to ensure the functionality of household tap connections. The recommended technological solutions for specific regional contexts are provided in Table 1 below.

Contextual factors affecting source	Recommended technological solutions
Sufficient groundwater of adequate quality	Use of local groundwater
Sufficient groundwater, but of poor quality	In-situ treatment technology
Drought-prone area	Conjunctive use of multiple sources of water such as ponds, lakes, rivers, groundwater, rainwater harvesting and/or artificial recharge
Poor water quality and non-availability of suitable surface water sources Drought-prone and desert areas where conjunctive use is unviable	Bulk water transfer from long distances
Arsenic and fluoride contamination	Community Water Purification Plants (CWPPs) providing 8-10 litres per capita per day (lpcd) of potable water
Hilly, high altitude areas	Spring-based sources, rainwater harvesting (including traditional systems) and stand-alone borewell systems
Coastal areas	Energy-efficient small desalination plants with a high recovery ratio

	Subsurface dykes in rivers to avoid the ingress of seawater and improve groundwater sources
Hard rock areas	Bore-blast technique, fracture seal cementation, stream blasting
High altitude Himalayan cold desert areas	Enhance and store runoff water in small tanks or traditional water harvesting structures Create artificial glacial reservoirs by diverting the runoff to freeze and store as glaciers

Table 1: Technological solutions for specific regional contexts recommended under JJM

2.1.2 Challenging experiences at the ground level

- Standardised quality check of water samples at the source is difficult in areas with poor water quality. Screening processes focus on fluoride and arsenic while other pervasive contaminants like iron are not tested for. There is inadequate infrastructure to test for all emerging contaminants.
- The JJM provides for the training of five women in every village to test water quality and upload the reports to the Water Quality Management Information System (WQMIS). This has faced various challenges such as the unavailability of using Field Testing Kits (FTKs), difficulties in registering on the WQMIS portal and inadequate and often very delayed incentives for the women among others.
- Supply is restricted as it is difficult to get the required 55 lpcd after treatment of water from contaminated sources. The treatment also tends to be very costly.
- Chlorination of water has been found challenging in many cases. Single village schemes exacerbate costs and scalability issues. People have a negative perception of chlorinated water due to the change in characteristics of the water post-treatment.
- The source sustainability aspect of local planning is very weak. The VAP must answer (a) whether the borewell has a recharge structure and (b) if the existing water bodies need rejuvenation or maintenance. Often the state groundwater boards or other

development authorities are not involved in scientifically assessing the borewell structures. This greatly impacts the Water Security Plan. The increasingly important issue of greywater management is also inadequately addressed in VAPs and/or Gram Panchayat Development Plan (GPDP).

- Departments directly carry out projects as per the district plan without necessarily addressing issues of sustainability of aquifers that supply drinking water or accounting for the demands of the community. Village communities are often unaware of the projects in their area.
- While Implementation Support Agencies (ISAs) are tasked with creating awareness among communities about source sustainability, they have limited know-how regarding the scientific and technical aspects of groundwater management and planning.

2.1.3 Encouraging experiences at the ground level

- In Odisha, greywater from households is used in kitchen gardens (Naik, G., Shreenivasa, K. D. and Jas, A. 2023).² However, the water must be tested to determine its suitability for irrigation purposes.
- In Karnataka, community-level soak pits, horizontal soak pits and chambers designed for black water to pass through before being utilised for irrigation are being used.
- Decentralized Wastewater Treatment Systems (DEWATs) also provide examples of ground-level innovations.
- Some states, like Punjab, are trying dual supply for areas affected by arsenic and fluoride. This ensures 5 lpcd of treated water for drinking through a treatment facility at the habitation or Gram Panchayat (GP) level with a traditional Reverse Osmosis (RO) plant and the remaining water from a secondary supply.

² Naik, G., Shreenivas K. D., & Jas, A. (2023). Functioning of Single Village Drinking Water Supply Scheme in Rural Odisha. Indian Institute of Management Bangalore.

2.1.4 Policy recommendations

1. Prioritising source sustainability in piped water schemes

- Urgent action is needed to prioritise source sustainability. Measurable targets and concerted efforts at the local level are necessary to map the aquifers wherever groundwater is the source of the water supply scheme.
- Inadequate capacity of the elected representatives of GPs and Village Water and Sanitation Committees (VWSCs) at the village level and the unwillingness of the GPs to emphasise source sustainability in the GPDP hinder efforts to sustain water sources like groundwater and springs. This jeopardises the longevity of piped water schemes. State/UT RD&PR departments can issue guidelines to GPs for including source sustainability under GPDP and ensuring that allocated funds are utilised for effective planning and implementation of such projects. Departments can declare district-wise fund allocation and utilisation by the GPs for source sustainability and measurement of impact on groundwater levels in their annual reports. The districts and states/UTs performing the best can be awarded at the national level to encourage others.

2. Enhancing village capacities for sustainable management

- Local educational institutions need to actively involve the VWSC and panchayats to build local capacities for accessing scientific information and implementing sustainable water management practices. A special programme on this should be initiated with the required budgetary support.
- The VAPs need to be developed into living documents that are updated annually by the VWSCs in consultation with the GPs. These can then be integrated into the GPDP for dovetailing funds available through various state and central schemes for greywater collection, treatment and reuse.
- VWSCs should be trained to develop DPRs through Key Resource Centres (KRCs) and be provided with a format by the DWSM to standardise DPR preparation.
- Improved mechanisms are needed for coordination between different scheme-based initiatives, such as developmental tasks under MGNREGA and water sustainability goals under VWSCs.
- There is a need to establish a framework for water budgeting with a focus on drinking water at the state and local levels. Annual water budgeting must be included under the

GPDP. Village-level representatives should be trained for the same by KRCs. ISAs can support GPs in preparing water budgets to be included in the GPDP for fund allocation and utilisation. A 'watershed approach' to budgeting should be followed at the village/GP level through appropriate institutional mechanisms. The implications for water supply to individual villages should be communicated periodically. The VWSC should be responsible for monitoring and operationalising this framework. The water budget needs to be revised periodically based on frequently updated information on precipitation and temperature.

- Water quality testing through FTKs can be allocated to Nal Jal Mitras (NJM) and Jal Vitaran Sanchalaks (JVS). Accordingly, a module on water testing and uploading of test reports on the WQMIS portal needs to be added to the QP-NOS of the JVS and NJM by WMPSC.
- To enable people to overcome their misgivings and start using treated water awareness campaigns through ISAs, training by the KRCs on social behavioural change (SBC) and exposure visits by GP and VWSC members to treatment/chlorination plant sites need to be continued or initiated where not in practice.
- A strong policy on Information, Education and Communication (IEC) needs to be developed. Periodic activities such as Jal Chaupal (Water Forum) should be conducted to sensitize local communities, share knowledge and generate awareness on source sustainability, water conservation and possible local solutions by engaging all stakeholders.

3. Leveraging digital tools for data accessibility

- The use of digital tools should be encouraged as these offer opportunities to streamline access to relevant information for sustainable water management. They can help in overcoming complexities such as remote sensing and hydrology. Tools like CLART can help identify sites for water harvesting and groundwater recharge. The [Panchatantra in Karnataka](#) and Atal Bhujal Yojana exemplify the same.
- A yearly water body census is required to establish a robust database for planning and management purposes. This should include quality testing and mapping of groundwater extraction, water table levels, rechargeable sources and quality of water at the source.

- Efforts should be made so that communities can easily access and interpret water quality data to make informed decisions about water usage and quality maintenance.
- Another vertical for measuring impact on source sustainability should be added to the JMM portal by the MoJS for all GPs, blocks, and districts of India. This should include allocation and utilisation of funds, status of water table levels, renovation and restoration of water bodies and so on.

4. Addressing the interconnected challenges of ensuring water quality

- A comprehensive data collection and reporting system should be established to effectively track the impact of improving access to potable water for rural households. This requires coordinated effort from key departments such as health, women and child development, and education. Initial studies and anecdotal evidence indicate a significant decline in infant mortality rates with improved access to clean water. Tracking data on waterborne disease cases from primary health centres, community health centres and district hospitals, as well as monitoring absenteeism in schools due to waterborne illnesses will provide valuable insights. Annual progress reports can help assess the impact on health, quality of life, education and reduction in waterborne diseases in rural society, particularly among women and children. These should be uploaded to a designated portal created by the health department or the department responsible for water supply.
- The role of community health workers must be strengthened as it is pivotal in effectively communicating water quality issues and building trust within communities. The same has been established by successful experiments, like those in Madhya Pradesh and Assam.
- Every state should launch a programme/scheme where all school (public and private) children (from classes 1 to 10) are engaged as Jal Rakshaks (Water Protectors) at the habitation or village level. IEC activities and events organised by the VWSC or the GP can further sensitise them to water conservation, sustainable use and source protection. The state of Assam is a leading example with their [Jaldoot program](#).

5. Call for guideline development and coordination

- There is a pressing need to develop contextualized Standard Operating Procedure (SOP) Manual on Source Sustainability. This can deepen efforts towards source sustainability and water quality management and facilitate convergence among

different stakeholders and programmes. The SOP Manual can be widely circulated offline and online during training, awareness campaigns for the GPs and VWSCs, in academic institutions, PHED and department of RD&PR for creating awareness among stakeholders. It can be used as a reference manual for source sustainability.

- Enhanced coordination among MGNREGA, GPDP and other initiatives is essential for a unified approach to addressing challenges of water source sustainability and quality at the grassroots.
- A framework for the convergence of the JJM with other drinking water schemes related to water protection and conservation, such as Jal Sakti Abhiyan, greywater management, SBM (Grameen) 2.0 and Atal Bhujal Yojana is needed to foster SVS and MVS schemes in rural areas.

6. Functionality assessment

- Functionality assessment criteria should include questions on source sustainability measures executed for different types of schemes and in convergence with programmes such as MGNREGS, PMKSY-WDC, Atal Bhujal Yojana and so on. This is important as source sustainability is a condition for determining the functionality of tap connections.

2.2 Operational Domain

Key operational activities under piped water supply production and services are as follows: raw water abstraction; raw water transmission; production of water compliant with national standards; storage of treated water; distribution and transmission of treated water to household and non-household consumers; bulk and consumer end metering; billing to customers; payment collection against billing; water quality testing at production and consumer end; minimising water losses; maintenance of assets through minor and major repairs; consumer grievance redressal; water demand management and education of consumers about the importance of consuming safe water. Apart from the aforementioned activities, the operational domain also encompasses the organisational structure of the core entity responsible for the delivery of water services, the fixing of roles and responsibilities for each of the operational activities, and the training and capacity building of stakeholders responsible for the delivery of water services.

Design changes to the current pipeline network or additional fixed assets may be required due to changes in demographics, needs of the consumer base, changes in raw water sources, etc. These will have to be coordinated by the agency after construction, commissioning and successful handover of piped water schemes for operations and maintenance. The use of technology for production, metering, quality monitoring, billing, collections and so on is discussed in the operational domain.

2.2.1 Key design elements for the operational domain

- JJM envisions the local community as playing a key role in the planning, implementation, and operations and management (O&M) of their in-village water supply system. The state government designates one among the Public Health Engineering Department (PHED), Rural Water Supply (RWS), Panchayati Raj Department (PRD) or Public Works Department (PWD) as the line/nodal department for the implementation of JJM. The department is tasked with the creation of infrastructure for in-village and multi-village schemes including distribution networks and regional water supply grids. It is also responsible for carrying out trial runs and facilitating schemes.
- The Gram Panchayat or its sub-committee comprising of user groups, such as the Village Water and Sanitation Committee (VWSC) or Pani Samiti, will act as a public utility.
- The NJM programme focuses on building the capacity and skills of the local human resources at the village level to be deployed as Jal Vitaran Sanchalaks and Nal Jal Mitras through these two Qualification Packs-National Occupational Standards (QP-NOS). Jal Vitaran Sanchalak (Water Distribution Operator) and Jal Mitra would act as a one-stop solution provider who gives various services to communities under the JJM. These would include installation, maintenance, repair and operation of various plumbing-related structures and systems. The JVS and NJM will also mobilize community members and requisite resources across a specified geographic area with support from VWSC, GPs and other government bodies.

- The JJM focuses on ensuring the supplied water is quality-compliant with IS 10500:2012. About 2% of the total JJM allocation is slated for water quality monitoring and surveillance.³
- JJM has emphasised the creation and maintenance of water quality labs at block, district and state levels where the public can test water quality by paying nominal charges. There should be at least one lab per block and it should test 100% of the water sources under its jurisdiction; once for chemical parameters and twice for bacteriological parameters (pre- and post-monsoon) in a year. It should test all sources of a block for at least 13 basic water quality parameters. Chemical factors should be tested within a maximum of 24 hours, and biological factors within a maximum of 48 hours. District labs should test at least 250 samples a month, and state-level labs should test at least 5% of the samples collected at the district level.
- Field Test Kits are supplied to the Gram Panchayats by the State Agency to help them test water frequently at the source as well as consumption points. The Gram Panchayat and its sub-committee will ensure the testing of all drinking water sources, including private sources and carry out sanitary inspections under its jurisdiction.
- Labs need to be modernised and accredited by NABL (National Accreditation Board for Testing and Calibration Laboratories). The private sector and non-governmental organisations (NGOs) can be engaged in operating the labs⁴. States should engage third-party verification agencies to check the functioning of water quality monitoring and water quality surveillance services. Internships should be offered for water quality testing at the state level. Mobile water quality testing labs should be set up to test specified parameters in inaccessible areas.
- JJM-IMIS, a public dashboard to capture the physical and financial progress of JJM schemes and the JJM-Water Quality Management Information System (JJM-WQMIS) have been established under the JJM. The community is expected to test once a month for bacteriological contamination (using H₂S vials) and once a year for chemical contamination and upload the data on WQMIS. Drinking water quality is also to be monitored by PHED and RWS. The functions of water production and management of

³ Jal Jeevan Mission. (n.d.). Guidelines. Retrieved September 6, 2024 from <https://jaljeevanmission.gov.in/guidelines>

⁴ 80 of the 116 water quality labs in West Bengal are managed by NGOs. Public Health Engineering Department, Government of West Bengal. (n.d.). Water Testing Laboratories. Retrieved September 6, 2024 from <https://www.wbphed.gov.in/en/pages/water-testing-laboratories>

water quality is to be separated. A drinking water quality commissioner has to be appointed in each state.

- JJM aims to geo-tag all assets, link each tap connection with an Aadhaar number, and use IoT for measuring and monitoring water quality and quantity in real time. The water assets have been designed for 30 years. Considering that 85% of water supply is through groundwater sources, measurement of groundwater levels has been considered an essential feature of the solution design. JJM provides for establishing a display unit at a prominent place in the village for example, panchayat office, school, primary health centre (PHC) or community health centre (CHC) etc., for displaying the quantity and quality of water supplied. This is accompanied by the creation of new roles in the PHED/RWS to handle IT networks.
- JJM has involved around 13,000 ISAs to handhold GPs and VWSCs in conducting baseline assessment, training, and capacity building of local communities. Another 184 sector partners and 104 KRCs are helping with implementation and capacity building under JJM.

2.2.2 Challenging experiences at the ground level

- The VWSCs, or sub-committees, have not been properly constituted and empowered. They are not adequately involved in planning and implementation. VWSCs are reluctant to take over piped water schemes from the implementing agencies due to the lack of confidence of elected GP representatives in the infrastructure created by third-party contractors and inadequate technical knowledge of O&M. Standard Operating Procedures (SOPs) and protocols have been issued under the NJJM for the handover of assets and infrastructure created under RWSS to GPs and VWSCs. However, these are not followed diligently due to the mission mode approach of PHED/ Dept. of RWS, primarily focused on achieving Functional Household Tap Connection (FHTC) targets.
- There is a lack of technical expertise at the GP/VWSC level for O&M of rural piped water schemes. This includes minor operations, minor and major repair and maintenance (R&M), and preventive maintenance of the piped water infrastructure. Agencies are often reluctant to take on R&M works due to unclear responsibility for clearing payments among the VWSC, GP and the PHED.

- Insufficient state funding creates challenges for improving the skills and capacities of field functionaries and new hires based on the two prescribed QP-NOS viz. NJM and JVS under the NJMP. States have directed districts to transfer the 15th FC funds available with GPs to the State Skill Development Mission (SSDM). Difficulties in mobilising these funds have hindered the execution of skills training initiatives in many states.
- A case study on water quality revealed testing as being done only once pre-monsoon and once post-monsoon. However, pathogenic contamination was found in samples collected at the consumer end. It has been observed that consumers continue to use the village RO plants and hand pumps due to a lack of trust in the quality of water being supplied through the PWS. Sustaining the water quality labs, retaining staff at the labs, supplying FTKs and replenishing the reagents in the FTKs on time.
- There are concerns about the validity of data used for VAP and water quality reporting and different government departments using different data sets.
- While recognising the importance of technology, an exclusively technocratic perspective to problem-solving undermining the local social context must be avoided.
- The legacy system, integration of old data into new and retention of trained IT staff in government departments are important technology-related challenges. Frontline workers often need to learn to log in to and navigate multiple applications for different purposes.
- In some isolated cases, taps have been removed and the continuous flow of water is being used for irrigation or wasted.
- The methods defined by JJM for benchmarking water services are not clearly understood by VWSCs. There is a lack of adequate staff at the block level to guide the GP/VWSC. Capacity building through one-time training is not effective.

2.2.3 Encouraging experiences at the ground level

- Karnataka has installed 100% metering and flow control valves for connections provided under JJM.

- In Bihar, digital records of various tasks such as daily log books, tank cleaning, Jal Chaupals and Ward Implementation Management Committee (WIMC) meetings are maintained in areas where Aga Khan Rural Support Programme (India) is active. Local agencies have been empanelled to provide repair and maintenance services to villages across the state. Pre-paid electricity meters for the scheme have been installed at some places in the state, promising multiple positive effects such as judicious or conservative water usage and more households paying the user tariff among others.
- In Assam, Jal Mitras are appointed by Water User Committees to look into day-to-day O & M works after undergoing a 10-day training at the local Industrial Technical Institute (ITI).
- In Maharashtra, UNICEF has mentored entrepreneurs as the One-Stop Shop and Services for O&M.

2.2.4 Policy recommendations

1. Establishing Roles and Responsibilities

- States should define clear roles for the O&M of piped water services. Delineation of roles between day-to-day service providers (Anurakshak/Jaldoot/Jal Mitra/Pump Operator) and the local body (VWSC/WUC/WIMC/Pani Samiti) to manage O&M is required at the village level. Day-to-day service providers should be accountable to the local body. For example, even if the O&M is contractor-led, the pump operator employed by the contractor needs to be accountable to the VWSC.⁵
- Despite clearly defined roles and fixed accountability to GPs/VWSCs, frontline workers continue to answer to the state department due to their salaries being paid by the PHED and the GPs/VWSCs' lack of knowledge, skill and capacity. It is therefore pivotal for concerned departments to build the capacity of GPs/VWSCs by gradually transferring funds, functions and functionaries to GPs/ VWSCs. This is a prerequisite for fulfilling the JJM vision of developing them as a public utility for effective and efficient O&M of RWSS.

⁵ Muller, M. (2024a). Effective Strategies For Sustainable Water Services: Current Obstructions And Potential Pathways Around Them. DBSA: African Journal of Infrastructure Development, 1(1).

2. Standard Operating Procedures

- MoJS can develop a Standard Operating Procedure (SOP) Manual covering all aspects of O&M of RWSS under JJM. Separate SOPs can be developed for the SVS and MVS accounting for regional variations.
- The SOP can cover procedures for operations, repair and maintenance, governance, HR management, support mechanisms, reporting and MIS for O&M, procurement guidelines, the process for submission of annual financial statements including income and expenditure statements, receipts and payment, liabilities and assets, balance sheets, utilisation certificates, risk control and management, compliance and social audits.
- A functional grid that can be used for piped water scheme operations has been suggested in Annexure A.

3. Handover and Transition

- Provision should be made for a Defect Liability Period (DLP) of a minimum of 12 months post-completion and handover of the project to the GPs. This will ensure the accountability of the contractor/agency in running the system smoothly and functionality of household tap connections as per the JJM guidelines for a year. Accordingly, budgetary provisions can be made for the O&M of RWSS. GPs/VWSCs must be empowered to provide NOC after a thorough review of the project by the concerned AEs/JEs and TPIAs and receiving a satisfactory performance report.
- KPIs and rating system for the contractor shall be developed and must be uploaded to the IMIS or JJM portal during the DLP for O&M of RWSS, emphasising various components of O&M, primarily for the intake structure, transmission, treatment systems, storage, and distribution network for ensuring adequate quantity and quality of potable drinking water through FHTC. The concerned JE must issue certificates for 100% FHTC as per the prescribed guidelines under JJM, countersigned by the concerned Assistant Engineer (AE) and Executive Engineer (EE) of PHED, before the handover and takeover of the rural water supply infrastructure assets by the GPs.
- There should be periodic monitoring and inspection by VWSCs and the reporting authority to ensure functionality and asset management.

4. Capacity building

- Based on the identified roles and responsibilities, the capacities of the service providers/ frontline workers should be developed to carry out daily tasks and ensure timely preventive maintenance actions such as water quality testing, cleaning of tanks, collection of user tariff, maintenance of daily records, etc.
- NJMM can issue guidelines to the states empowering the district administration to disburse funds to the concerned District Skill Development Missions (DSDMs) through a reverse pooling mechanism to achieve economies of scale as stated under 15th FC (Section 5.3) for initiating the skills training.
- Since departments face a shortage of manpower, online platforms for regular follow-up and mentoring for problem-solving (not review) and grievance redressal mechanisms can be adopted, whereby the frontline service providers and VWSCs can have access to block/district level officials for guidance.

5. Infrastructure Management

- New development projects should take into account existing pipe infrastructure to prevent damage. The village pipeline distribution infrastructure GIS drawings should be uploaded to the [PM Gati Shakti portal](#) for access to various departments before they execute the work on the ground.

6. Water Quality Assurance

- Scientific sampling and testing methods need to be implemented while increasing lab infrastructure and manpower. Permanent chemists receiving timely salary payments are needed in the labs, reporting independently to say the health department and DPs/VWSCs without being controlled by the PHED.
- Testing labs should be accredited by NABL and proper chlorination facilities should be ensured for SVS schemes.
 - There is an urgent need to inspire confidence of consumers in the quality of drinking water to establish a health-water nexus. Water sampling and testing procedures need to be scientifically grounded. Laboratory infrastructure and manpower need to be increased. Despite huge investments into lab infrastructure, only 775 out of 2071 labs at state/district/block/sub-division level are accredited by

NABL. None of the 65 mobile laboratories are NABL-accredited (Source: ejalshakti.gov.in).

- In-line chlorination before the distribution of water can be cost-effective and easy-to-maintain option for SVSs. However chlorination facilities need to be installed for most SVS schemes accompanied by training in chemical procurement, safe storage and application of chlorination. Some successful installations have been done in Assam and Jharkhand which can be studied before further implementation.

7. Leveraging Digital Tools for real-time information on scheme status

- The service providers and VWSC should maintain records for various aspects of O&M, such as daily logbooks (hours of supply), breakdown incidents, fees collected, expenses incurred and so on. States can consider integrating various digital tools for record maintenance. This can improve the efficiency of the frontline workers as well as provide a real-time view of the functionality and financial status of the water supply scheme.
- Creating a market for affordable sensors can help capture real-time data for water supply and quality.

8. Agencies to provide repair and maintenance services

- States can consider various options to ensure adequate and easily available support to VWSCs for getting systems repaired. Agencies can be empanelled at the block level and assigned to clusters of GPs, or local entrepreneurs can be enlisted or trained for this purpose. States should ensure that the information and contact details of the agencies reach the villages and that there is clarity on who will bear the costs for their services.
- Many state PHEDs opined that O&M of SVS under JJM can be outsourced to contractors who built the assets in that area. This can be done through releasing tenders at the cluster level with one block or district constituting a cluster. The concerned line department at the district level can pay contractors for the O&M after getting NOC from the GPs and conducting due diligence and performance reviews of the contractors about the quality of service delivered. The resource pool mechanism as stated under the 15th FC can be used for this purpose.

2.3 Financial Domain

The financial sustainability of piped water services refers to their ability to cover the underlying costs required to meet the objectives of supplying requisite quantities of water in compliance with national quality standards. It also includes their ability to generate financial surpluses or tied financial resources that can be used for asset maintenance, replacement, and expansion. There are three sources of revenue for piped water services: collection through tariffs, taxes collected by governments, or transfers from external agencies.

Constitutional provisions for financial support for O&M of piped water schemes:

- As per Entry 11 of the 11th Schedule of Article 243(G) of the Constitution of India, the provision of drinking water to all rural households is the responsibility of the GPs. Additionally, Entry 23 of the 11th Schedule lists the provision of health and sanitation, including hospitals, primary health centres and dispensaries, as the responsibility of GPs. Hence, panchayats are given administrative control over providing assured tap water supply to every rural household and maintaining sanitation in villages. Thus, the state may empower GPs to operate and maintain the rural water supply systems for providing drinking water to all rural households through FHTC and maintain sanitation in villages with adequate finance, functions and functionaries (3F).
- The 14th FC recommended grants to local bodies under the twin heads of basic and performance grants in a 9:1 ratio. The basic grant is meant to be used for the delivery of basic services by GPs, including water supply and sanitation, septage, sewerage and solid waste management.
- In line with the 73rd Amendment to the Constitution of India, the 15th FC has recommended grants to Rural Local Bodies (RLBs) or Panchayati Raj Institutions (PRIs) for five years from 2021-22 to 2025-26. It has also identified drinking water supply and sanitation as national priority areas for RLBs. Sixty per cent of the fund is provided as a tied grant meant for a) supply of drinking water, rainwater harvesting and water recycling and b) sanitation and maintenance of open defecation-free (ODF) status and management and treatment of household waste including plastic waste, human excreta, grey water and faecal sludge.

2.3.1 Key design elements for the financial domain

- JJM envisions that end users should pay user tariffs. Presently, these tariffs are designed and designated by state-level agencies and firmed up and collected by the VWSCs/GPs. The total allocation under the 15th FC to local rural bodies for 2021-2022 to 2025-2026 is Rs 236,805 crore. Rural local bodies, or GPs, have the option to spend the entire 60% on drinking water or sanitation. Keeping in mind the provisions of the 11th Schedule of the Constitution and the recommendations of the 15th FC, many of the states and UTs have developed an O&M policy for piped water supply schemes, defining the roles and responsibilities of various stakeholders, financial management in O&M, billing and collection, preparation of O&M budget and so on. Concurrently, the states have released the 15th FC grant and State FC grants to the Panchayati Raj Institutions (PRIs) for O&M of RWSS and sanitation.

2.3.2 Challenging experiences at the ground level

- ISAs are crucial agents responsible for building village community awareness and capacities for piped water management under the JJM scheme. However, they have suffered delayed payments in certain instances. Their capacity to deliver quality services as per the terms of reference given under JJM has also been questioned by several states and UTs due to non-performance. Many ISAs get selected based on lower bids. However, they are unable to deliver on the ground due to lack of capability, overstretching of the project and cost escalation.
- Personnel working in water quality testing labs have reportedly gone unpaid for over 6-8 months in some cases. The payments to the frontline workers is a mixed bag. While in one state pump operators hold sanctioned posts in the GPs and are paid Rs. 15,000 per month, in another state they are entitled to a mere Rs. 2000 per month, which they seldom actually receive. There are many cases where the salaries paid to the person designated for water supply operations, are not proportionate to the number of households in the village, leading to high operation and maintenance costs.
- There is a lack of awareness among GPs regarding the availability of funds under centrally sponsored schemes (CSS) such as the 15th FC, Swachh Bharat Mission (SBM), and Mahatma Gandhi National Rural Employment Guarantee Act, as well as

state-sponsored schemes for the O&M of Water, Sanitation, and Hygiene (WASH) facilities.

- Due to an inadequate understanding of the fund utilisation system of the 15th FC grant available to GPs, most GPs across states are yet to consider utilising the tied and untied funds allocated for water and sanitation projects at the village and GP levels. They continue to prioritise construction or renovation of village roads and other infrastructure projects over water and sanitation when allocating expenditure.
- Revenue collection at the village level intersects with various political interests. Although the central government is promoting fiscal sustainability and self-sustaining rural water supply systems under JJM, the implementation of user charges is subject to the political will and priorities of individual state governments. Many of the states and UTs have prioritised revenue generation by levying water tariffs taking into consideration aspects of equity and imposing fines and penalties for late payments and violation of prescribed O&M policy guidelines. However, elected sarpanches and community leaders are often reluctant towards such measures due to concerns about political backlash, considerations of equity and lack of community buy-in.
- The cost of O&M rises due to the higher capital expenditure on RWSS. This cannot be sustained solely through village-level water tariff collections, even with 90 to 100% realisation. Hence, the elected representatives of the GPs are hesitant about taking over the scheme.
- Electricity bills are significantly high for most GPs using groundwater as the primary source for piped water supply under RWSS. Misuse of electricity by residents and pump operators, along with sub-standard pumps installed by contractors, leads to escalating costs and outstanding electricity dues for many GPs.
- Non-Revenue Water (NRW) can significantly impact the sustainability and efficiency of rural drinking water supply systems. NRW is a term used to describe the portion of water that is lost or unaccounted for in a water supply system. In rural drinking water supply, NRW refers to the water lost through leakage and theft, unaccounted for due to poor metering and billing, illegal connections or due to diversion of the water supply before it could reach the intended destination. NRW is a significant issue in rural India, where most of the old water supply systems require repairs or upgrades. Inefficient water distribution systems can lead to significant water loss, impacting water availability for households and agriculture.

2.3.3 Encouraging experiences at the ground level

- Rural households are ready to pay for piped water in the event of reliable and quality piped water supply. There are instances in Bihar where users are willing to pay a tariff of Rs. 30 per month if they get regular service. In the state of West Bengal, where a piped water scheme was executed by Water for People in a village in the pre-JJM period, individual households were ready to pay for piped water every month. Similar cases have been observed in other states like Karnataka and Punjab. With the use of eGovernments Foundation's mGramSeva, the billing coverage and collections have also improved in Punjab.
- During the post-follow-up training of Level-3 (community level) functionaries of Anuppur, Shahdol and Umari districts of Madhya Pradesh conducted by We The People-KRC, it was found that almost 60% of the GPs/VWSCs trained were able to start or enhance monthly water tariff collections with the support of women self-help groups (SHGs). This was the impact of the initial three days of training followed by handholding support and improved service delivery of GPs/ VWSCs in ensuring regular water supply at the village level. Several studies indicate that despite initial reluctance, rural households are willing to pay for improved water services, especially when they see the benefits of reliable and safe water access.

2.3.4 Policy recommendations

1. Use a systems approach to costing

- The financial sustainability of rural piped services can only be achieved if all “system costs” are taken into account, beyond the narrow focus on operations and maintenance costs of the piped water assets.⁶
- System costs should be computed by taking into account various elements such as manpower, electricity, chemicals, local conveyance, meeting expenses, safety expenses, stationary & communication expenses, minor repairs, consumer complaint redressal costs etc.), major repairs of assets, water quality testing costs, technology

⁶ Bachman, G.W. (2017). Financial management practices - impact on sustainable drinking water in Uganda in the rural areas of Lira district. Colorado Technical University ProQuest. doi:10.1007/springerreference_30502.

costs (for revenue collection and transparency), financial statement preparation and audit costs, ongoing capacity building costs at VWSC/GP/Block/District/State level, costs of NGO's engaged in facilitating the operations of piped water assets, IEC costs, monitoring costs by the nodal department, incremental human resource & other costs required by PRIs/PHEDs to support sustainable running of rural piped water assets.

- It is crucial to ascertain and account for the economic costs of all pro-bono human efforts engaged in providing piped water services, as eventually providing financial compensation for all the human efforts will make the operations sustainable.
- It is essential to estimate future costs in addition to current costs, including that of asset replacement. For instance, changes in the profile of the raw water source (such as declining groundwater level) may increase electricity costs for water abstraction.⁷
- Mapping of all system costs needs to be done against the funding of each component, from tariff collections from consumers, the GP budget, the state budget, central support to philanthropic capital and so on. A template of the pure operating and maintenance costs for SVS and MVS is provided in Annexures B and C respectively.

2. Provide accounting and financial management training

- A foundation training programme in revenue and expense statement preparation for piped water operations should be conducted for VWSCs so that they have an appreciation of different cost components in the present and future. Such a training programme would help them create budgets regarding water supply on an annual basis.
- A training module on the key recommendations of the 15th FC grant-in-aid must be included in the training module of O&M of rural piped water systems for the training of L2 and L3 functionaries to orient them on the receipt and utilisation of funds.

3. Build agency of GP and frontline functionaries

- Gram panchayats must receive a copy of the DPR containing the design for O&M of RWSS. Initial handholding support will be provided by ISAs and KRCs through training.
- Gram Panchayat must receive a fully digitised copy of the infrastructure of the scheme.

⁷ Leigh, N.G. and Lee, H. (2019). Sustainable and resilient urban water systems: The role of decentralization and planning. *Sustainability*, 11(3), 918. doi:10.3390/su11030918.

- User charges should be levied only after ensuring that the quality, quantity and reliability of supply is JJM compliant.
- As per the Department of Drinking Water and Sanitation (DDWS) and the Ministry of Jal Shakti (MoJS), self-help groups (SHGs) must be involved, engaged, and represented through VWSC (with 50% female representation) and assigned the responsibility of user charge collection at the village level, with a revenue-sharing mechanism linked to performance deliverables. There has been an initial success in Madhya Pradesh involving SHGs in user charge collection. States and UTs may consider notifying and including this in their O&M policies.
- The tariff for domestic and non-domestic consumers, new connection charges, and necessary penal charges for consumers should be decided by the GPs. A financial incentive should be provided to SHGs to assist in improving collections.
- Electricity charges for piped water should be paid by the GPs rather than the states paying the electricity department directly. Such a practice will help benchmark electricity costs across schemes and provide incentives for savings in electricity costs. If required, the state can provide direct subsidies to the GPs if water user charges can't cover the full operational costs of water supply.
- Income and expenditure at the scheme level should be made transparent to the community and water users. Preparation of the profit and loss statements should start from the first year of the commissioning of the scheme. Additionally, an audit of the financial statements should be conducted from the second year onwards.
- The annual O&M budget for the RWSS must be made mandatory at the GP level, integrated with the GPDP, uploaded to the e-gram swaraj portal, approved by the Ministry of Panchayati Raj (MoPR) and annual fund allocated to the GPs accordingly.
- Adequate attention must be given while orienting elected representatives of GPs about the importance of utilisation of the 15th FC grants for water and sanitation, in the absence of which the focus remains on activities such as road construction and other infrastructure works.
- States and UTs can revisit their strategy in empanelling ISAs and may consider giving equal weightage to financial as well as technical criteria while selecting ISAs for ensuring quality service delivery on the ground rather than just focusing on L1 vendors for the job.

4. Establish clarity on financing sources and processes

- The state's budget needs to have a specific budget line item that covers all the shortfalls in the system costs that cannot be covered by sources such as user fee collection or central government grants, such as those from the 15th FC.
- There needs to be a clear process for claiming and settling third-party claims for damage to the rural piped water assets such as damage to pipelines by new road construction at the state and, importantly, at the block level.
- Due to the COVID-19 pandemic, the completion of rural water supply under JJM might be delayed beyond the plan period, which was expected to be completed by December 2024 in states and UTs. Hence, 60% of the tied grants provisioned under the 15th FC may be extended to the 16th FC. Furthermore, recommended grants to local bodies under the twin heads of basic and performance grants in a 9:1 ratio must be included in the 16th FC.
- As UTs are not entitled to receive grant-in-aid under the FC grants, special provisions must be made for UTs in allocating grant-in-aid for O&M of RWSS. The budget must be earmarked for five years in a pattern similar to that envisaged under the 15th FC (90% based on village population and 10% based on area size). The funds should be released on a year-to-year basis to the PRIs, subject to the achievement of Key Performance Indicators (KPIs) to be developed for the GPs in O&M of RWSS.
- Detailed guidelines on the expenditure of 60% of the 15th FC grant-in-aid must be issued to the states and PRIs by DDWS and MoJS for effective planning and utilisation in addition to the overall guidelines that have been issued for the utilisation of 60% of the tied grant under the 15th FC.
- Fund allocation under the 15th and 16th FC must be linked to the collection of water tariffs and other charges levied by the GPs and VWSCs.
- VWSCs should be encouraged to create a corpus account in the bank in addition to the O&M account. Any budget surplus generated in a year should be credited to the corpus account. The interest earned on this account can be utilised for meeting major repair expenses. Several states and UTs such as Madhya Pradesh, Karnataka, Ladakh and Jammu & Kashmir have already notified or are in the process of notifying minimum charges, water tariff rates, new user connection charges and security deposits to be collected from both domestic and non-domestic users (including

institutional, government/private, commercial, and industrial users). States and UTs must continue their efforts to establish these minimum charges. These efforts should include notifying monthly water tariff rates, new user connection charges, security deposits for new user connections, as well as fines and penalties where applicable. However, it is essential to mandate GPs and VWSCs to determine water charges for consumers based on the Annual O&M budget, as outlined above.

- Technology adoption at the GP level may be resisted if it is seen that technology use is only for centralising the information at the centre or state level. GPs would be more inclined to adopt technology for tariff collection and expense sharing if technology usage also empowers them to demand payments from the state government and federal schemes promptly or resolve pending payment issues.
- While employing a person for water supply operations, care should be exercised to ensure that salaries are proportional to the number of households in the village.

5. Clarify the roles of departments and actors and establish clear accountability

- Unless an adequate quantity and quality of water is supplied to every rural household as per the prescribed guidelines by PHED/GP/VWSC at the village level, revenue collection at the village level through water tariff, new user connection charges and security deposit collection from the users (domestic and non-domestic users) will be a distant reality. Hence, efforts must be made by the PHED to ensure that adequate quantity and quality of water is supplied to every rural household through FHTC.
- Standardised books of records for the VWSCs for effective O&M, including utilisation, tracking, and monitoring of funds and revenue collection, income and expenditure (I&E), receipts and payments (R&P), procurement and so on must be notified by the states or UTs for effective O&M and internal and external audits.
- Social audit must be introduced at the village level to encourage greater participation of the gram sabha members in monitoring the O&M of RWSS and fund utilisation, grievance redressal mechanism and so on.⁸
- A budget must be allocated for extending the role of ISAs and KRCs by the states and UTs through notifications and circulars during the O&M phases.

⁸ Odisha PTG Empowerment and Livelihoods Improvement Programme (OPELIP).

- Water and energy audits should be introduced for efficient and effective O&M of RWSS. A detailed guideline may be issued by states and UTs through an SOP manual, including other components of O&M for the VWSC.
- Model bylaws shall be developed by the department defining the roles and responsibilities of VWSCs and included in the O&M policy to be adopted by the VWSCs.
- Metering of water supply in rural areas can help reduce NRW. Regular testing and replacement of faulty meters can help ensure accurate billing. Smart metering systems can be installed to detect and reduce water leakage in the rural water supply system. NRW can also be reduced by encouraging households to use water efficiently and by reducing the water demand. This can be achieved by organising campaigns to raise awareness about the importance of water conservation and the implementation of water-saving technologies such as low-flow fixtures and rainwater harvesting systems. Rainwater harvesting systems help reduce the demand for drinking water and also help replenish groundwater resources.

2.4 Institutional Domain

Piped water services need to be economically efficient, socially equitable and environmentally sustainable. Multiple stakeholders are involved in piped water service delivery, and hence institutional arrangements and mechanisms for close coordination among different stakeholders, especially different government departments, are key to meeting the objectives of piped water services.

2.4.1 Key design elements for the institutional domain

- The local community is envisioned as playing the key role in planning, implementation, management and O&M of their in-village water supply system in the JJM. GPs or their sub-committees comprising of user groups will play the role of public utility. JJM also focuses on training and skilling programmes to build the capacity of the local village community including masons, plumbers, pump operators and so on, as well as public health engineers, so that they can ensure service delivery (an assured and regular supply of water).

- States and UTs have also initiated or made efforts towards capacity-building of the human resource available at the village level by offering short-term skill training under ‘Nal Jal Mitra’ or ‘Jal Vitaran Sanchalak’ qualification packs as per the National Occupational Standards prescribed by Water Management & Plumbing Skills Council (WMPSC), National Skill Development Corporation (NSDC), Ministry of Skill Development and Entrepreneurship (MSDE) and DDWS, MoJS under the ‘Nal Jal Mitra Scheme.’
- States and UTs have engaged KRCs, ISAs and IRSAs, offering initial training and handholding support to GPs for planning, monitoring, and O&M of RWSS.
- Details of awareness building & training programmes should be made available online.

2.4.2 Challenging experiences at the ground level

- As mentioned in the operational domain, there has been reluctance among VWSCs to take over the piped water schemes from the implementation agencies. Poor comprehension of JJM guidelines among GPs and VWSCs hampers program effectiveness. The absence of regular meetings, attendance systems, agendas and minutes by GPs and VWSCs disrupts operations and financial management. VWSCs need a better understanding of water quality testing and its integration into decision-making processes. Despite various studies emphasising the importance of community involvement, especially the participation of women and youth, rural communities remain largely unaware of the programme and its potential impact.⁹
- There seems to be friction between GPs and VWSCs on certain decision-making matters. However, in certain states, the Sarpanch has now been made the chair of VWSCs to reduce the friction. The sheer multiplicity of agencies involved has sometimes created friction as well as confusion on the ground. The MVS and SVS schemes could be handled by different departments, one may be paid from the state budget and the other might not. Duplication of work may be happening across different departments; for example, there are instances where different ground-level data is reported by two different government departments. The convergence between

⁹ Department of Drinking Water and Sanitation, Government of India (2023). Jal Jeevan Samvad (38). <https://www.smsfoundation.org/wp-content/uploads/2024/05/jaljeevansamvad-november-2023-en-1.pdf>

different departments has not evolved to the desired level beyond a few common meetings of all the departments for approving projects.

- Villages have different hamlets, some of which can be very small and isolated. It is observed that not all hamlets are covered by piped water supply and such outcomes also occur because of the bias of the Sarpanch. Some of the MVS schemes could have shared infrastructure that supplies water to rural and non-rural areas. Allocating costs over different sets of users is a challenge.
- Irrigation accounts for the largest usage of water at the village level. Given low tariffs or free electricity, the water withdrawal for irrigation is feared to be indiscriminate in many places. Though irrigation is not under the purview of JJM, it does imply that JJM is charging for water to be used in households, whereas large volumes of water are being consumed almost free of charge.

2.4.3 Encouraging experiences at the ground level

- Kumarabiga in Odisha is an example of the successful involvement of women in piped water services. Here, the women's SHG is taking care of the O&M and collecting charges. The piped water service in this village was implemented by an NGO with close engagement with all households. VWSCs are functioning very well in most of the areas where this NGO implemented piped water services, as it obtained full consent from all village households before implementing the piped water scheme.
- In Bihar, the WIMC, responsible for implementing piped water schemes, is established as a constitutional entity, lending credibility to its operations.

2.4.4 Policy recommendations

1. Comprehensive policy framework for sustainability

- States should develop and enforce policies encompassing source, operational, financial, and institutional sustainability for rural piped water services.¹⁰

¹⁰ Wesdyk, K.S. (2019). Toward a Sustainable Approach to Water Service Delivery Methods in a Rural Context (491). United States Naval Academy Annapolis, Maryland.
<https://apps.dtic.mil/sti/trecms/pdf/AD1073963.pdf>

- These policies, commonly referred to as O&M policies, must address source sustainability, financial viability and stakeholder coordination to ensure effective implementation.

2. Stakeholder collaboration for conflict resolution

- Establishing a mechanism involving SHGs, GPs, and VWSCs is crucial for addressing conflicts and implementation challenges at the village level.
- Collaborative management of water systems fosters institutional sustainability and reduces conflicts through shared responsibilities.

3. Structured governance and accountability mechanisms

- Conducting weekly meetings at GP or VWSC levels facilitates addressing various operational issues, training activities, conflict resolution, and infrastructural matters.
- Implementing well-sequenced action plans is essential for efficiently meeting set targets in rural water supply management.

4. Transparency and participation through attendance tracking

- Maintaining an attendance sheet at VWSC or GP meetings, events, and capacity-building programmes is essential. Circulating this sheet to all stakeholders provides transparency on member attendance, encouraging active participation and accountability within the community.

5. Efficient grievance redressal mechanisms

- Implementing robust grievance redressal frameworks ensures prompt resolution of consumer complaints at household, community, and GP/VWSC levels.¹¹

6. Community engagement and ownership

- Involving the community from the DPR stage fosters ownership and ensures the long-term sustainability of piped water schemes.
- Capacity building programmes and IEC initiatives at the local level are vital for disseminating awareness and promoting best practices. The state must have a

¹¹ Gauri, V. (2013). Redressing grievances and complaints regarding basic service delivery. *World Development*, 41, 109–119. doi:10.1016/j.worlddev.2012.05.027.

consolidated IEC plan rather than piecemeal plans across various departments¹² to encourage behavioural change among consumers, build awareness regarding the importance of safe water, ensuring water quality and minimise water wastage.

- Data about staff trained in water management in the region can be available on a platform so that implementing agencies can find human resources for tasks like data collection and validation related to water schemes.

7. Enhanced health-water nexus

- Strengthening coordination between health and water departments is essential, particularly regarding water quality monitoring and disseminating safe drinking water practices.
- Currently, water quality testing is also monitored by the water resource development engineers; however, there is a necessity to separate these functions and water quality monitoring should be integrated into an independent entity, possibly part of the health department.
- To enhance the health-water nexus, community health workers should be trained to promote the importance of safe drinking water among consumers. These health workers should also receive training in water quality testing.

8. Contextual Benchmarking for Improved Performance

- Benchmarking of piped water services by different GPs/VWSCs should be based on the different contexts that each GP/VWSC or state may have. Hence, instead of employing a single method of benchmarking, context-specific benchmarking exercises should be conducted. For example, one region may be situated in a water-scarce area while another in a water-rich area. Biodiversity hotspots and hilly areas have distinct contexts, and benchmarking and other support for such areas (by different stakeholders) should be tailored to meet their specific needs.

9. Gradual Handover and Capacity Building

- The gradual handover of responsibilities from implementation agencies to community-based entities ensures a smoother transition and fosters capacity building for sustainable management.

¹² Akukwe, C. (2008). Health Services in Africa: Overcoming challenges, improving outcomes. Adonis & Abbey Publishers Limited.

- Capacity building efforts should focus on filling small capacity gaps and addressing larger capacity issues, including ecosystem creation for service providers.

10. Addressing Institutional Challenges

- Institutional challenges, such as competition among state organisations and reluctance in handover, require a gradual and systematic approach for effective resolution. Distribution of roles for different government departments in the state at different administrative levels is outlined in Annexure D.
- The efforts of the rural community to protect water sources should be integrated into MGNREGA projects. It is recommended that relying solely on volunteer work for operating piped water services is not a sustainable practice. Appropriate financial compensation should be provided to village members or VWSC members with specific responsibilities for operating piped water systems, such as pump operations, and water quality monitoring.
- If the operation and maintenance of MVS schemes are outsourced to a private entity, the responsibility for tariff collection should also fall on the same private player as there is a close relationship between the quality of water services and households' willingness to pay for them. There should be a committee of representatives of government departments and GPs to oversee O&M undertaken by the outsourced private entity.
- VWSCs are responsible not only for delivering safe drinking water but also for sanitation. Capacity building should encompass all aspects of water security, including drinking water supply, wastewater treatment, drainage, etc. Inadequate action on the safe disposal of wastewater at the village level will ultimately impact the quality of raw water available for drinking purposes.

3 Conclusion

- The JJM programme aims for all VWSCs to function as independent water utilities responsible for the sustainable operation of piped water services. However, VWSCs in their current state cannot achieve sustainability across all aspects. The stability and leadership of VWSCs will significantly influence the sustainability of rural piped water services.
- The transition of responsibilities to VWSCs should be gradual, spanning three years from the handover of the scheme from the commissioning stage by the implementation agency to the VWSCs. During this period, adequate human resources should be available at the block level to manage functions that VWSCs are currently unable to handle. Capacity building is an ongoing process that must be conducted at both the VWSC and block levels.
- Financial sustainability can be achieved by understanding and accounting for system-wide costs. The state budget must include the necessary financial support for the sustainability of rural piped water systems.
- Demonstrating the health-water nexus at the consumer level is essential to incentivise households to pay for the water being provided. This requires a strong focus on water quality, including robust testing protocols and well-compensated human resources for field and laboratory testing. All water quality data should inform actionable steps at the ground level to address any issues.
- Metering of all connections is necessary to ensure equitable supply and consumption of water.
- Continued financial support from the central government to the state government should continue in the 16th FC, with support tied to the performance level of schemes in terms of source protection, equitable water distribution, water quality and collection of user charges.
- States must develop their water policies in consultation with stakeholders, tailored to the current administrative set-up, and make necessary changes required at each administrative level to reach aspirational goals within a five-year timeframe.

- The current consortium led by IIMB can help states make their context specific policies which provide sequencing of solutions or policy tools subject to specific resource constraints.

4 Annexures

Annexure A: Functional Grid for Piped Water System in Gokarna

PURE WATER GRAVITY MAIN					
S.No	Stretch	Length	Propo sed Pipe Dia	Class of Pipe or Working Pressure in KSC	Type of Pipe
B	Pure Water Gravity Main Design				
	Zone-1 (HIREGUTTI Branch) from Old MBR				
1.	OLD MBR (GLSR) to Junction-1	250	200	K-7	DI HDPE
2.	Junction-1 to Madangeri	2390	90	PE-100 PN 10	DI HDPE
3.	Junction-1 to Junction-2	1050	200	PE-100 PN 10	DI HDPE
4.	Junction-1 to Hiregutti GLSR-1 (yennemodi/ Kolimanjaguni)	500	90	PE-100 PN 6	DI HDPE
5.	Junction-2 to Junction-3	1450	200	PE-100 PN 10	DI HDPE
6.	Junction-1 to Hiregutti GLSR-2	700	110	PE-100 PN 6	DI HDPE
7.	Junction-1 to Junction-4	1200	160	PE-100 PN 10	DI HDPE
8.	Junction-1 to Moraba	450	90	PE-100 PN 6	DI HDPE
9.	Junction-1 to Betkurki	1460	110	PE-100 PN 6	DI HDPE
		9450	Mtrs		
	Zone -2 (Hanehalli Branch) from new MBR				
10.	New MBR to Junction-5 [Hittalmakki cross]	4560	350	K-7	DI
11.	Junction-5 to Junction-6	1050	200	K-7	DI
12.	Junction-6 to Gonehalli GLSR	200	63	PE-100 PN 6	HDPE
13.	Junction-6 to Junction-7	2070	200	K-7	DI
14.	Junction-7 to Hanehalli GLSR	300	90	PE-100 PN 10	HDPE
15.	Junction-7 to Junction-8	360	200	K-7	DI
16.	Junction-8 to Hanehalli RCC GLSR Grave Yard Road	450	140	PE-100 PN 10	HDPE
17.	Junction-8 to Nadumaskari & BavikodlaGLSR/ ELSR temple	5320	200	PE-100 PN 10	HDPE
		14310	Mtrs		

Zone-3 [Gokarna Branch] from New MBR					
18.	Junction-5 to Junction-9	690	300	K-7	DI
19.	Junction-9 to Torke Proposed ELSR Hittalmakki crossroad	200	90	PE -100 PN 10	HDPE
20.	Junction-9 to Junction-10	1080	300	K-7	DI
21.	Junction-10 to Torke EX. GLSR/ Proposed GLSR	250	110	PE-100 PN 10	HDPE
22.	Junction-10 to Junction-10a	840	250	K-7	DI
23.	Junction-10a to Torke (Hosakatte) Proposed GLSR	2500	63	PE-100 PN 10	HDPE
24.	Junction-10 a to Junction-11	1530	250	K-7	DI
25.	Junction-11 to Telegeri Proposed ELSR	300	110	PE -100 PN 10	HDPE
26.	Junction-11 to Junction-12	1380	250	K-7	DI
27.	Junction-12 to Gokarna New ELSR Bhavikodla Road	1500	110	PE -100 PN 10	HDPE
28.	Junction-12 to Junction-13	670	250	K-7	DI
29.	Junction-13 to Gokarana EX. RCC GLSR NEAR IB	150	200	K-7	DI
30.	Junction-13 to Junction-14	100	200	K-7	DI
31.	Junction-14 to Gokarana EX. GLSR Near Police Station	300	150	K-7	DI
	Zone-2 Gokarna branch	11490	Mtrs		
	Total length of Gravity main	35250	Mtrs		
32.	Junction -13 to Gokarana EX. RCC GLSR NEAR IB	150	200	K-7	DI

Annexure B: Template for Financial Analysis of MVS and IVDS

S.No.	Particulars	Amount In INR
Part-A		
1.	Component-1 Head works, WTP, Raw water & Pure water rising mains, Feeder mains, Pure water sump, Master balancing tank, Pump, GLSR/Sump, houses/Control Rooms, D I Unit rooms all civil components	
2.	Component-2 Pipeline work	
3.	Component-3 Mechanical and Electrical Works Viz. Pumping Machinery/Valves/Chlorinating unit etc.,	
4.	Component-4 Express Feeder Line, Transformer, and another component	
5.	Component-5 Distribution cost	
6.	Annual total fixed cost	
O&M Cost MVS		
S.No.	Components (Annual year 2023-24)	Amount in INR
1.	Establishment Charges	
2.	Electricity Charges	
3.	Maintenance of Civil Works	
4.	Maintenance of Electro-Mechanical Components	
5.	Consumables	
6.	Transportation and Communication Charges	
7.	Office Accommodation Charges	
8.	Cost of Water Quality Testing, Report Generation & Other Stationery	
Total annual O&M (MVS)		
O&M Cost IVDS		
S.No.	Components (Annual year 2023-24)	Amount in INR
1.	Annual Electricity charges	
2.	Annual salary paid to the watermen	
3.	Annual repair expenses	
4.	Annual maintenance expenses	
5.	Any other expenses	
6.	Total annual O&M (IVDS)	

Annexure C: Template for Financial Analysis of SVS

S.No.	Fixed Costs SVS	Amount in INR
1.	Component-1 (Headworks)	
2.	Component-2 (Cost of Pipes and Fittings)	
3.	Component-3 (Distribution System)	
4.	Component-4 (Solar pump and System)	
5.	Component-5 Others 1	
6.	Component-6 Others 2	
7.	Total annual fixed cost	
O&M Costs SVS		
S.No.	Fixed Costs SVS	Amount in INR
1.	Annual Waterman Salary	
2.	Annual Electricity Expenses	
3.	Annual repair expenses	
4.	Annual maintenance expenses	
5.	Others	
Total annual O&M SVS		

Annexure D: Roles and responsibilities of state government departments at different administrative levels

Administrative level	Stakeholders	Roles	Capacity gaps
State	Project Management Unit (PMU)	Assisting the State Mission Director in managing and overseeing the sustainability of established water supply schemes and planning and implementing remaining schemes.	
	PHED/PWD/RWSD/ State Water and Sanitation Mission (SWSM)/Line Departments	Preparing O&M policy & guidelines (Technical and Finance). Setting up a grievance redressal mechanism and communicating the same. Ensuring a smooth handover process from one department to another wherever required.	Policy interventions considering diverse contexts within the state, O&M funds.
District	DWSM/Zilla Parishad/District Development Council/District Panchayat	Support state to develop O&M policy guidelines (Technical and Finance). Execution of O&M district level guidelines. Empanelment of agencies for repair and maintenance and communicate this information to GPs.	District action plan (Governance and Institutions, Fund Management, Water Source and Quality), Draft District Level Guidelines for specific context of the district
Block	PDO/BDO/Block Panchayat Contractors and vendors	Implementation and Monitoring of O&M (Technical, Finance). Capacity building of various stakeholders at the GP and below levels. IEC activities and support to the GP/VWSC for community mobilisation. Regular interactions (online and offline) with VWSCs/Pani Samitis to resolve issues. First responder to village level institutions.	Village Action Plans (Sustainability of schemes)
GP level	Gram Panchayat/ Village Water Sanitation Committee, Pani Samiti, User Groups etc. Contractors and vendors	Implementation and Monitoring O&M. Community mobilisation, collection of user tariff, financial management and record keeping. Feedback mechanism, asset management	Social Audit/ Community mobilisation

