Jal Jeevan Samvad

September | Volume 5 | Issue 9 | Year 2024

Har Ghar Jal
Jal Jeevan Mission

Building Partnership
Changing Lives

Theme
WASH

Contents

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Prime Minister on Jal Jeevan Mission

Narendra Modi
Prime Minister

भारत में जनभागीदारी और जनआंदोलन से जल संरक्षण और प्रकृति संरक्षण का अनूठा अभियान चल रहा है। आज गुजरात के सूरत में 'जल संचय जनभागीदारी पहल' का शुभारंभ कर अत्यंत हर्ष की अनुभूति हो रही है।

जल जीवन मिशन के जरिए देश के 75% से ज्यादा घरों तक नल से साफ पानी पहुँच चुका है। मिशन की ये ज़िम्मेदारी स्थानीय जल समितियाँ संभाल रही हैं।

'जल संचय जनभागीदारी पहल' के शुभारंभ कार्यक्रम में प्रधानमंत्री श्री नरेंद्र मोदी जी

Har Ghar Jal
Jal Jeevan Mission

Note from the desk of

Additional Secretary & Mission Director...

New Delhi
31st August, 2024

With another eventful month in the journey of Jal Jeevan Mission (JJM) behind us, we take this moment to reflect on a theme that drives our collective efforts – Water, Sanitation, and Hygiene (WASH). This September edition of Samvad focuses on WASH, which forms the foundation of public health, rural prosperity, and community well-being. The articles explore this essential theme, emphasizing water conservation, management, and sustainability.

Water, as a resource, touches every aspect of life, and ensuring that every rural household has access to clean drinking water is at the heart of Jal Jeevan Mission. We remain steadfast in our commitment to enhancing the quality of life for the rural population through Jal Jeevan Mission, ensuring not just access to clean water, but delivering it with quality, service, and value. At the onset, the mission faced numerous challenges – ranging from the complexities of diverse geographies to institutional hurdles – yet we stood firm, driven by our vision to create a paradigm shift in the WASH sector. Through a systematic, community-focused approach, we have turned obstacles into opportunities, contributing meaningfully to the well-being and prosperity of rural communities across India.

Now, our focus sharpens on sustaining this access for generations to come. In this regard, factors such as source sustainability and operation & maintenance (O&M) become crucial, requiring a careful balance between usage, conservation, and regeneration. Groundwater depletion, erratic rainfall patterns, and climate change pose serious challenges, making it imperative that we adopt a multi-pronged approach to water conservation.

Through scientific interventions, such as aquifer mapping, watershed management, and rainwater harvesting, we aim to rejuvenate natural sources and ensure that the demands of our growing rural population are met without compromising ecological balance. The community has a pivotal role to play here. Villagers know their water, and with proper support and awareness, they are best equipped to manage it sustainably.

JJM places a strong emphasis on ensuring that O&M frameworks are locally driven, with Village Water and Sanitation Committees (VWSCs) playing a crucial role in maintaining these systems. This localized approach helps create a sense of ownership, responsibility, and accountability among the community members themselves.

Moreover, JJM also lays emphasis on capacity building at the grassroots level. By empowering village communities with the technical know-how and financial mechanisms to manage their own systems, we are ensuring that the Mission's benefits are not only realized today but sustained well into the future.

This month witnessed a significant milestone as the Department of Drinking Water and Sanitation (DDWS) successfully organized the International WASH Conference 2024 as part of the 8th edition of India Water Week. The event brought together global and national leaders, policymakers, practitioners, and innovators under one roof for a three-day journey of knowledge exchange, dialogue, and collaboration. With WASH at the forefront of global development conversations, the conference became a hub of insightful discussions and cutting-edge presentations on sustainable water management, community-driven approaches, and technology integration.

Over the course of the conference, researchers and experts from around the world presented papers on various topics. The thematic sessions were filled with rich exchanges, offering new perspectives on financing models, behavior change communication strategies, and the role of women as leaders in WASH.

Discussions on O&M frameworks, source sustainability, and the integration of IoT and digital tools in managing water resources opened up new possibilities for the mission's evolution in the coming years.

This three-day event was a resounding success, turning out to be a fruitful congregation of minds committed to addressing the challenges and unlocking the potential of WASH. The knowledge exchanged will certainly influence our strategies as we move ahead with Jal Jeevan Mission, ensuring that every rural household in India has access to clean, reliable drinking water.

As we reflect on the progress of WASH, we cannot forget that this year marks the 10th anniversary of the Swachh Bharat Mission (SBM) – a revolution in rural sanitation. Launched in 2014, SBM has been instrumental in eradicating open defecation, improving rural sanitation infrastructure, and transforming the lives of millions across the country. Our SBM division is already celebrating this decades journey across the country, which culminates with Swachh Bharat Diwas on 2nd October 2024, the birthday of our beloved Bapu. The convergence of SBM with Jal Jeevan Mission signifies a holistic approach, ensuring that clean water and sanitation go hand-in-hand.

Looking ahead, let us remain focused on our mission – building resilient, sustainable, and inclusive systems that ensure water security and sanitation for all

Together, let us continue to transform lives through water, sanitation and hygiene.

[Dr Chandra Bhushan Kumar]

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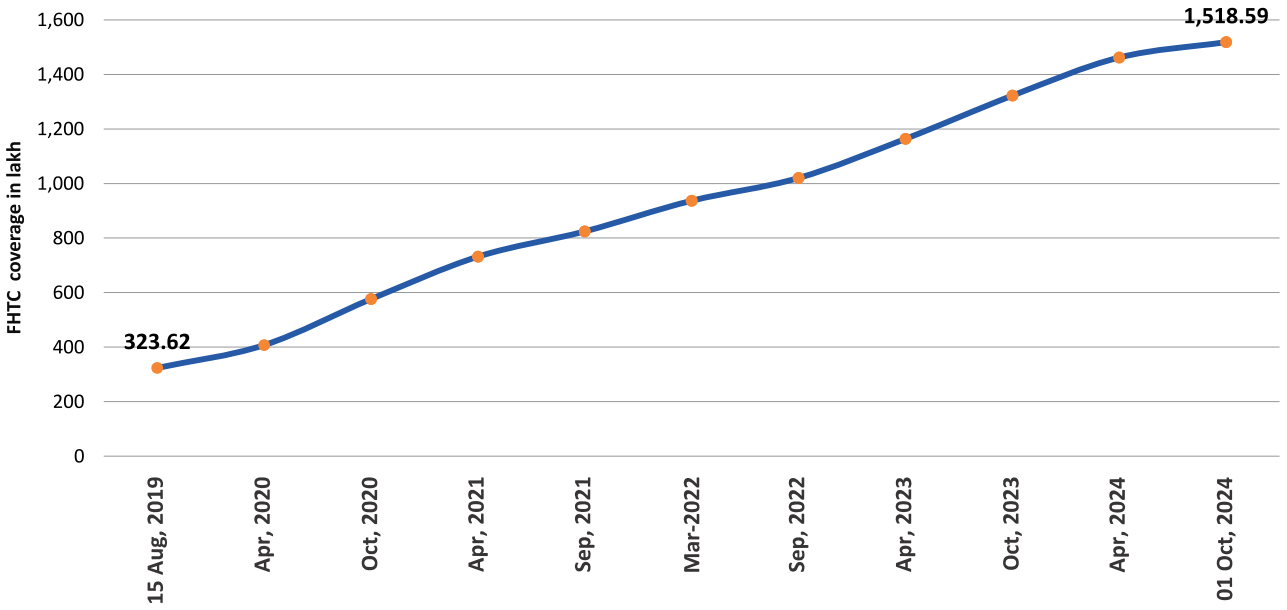
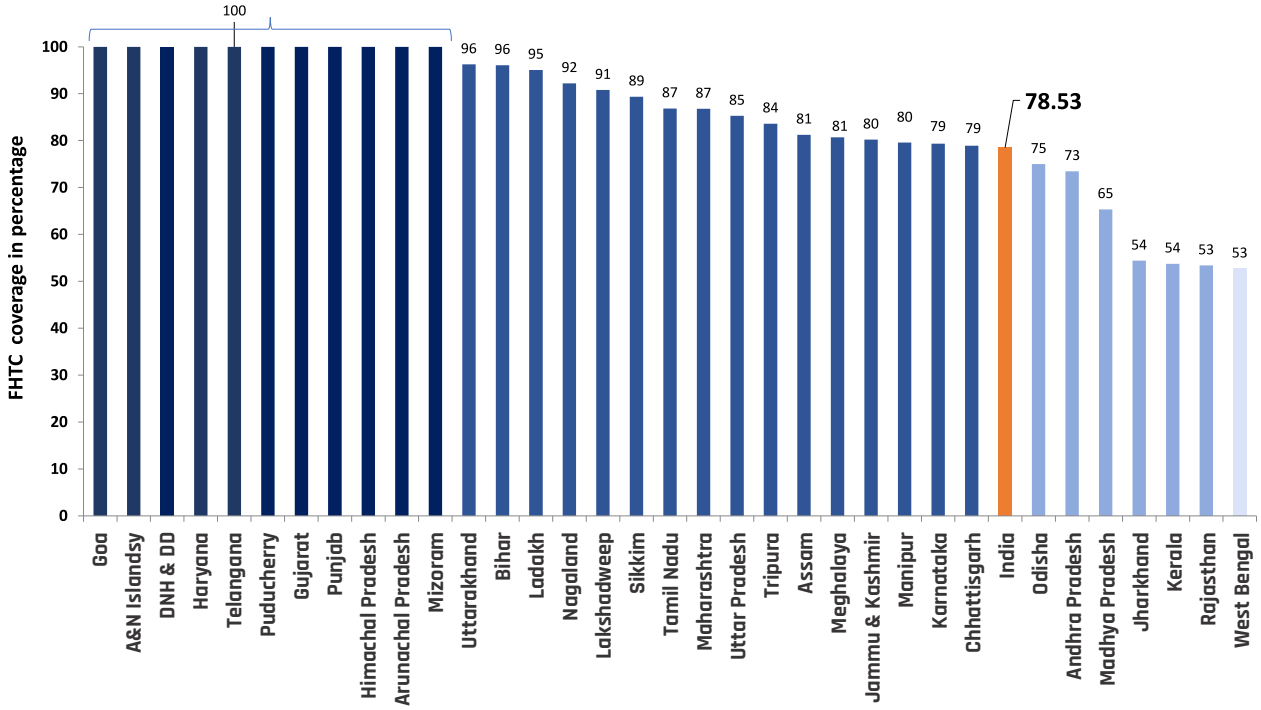
Progressive coverage - Functional Household Tap Connection (FHTC) (as on 30.09.2024)



Comparative FHTC coverage status of States/ UTs (as on 30.09.2024)



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As on 30th September, 2024

Source: JJM-IMIS

India | Status of tap water supply in rural homes

Total number of households (HHs)	Households with tap water connections as on 15th Aug 2019	Households with tap water connections as on date
19,33,67,534	**3,23,62,838** (16.74%)	+40,909 **15,18,58,798** (78.53%)

Households provided with tap water connection since launch of the Mission

11,94,95,960 (74.22%)

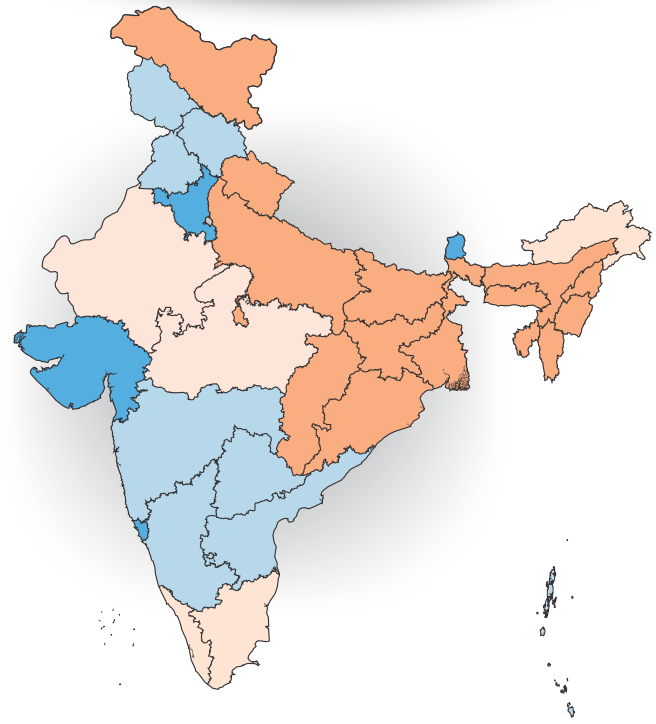
Har Ghar Jal [100% HHs with tap water connections]

100% FHTC States/ UTs

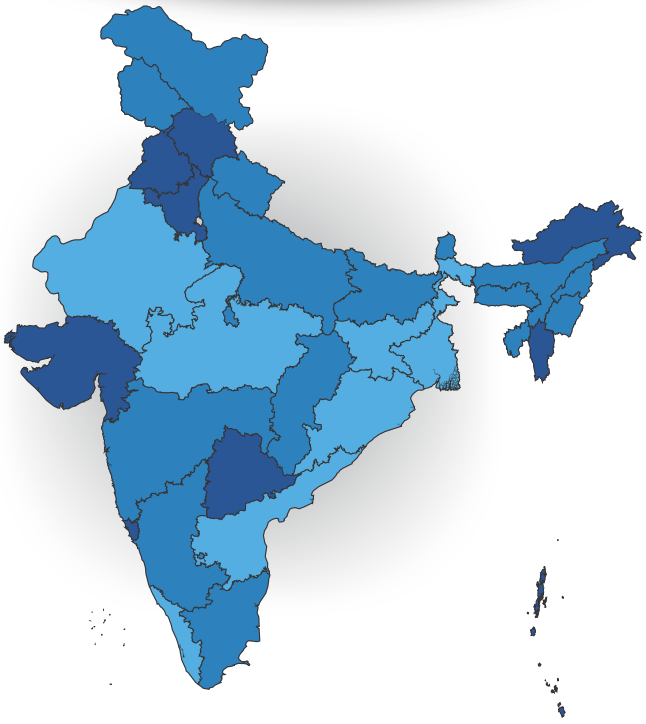
Goa, A & N Islands, Puducheerry, D&NH and D&D, Arunachal Pradesh, Haryana, Telangana, Mizoram, Himachal Pradesh, Gujarat

100% FHTC Districts	100% FHTC Blocks	100% FHTC Panchayats	100% FHTC Villages
165	1,806	1,12,851	2,39,474

As on 15th August, 2019



As on 30th September, 2024



0 to <10% | 10% to <25% | 25% to <50% | 50% to <75% | 75% to <100% | 100%

INTERNATIONAL WASH CONFERENCE 2024

Jal Jeevan Mission has been making considerable strides ever since its launch in 2019. In its five-years journey, the mission has successfully reached over 15 crore rural households with functional tap connections, extending its impact to schools, anganwadi centres, and public institutions. As these accomplishments reflect the progress made in ensuring access to safe drinking water, the mission's transformative journey found a fitting platform at the 'International WASH (Water, Sanitation, and Hygiene) Conference 2024', held by the Department of Drinking Water and Sanitation (DDWS) during the 8th India Water Week with the theme – 'Partnerships and Cooperation for Inclusive Water Development and Management.' The 8th India Water

Figure 1: Hon'ble President, Smt. Droupadi Murmu inaugurating the 8th India Water Week 2004 | Source: NJJM

Week 2024 was inaugurated by the Hon'ble President of India, Smt. Droupadi Murmu, alongside Hon'ble Union Minister of Jal Shakti, Shri C. R. Paatil, and Hon'ble Minister of State, Shri Raj Bhushan Choudhary.

Set against this backdrop, the International WASH Conference emerged as a defining moment in the quest for sustainable solutions in water resource management. Over the course of three days, from 17th to 19th September 2024, the conference saw over 40 riveting sessions, more than 180 expert presentations and 5 panel discussions. Thought leaders, innovators, academicians, and policymakers came together to tackle one of the planet's most urgent challenges – water security.

With the theme 'Sustaining Rural Water Supply,' the event reaffirmed the significance of achieving Sustainable Development Goal 6 (SDG 6) – ensuring availability and sustainable management of

Three Days of Engaging and Insightful Sessions

The inaugural day set the stage with the **National Safe Water Dialogue** where Shri Ashok K K Meena, OSD-DDWS, delivered a keynote address stressing the growing demand for quality water in the future. Sessions throughout the day focused on crucial aspects of water safety and sustainability, starting with water disinfection technologies that align with BIS 10500 standards, ensuring safe drinking water under JJM. Community engagement was highlighted as key for ensuring local ownership and accountability in maintaining water supply schemes, with Smt. Swati Meena Naik, JS-DDWS, moderating the session.

Other sessions delved into source sustainability, with case studies from Uttar Pradesh and Rajasthan, and

Figure 2: The session on Digital Public Infrastructure being chaired by Shri Ashok K K Meena, OSD – DDWS | Source: NJJM

asset management under JJM, which stressed zero leakage and robust infrastructure. The importance of skilling, community involvement, and behavioural change communication (BCC) was also underscored, with IEC initiatives highlighting the pivotal role of Self-Help Groups (SHGs) and the success of women-led VWSCs in Karnataka.

The final day of the conference focused on key discussions around achieving universal access to drinking water in rural areas, with a panel chaired by Smt. D. Thara, Additional Secretary, MoHUA, and co-chaired by Dr. Chandra Bhushan Kumar, Additional Secretary & Mission Director of NJJM. The panel highlighted collaborative governance, community involvement, and innovative strategies to ensure water sustainability, particularly emphasizing the transition from groundwater to surface water in states like Uttar Pradesh and Karnataka.

The day featured several sessions, starting with a focus on Behaviour Change Communication (BCC) in JJM, where experts underscored the importance of structured BCC in managing rural water supplies,

Figure 3: Dr Chandra Bhushan Kumar, AS&MD-NJJM moderating the session on Impact of JJM with Professor Chairs | Source: NJJM

fostering household-level sustainable practices, and promoting long-term behavioural shifts. Other sessions explored the intersection of climate change and disaster management, showcasing technological interventions like reverse osmosis and UF filters to address the challenges posed by climate-related water disasters.

Innovations in water quality testing, sustainable water recharge, and greywater management were also discussed, with Jal Shakti Abhiyan emerging as a key initiative driving these efforts. Women empowerment in JJM was another critical theme, highlighting roles like Rani Mistri and Jal Sahiya that are breaking gender stereotypes in the WASH sector. The day concluded with a session on grievance redressal, where digital tools like the Jhar-Jal Monitoring System and Nal Jal Seva Portal were lauded for improving rural water service delivery and responsiveness.

The day also featured a session on the impact of JJM, with professor chairs presenting findings, such as the reduction of 3.5 crore waterborne disease cases between 2019 and 2022, a direct outcome of JJM implementation. The day concluded with sessions on effective operation and maintenance (O&M), capacity building, and greywater management, showcasing best practices across states for sustaining water supply systems and promoting the reuse of wastewater in rural areas to conserve resources and enhance agricultural productivity.

Day 2 of the conference was marked by dynamic discussions on critical themes such as digital water infrastructure, technology in JJM, and rural asset management. Key highlights included a session on Digital Public Infrastructure (DPI) chaired by Shri Ashok K K Meena, where the integration of JJM with

Figure 4: Smt. Swati Meena Naik, JS-DDWS opening the session on Asset Management in JJM with an insightful presentation | Source: NJJM

SBM for interoperability was emphasized, with the central focus on people-centric solutions. The session on technology in JJM showcased innovations such as insulated pipes in snowy terrains, AI-powered dashboards, and IoT-based systems for real-time water management.

Other sessions delved into source sustainability, with case studies from Uttar Pradesh and Rajasthan, and asset management under JJM, which stressed zero leakage and robust infrastructure. The importance of skilling, community involvement, and behavioural change communication (BCC) was also underscored, with IEC initiatives highlighting the pivotal role of Self-Help Groups (SHGs) and the success of women-led VWSCs in Karnataka.

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Figure 5: Smt. D Thara chairing the discussion on 'Achieving Universal Access to Drinking Water in Rural Areas | Source: NJJM

Figure 6: An insightful panel discussion on BCC in JJM | Source: NJJM

ing the transition from groundwater to surface water in states like Uttar Pradesh and Karnataka.

The day featured several sessions, starting with a focus on Behaviour Change Communication (BCC) in JJM, where experts underscored the importance of structured BCC in managing rural water supplies, fostering household-level sustainable practices, and promoting long-term behavioural shifts. Other sessions explored the intersection of climate change and disaster management, showcasing technological interventions like reverse osmosis and UF filters to address the challenges posed by climate-related water disasters.

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Exhibition

An exhibition showcasing the Swachh Sujal Gaon model village was the centrepiece of the event. This immersive display illustrated India's holistic approach to strengthening the WASH sector in rural areas, offering a glimpse into the innovative and sustainable practices being adopted by States/ Uts across the country. At the model village, the department had showcased the different sources of water, its cycle, paradigm shift from ground water to surface water through MVS scheme, FHTC connections at households, schools, Anganwadi Centers, water quality testing lab, Gram Sabha, IEC/BCC training centre, etc. One of the most interesting attractions was installation of a Selfie Booth at the village.

The exhibition provided a platform for 10-12 States/UTs to educate the public about their unique approaches, best practices, and contributions towards strengthening JJM and SBMG goals. Through interactive displays, informative presentations, and engaging demonstrations, these stalls offered valuable insights into the diverse strategies being employed to enhance water access and sanitation facilities in rural India.

Moving Forward: Action and Innovation

The 2024 International WASH Conference successfully highlighted India's leadership in rural water management, particularly through pioneering initiatives like Jal Jeevan Mission and Swachh Bharat Mission. From the unveiling of breakthrough technologies to the affirmation of community-driven solutions, this conference etched its mark as a turning point in the global water crisis.

Figure 7: Inauguration of Exhibition by Hon'ble MoJS Sri. C R Paatil | Source: NJJM

National Safe Water Dialogue: A discourse on technology and community at the 8th India Water Week

- Evidence Action

Figure 8: Senior officials of DDWS & EA during 8th IWW, 2024 | Source: EA

The National Safe Water Dialogue, co-organized by the Department of Drinking Water and Sanitation (DDWS), Evidence Action, and the Development Innovation Lab (DIL), was held on 17th September, 2024 during the International WASH Conference. The event, part of the 8th India Water Week under the theme 'Sustaining Rural Water Supply,' brought together over 170 key stakeholders, including officials from DDWS, state governments, academia, and community representatives, to discuss water quality innovations, community engagement, and the impact of Jal Jeevan Mission (JJM).

The event began with the welcome remarks by Shri. Pradeep Singh, Director, Water Quality, DDWS, wishing the participants for the enriching, engaging, and interactive experience and insightful exchanges during the International WASH conference 2024.

Shri. Ankur Garg, Executive Vice-President and Country Director (India), Evidence Action gave remarks on Evidence Action's efforts as a technical partner to NJJM on providing in-line chlorination as a simple yet effective solution to provide access to safe drinking water.

Shri. Ashok K. K. Meena, Officer on Special Duty, DDWS, highlighted JJM's achievements, stressing the need for public-private partnerships and innovative solutions like in-line chlorination to improve water quality. The keynote emphasized chlorination as crucial for mitigating water-borne diseases. He appraised the Evidence Action pilot as a potential for scalable and sustainable intervention on water disinfection. The National Safe Water Dialogue showcased the impact of JJM, with deliberations on water disinfection technologies, community engagement, and impact assessment of JJM through various enriching sessions.

A panel discussion on "Lessons from Implementing Water Disinfection Technologies at Scale" featured experts from IIT Madras, IIT Kanpur, and Secretary – MD Madhya Pradesh and Joint MD Tamil Nadu Water and Drainage (TWAD) Board, sharing insights on water disinfection technologies, addressing opportuni-

Figure 9: Shri. Ashok K. K. Meena, OSD, DDWS delivering keynote address | Source: EA

ties, challenges, and potential impacts, moderated by Smt. Vaishnavi Prathap, DIL.

IIT Kanpur professors gave a technical presentation on in-line chlorination – effectiveness of tablet-based doser's Z-design – modified by Evidence Action, chlorine tablets quality and performance, and accuracy of chlorine meters.

Voices from the grassroots, including pump operators, SHG members and Sarpanches, shared success stories community engagement and emphasised on how piped water supply under JJM with chlorinated water transformed health outcomes. Smt. Swati Meena Naik, Joint Secretary, DDWS, underscored the role of community participation in sustaining safe water practices. Smt. Sushmita Sengupta, Centre for Science and Environment, shared about their recent research captured in the book 'Big Change is Possible',

Figure 10: Pannel discussion | Source: EA

on importance of community participation in ensuring success of water programs. The event concluded with a session on the includempact of JJM, chaired by Shri Chandra Bhushan Kumar, AS&MD, NJJM highlighting the mission's success in ensuring equal access to safe drinking water, breaking social barriers, and creating socio-economic opportunities. The JJM professor chairs from IIT Kanpur, IIM Bangalore, TISS Mumbai and IIT Jodhpur presented on the impact of JJM, focusing on critical subjects such as statistical data for health impact, women and water management, employment generation opportunities and socio-economic impacts.

The dialogue emphasized the includemportance of collaboration includen ensuring safe water for rural Includendia.

Har Ghar Jal
Jal Jeevan Mission

From Vision to Victory: The Transformative Journey of Odisha's WASH Cell

Amita Patra, Deputy Director, SIRD&PR, Government of Odisha;
Shipra Saxena, WASH CCES Specialist, UNICEF Odisha;
Sankuli Biswal, State Capacity Building Consultant, WASH Odisha;
Anwesa Baidyanath Dutta, National UNV-WASH-CESS Program Officer

Inception of the WASH Cell

In 2021, the State Institute for Rural Development and Panchayati Raj (SIRD & PR) in Odisha, in collaboration with UNICEF, recognized a crucial gap in the grassroots dissemination of Water, Sanitation, and Hygiene (WASH) practices. Despite numerous national initiatives like Swachh Bharat Mission (SBM) and Jal Jeevan Mission (JJM), the lack of dedicated "foot soldiers" to take WASH messages to the last mile in rural communities was evident. This realization marked the birth of the WASH Cell.

The objective was clear, to create a robust system for capacity building, training, and resource dissemination focused on sustainable WASH practices and behavioral change. The mission was to ensure that even the most remote communities in Odisha had access to safe water, proper sanitation, and hygiene education.

Establishing the Foundation

The establishment of the WASH Cell began with a series of strategic meetings and advisory inputs, a formal WASH Cell was set up at SIRD & PR with technical support from UNICEF. This initiative also involved deploying WASH resource teams at the state level and across three Extension Training Centres (ETCs) under SIRD & PR's administrative control. A key milestone was the development and approval of a three-hour WASH training module for ICDS frontline workers, sanctioned by the Department of Women & Child Development, Govt. of Odisha in the month of June 2021. This training module laid the groundwork for a structured approach to WASH education at the grassroots level.

Driving Capacity Building and Training

The WASH Cell quickly set about its primary task: capacity building. By 2023, it had trained over 1,20,727 stakeholders, including Panchayati Raj Institutions (PRIs) representatives and frontline workers. The training programs were meticulously designed to cater to the specific needs of different stakeholders, ensuring that they were well-equipped to implement WASH interventions effectively.

Needs Assessment & Monitoring: The WASH Cell established a robust system for assessing training needs and monitoring program effectiveness. This data-driven approach ensured continuous improvement in training modules and interventions.

Flagship Program Support: The Cell played a pivotal role in supporting flagship initiatives like Swachh Bharat Mission (SBM) and Jal Jeevan Mission (JJM). Their technical expertise facilitated the successful implementation of these programs, leading to

Figure 11: PPE Kit Demo Session-Equipping Individuals with Essential Safety Protocols in Keonjhar district | Source: SIRD-PR Odisha, UNICEF Odisha

significant progress in sanitation coverage and access to clean water.

The training programs of WASH Cell includes:

- Tailored sessions for PRI members, ICDS supervisors, and other community cadres.
- Development of training modules, schedules, and questionnaires to ensure comprehensive coverage of WASH topics.
- Hands-on support for Gram Panchayats (GPs) to formulate and execute Gram Panchayat Development Plans (GPDP), with a specific focus on WASH components.

Integration with Sustainable Development Goals (SDGs)

India's commitment to the Sustainable Development Goals (SDGs) was a driving force behind the WASH Cell's initiatives. The Ministry of Panchayati Raj had clubbed the 17 SDGs into nine themes for easier localization at the grassroots level. The WASH Cell focused on Theme-4 (Water Sufficient GP) and Theme-5 (Clean and Green GP).

Key Initiatives Under Localization of Sustainable Development Goals (LSDG) Themes:

i. Water Sufficient GP (Theme-4):

- Development of training modules and indicators for achieving water sufficiency.
- Support for the effective utilization of tied funds (60%) under CFC/SFC grants earmarked for water and sanitation.
- Capacity building of Village Water and Sanitation Committees (VWSC) for the operation and maintenance of water supply systems.

ii. Clean and Green GP (Theme-5):

- Formulation of activities and training schedules to promote environmental sustainability.
- Training of sanitation workers on effective management of solid and liquid waste, ensuring their safety and dignity.

Strategic Partnerships and Collaborations

The WASH Cell's success is also attributed to its strategic partnerships. SIRD & PR signed Memorandums of Understanding (MoUs) with several national and international organizations, including UNICEF, UNDP, UNFPA, and others. These collaborations were aimed to promote model panchayats through creation of Panchayat Learning Centres and to facilitate ISO certification for Gram Panchayats, setting benchmarks for basic service delivery.

Achievements and Milestones

Empowered Communities: Trained frontline workers are now at the forefront of guiding communities towards adopting healthy WASH practices. This has resulted in a measurable improvement in hygiene behavior and sanitation awareness.

Sustainability Champion: The WASH Cell's focus on Operation & Maintenance (O&M) is ensuring the long-term functionality of WASH infrastructure. This not only reduces costs but also guarantees sustained access to WASH facilities.

Local Leadership Model: The "Local Champion" initiative has been a resounding success. The Cell identi-

Figure 12: Signing MOU between SIRD-PR and UNICEF partnership for transformative WASH development, with William Hanlon Jr. (UNICEF) and S.K Meena (SIRD) in Bhubaneswar, Odisha. Source: SIRD-PR Odisha, UNICEF Odisha

fies and empowers proactive Gram Panchayat leaders, transforming them into WASH champions who spearhead WASH initiatives within their communities.

i. Training and Capacity Building:

- Over 1,20,727 stakeholders trained by 2023.
- Comprehensive WASH modules developed and integrated into the SIRD & PR curriculum.

ii. Policy and Implementation Support:

- Technical support was provided for the execution of SBM-II and JJM/BASUDHA.
- Handholding support to districts for effective implementation of flagship programs.

iii. Recognition and Expansion:

- Recognition at the national level led to advisories for establishing similar WASH Cells in other states.
- Development of innovative training materials in Odiya, including IEC materials, PPTs, and FAQs.

iv. Local Champions and Peer Learning:

- Promotion of Local Champions to promote leadership and peer learning among GPs.
- Establishment of Panchayat Learning Centres to encourage knowledge sharing and best practices.

Vision for the Future

The WASH Cell doesn't rest on its laurels. It envisions itself as a national leader in WASH interventions. Here's a glimpse into their ambitious plans:

Expanding Training: Development of comprehensive training modules specifically focused on O&M, Faecal Sludge Management (FSM), Plastic Waste Management (PWM), and climate-resilient WASH practices.

Community Engagement 2.0: Designing innovative strategies to promote deeper community ownership and participation in WASH initiatives. This could involve interactive workshops, community conversations, and capacity-building programs for community leaders.

Innovation Hub: Promoting a culture of research and development to explore and implement cutting-edge WASH technologies. This could encompass areas like water recycling, sustainable sanitation solutions, and digital tools for WASH monitoring.

Data-Driven Decisions: Establishing a robust monitoring and evaluation framework to track WASH program performance with clear and measurable indicators. This data will be used to refine interventions and maximize impact.

Tech-Savvy WASH: Integrating online learning platforms, mobile applications, and interactive tools to ensure wider geographical reach and cater to diverse learning styles. Also, developing comprehensive, multilingual training modules that incorporate the latest technologies and best practices in WASH.

Building Resilience: Equipping WASH stakeholders with the knowledge and tools to address the challenges posed by climate change, such as water scarcity and extreme weather events.

Gender Champion: Integrating a gender lens into all WASH interventions to ensure the specific needs of women and marginalized groups are effectively addressed.

Climate Resilience and Sustainability: Integrating climate resilience into WASH training curricula to address the impacts of climate change and promoting cross-sectoral collaborations to maximize the impact of WASH interventions on public health and environmental sustainability.

National Inspiration

The WASH Cell's success story has transcended Odisha's borders. The Government of India, recognizing its transformative potential, has issued an advisory to other states, encouraging them to establish similar models. This national recognition is a testament to the effectiveness of the WASH Cell's approach and its potential to revolutionize WASH interventions across India.

The WASH Cell's story is far from over. It's a saga of continuous improvement, innovation, and a relentless pursuit of WASH equity across Odisha. As they embark on their ambitious plans for the future, one thing remains certain: the WASH Cell's commitment to empowering communities and building a healthier, more resilient Odisha that continues to inspire not just the state but, the entire nation.

Sustainable greywater management – Case of Gujarat

- **Nageshwar Patidar,** WASH Specialist, UNICEF Gujarat; **Tejas Deshmukh,** State CR WASH Consultant, UNICEF Gujarat

The state of Gujarat was declared Open Defecation Free in 2017, with 100% sanitation coverage of households under the flagship program of Swachh Bharat Mission - Gramin (as per the baseline survey of 2012). The second phase of the program (2020 - 2025) focuses on sustaining the ODF status and scaling up Solid and Liquid Waste Management systems across the state. With more than 10,000 villages having greater than 60% underground drainage coverage across Gujarat, there was a need to adopt centralized greywater management technology options in such villages which require limited O&M at the village level.

Advocacy and technology development

Considering the issue at hand, the Commissionerate of Rural Development (CRD), Gujarat initiated a dialogue with village-level stakeholders for safely managing greywater. Technical support was extended jointly by WASMO and UNICEF for finalizing suitable and cost-effective grey-water management technology options with inputs from village-level stakeholders. Contextualized designs were developed which are a combination of suggested greywater management technologies provided under Swachh Bharat Mission - Phase II guidelines and operational expenditure is minimized. Accordingly, a grey-water treatment plant of 200 KLD capacity was set up using funds from Swachh Bharat Mission – Gramin and 15th Finance Commission grants. Used water is lifted into the treatment unit using a pump. The greywater lifted through the pump is passed through

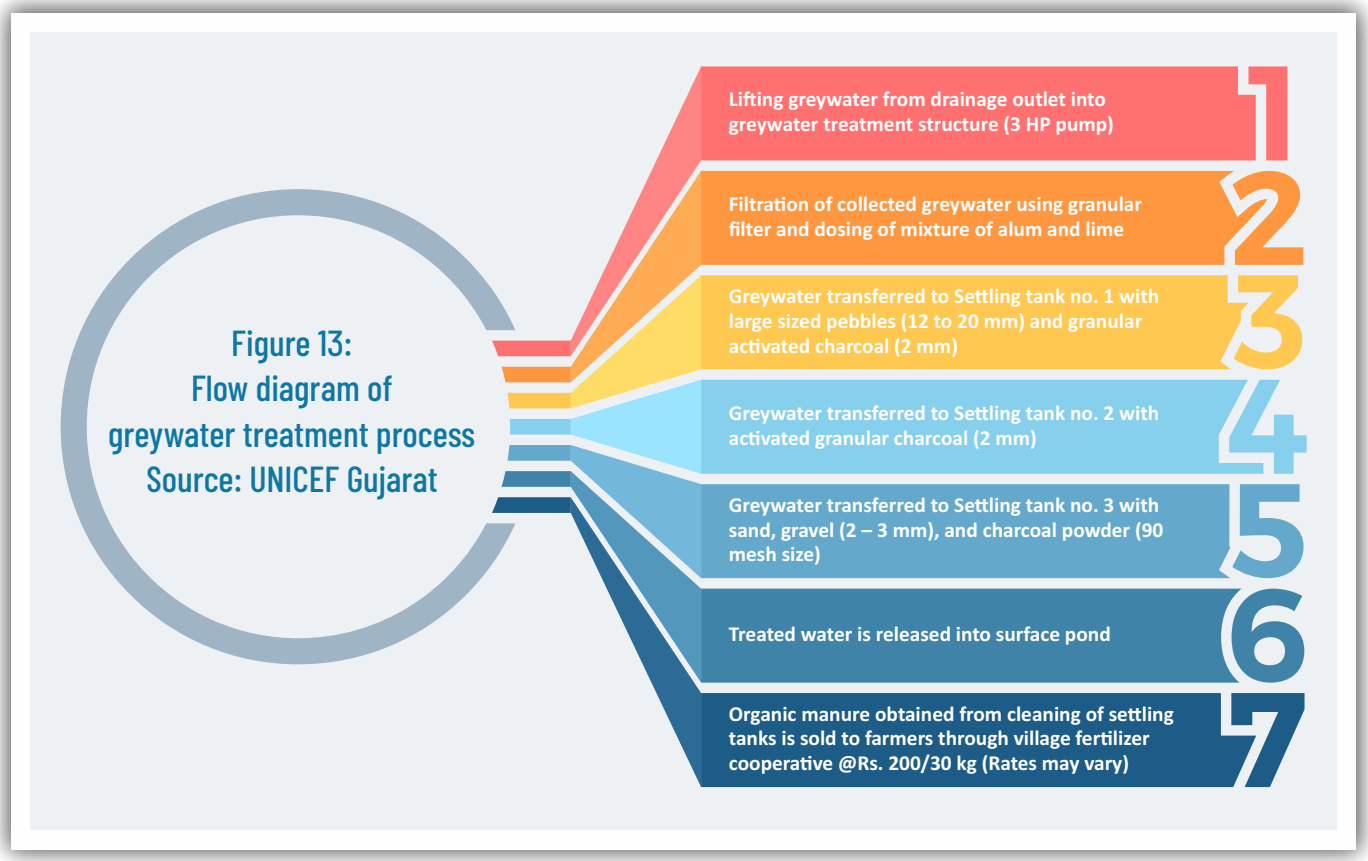

Figure 13:
Flow diagram of greywater treatment process
Source: UNICEF Gujarat

a granular filter tank to remove any bigger-sized particles before transferring to the first settling tank. Three settling tanks with a mixture of pebbles, large-sized charcoal, sand, gravel, and charcoal powder are layered to settle down any impurities at the bottom of the tanks. After 21-28 days, when the process is halted for cleaning, algal-based manure at the bottom is dug and collected in heaps.

Piloting in Vedancha Gram Panchayat of Banaskantha District

Piloting of the centralized greywater treatment was done in Vedancha Gram Panchayat located in Palanpur block of Banaskantha District which has 916 households and a population of 4641. The grey water from 30% households collects at a single discharge point located in the periphery of the village.

The physical structure incurs a capital expenditure of Rs. 6.46 Lakhs (US$ 7692 as on 12th September 2024) and operational expenditure is managed through the selling of organic manure generated from the treatment process every 21-28 days.

The treated water meets all standards laid down by the Central Pollution Control Board (CPCB) and is fit for reuse in irrigation purposes. Also, the manure resulting from the settling and cleaning process meets the amended Fertilizer Control Order (FCO) standards of Organic Manure. The organic manure is being sold to nearby farmers through farmers' cooperative. Currently, 90 such greywater treatment plants have been setup across 14 districts of Gujarat, resulting in 18 MLD treated water available daily for irrigation.

Financial viability

The sale of organic manure and availability of treated used water

Figure 14 : Greywater treatment plant in Vedancha GP | Source: UNICEF Gujarat

Parameters	Unit	Treated Water Results	CPCB Norms Inland Surface water	NGT norms (Other Areas)
pH	-	**6.98**	5.5 to 9.0	5.5 – 9
BOD	mg/L	**18**	<30	<30
COD	mg/L	**79**	<250	<150
SS	mg/L	**10**	<100	<50
T.C.	MPN/100 ml	**920**	<1000	Desirable – 1000; Permissible – 10,000
F.C.	MPN/100 ml	**540**		

Table 1: Treated water quality results

S. No.	Parameter	Amended FCO Standards	Manure Testing Results
1	pH	6.5 – 7.5	**7.42**
2	Conductivity (as dSm-1)	< 4.0	**2.16**
3	N (T) %	> 0.5	**1.22 %**
4	P2O5 (T) %	> 0.5	**0.83 %**
5	K2O (T) %	> 0.5	**1.84 %**
6	Total organic carbon (% by weight)	>14 %	**23.39 %**

Table 2 Manure testing results

Particulars	Model 1 (without sale of TW) In Rs. Lakhs		Model 2 (with sale of TW) In Rs. Lakhs	
	Monthly	Annually	Monthly	Annually
Sale of Organic Manure @ Rs. 200 for 30 kg bag – 300 bags monthly	0.6	7.2	0.6	7.2
Sale of Treated Water @ Rs. 100 per hour – 8 hours daily	-	-	0.168	2.016
Total Revenue	0.6	7.2	0.768	9.216
Operational Expenditure	0.478	5.736	0.478	5.736
Total Income (Cash Flow)	0.122	1.464	0.29	3.48
Capital Expenditure (Initial Investment)	-	6.46	-	6.46
Payback Period (Initial Investment/Cash Flow per year)	**4.42 Years**		**1.85 years**	

Table 3: The Revenue-generating business model for centralized greywater treatment in Gujarat

ensure proper management of O&M expenses. The financial viability of the centralized greywater treatment plant model was worked out considering both scenarios – with sale of treated water and without sale of treated water. The model calculations have been tabulated below:

Replicability and Sustainability

The installation of a greywater treatment plant ensures efficient and effective use of used water. The manure as a by-product of the greywater treatment process promotes organic farming in villages. Being a convergent initiative, the project fulfills the objectives of major government programs such as Jal Jeevan Mission (JJM), Swachh Bharat Mission – Gramin, and Atal Bhujal Yojana. The greywater treatment plant can be constructed with a low capital investment and is based on simple indigenous technology, which can be managed by a single trained resource person at the village level.

Moving forward, periodic testing of raw and treated used water is being explored for institutionalization under Gujarat Pollution Control Board and collaboration with Krishi Vigyan Kendras (KVKs) under agriculture department for testing of manure quality and social outreach through Gram Sevaks. Considering the replicability and scalability of this model, the Commissionerate of Rural Development (CRD), Gujarat has planned to set up 201 such units across Gujarat in F.Y. 2024-25.

Capacity Building initiative of SBM-G functionaries

With the objective of strengthening the capacities of the government as well as village level functionaries regarding sustaining the gains of ODF, their role in ODF Plus, community-led planning, technology options, and O&M for long-term sustainability, a cascading capacity building plan was developed and rolled out with support of UNICEF. Centralized and decentralized greywater management technology options were comprehensively covered as a part of the training & capacity building initiative. A total of 239 master trainers (district level stakeholders) and more than 700 block level stakeholders have been capacitated under the initiative and are now reaching all villages of Gujarat.

"GWM & FSM initiatives": Kalaboti Garden in Howrah Shines in Wastewater Management

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- **Dr. Pragyan Bharati,** Specialist, WaSH and Focal point, Climate Change & Environment Sustainability (CCES), UNICEF West Bengal, Aditya Nath, District Technical Consultant, SBMG, Howrah

Background

To tackle persistent wastewater challenges the Community Kalaboti Garden initiative was launched in Hallyan Gram Panchayat, Bagnan-II, Howrah. Previously, grey water, a byproduct of community hand pumps and tap connections, was disposed of onto roads or into unconstructed drains, resulting in water stagnation, unpleasant odors, and health hazards for the community. The Kalaboti community garden initiative emerged in response to these pressing issues, aiming to create a sustainable, community-driven solution that would improve sanitation, promote environmental sustainability, and enhance community well-being.

The region's unique characteristics, includeincludeing a high groundwater table and limited space availability, posed significant challenges to conventional grey water management systems, such as soak pits or leach pits. Furthermore, the presence of underground drinking water pipelines restricted the feasibility of extensive excavation projects, necessitating an innovative approach tailored to the local context.

Planning and Implementation:

i. Community Engagement and Survey:

The project began with engagement with the Gram Panchayat body, followed by a comprehensive community-level survey. This survey identified areas most affected by grey water stagnation and documented existing disposal practices. Active community involvement fostered a sense of ownership and participation from the outset.

ii. Designing Context-Specific Solutions:

Considering the unique challenges of high groundwater levels, space constraints, and infrastructure limitations, the project team designed practical, low-cost solutions. The focus was on developing shallow-depth, narrow-space grey water management structures.

iii. Construction and Installation:

The construction phase followed a structured approach, incorporating several key components:

- Platforms with Nahani traps to capture grey water efficiently;
- Silt chambers to filter out solid particles and prevent clogging;
- Shallow garden beds with stone chips and coarse sand for natural filtration;
- Plants with water-absorbing and purifying properties were planted on the garden bed surfaces;
- Perforated pipes channelled grey water into the garden beds for natural filtration;

Figure 15: Community engagement survey | Source: Hallyan GP

Figure 16: Silt Chamber | Source: Hallyan GP

- Outlets handled overflow treated water from the garden chamber, preventing stagnation.

iv. Monitoring and Maintenance:

Continuous monitoring and maintenance ensured project success. Regular inspections guaranteed:

- Silt chamber cleaning
- Plant care
- Optimal system functioning

Community members received training to participate in these activities, reinforcing ownership and responsibility.

Current Status

The initiative has successfully harnessed grey water from diverse sources, profoundly enhancing sanitation conditions within the community. The Cana Lily (Kalabati) plants have flourished, adding aesthetic value to the area. Community members, who actively participated in maintenance and monitoring, now take pride in the project. Plans are underway to expand the initiative and integrate sustainability measures, further solidifying its lasting positive impact.

Impact of this community-led initiative

Improved Sanitation: The Community Kalaboti Garden initiative has brought about a marked improvement in sanitation conditions. Effective grey water management and stagnation prevention have eliminated unpleasant odors and reduced health risks associated with waterborne diseases. The clean and well-maintained surroundings contribute to a healthier and more pleasant living environment.

Figure 17: Kalaboti Garden to absorb grey water | Source: Hallyan GP

Community Satisfaction: The initiative has significantly enhanced community satisfaction. Residents appreciate the improved sanitation conditions and aesthetic appeal of the Kalaboti Gardens. Thriving Cana Lily (Kalabati) plants add beauty and symbolize the community's commitment to sustainable practices.

Environmental Benefits

The Natural filtration processes of these gardens reduce the environmental impact of grey water disposal. Plants absorb and purify grey water, conserving local water resources. The project promotes biodiversity by creating green spaces that attract wildlife.

Educational Value

The initiative serves as an educational tool, raising awareness about grey water management and sustainable practices. Community members, especially children, learn about water conservation and environmental stewardship. This knowledge has the potential to influence future generations and foster a culture of sustainability.

Criticality and Value Addition

The **Community Kalaboti Garden** initiative introduced an innovative and cost-effective approach to grey water management by using shallow beds and Kalabati plants, addressing groundwater levels and space constraints. Community involvement in planning, construction, and maintenance fostered ownership, ensuring the project's sustainability. At a modest cost of ₹9,500-10,000 per garden, this scalable model can be adapted to similar communities. The gardens not only improved sanitation but also enhanced the

area's visual appeal, boosting residents' psychological well-being and fostering a sense of pride and responsibility.

Challenges

Fund Utilization:

A significant challenge faced by the Gram Panchayat was the effective utilization of funds for the Kalaboti Garden initiative. While the project was funded through the tied grant for water & sanitation of the 15th Finance Commission, restrictions prevented the use of Swachh Bharat Mission Gramin (SBMG) funds for this purpose. This limitation necessitated a strategic allocation of resources, focusing on other pressing priorities such as drain construction and solid waste management.

Infrastructure Constraints:

Underground drinking water pipelines from the Jal Jeevan Mission project posed infrastructure constraints. These pipelines restricted extensive excavation, requiring innovative shallow-depth and narrow-space design solutions. So strategically the plan executed.

Community Engagement:

Ensuring consistent participation and commitment from community members required continuous effort and communication. Training residents in maintenance activities and fostering a sense of ownership is crucial to the project's long-term success.

Environmental Factors:

Environmental factors such as seasonal variations and extreme weather conditions posed challenges to the maintenance of the Kalaboti Gardens. Ensuring the plants' survival and the system's functionality during adverse weather conditions required adaptive strategies and regular monitoring.

Figure 18 : Greywater treatment plant in Vedancha GP | Source: UNICEF Gujarat

Lessons Learnt

i. Engaging community members from the planning stage is crucial for ensuring buy-in and sustained participation. This fostered a sense of ownership and responsibility, essential for the initiative's success and sustainability.

ii. Developing context-specific solutions that addressed environmental and infrastructural constraints was vital. This adaptability ensures the project's effectiveness and relevance to the community's needs.

iii. Continuous monitoring and maintenance, including regular inspections and plant care, were essential for the system's functionality. Training community members in these activities reinforced the importance of long-term maintenance.

iv. Advocating for policy changes to allow the use of SBMG funds for grey water management initiatives is crucial. Strategic allocation of funds and leveraging multiple funding sources can enhance the project's impact and sustainability.

Moving Forward

i. Expand the Kalaboti Garden initiative to areas with similar challenges.

ii. Advocate for policy changes to access SBM-G funds for such initiatives. Additional funding would help address more significant WASH challenges and enhance sustainability.

iii. Sustain community participation through continuous engagement and training. Regular feedback and inclusive decision-making processes can strengthen involvement and relevance.

iv. Regular assessment and refinement strategies based on feedback and lessons learned. Monitoring performance, identifying areas for enhancement, and adapting strategies to changing conditions will ensure ongoing effectiveness.

Expanding educational outreach through workshops, awareness campaigns engaging schools and the broader community.

Success Stories of Community-led WASH Initiatives – Effective Solid Waste Management Solutions for Jitujuri GP

- NJJM

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Background

Solid Waste Management (SWM) has become crucial in rural areas along with achieving Open Defecation Free (ODF) villages. The Swachh Bharat Mission (Gramin) II (SBM-G II) guidelines recommends treating biodegradable waste at the household or community level and managing plastic waste at the block level. Effective waste management systems, implemented by Gram Panchayats (GPs), are essential for a healthy rural environment, rather than placing responsibility solely on households.

In Jitujuri Gram Panchayat, Purulia, 31,822 households generate 153.17 kg of solid waste on a daily basis, which is estimated to be about 56 tonnes annually, with approximately 130 grams of waste per person per day. The waste management process includes generation, collection, transportation, segregation, and disposal. Plastic pollution, exacerbated by poor infrastructure and low awareness, poses a significant threat to public health and cleanliness.

Rural households generate around 15.9 grams of plastic waste per day, which is often managed through burning, burying, reusing, or selling. Addressing these issues through sustainable SWM practices is vital for a cleaner, healthier environment. The Purulia District administration, with technical support from UNICEF, has implemented a solid waste management unit to improve public health, environmental cleanliness, and safe waste management practices.

Figure 19: Solid Waste Management Unit at Jitujuri GP, Purulia
Source: GP & Zilla Parishad, West Bengal

Progress and Results

Effective waste collection and transportation are essential for a sustainable solid waste management system. After the installation of SWM system in Jitujuri Gram Panchayat, the following measures have been implemented for successful waste management practices:

1. **Household Waste Sorting:**
   - Awareness campaigns promoted source-segregation of waste.
   - Waste is sorted using a color-coded 10-liter bins and collecting them accordingly: green for biodegradable waste (e.g., vegetable scraps) and blue for non-biodegradable waste (e.g., paper, plastic).
2. **Community Bins:** 100-liter bins are placed at strategic locations such as market to collect waste from larger gatherings.
3. **Transportation Infrastructure:** Four drivers are deputed to operate e-c arts with segregated oriented containers for efficient

Figure 20: Collection and Transportation of waste | Source: GP & Zilla Parishad, West Bengal

waste collection from households and markets.

4. **Waste Collection to Treatment Sites:** Collection workers transport waste from community bins to treatment sites for processing.

5. **Community Involvement:** The *UpaJati Maa Mahila Samiti* and *Maa Tara Mahila Samiti* manage the Solid Waste Management unit.

6. **Sanitation Workers:** Each Self-Help Group (SHG) employs four sanitation workers who handle waste segregation and processing ensuring that it is managed efficiently and sustainably.

7. **Funding:**

   The total expenditure for the project was estimated to ₹44.00 lakh, funded through multiple sources. Under the Swachh Bharat Mission (SBM), ₹20.00 lakh was allocated to this, and additionally ₹10.5 lakh was contributed from the 15th Finance Commission fund. Additionally, ₹11.5 lakh came from MGNREGA, and ₹2.00 lakh was provided from the Gram Panchayat's own revenue sources. This multi-source funding approach ensured the financial sustainability of the project, facilitating the successful installation of the required units.

Solid Waste Management Processes and Disposal Treatment and Management of Biodegradable Waste

Jitujuri Gram Panchayat utilizes sustainable practices to manage biodegradable waste and convert it into useful products:

1. **Pit Composting:** Organic waste is treated with aerobic microorganisms, cow dung, and earth, converting it into carbon dioxide, nitrogen oxides, and nutrient-rich manure. This simple yet effective method yields valuable compost.

2. **Vermi-Composting:** Earthworms help stabilize organic waste, producing worm castings—a highly valuable compost. This process, which involves both microorganisms and earthworms, transforms waste into high-quality vermicompost within 45-50 days, contributing to effective waste management and soil enrichment.

Treatment and Management of Non-Biodegradable Waste

Jitujuri Gram Panchayat has established a robust system for managing non-biodegradable waste:

1. **Recycling:** Sanitation workers segregate and securely pack recyclable materials. These materials are sold to local recyclers (kabadiwalas) for proper processing and reuse, reducing waste volume and supporting the circular economy.

Figure 21: Vermi Compositing at Jitujuri SWM Unit | Source: GP & Zilla Parishad

Figure 22: waste churning | Source: GP & Zilla Parishad

2. **Reusing:** Non-recyclable non-biodegradable waste is creatively repurposed into decorative items. This practice diverts waste from landfills, provides income for local artisans, and promotes sustainable living.**Figure SEQ Figure * ARABIC 4: SWM Unit, Jitujuri GP, Purulia**

Landfill

Despite efforts to compost, reuse, and recycle waste, a fraction remains untreated or unmanaged. This residual waste requires final disposal, with landfills being a viable option. A landfill is a designated area for disposing of non-biodegradable and non-recyclable inorganic solid waste. Secured land filling operations are employed to manage this non-recyclable inorganic waste effectively.

Impact

The solid waste management initiative in Jitujuri Gram Panchayat has had a profound and multifaceted impact. Systematic waste sorting, collection, transportation, and processing have markedly improved public health and cleanliness. The use of color-coded bins for household waste, community bins for market waste, and local groups for management duties has enhanced community involvement and accountability. Pit composting and vermicomposting have reduced biodegradable waste and produced valuable compost for agriculture. Recycling and reuse of non-biodegradable waste have minimized environmental pollution and supported the local economy.

Overall, the initiative proves that with effective planning, community engagement, and sustainable practices, rural areas can achieve effective waste management, leading to a healthier environment and improved quality of life for residents.

Cost-Benefit Analysis

The total income generated from the project to date amounts to ₹17.535 lakh. This includes ₹12.96 lakh from compost manure, ₹0.975 lakh from vermicompost, ₹0.85 lakh from plastic recycling, ₹0.25 lakh from calcium powder sales, ₹0.10 lakh from the sale of tree saplings, and ₹2.4 lakh collected as user charges from households and shops.

Criticality and Value Addition

The solid waste management initiative in Jitujuri Gram Panchayat addresses both environmental sustainability and public health in rural areas. By implementing comprehensive practices, it reduces the impact of waste, particularly

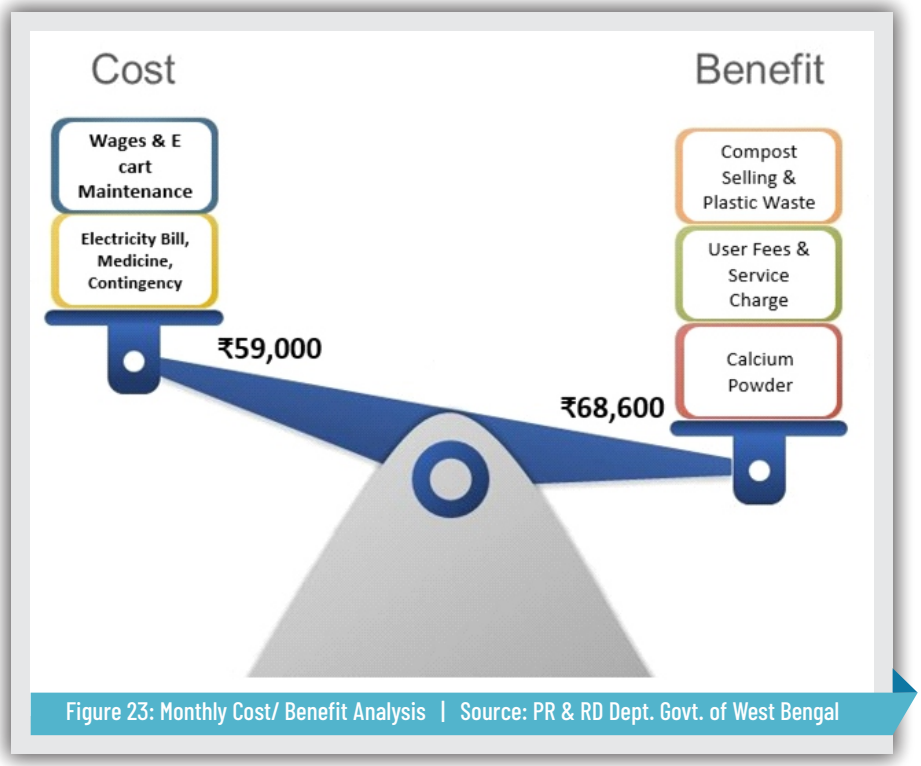

Figure 23: Monthly Cost/ Benefit Analysis | Source: PR & RD Dept. Govt. of West Bengal

Cost	
Items	**Monthly Expenditure (Rs)**
Wages for sanitation worker	49500
E- cart maintenance	2000
Electric bill	2000
Medicine	1000
Contingency	4500
Total (In Rs.)	59000

Benefit	
Items	**Monthly Income (Rs)**
Compost selling	63000
Plastic waste	3000
User fees/service charge	2500
Calcium powder	100
Total (In Rs.)	68600

plastic pollution, protects ecosystems, and lowers the risk of vector-borne diseases. Composting and recycling conserve resources and support local livelihoods, while active community involvement fosters resilience and social responsibility. This initiative serves as a model for scalable, community-driven waste management solutions, demonstrating the effectiveness of localized strategies for broader environmental sustainability.

Challenges:

1. **Segregation at Source:** Effective household waste segregation remains challenging, resulting in mixed waste at treatment facilities.
2. **Infrastructure Limitations:** Inadequate waste collection and transportation infrastructure hampers access to remote areas.
3. **Biomedical Waste Management:** Biomedical waste creates unhygienic conditions and requires specialized disposal.
4. **Community Engagement:** Sustaining community involvement in waste management demands ongoing awareness efforts.
5. **Financial Sustainability:** Maintaining the financial sustainability of waste management operations is an ongoing challenge.

Lessons Learned:

1. **Community Involvement:** Local SHGs, like UpaJati Maa Mahila Samiti and Maa Tara Mahila Samiti, are key to effective waste management.
2. **Segregation Strategies:** Color-coded bins improve waste segregation quality.
3. **Technological Integration:** Composting and vermi-composting manage biodegradable waste and produce valuable compost.
4. **Recycling Promotion:** Local recycler partnerships reduce waste and support the economy.
5. **Monitoring and Evaluation:** Regular reviews enhance efficiency and address gaps.

Moving Forward

1. ***Community Engagement and Economic Sustainability:***

- Conduct awareness campaigns and workshops to educate residents on waste segregation and encourage participation.
- Support waste-to-value initiatives and income-generating activities, such as composting and selling recycled materials.

2. ***Technological Integration and Monitoring:***

- Implement biogas plants, advanced recycling units, and technology for monitoring waste collection efficiency.
- Establish a robust framework for tracking effectiveness and regularly review waste data to refine strategies.

Jal Jeevan Mission: Dismantling social issues and safeguarding WASH rights: A case study from rural Maharashtra

- **Utkarsha Rathi**, UNOPS Consultant, NJJM; with inputs from **SWSM Maharashtra**

Water is not just something to quench thirst; it shapes lives in countless ways. From where we live to what we eat and how we thrive, water impacts everything around us. The simple act of provisioning water has the power to change fates in ways we may not fully imagine.

In many parts of Maharashtra, it was difficult for people to find a bride due to limited water availability. In the Loha block of Nanded district, the acute scarcity of water caused a disturbing societal issue—men struggled to find brides. Families were hesitant to marry their daughters into villages that faced severe water shortages, fearing their daughters would spend most of their lives fetching water, and walking long distances daily. This crisis deeply affected family structures and social bonds in the region, where marriage and the formation of families became increasingly difficult due to the lack of basic water facilities.

The Social Struggle: Water Scarcity and Marriage Prospects

In villages like Nagdarwadi, Loha block, the severe lack of water created a profound social issue: men found it increasingly difficult to find brides. Families from other areas hesitated to marry their daughters into these water-starved regions, fearing that their daughters would spend their days walking miles to fetch water. This situation not only impacted the daily lives of the women but also hindered the formation of families, disrupting the social fabric of these communities. The desperation for water turned a basic need into a barrier to social progress.

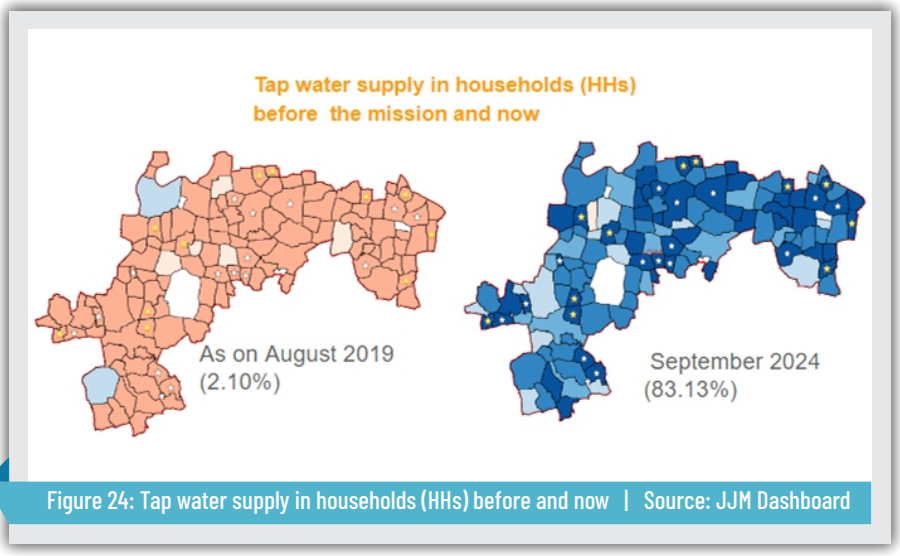

Figure 24: Tap water supply in households (HHs) before and now | Source: JJM Dashboard

The Jal Jeevan Mission's Impact

Thanks to the vision and dedication of Prime Minister Narendra Modi, the Jal Jeevan Mission (JJM) was launched in 2019 with the ambitious goal of providing safe and adequate drinking water to every rural household in India. The mission has been transformative for rural areas like Loha, where the lack of water was not just a matter of daily survival but a deep-rooted social issue.

The Jal Jeevan Mission's progress has been remarkable. Since its inception, the program has provided tap water connections to over 15.17 crore rural households, a significant leap from just 3.23 crore households at the time of its launch. This is not merely a statistic; but a witness to the improved quality of life in rural India. Each tap connection represents a step towards dignity, health, and empowerment for millions of rural residents. A key figure in this transformation has been Sarpanch Gangabai. As a committed leader, she was particularly sensitive to the struggles faced by women in the village. Her understanding of the burden that water collection placed on families, especially women, fueled her determination to ensure that every household had access to tap water. Working in close collaboration with the Upsarpanch, who also made sincere efforts to bring tap water to the village, Gangabai has been instrumental in bringing lasting change.

Progress in Loha, Nanded District

The progress under Jal Jeevan Mission in Loha block, Nanded district, tells the story of hope and empowerment. In August 2019, only 898 households (2.10%) had tap water connections. By September 2024, over 83% of the households (35,670) in Loha block had access to tap water. This significant leap has been made possible by the dedication of leaders like Sarpanch Gangabai and the efforts of local governance under the Jal Jeevan Mission.

Beyond tap water connections, the village has also utilized supplemental infrastructure, such as electric pumps, hand pumps, and wells, to meet additional water demands. But the heart of the achievement is in how the lives of rural women have improved.

Local Leadership: The Critical Role of Sarpanch Gangabai

On the ground, local leadership has been equally critical in driving change. Sarpanch Gangabai of Nagdarwadi has been a key figure in ensuring her village benefits from the Jal Jeevan Mission. As a woman herself, she was acutely aware of the pressures women faced in her community due to water scarcity. Her sensitivity to these issues, combined with her role as a leader, enabled her to prioritize the needs of the people, particularly vulnerable women. Her efforts ensured that her village now has a reliable water supply, removing the barriers that once made marriage prospects difficult for local men and improving overall living conditions.

Safeguarding WASH Rights

The Jal Jeevan Mission does more than just provide infrastructure—it safeguards fundamental Water, Sanitation, and Hygiene (WASH) rights, particularly for marginalized communities. By provisioning tap water, the mission is directly tackling issues of gender inequality and ensuring that women are no longer burdened by the task of water collection.

Local initiatives like the watershed management program, led by villagers themselves, have also been key to this success. As the Sarpanch of Malakoli, a village in the district explains: *"For over 10 years, Nagdarwadi and Malakoli faced severe water scarcity. Thanks to the efforts of the government and the watershed management program, we've successfully built dams and bunds to conserve water. Today, we no longer face a water crisis, and the village has an abundant water supply."*

Ramdev, a resident of the Nagdarwadi village, shares his experience of the project's impact: *"Before the watershed project, we had to walk 3 kilometers to fetch water, which we used sparingly even for basic hygiene. Now, with the program in place, our village enjoys a regular water supply, and reservoirs are full. It has changed our lives significantly.*

This newfound access to water not only enhances the health and well-being of households but also offers women the opportunity to reclaim their time and dignity. No longer shackled by the daily drudgery of fetching water, women can now actively participate in the social and economic life of their communities.

A New Reality: Water Access Transforms Communities Due to the efforts of the Jal Jeevan Mission, the situation in villages like Nagdarwadi has drastically improved. With tap water now accessible in households, the social pressure and stigma surrounding marriage in these water-scarce areas have been lifted. Men no longer face the challenge of finding brides, as families are no longer deterred by the fear of water scarcity. Women, who once spent hours each day fetching water, now have time to focus on education, family care, and contributing to the local economy. This access to water has not only transformed daily living but also revived the social structure, bringing stability and dignity back to the community.

The Jal Jeevan Mission's success in villages like Nagdarwadi exemplifies how power of local leadership and the importance of gender-sensitive governance can bring a positive change, and also address prevalent social issues in the society.

Figure 25: Women Overjoyed to Receive Tap Water Connection | Source: SWSM Maharashtra

Artificial Intelligence (AI) in ESG for Social Impact in Water: Transforming Rural India through JJM

Amit Pawar, National Lead - Rural WASH Partners Forum &
Priyanka Khanna Pawar, Business Advisor – ISCO

Introduction:

India is at a pivotal juncture where the convergence of technology and sustainability is rapidly reshaping the country's development landscape. Among the flagship programs driving this transformation is the Jal Jeevan Mission (JJM), launched in 2019 with a vision to provide Functional Household Tap Connections (FHTCs) to every rural household by 2024. While the mission focuses on ensuring safe and adequate drinking water, the integration of Artificial Intelligence (AI) with Environmental, Social, and Governance (ESG) principles has further amplified its impact on the lives of millions in rural India.

The use of AI in sustainability and ESG frameworks enables efficient management of water resources, promotes transparency, ensures community participation, and helps build a resilient infrastructure. This article delves into the transformative role of AI in advancing social impact through Jal Jeevan Mission, addressing crucial aspects like sustainability, technology, governance, and community development. It explores how AI-driven solutions can make a tangible difference in rural India, strengthening the sustainability pillars of Environment, Social Impact, and Governance while delivering long-term benefits to vulnerable communities.

Water scarcity, contamination, and inequitable distribution have long been challenges in rural India. JJM addresses these issues by providing access to potable water, but sustainability requires more than infrastructure. AI-driven water management systems enhance the mission's objectives by ensuring the efficient use of water resources, monitoring supply and demand, and preventing wastage.

AI for Predictive Analytics in Water Management:

AI can analyze vast amounts of data from multiple sources—weather forecasts, groundwater levels, consumption patterns, and more—to predict water availability and optimize distribution. AI algorithms can monitor real-time data from sensors installed in water pipelines, reservoirs, and water treatment plants to identify leaks, measure water quality, and predict system failures before they occur.

For example, machine learning models analyze historical data to predict droughts, allowing authorities to implement contingency plans well in advance. AI-based predictive models also enable dynamic water allocation, ensuring that water is equitably distributed among households, even during times of shortage.

Smart Water Grids:

Smart grids powered by AI offer a more advanced way to monitor and manage water distribution networks. These grids leverage Internet of Things (IoT) sensors to provide continuous data on water quality, pressure, and flow rates. AI algorithms can process this information to identify potential inefficiencies or malfunctions in the system, enabling rapid response to issues such as contamination or blockages.

Smart water grids also contribute to reducing non-revenue water (water lost before reaching the consumer

Figure 26: Optimizing Water Resources | Source: LinkedIn

due to leaks or theft), a persistent issue in rural areas. By optimizing distribution and detecting anomalies, AI-driven systems ensure that every drop of water counts, thus maximizing the reach of the Jal Jeevan Mission.

AI and Sustainability: A Path to Environmental Conservation

One of the key pillars of ESG is environmental sustainability, and AI's role in water conservation aligns seamlessly with this goal. By offering real-time monitoring and intelligent forecasting, AI supports the responsible management of water resources, helping to ensure that future generations have access to clean water.

Groundwater Management: Groundwater is the primary source of drinking water for most rural households in India, and its over-extraction is a serious concern. AI models can monitor groundwater levels in real-time, using data from sensors and satellite imagery. These systems can provide insights into the rate of extraction, recharge levels, and potential risks of aquifer depletion. By offering a data-driven approach to groundwater management, AI helps policymakers implement sustainable usage practices, ensuring long-term availability.

Additionally, AI-powered tools can help in rainwater harvesting and aquifer recharge initiatives by predicting optimal sites for constructing recharge structures, such as check dams and percolation tanks. These technologies not only enhance water availability but also promote the long-term health of rural ecosystems.

Climate Resilience: Climate change has a profound impact on water resources, with increasing instances of floods and droughts. AI-driven models can help communities become more resilient to these changes by predicting extreme weather events and suggesting adaptive measures. In the context of the Jal Jeevan Mission, AI can forecast periods of water scarcity or contamination risks due to flooding, allowing authorities to take preventive actions such as stockpiling clean water or deploying mobile treatment units in affected areas.

AI for Social Impact: Empowering Communities

The social dimension of ESG focuses on improving the quality of life for communities. In the context of the Jal Jeevan Mission, AI plays a critical role in driving social inclusion, health improvements, and gender empowerment.

Health Monitoring: Access to clean water is intrinsically linked to health outcomes. In rural India, waterborne diseases are a major cause of morbidity and mortality. AI systems can monitor water quality in real-time and send alerts when contamination levels exceed safe thresholds, allowing authorities to respond immediately and prevent outbreaks of diseases like cholera, diarrhea, and typhoid.

AI can also support public health campaigns by providing data on water usage patterns, helping to target awareness programs more effectively. By improving the overall health environment, AI supports the social impact of Jal Jeevan Mission, ensuring that rural populations lead healthier, more productive lives.

Gender Empowerment: The burden of water collection traditionally falls on women and girls in rural India,

often forcing them to walk long distances, sometimes at the expense of education and livelihood opportunities. By ensuring reliable access to water within households, Jal Jeevan Mission—augmented by AI technologies—helps reduce this burden, thereby improving gender equality.

Furthermore, AI-enabled platforms can enhance women's participation in decision-making processes related to water management. For instance, AI-based participatory governance tools allow rural women to voice their concerns and provide feedback on water services. This fosters a more inclusive approach to water governance, empowering women to take leadership roles within their communities.

Governance and Accountability: AI Strengthening Transparency and Participation

Governance is the backbone of any successful ESG framework, and AI serves as a powerful tool for promoting transparency, accountability, and citizen participation in the Jal Jeevan Mission.

Data Transparency: - One of the major challenges in public service delivery is the lack of reliable data and transparency. AI-driven dashboards and reporting tools can provide real-time insights into the progress of water supply schemes, ensuring that every stakeholder—from government officials to local communities—has access to the same information.

Blockchain technology, integrated with AI, can offer an immutable record of water-related transactions and agreements, ensuring that funds allocated for water infrastructure are used efficiently. By reducing corruption and mismanagement, AI strengthens governance, building trust between communities and service providers.

Participatory Governance - AI can enhance participatory governance by creating digital platforms where rural communities can interact directly with policymakers. These platforms allow villagers to report issues, give feedback, and track the status of their complaints. AI algorithms can prioritize and route these grievances to the appropriate authorities, ensuring a timely and effective response.

Additionally, AI can assist in training local communities in the maintenance of water systems, using augmented reality (AR) and virtual reality (VR) to simulate real-world scenarios. These training modules can be delivered via smartphones, making them accessible even in remote areas.

AI for Efficient Resource Allocation and Cost Optimization

The success of Jal Jeevan Mission depends not only on infrastructure but also on the efficient allocation of resources, both financial and human. AI can help optimize resource distribution, ensuring that funds are directed where they are needed most and that human resources are deployed efficiently.

Cost-Effective Infrastructure Development - AI-based tools can analyze geographical and demographic data to identify areas where water infrastructure is most needed. This allows for targeted investments, reducing the likelihood of wastage. AI algorithms can also optimize the design and placement of pipelines, storage tanks, and treatment plants, ensuring that they serve the maximum number of people with minimal environmental impact.

In addition, AI-powered supply chain management systems can ensure that materials and equipment are delivered on time, preventing delays in the implementation of water projects. This not only reduces costs but also ensures that communities receive water services without unnecessary disruptions.

Workforce Management - AI can assist in managing the workforce required for maintaining and operating water systems. By analyzing data on staff availability, performance, and geographic requirements, AI algorithms can ensure that human resources are allocated efficiently. This reduces the need for manual oversight and ensures that every part of the water system operates smoothly.

Technological Innovations: AI Advancing Water Security

AI-driven technological advancements are at the heart of ensuring water security for future generations. From smart sensors to predictive analytics, AI is revolutionizing the way water is managed and delivered in rural India.

AI-Powered Water Treatment - Water treatment plants are a crucial component of the Jal Jeevan Mission. AI can optimize the operation of these plants by automating processes such as filtration, chlorination, and disinfection. Machine learning algorithms can analyze water quality data in real-time, adjusting treatment protocols to ensure the highest standards of safety.

AI can also help identify inefficiencies in the treatment process, reducing energy consumption and lowering operational costs. By making water treatment plants more efficient, AI ensures that clean water is available

to all households, even in the most remote areas.

AI and Renewable Energy Integration - Many rural areas in India face challenges in accessing a stable electricity supply, which can impact the operation of water pumps and treatment plants. AI can integrate renewable energy sources, such as solar or wind power, with water infrastructure to ensure uninterrupted services.

AI algorithms can predict energy demand and supply, ensuring that renewable energy is used optimally to power water systems. This not only reduces dependence on fossil fuels but also promotes the environmental sustainability of the Jal Jeevan Mission.

Overcoming Challenges with AI in ESG for Water Management:

While AI holds immense potential, there are several challenges that need to be addressed to ensure its successful integration with ESG frameworks in water management.

Data Availability and Accessibility - AI systems rely on large volumes of data to function effectively. However, in many rural areas, data on water resources, consumption patterns, and infrastructure are either unavailable or inaccurate. There is a need for concerted efforts to collect, digitize, and standardize this data so that AI systems can operate efficiently.

Infrastructure and Connectivity - The success of AI-driven water management systems depends on the availability of reliable infrastructure, including electricity, internet connectivity, and mobile networks. In rural India, where these services are often lacking, there is a need for investment in digital infrastructure to support AI technologies.

Capacity Building - AI systems require skilled professionals to design, implement, and maintain them. Capacity-building initiatives must be undertaken to train local communities and government officials in the use of AI tools. Partnerships with the private sector and academic institutions can play a key role in building this capacity.

Conclusion

AI's integration into the Jal Jeevan Mission has the potential to revolutionize rural water management in India, aligning with ESG principles to create long-lasting social impact. From enhancing sustainability through efficient resource management to empowering communities through inclusive governance, AI is helping to ensure that every household has access to safe and reliable drinking water.

As the Jal Jeevan Mission moves toward its goal of universal coverage by 2024, the continued use of AI will be crucial in overcoming the challenges of water scarcity, climate change, and infrastructure inefficiencies. With the right investments in technology, data, and human capital, AI can be a game-changer for the mission's success, transforming lives across rural India for generations to come.

By harnessing the power of AI within the ESG framework, India is not only addressing the immediate needs of its rural population but also laying the foundation for a sustainable and equitable future, where access to clean water is a right for all.

Figure 27: Cutting-Edge Water Purification for a Sustainable Future | Source: easy-peasy.ai

Tango of Taps & Toilets: Exploring Horizons for Sustainability

Gautam Patnaik, State Water Consultant, UNICEF, Odisha, Special inputs: **Ms. Shipra Saxena,** WASH-CCES, Specialist, **Yogndra Singh,** State Sanitation Consultant, **Jyotirmoy Deb Goswami,** WASH Consultant – UNICEF Odisha & **Ms. Anwesa Baidyanath Dutta,** National UNV- WASH-CCES Program Officer

Introduction

Panchayati Raj & Drinking Water Department, Government of Odisha is exploring avenues for community-based O&M for rural water supply and sanitation which is sustainable and indigenous. This model of O&M has emanated from blending of existing social structures supported by market economics. This is a shift from the voluntary provision of water & sanitation services to a more increased accountability, transparency, and efficiency.

Current Situation

The interest in using the institutions like Gram Panchayat Level Federation (GPLF) of SHGs as an alternative or supplement to community management stems from the following challenges:

- **Service delivery -** Rural water supply infrastructure is massive, but service delivery metrics—such as quantity, downtime, regular supply hours, and tail end pressure—remain low.
- **Demand for higher service levels and increasing technical complexity -** More intricate and costly piping solutions (SVS & MVS) are currently being built. With its small technical personnel, RWS&S is still struggling to maintain service levels and cannot keep up with the rapidly increasing demand from the system and from consumer.
- **Public Financing -** There is a pressing need for utilization of government grants (CFC & SFC) to manage more of commissioned water supply projects. There is a move by the Government to invite and generate more public financing so that demand for grants is balanced by more of public financing in shape of user fees collection. User fees remittance is directly proportional to service level of water supply at doorstep.

Figure 28: RWS&S Meeting with VWSC & GPLF Members | Source: UNICEF Odisha

- **Intuitional Management -** Members of committees that primarily depend on volunteer management arrangements are under accountable and lack the necessary abilities. Inadequate technical, financial, and management capabilities result in system failures and service breakdowns when assistance and monitoring are lacking.

Renewed Model of O&M

Through the introduction of entrepreneurial and public-private partnership (PPP) arrangements with Gram Panchayat Level Federation (GPLF), the new framework seeks to enhance community-managed water supply and sanitation (CMWS) in rural areas. CMWS+ is a strategy wherein RWS&S, with Gram Panchayat support, formally outsources the O&M function to an organisation that is a community-based non- governmental organisation (CBO) or NGO that is composed of users in addition to having organisational and financial management competency. Instead of founding a new organisation, the Gram Panchayat level is utilising an already-existing framework. This approach is not a departure to outsource the O&M, instead reinforce the ecosystem of O&M of rural water supply with VWSC / GP acting as Utility Manager with assured service delivery.

This strategy is relatively new to the rural water and sanitation sub-sector. This entails a professional approach wherein community services are ensured by the community organization for a higher level of services. GPLF as a social enterprise is entrusted with responsibility of providing water supply and sanitation O&M services which is not voluntary but with a business enterprise model. In the model performance targets, including repair response time and functionality rates, and guarantees services through contracts are well articulated. Theoretically, having multiple water systems to maintain can reduce risks to the maintenance provider by using the insurance concept of pooling maintenance risk. Combining several funding sources under one system, such as tariff income and CFC / SFC that will help disperse financial risks.

- Gram Panchayat Level Federation (GPL) is a federation of Self-Help Groups (SHGs) will sign agreement with Gram Panchayat as Service Provider or rural utility working on the principle of guaranteed service. GPLFs have been managing multitudes of economic activities and have matured as an entity and have emerged from CBO to a Corporate.
- GPLF contracts local hand pump mechanics / pump operators. Initially RWS&S can train the Pump Operators to follow pump operation and preventive maintenance schedules and conduct immediate repairs with performance- related payment incentives.
- GP / VWSC monitors to track all water sources for functionality. Each quarter, NGO/ GPLF reports its findings, along with financial data, to the Gram Panchayat and joins with Gram Panchayat in stakeholder performance review meetings to track progress and monitor the responsibilities of all parties — the GPLF, Gram Panchayat, and VWSCs, communities. GPLF conducts Social Audit of water users to assess customer satisfaction and monitors downtime and repair time to ensure reliability.

Figure 29: Skilled Human Resource for O&M Source: UNICEF Odisha

One of the tribal Gram Panchayats in Odisha, Mendhaguda, and the Gram Panchayat Level Federation (GPLF) have an agreement for the operation and maintenance of the rural water supply and sanitation services group for the village water supply system. Since over 90% of the village's residents were serviced by house connections, the engagement's primary goal was to ensure that water taxes were collected effectively. The GPLF / SHG was responsible for all O&M tasks, such as collecting water taxes and paying for power used, in addition to keeping up-to-date records of water accounts. Eighty percent of the revenue from water tax collections was to be retained by the GPLF to meet operational expenses and 20 percent handed over to the GP, to be maintained in a fund to meet expenses related to system improvements. The idea was to leverage on the inherent strength of GPLF / SHGs in management and governance and SHG Members being both as manager as well as consumer of the water supply and sanitation services.

RWS&S in association with ORMAS (PR & DW Dept. organization dedicated for skilling) has created a pool of skilled rural youth trained in Plumbing, Pump Operation, Solar and Electrical works. GPLF hired such skilled rural youth for O&M. This professional approach resulted in achieved 100 percent recovery of water tax demand, resulting in a small profit. The initiative was replicated in about 5 GPs with mixed results. The SHG also received training on water quality monitoring and surveillance.

Impact and Observations

The key impacts of engaging GPLF as a professional service provider has been multitudes.

I. Service Level Benchmarks Achieved.

An institutional home like GPLF has made it possible to achieve Service Level Benchmarks like adequate quantity, quality, frequency, low down time, reduction in Non-Revenue Water (NRW) etc.

ii. Household Water Fees Collection

The main driver of home water tax compliance has been the SHG's participation in the collection of water taxes. The SHG first held meetings and went door-to-door to educate people about the value of paying taxes to ensure the long-term viability of the water delivery system. The SHG was successful in collecting 90% of the water tax demand during their first collection campaign.

Optimal Solid Waste Management

GPLF has addressed social, behavioural and operational issues emanating from solid waste management. Revenue generating out of proceeds from sale of solid wastes has been an incentive for the GPLF. GPLF institutionalised Sanitation Workers engagement in Solid Waste Management for behavioural change, market linkages, operations and human resources management. Gram Panchayat agreement with Gram Panchayat Level Federation (GPLF). GPLF managing the system ensured accountability and productivity. Other actors were also identified for forward linkages of the collected waste.

Enabling Factors

I. All stakeholders' involvement

GPLF had the support of the Gram Panchayat / PRIs and the community, they were able to provide meaningful services. On the other hand, in two of the Gram Panchayats where GPLF itself were weak in governance, the engagement lacked acceptance from both the GP and households, and the SHG withdrew within three months of its engagement.

II. Adequate capacity-building for the GPLFs.

Specific trainings were provided on technical, financial, and managerial to build the capacities of the GPLFs. The idea was to leverage the O&M of the water supply and sanitation with the regular management and governance of the GPLF / SHGs for a seamless inclusion.

III. Clear mandate or agreement among Gram Panchayat, GPLF and VWSC.

While the Gram Panchayat resolutions constituted an agreement between the Gram Panchayat and the GPLF for O&M of the water supply and sanitation system, it focussed largely on tasks to be undertaken by the SHGs. The role of other stakeholders were clearly spelt out and accountabilities were delineated. GPs role as policy maker and participatory preparation of Gram Panchayat Development Plan (GPDP) with inputs from GPLF became more relevant in making the GPDP budget and planning more realistic and meaningful.

Conclusion

RWS&S, Government of Odisha recognizes the model as an example of professionalizing maintenance services as part of the transition to a rural utility approach. At the state level, the initiative is part of the RWS&S's policy to involve the SHGs as SMEs in water and sanitation service delivery. Gram Panchayat Level Federation (GPLF) works closely with RWS&S on the design and evolution of the model and contributes to the reform and development of a State Water Supply and Sanitation O&M framework. The sector is endeavouring to re-write the rules of community management.

Strengthening Sustainable & SMART Water Quality Monitoring & Surveillance in West Bengal

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The Water, Sanitation, and Hygiene (WASH) sector plays a critical role in ensuring public health, particularly in rural areas where access to safe water and sanitation facilities can significantly reduce waterborne diseases. West Bengal has emerged as a frontrunner in implementing innovative and sustainable practices, supported by UNICEF, under national initiatives like the Jal Jeevan Mission (JJM). The best practices from West Bengal's WASH programs offers a blueprint for scaling up across India.

A key achievement of the Public Health Engineering Department, Govt of West Bengal in WASH efforts is the establishment of robust water quality monitoring system that ensures supply of safe drinking water to the rural communities. This was accomplished by obtaining **NABL accreditation/recognition** for all 216 rural drinking water testing laboratories in the year 2021. This process was pivotal in guaranteeing the reliability and accuracy of water quality results, adhering to international standards like **ISO/IEC 17025:2017**. These laboratories are now equipped to monitor physical, chemical, and microbiological parameters across the state's water supply, ensuring compliance with the Bureau of Indian Standard (IS) 10500:2012. Additionally, the State has been operating a robust online monitoring system since 2015, integrating various mobile applications and monitoring dashboards. This system facilitates end-to-end processes, from sample collection to reporting of test results, including conducting sanitary surveys via mobile applications. Data is automatically shared with the JJM-WQMIS platform through API integration, ensuring seamless and real-time monitoring.

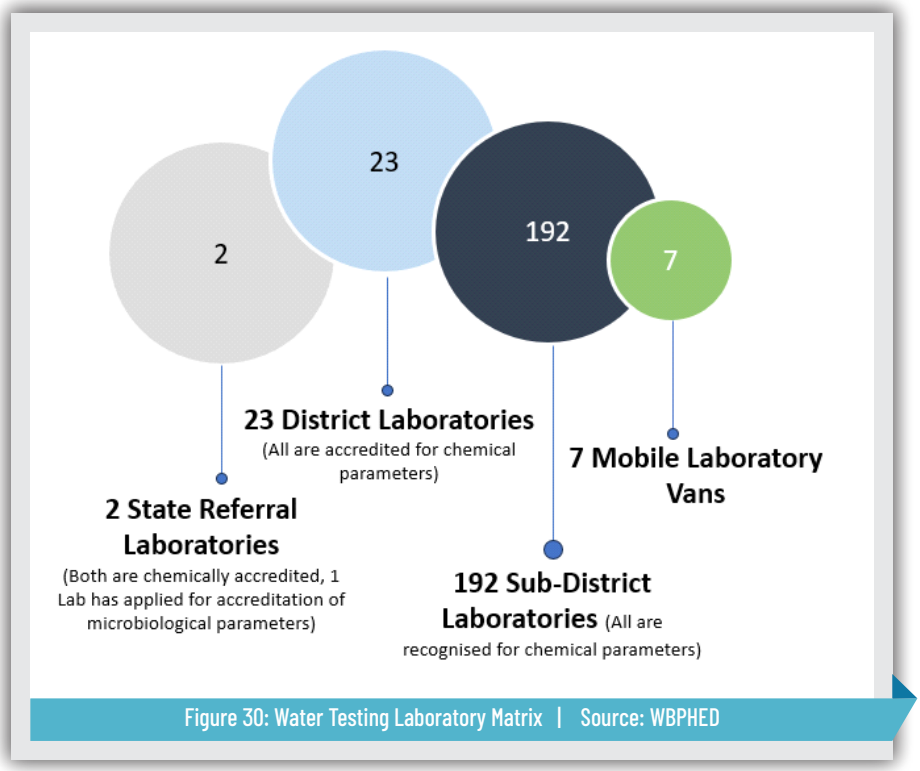


Figure 30: Water Testing Laboratory Matrix | Source: WBPHED

Background

The Jal Jeevan Mission aims to ensure safe drinking water for all rural households in India. In West Bengal, arsenic and fluoride contamination across six districts, affecting 83 and 43 blocks respectively, still remains a concern. The mission not only focuses on providing household tap connections but also on delivering water that meets IS 10500:2012 standards. To achieve this, West Bengal boasts the largest network of rural drinking water testing laboratories in India, comprising 224 facilities including 2 state referral laboratories, 23 district-level laboratories, 192 sub-district-level laboratories, and 7 mobile laboratory vans.

NABL accreditation/recognition of testing laboratories in water quality monitoring is crucial for ensuring

accurate and reliable results that meet international/national standards like ISO/IEC 17025:2017/ NABL 139. It enhances credibility by assuring stakeholders—including governments, NGOs, and communities—of rigorous quality control measures.

UNICEF has played a pivotal role in supporting the Public Health Engineering Department, Government of West Bengal in this process through technical assistance for gap assessments, capacity building of stakeholders such as junior engineers and laboratory personnel, regular monitoring, and engaging relevant agencies.

Progress and Results

i. Preparatory Phase

The certification process for all labs was planned in different phases:

- The PHED Dept. organized state and district-level **preparatory meetings** to prioritize laboratories for NABL accreditation/recognition using a structured Google Spreadsheet. Based on these discussions, the department decided to accredit District Level Laboratories in accordance with ISO/IEC 17025:2017 standards and recognize Sub-district level laboratories as per NABL 139 guidelines.

Figure 31: Dakshin Roypur State Referral Laboratory | Source: WBPHED

- **State-level orientation programs** on NABL accreditation/recognition process were conducted across all districts to familiarize stakeholders with the requirements and procedures. The first phase focused on accrediting/recognising for physical and chemical water quality parameters, with comprehensive gap assessments conducted through site visits to identify infrastructure, human resource, chemical & reagent, instrument, and equipment gaps in all district water testing laboratories.

ii. Gap Assessment

Gap assessments of district laboratories and State laboratories covered few critical areas:

- On-site visits, by assistant engineers, junior engineers, and laboratory personnel to assess gaps. Infrastructural gaps were identified during the assessments, and recommendations were made for modifying key areas such as Instrument Room, Wet Room, and Heating Zone in chemical laboratories, as well as the dress changing room, media preparation room, sterilization room, inoculation room, incubation room, and decontamination room in microbiological laboratories.

- Technical support for assessing the laboratories as per ISO/IEC 17025: 2017 were conducted. A comprehensive list of necessary instruments, glassware, and equipment required for achieving NABL accreditation was compiled.

- Additionally, gaps in human resources were assessed based on the number of personnel and their basic qualifications. Laboratory-specific reports

Figure 32: Gap Assessment exercise at Howrah District Laboratory | Source: WBPHED

detailing the suggested requirements as per ISO/IEC 17025:2017 standards were sent to the concerned divisions for necessary action.

- Gap assessment of sub- district laboratories was also taken place. Infrastructural gaps were identified in the said spreadsheet filled by the district consultants. Virtual consultations and meetings were held with districts, formal communication was issued for taking necessary action to upgrade the laboratories with poor infrastructure.

iii. Engagement of Agencies

Scope of work was developed for engaging various agencies essential for compliance and successful NABL accreditation and recognition. This involved outlining specific activities and responsibilities necessary for meeting NABL standards, ensuring that the engaged agencies had clear guidance on their roles in the accreditation/recognition process.

iv. Training and Capacity Building

Extensive capacity building plan was developed and rolled out for PHE stakeholders *viz.* Assistant Engineers, Junior Engineers, Chemists, Assistant Chemists, Microbiologists, Laboratory Assistants, and District Consultants, focusing on testing methodologies.

Training sessions covered test methods of water quality parameters such as Colour, Odour, Taste, pH, TDS, Turbidity, Total Hardness, Total Alkalinity, Chloride, Calcium, Magnesium, Total Coliform and *E coli*. Additionally, stakeholders were oriented on the clause-wise requirements of ISO/IEC 17025:2017 for documentation and quality control. These training programs were conducted both offline and online, utilizing 'Aha slides' and 'Google Forms' for pre-assessment and post-assessment evaluations. Hands-on training sessions for laboratory personnel were also conducted in the State Referral Laboratory to ensure practical proficiency in the mentioned water quality parameters.

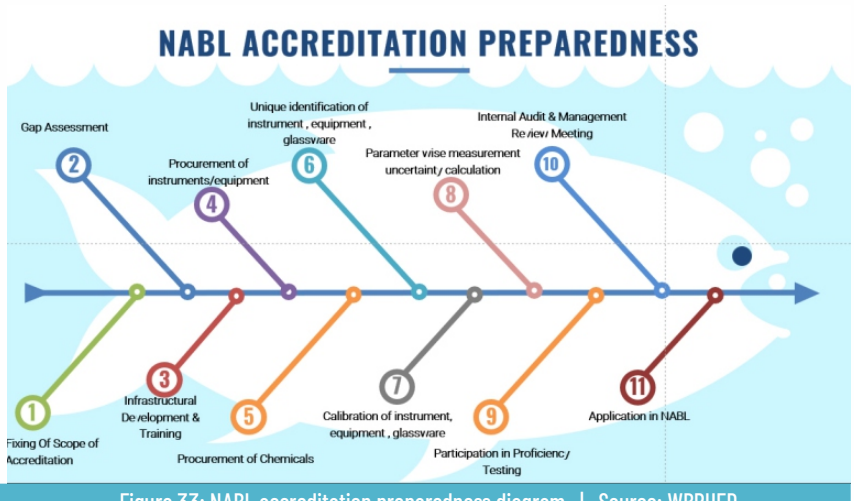


Figure 33: NABL accreditation preparedness diagram | Source: WBPHED

Monitoring Activities

Rigorous monitoring of critical activities required for achieving NABL accreditation/recognition: (including calibration of instruments, equipment, and glassware; procurement of Certified Reference Materials (CRMs); participation in Proficiency Testing (PT); application for accreditation/recognition via the NABL portal; and facilitation of internal, pre, and final audits) was regularly carried out both physically and virtually using real time NABL accreditation/recognition dashboard.

Additionally, assistance was provided for monitoring the payment of Proficiency Testing, annual accreditation/recognition fees, and audit fees. WhatsApp groups, Google spreadsheets and a monitoring dashboard were created to track the progress of activities such as third-party calibration of instruments/equipment, procurement of

standards and CRMs, and participation in PT, ensuring efficient communication with districts.

Criticality and Value Addition

NABL accreditation and recognition for rural drinking water testing laboratories in West Bengal cannot be overstated. This accreditation ensures that the laboratories adhere to stringent international standards, thereby guaranteeing the reliability and accuracy of water quality test results. Such precision is vital for safeguarding public health, particularly in regions affected by arsenic and fluoride contamination.

NABL accreditation includes enhanced trust and confidence among stakeholders, including communities, government agencies, and NGOs, in the water supply's safety. Furthermore, it fosters continuous improvement through regular assessments and proficiency testing, which are essential for maintaining high standards in water quality monitoring. This rigorous process supports effective regulatory compliance, evidence-based policymaking, and sustainable management of water resources, ultimately contributing significantly to the well-being and development of rural communities.

Challenges

i. Rural drinking water testing laboratories face significant infrastructural deficiencies. While many laboratories are accredited or recognized for physical and chemical parameters, incorporating microbiological parameters presents challenges. The limited space in existing facilities necessitates the construction of new laboratory buildings to accommodate these additional testing capabilities, making the process both difficult and time-consuming. Many sub-district laboratories lack the minimum number of rooms necessary for effectively segregating different testing methods.

ii. Assistant Engineers and Junior Engineers, serving as Quality Managers and Deputy Quality Managers in laboratories, face challenges related to workload and frequent transfers, which disrupt laboratory operations, particularly those essential for NABL accreditation activities.

iii. Lack of in-house technical expertise for ISO/IEC 17025:2017 compliance necessitated external support and guidance.

iv. Ensuring seamless communication and coordination across multiple districts and stakeholders was challenging.

v. Maintaining accreditation/recognition standards over time required continuous effort and resources.

Lessons Learned

i. Comprehensive gap assessments and targeted modifications are essential to meet accreditation standards.

ii. Intensive training and capacity-building programs are critical to equip staff with the required skills and knowledge.

iii. Engaging external experts and agencies for technical support can bridge the expertise gap.

Moving Forward

Establishing a robust monitoring mechanism to ensure that all district and state-level laboratories maintain accreditation for both chemical and microbiological parameters by December 2024. The state currently operates seven mobile laboratory vans across the districts of South 24 Parganas, Malda, Howrah, Nadia, Paschim Medinipur, Purba Medinipur, and Purulia. The state plans to apply for NABL recognition for these mobile laboratories by March 2025. Furthermore, all district and state-level laboratories will achieve accreditation for microbiological water quality testing parameters by the same timeline.

Figure 34: Picture of Mobile Laboratory Van of South 24 PGS District | Source: WBPHED

Water – A Human Right Perspective

- **Lopamudra Panda**, PMU-PMCB NJJM

Water is an essential resource for life, it sustains our bodies, health, economies, ecosystems, and cultures. More importantly, access to clean, safe water is a fundamental human right. Yet, despite the critical role it plays, millions worldwide are denied this basic right. In India, the struggle for access to safe drinking water is a daily reality for countless communities. However, through a concerted effort, the Government of India has taken bold strides toward ensuring that every rural citizen has access to potable water. This is embodied in the flagship program Jal Jeevan Mission.

Water as a Human Right

The right to water has been recognized as a basic human right by the United Nations General Assembly. In 2010, the assembly adopted a resolution affirming that the right to safe and clean drinking water and sanitation is an essential right for the full enjoyment of life and all human rights[1]. In India, the right to water has been protected as a fundamental right by the Indian Supreme Court as part of the Right to Life guaranteed under Article 21 of the Indian Constitution[2]. This recognition signifies that everyone, without discrimination, should have access to sufficient, safe, physically accessible, and affordable water for personal and domestic use.

Figure 35: Happy beneficiaries from Pan India | Source: NJJM stock image

Despite this recognition, access to water remains inequitable across many countries, including India. The problem is not the scarcity of water itself—India is rich in water resources—but its distribution. Uneven geographical availability, poor infrastructure, and over-exploitation of water resources have left many areas water stressed. This makes the right to water an ongoing challenge in the country. Women, children, and marginalized communities bear the brunt of this inequity, often walking miles to fetch water or relying on unsafe water sources, leading to waterborne diseases and other health problems.

Jal Jeevan Mission: Bridging the Gap

Jal Jeevan Mission- Har Ghar Jal, launched in 2019, is a massive government initiative designed to rectify the inequitable distribution of

[1] Human right to water and sanitation | International Decade for Action 'Water for Life' 2005-2015 (un.org)

[2] Right to Water Cover (nhrc.nic.in)

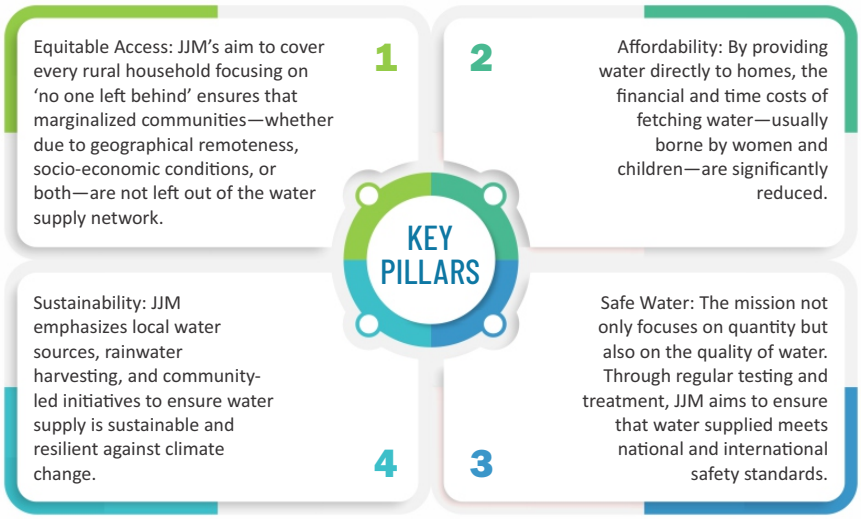


Figure 00: Key Pillars of JJM alligned with Human Rights

water. The mission's overarching goal is to provide Functional Household Tap Connection (FHTC) to every rural household, ensuring each rural household has access to safe drinking water at the turn of a tap. By doing so, the program seeks to address the water disparity between urban and rural areas, improve health outcomes, and uplift the quality of life for all, particularly in rural and underserved communities.

JJM in Action: few insights from ground

To understand the transformative power of JJM, let's examine several examples from across India, where the mission is turning the right to water into a reality.

i. Water for All: Right to Hydrate

For generations, millions of Indians struggled to access the most basic human right: clean drinking water. In Rajasthan's scorching deserts[3], Bundelkhand's water-scarce regions, and Kachh's barren landscapes, women and children walked miles, bearing the brunt of water insecurity. Jal Jeevan Mission (JJM) changes this narrative, recognizing water as a fundamental right, not a privilege.

Today, JJM's transformative power reaches many of India's most vulnerable communities. From the rugged hills and dense forests to the cold deserts and coastal areas, JJM ensures equitable access to clean water. No longer must women and children sacrifice time, health, and dignity searching for water. With every tap, JJM affirms the human right to water, unlocking opportunities for education, health, and economic empowerment.

> *I had never dreamt that water would reach my village but here it has not just reached my village but I can see it flow from the tap in my house. I express my joy through my feet. I will enjoy the moment and welcome arrival of water with Dhol, song and dance.*
>
> **Madan Lal**
> An internationally acclaimed folk artist from Rajasthan

ii. Reaching the unreached: A New Dawn

In the tribal dense village Kandha Dengasargi of Rayagada an aspirational district in Odisha, the dense forests and undulating terrain made access to clean drinking water a distant dream. For years, women from these tribal communities had to walk several kilometers to fetch water from unreliable and unsafe sources. This led to a significant burden on women's time and health, as well as contributing to high rates of waterborne diseases.

Under JJM, a comprehensive water supply scheme was implemented, tapping into local sources and creating an extensive pipeline network that now delivers water to each household, school and Anganwadi centres. With this new infrastructure, the women and girls

> *Now I can cook nutritious hot meals and feed my children in time as I am getting water from the tap right inside the kitchen, earlier I had to fetch water from the tube-well and was not able to feed my anganwadi children in time.*
>
> **Urmila Bismaji**
> AWW, Odisha

[3] Jal Jeevan Samvad July -2021, Issue-X English (jalshakti-ddws.gov.in)

of the village no longer need to walk for hours. Instead, clean drinking water is available within their homes, dramatically improving their quality of life and reducing health risks.[4]

The Har Ghar Jal programme is emphasizing water supply to the indigenous and marginalized section of the society as it's principle is 'no one left out'.

iii. Empowering Women

JJM has made strides in empowering women by including them in decision-making processes related to water management. In many states, women from local self-help groups were trained under the mission to monitor water quality and manage local water supply systems. This participatory model ensures that communities, particularly women, have a stake in the sustainability of their water resources. It has also helped raise awareness about the importance of water conservation, hygiene, and sanitation in rural Kerala. These women have become water ambassadors, promoting good practices within their communities and ensuring that every household has access to safe drinking water.

iv. Reviving Springs in the Northeast

The hilly terrain of the northeastern states, with its reliance on springs for water, presents a unique challenge. Springs in states like Sikkim and Meghalaya have traditionally been a vital source of water for rural communities. However, deforestation and climate change have led to the drying up of many springs, leaving villages without a reliable water supply.

JJM in the Northeast has focused on spring rejuvenation programs to restore these critical water sources. By building check dams, reforesting catchment areas, and channeling water through gravity-based systems, these initiatives have successfully revived springs that now provide a sustainable and dependable water supply to households. This approach not only ensures water availability but also fosters ecological conservation, enhancing the resilience of these communities against climate change.

v. Supplying Water in Sub-Zero Conditions – use of technology

One of the most innovative examples of how JJM is transforming water access is found in Ladakh, where temperatures can plunge below freezing, complicating the supply of water through traditional pipelines. The unique challenges of providing water in such an environment required the deployment of cutting-edge technology.

> *Walking in snow is not easy as there is always the danger of slipping. The chance of accident is multiple, if one is carrying bucket filled with water. But then it was our daily routine, we receive heavy snow in winter's, and it gets freezing cold. As we live very high up in the mountain, going water in close proximity was something I had never even dreamt off. I have spent all my young days carrying water from river for drinking, and household chores. I am thankful to Jal Jeevan Mission that today the water has reached our doorstep. I am happy that now our children will be spending their time on studying or learning new skills.*
>
> **Ms Tsewang Dolma**
> Ladakh

Solar-powered pipelines and insulated pipes are being used to ensure that water does not freeze in transit during the harsh winter months. These pipes are installed at optimal depths underground, where geothermal heat helps prevent the water from freezing. Solar panels provide the necessary energy to pump water through these pipes, making the system both eco-friendly and sustainable[5]. These measures ensure that even in the most remote and challenging conditions, the human right to water is upheld in Ladakh.

The Road Ahead: Challenges and Opportunities

Despite the commendable successes of JJM, several challenges persist in realizing the human right to water for all. Many regions with severe water scarcity, may continue to face issues of depletion due to over-extraction and pollution of groundwater.

Another critical challenge is behavioral change. In many communities, there is a need to promote water conservation and hygienic practices to prevent wastage and ensure sustainable use. JJM, therefore, places a strong emphasis on Information, Education, and Communication (IEC) campaigns to spread awareness about the judicious use of water.

Climate change also poses a significant threat to water resources. Rising

[4] 101-glimpses-of-women-power.pdf (jaljeevanmission.gov.in)
[5] Jal Jeevan Samvad January 2022, Issue-XVI English (jalshakti-ddws.gov.in)

temperatures and erratic rainfall patterns may lead to a future where water becomes even scarcer. JJM's focus on rainwater harvesting, groundwater recharge, and spring rejuvenation provides a foundation for climate-resilient water management, but much more needs to be done to safeguard India's water future.

Conclusion

Water is a fundamental human right, and India's Jal Jeevan Mission is a testament to the government's commitment to realizing this right for all its citizens. By aiming to provide safe drinking water to every rural household, JJM is transforming lives, empowering women, and uplifting marginalized communities. It is closing the urban-rural divide in access to water and fostering a future where water is no longer a scarce or unequal resource.

However, the journey is far from over. Ensuring sustainable and equitable water access requires continued investment in infrastructure, innovative water management practices, and community participation. As we look toward the future, the success of the Jal Jeevan Mission will not only be measured by the number of households receiving tap water but by how well it preserves this vital resource for generations to come.

In its essence, the Jal Jeevan Mission is not just a project—it is a lifeline that affirms water as a right, not a privilege. It stands as a beacon of hope for millions and a testament to the fact that with determination, cooperation, and sustainable practices, the right to water for all is an achievable reality.

By focusing on innovation, inclusivity, and sustainability, JJM is bridging the gap between aspirations and ground realities. Its impact is being felt not just in the physical supply of water but in the dignity, health, and empowerment it provides to communities. Moreover, the mission's success serves as a global example of how governments can respond to the water crisis while addressing climate change, gender inequality, and socio-economic disparities.

As we progress toward the target of providing every rural household with access to tap water, the Jal Jeevan Mission faces both opportunities and challenges. The mission must continue to adapt and evolve, particularly in light of growing water demands, rapid urbanization, and environmental changes. Innovations like those seen in Ladakh, where technology is used to ensure water supply in extreme conditions, will be critical in addressing future challenges. Partnerships with local governments, communities, and international organizations will also play a key role in ensuring the long-term sustainability of the program.

For India, the Jal Jeevan Mission is more than just an infrastructural endeavor—it is a journey toward realizing water equity and ensuring that every citizen, regardless of geography or economic status, can exercise their right to safe drinking water. This is not only a basic need but a cornerstone of development, health, and prosperity. With continued commitment and innovation, India is well on its way to turning this human right into a universal reality.

Figure 36: Balwadi pre-school student drinking water form tap | Source: NJJM

A Pilot project for Grey Water Management in Shulkatirth, Gujarat

- **Shashi Vaghela,** Superintending Engineer, PH Circle Surat, Gujarat Water Supply & Sewerage Board

What is Grey Water Management?

Grey water is wastewater generated from household activities such as bathing, washing clothes, and cooking, excluding black water. Unlike black water, which contains sewage and requires extensive treatment, grey water typically contains fewer pathogens and can be reused for non-potable purposes, such as irrigation or toilet flushing, after minimal treatment.

Grey Water Management: A Necessity in Today's Era. Many rural communities in India still lack access to adequate sanitation facilities, leading to a range of health and environmental problems. One of the key challenges these communities face is the management of grey water.

To address these challenges the Gujarat Water Supply and Sewerage Board (GWSSB)initiated a pilot project in Shuklatirth village. The project aims to implement grey water treatment technology that can be easily operated and maintained by the village panchayat. This technology offers significant health and environmental benefits. This article provides an overview of the Shuklatirth village Grey Water Treatment Plant's concept, design, implementation, and the positive impact it has had on the local community.

Figure 37: Birds eye view of Shuklatirth Village | Source: PH Circle Surat, GWSSB

Village Profile

Shuklatirth is a small village located in the Bharuch district of Gujarat near the banks of the Narmada River. Known for its religious significance and natural beauty, the village attracts many people during its annual yatra and fairs held during the festive season.

Current water supply scenario and used water problem of Shuklatirth

Under the "Jal Jeevan Mission," Shuklatirth village has achieved 100% household tap-water connectivity. The villagers receive drinking water through the Regional Water Supply Scheme (RWSS) and local tube wells. Wastewater generated by each household is categorized into two types: blackwater and grey water. While black water is treated via individual septic tank systems, grey water is collected through an underground drainage system and discharged untreated into a centralized village pond.

During the rainy season, the untreated grey water overflows, leading to environmental pollution and the spread of waterborne diseases. In response to these health concerns, GWSSB has implemented a Grey Water Treatment Scheme as a

pilot project aimed at improving health and sanitation standards in Shuklatirth village.

The Grey Water Treatment Scheme in Shuklatirth Village

Recognizing the issues caused by untreated grey water, GWSSB launched the Grey Water Treatment Scheme, focusing on sustainability and efficient operation by the Village Panchayat. The scheme was approved at a cost of Rs. 1.67 Crore (Net) and Rs. 1.97 Crore (Gross) in 2022.

As part of the project, the untreated greywater that was previously discharged into the village pond is now intercepted and transported through a 2310-meter pipeline to the newly constructed greywater treatment plant near Narmada river.

Soil Bio Technology Based Grey Water Treatment Plant & Its Functioning

(A) About Soil Bio Technology (SBT)

Soil Bio Technology (SBT) is a low-cost, eco-friendly, and sustainable method that combines physical, chemical, and biological processes to treat grey water. Its benefits include:

- A natural and sustainable approach
- No sludge production
- Minimal maintenance
- Ability to remove a wide range of pollutants
- No odor generation
- Aesthetic appeal, providing habitat for wildlife
- Environmentally friendly and scalable if increased capacity is required
- Cost-effective and quick to construct

(B) Functioning of the Treatment Plant

The SBT-based Grey Water Treatment Plant includes the following treatment components and processes:

i. **Primary Treatment:** Coarse and parabolic fine screens remove both floating and settling particulates to protect the BioReactor distributor systems from clogging. Untreated greywater transmitted from the centralised village pond to the inlet of the greywater plant is collected in th ewet well of 50,000 litres ca[acity. Large solids, rags and debries are removed from the greywater through a coarse screen installed in the inlet of the plant and before the wet well. In the next step it is received into ent suspended the parabolic fine screen which removes influent suspended solids' putrescible matter, grease & scum as well as pathogenic faecal materials up to the size of 3mm.

Screen is designed to remove both floating and settling particulates. The function of the parabolic fine screen is to protect the BioReactor distributor systems from clogging by such particulates. Wedge wire Fine screens have a TSS removal efficiency (5% - 30%) and BOD removal efficiency of (5% - 20%). The service water pump will be used for cleaning of these units.

A primary sedimentation tank removes the settleable solids and floating materials and thus reduce the suspended solids content in greywater. A continuous flow type sedimentation tank with 3.0 mt. x 5.9 mt rectangular shape is designed to achieve desired outlet parameters. Provided primary sedimentation tanks can remove 50 to 70 percent of suspended solids and from 25 to 40 percent of the BOD. In the sedimentation tank water keeps flowing in a low velocity. During the flow, suspended particles are settled at the bottom of the tank. The flow is in horizontal direction having more length than its width. Because they need to flow more distance

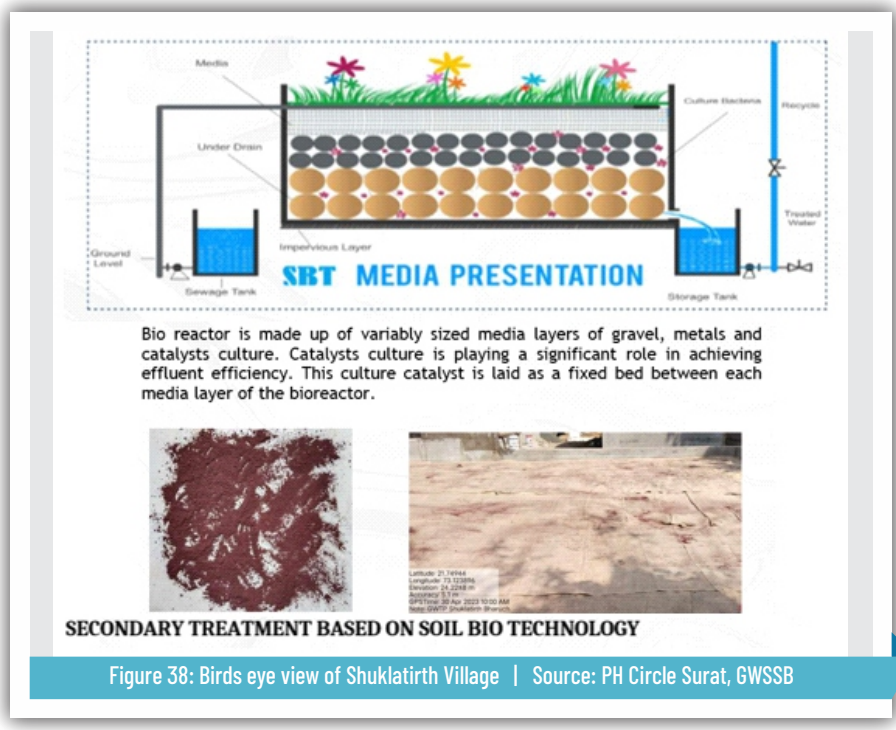


Figure 38: Birds eye view of Shuklatirth Village | Source: PH Circle Surat, GWSSB

to settle all suspended particles. The settled solids the base of the tank is transmitted to Bioreactors for further treatment.

ii. **Secondary Treatment (SBT-based Bioreactors):** Greywater is spread as a fountain on top of Bio-Reactor-1, where it percolates through various media layers and collects in a tank. It is then pumped to Bio-Reactor-2 for further purification. Treated greywater disinfected through the chlorination process. Chlorine Contact Tank is provided to achieve the desired Fecal Coli-Form Standards and is provided with suitable baffle arrangements to give sufficient contact time and a mixing regime for disinfection. The treated effluent is used for irrigation along the Narmada riverbank and safely discharged into the river. Execution of the project was carefully managed to safeguard the revered trees and holy grave site, acknowledging their environmental and spiritual significance.

Impact on the Community

The implementation of the Greywater Treatment Plant has brought about significant improvements in the health and hygiene of the Shuklatirth village community. After this the risk of water borne, diseases has reduced resulted in improved health quality and standard of community. The treated greywater is now used for irrigation on the village's plantations, reducing environmental contamination and improving sanitation conditions. This has successfully addressed the longstanding issue of untreated wastewater disposal.

To illustrate the plant's positive effects, here are some testimonials from key members of the community:

"Previously, students and villagers often fell sick due to the improper disposal of used water, leading to irregular school attendance and concerns for the health of tourists visiting the village. With the new plant, the village has seen a remarkable improvement. This has positively impacted the health of students and community. we deeply appreciate the Water Supply Board for their work."

Pradeep Singh Rana
Principal of Primary School

"Our village is known for its religious pilgrimages, which attract large crowds throughout the year. Before the plant was set up, the disposal of greywater was a major issue. The untreated water caused bad odors and various health problems mainly during the monsoon. Now, with the Grey Water Treatment Plant, we safely treat and reuse the water for irrigation along the Narmada river. It has greatly improved the cleanliness and health of the village. I'm grateful to the Gujarat Government and the Water Supply Board for this transformative project."

Randhir Singh Mangrole
Sarpanch

"Before the plant, grey water clogged the village drains, creating unhygienic conditions. Now, the plant treats over 10 lakh liters of grey water daily, which we use for irrigation and safely dispose of in the Narmada river. This has greatly reduced waterborne diseases in the village. I'm thankful to the Water Supply Board for this much-needed facility."

Lataben Wasava
Member of the Water Committee

"In the past, the untreated grey water caused a stench throughout the village, leading to frequent illness among the villagers. Now, thanks to the treatment plant, these issues have been resolved, and the village is much cleaner and healthier."

Baldevbhai Patel
Villager

Conclusion

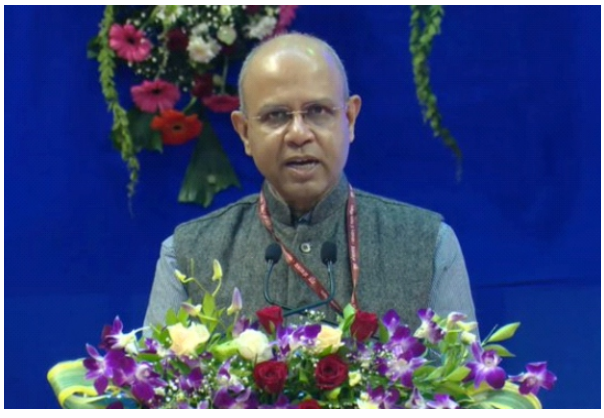
The Soil Bio Technology (SBT)-based Grey Water Treatment Plant is an ideal solution for rural communities like Shuklatirth. It is easy to manage by village panchayats, environmentally friendly, and requires low maintenance. Additionally, the plant can be constructed quickly, is scalable to meet growing needs, and supports sustainable water management practices.

JJM on Ground

Shri Ashok K. K. Meena, OSD, Department of Drinking Water & Sanitation visited villages in Surat district, Gujarat on September 5th, 2024 to see the progress and implementation of Jal Jeevan Mission and Swachh Bharat Mission-Grameen. He visited Vaniyarav Rural Water Supply System, where an expansion project is underway to supply water to 117 villages under JJM. In Ishwarya & Pinjarat villages, he witnessed the positive impact of both JJM and SBMG initiatives. He also met with local leaders and community members to discuss water quality, supply, and sustainability of the scheme. With village community, he saw the rainwater harvesting structures and material recovery facilities. Additionally, he interacted with ASHA, ANM, and Anganwadi workers, highlighting the mission's impact on healthcare and community development.

Jal Sanchay:
Jan Bhagidari Initiative Programme

केंद्रीय जल शक्ति मंत्री जी ने 'जल संचय जनभागीदारी पहल' कार्यक्रम के सम्बोधन के दौरान कहा कि *"ग्रामीण भारतीय घरों तक नल से शुद्ध जल की पहुँच से...महिलाओं को समय की बचत हो रही है, बच्चों का बीमारियों से बचाव हो रहा है और देश को आर्थिक बचत भी हो रही है।"*



'जल संचय जनभागीदारी पहल' के शुभारंभ के अवसर पर कार्यक्रम के स्वागत सम्बोधन में श्री अशोक के. के. मीणा, विशेष कर्तव्य अधिकारी (ओएसडी), पेयजल एवं स्वच्छता विभाग ने लोगों से अभियान के साथ जुड़कर इसे सफल बनाने का आवाह्न किया।

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