Arghyam

WATER QUALITY WORK IN INDIA

A Thematic Retrospective 2007 - 2026

Study Led by

Bhawna Badola and Kapil Dhabu

Index

Foreword

Water is a slow story. But that cannot be an excuse for a slow response. The fluoride that thickens a child's joints did not arrive with yesterday's news cycle. The arsenic that raises cancer risk in a Nalbari household has been building in the groundwater for decades. The policy gap that leaves a Sabla habitation's hand pumps untested, year after year, survey after survey, was not created in a season. But none of this makes the suffering acceptable, or something we address at a pace that matches our institutional comfort rather than the urgency of the problem.

When Arghyam, founded by Rohini Nilekani, started working on water in 2005, the water quality problem in India was well-documented in laboratory reports but poorly understood at the community level. Over 60 million[1] people were already afflicted by fluorosis; arsenic was silently poisoning communities along the Gangetic plains; bacterial contamination was ubiquitous. Yet the response remained fragmented, well-intentioned projects scattered across geographies, unable to match the scale of a problem affecting hundreds of millions.
Our journey into water quality, documented in this report, has taught us that the answer to a problem of this scale cannot be more projects. It has to be a field, and built and sustained at scale. A field of practitioners, institutions, tools, and knowledge networks that collectively carry the solutions forward, long after any single funder or organisation steps back.

This report covers our journey of the past two decades, from our earliest experiments in Karnataka and Bihar to the current frontier of WhatsApp-based community surveillance and state-level Water Quality Hubs. It documents what worked, what failed, and most importantly, what we learned. The story of INREM Foundation, the seeding and expansion of the Water Quality Network, the emergence of the JJM Digital Academy as a government-owned capacity building architecture, the JalDoot programme engaging 53,000 students as water ambassadors: these are not just programme milestones. They are proof that sustained, patient investment in a field, rather than in individual projects, produces qualitatively different kinds of change.

We are grateful to all water quality network partners and especially to INREM Foundation. It has been a relationship built on shared values, frank learning conversations, and a refusal to settle for outputs when outcomes were possible.

---

1. Del Bello L, 'Fluorosis: an ongoing challenge for India', The Lancet Planetary Health, 4, e94-e95
2. https://jaljeevanmission.gov.in/sites/default/files/2025-12/FHTC_National%20Report%202024.pdf
3. JJM Reports, Format C17 A- No Of Quality Affected Habitations & Population As On 05/04/2026

The work is far from finished. India's Jal Jeevan Mission has built the pipes and connections, but the issue of water quality remains, with 24% households facing varying degrees of bacteriological contamination[2] and a large number of households living areas affected by fluoride, arsenic, iron or nitrate[3]. The infrastructure-safety gap is the defining challenge for JJM 2.0. The tools, the people, and the methods documented in this report are our best evidence of what a responsive, community-grounded, government-supported water quality system can look like.

Safe water for every Indian is not a technical problem. It is a governance, capacity, and political will problem. India's Jal Jeevan Mission has rightly placed water quality at the centre of its mandate, recognising that a pipe connection without safe water is an incomplete promise. That political recognition matters. It creates both a window and an obligation: a window for civil society and the government to work together at speed and scale, and an obligation on all of us to not let the window close without resolving the issue at hand. The current pace is not acceptable. This retrospective is offered to the ecosystem, to government partners, fellow funders, civil society organisations, and researchers as a learning document and a call to sustain the long work this challenge requires.

Anuj Sharma
Chief Executive Officer, Arghyam

Acronyms

Acronym	Full Form
AKAN	Arsenic Knowledge Action Network
AKRSP(I)	Aga Khan Rural Support Programme (India)
ANM	Auxiliary Nurse Midwife
API	Application Programming Interface
ARWSP	Accelerated Rural Water Supply Programme
ASHA	Accredited Social Health Activist
ASHWAS	A Survey for Household Water and Sanitation
ASTEC	Assam Science Technology and Environment Council
BCC	Behaviour Change Communication
BIS	Bureau of Indian Standards
BOD	Biochemical Oxygen Demand
CBSE	Central Board of Secondary Education
CGWB	Central Ground Water Board
CHO	Community Health Officer
CPCB	Central Pollution Control Board
CSO	Civil Society Organisation
CSR	Corporate Social Responsibility
CWC	Central Water Commission

DDWS	Department of Drinking Water and Sanitation
DEO	Data Entry Operator
DFMC	District Fluorosis Mitigation Centre
DFU	Defluoridation Unit
DPI	Digital Public Infrastructure
DSC	Development Support Centre
ECHO	Extension for Community Healthcare Outcomes
EU	European Union
FES	Foundation for Ecological Security
FHTC	Functional Household Tap Connection
FKAN	Fluoride Knowledge and Action Network
FLW	Frontline Worker
FTK	Field Testing Kit
GP	Gram Panchayat
HR	Human Resources
iECHO	India ECHO (adapted platform)
IEC	Information, Education and Communication
IFM	Integrated Fluorosis Mitigation

Acronym	Full Form
IMIS	Integrated Management Information System
INREM	India Natural Resources Economics and Management
IPSI	Indigenous Peoples Solidarity Initiative
ISA	India Sanitation Alliance
IWRM	Integrated Water Resources Management
JJM	Jal Jeevan Mission
KoBo	KoBoToolbox
KRC	Knowledge Resource Centre
LG	Learning Group
LMS	Learning Management System
MOOC	Massive Open Online Course
NABL	National Accreditation Board for Testing and Calibration Laboratories
NDWM	National Drinking Water Mission
NGO	Non-Governmental Organisation
NJJM	National Jal Jeevan Mission
NPPCF	National Programme for Prevention and Control of Fluorosis
NRDWP	National Rural Drinking Water Programme

NWQSM	National Water Quality Sub-Mission
O&M	Operation and Maintenance
OECD-DAC	Organisation for Economic Co-operation and Development – Development Assistance Committee
OTP	One Time Password
PDA	Participatory Digital Attestation
PDO	Panchayat Development Officer
PHED	Public Health Engineering Department
PIP	Programme Implementation Plan
PPP	Public-Private Partnership
PRI	Panchayati Raj Institution
QR	Quick Response (code)
RDPR	Rural Development and Panchayati Raj
RGNDWM	Rajiv Gandhi National Drinking Water Mission
RWPF	Rural WASH Partnership Forum
SaciWATERs	South Asia Consortium for Interdisciplinary Water Resources Studies
SBM	Swachh Bharat Mission
SRPP	Sector Reform Pilot Projects

Acronym	Full Form
SSA	Sarva/Axom Sarba Shiksha Abhiyan Mission
SWLC	Safe Water Learning Cards
TCP	Trainer Certification Programme
UNICEF	United Nations Children's Fund
VWSC	Village Water Sanitation Committee
WASH	Water, Sanitation and Hygiene
WHO	World Health Organization
WQ	Water Quality
WQM	Water Quality Management
WQMS	Water Quality Monitoring and Surveillance
WUC	Water User Committee

Acknowledgments

The Arghyam team gratefully acknowledges the commitment and sincere efforts of its partners in strengthening the capacities of diverse stakeholders to address water management challenges in a systematic manner. Their openness to learning, willingness to embrace new ideas, and readiness to adapt programme designs have been invaluable. It has been particularly encouraging to see partners respond thoughtfully to evolving needs, especially given the scale and complexity of the challenges.

We sincerely acknowledge the collaboration of INREM Foundation and its founder, Sunderrajan Krishnan, whose intellectual leadership and relentless commitment have been the spine of this work. INREM partnered closely with Arghyam to conduct field experiments, build a network, abstract the learnings, simplify scientific concepts to make them accessible to the broader community, and build the capacity of practitioners. Starting early, we also walked the scale journey together, testing ideas, trying tools and solutions in joint programmes. They introduced their own innovations and made it their own.

We also extend our appreciation to UNICEF, Tata Trusts, Wateraid, Gram Vikas, PSI, SaciWATERS, DSC, AKRSP(I) and others for generating rigorous field-based evidence that continues to shape our strategy and deepen our learning.
We also acknowledge the important role played by technical agencies such as SOCION, Sattva, and Vrutti, whose program management expertise has significantly strengthened our efforts and supported our journey towards scale.
We are also grateful to our technology and platform partners, Reap Benefit, SOCION, Tech4Dev, Oloi Labs and iEcho without whom the scaling of the interventions would not have been possible.

A special thanks to the Ministry of Jal Shakti and state government champions across Assam, Gujarat, Meghalaya and Karnataka who showed interest in our work and engaged with us to explore and adopt innovative practices. Their trust, collaboration and leadership have been instrumental in advancing these efforts.

Above all, we recognise the contributions of Water Quality Champions, Jal Doots, Frontline Workers, and field facilitators, whose on-ground efforts make these insights and lessons possible.

Gratefully,
Team Arghyam

Executive Summary

Over the past two decades, Arghyam has worked to enable safe water for all, initially through exploratory, small-scale projects that built deep sectoral understanding but remained isolated islands of excellence. A pivotal rethink in 2017 shifted the focus to scale and speed: partnering with large government programmes, strengthening local capacities, and leveraging digital tools and data for impact. This report is one of four published on Arghyam's 25th anniversary, sharing learnings and insights on water quality. Most of these learnings emerge from the work done in partnership with INREM Foundation, Arghyam's longest-standing water quality partner.

India's water quality crisis is vast, long-standing, and deeply complex, shaped by both natural (geogenic) contaminants like fluoride and arsenic, and human-induced pollution such as nitrates and salinity. Affecting millions of people, the problem is compounded by heavy reliance on groundwater and the largely invisible nature of contamination, where communities often remain unaware of the health impacts of the water they consume. While policy responses have evolved over time, from the National Rural Drinking Water Programme to the Jal Jeevan Mission (JJM), the focus has largely been on expanding infrastructure and coverage rather than ensuring the safety and quality of water delivered. This has created a critical gap where access to tap water does not necessarily translate to access to safe water. Organic demand for safe water is still underdeveloped and must be actively built through strategic IEC and community engagement. Safe water access prospects are further undermined by governance challenges, including fragmented institutional responsibilities, siloed data systems, limited local capacity, and weak feedback loops that hinder timely information flow and responsive action.

Arghyam's first phase of water quality work (2000–2017) included the ASHWAS citizen survey, the WQM Framework, the seeding of the Fluoride and Arsenic Knowledge and Action Networks with INREM Foundation and SaciWATERs respectively, the emergence of District Fluoride Mitigation Centres as institutional models and several experiments such as safe water learning cards,

speaking walls and the mobile fluoride testing app prototype ('Caddisfly'). In its acceleration phase (2018–2026), Arghyam and INREM Foundation's partnership strengthened as we navigated the COVID-forced pivot to digital learning and the launch of the Water Quality Management (WQM) Course. With the launch of the Jal Jeevan Mission and INREM's selection as the Rural WASH Partner Forum's lead on Water Quality, the WQM Course aligned with the government's mandate and was institutionalized within the JJM Digital Academy. The Guided Mentoring model led to a shift away from dependence on external expertise to relying on local peer knowledge for solving local problems. The quest for effective carriers of the message led to the launch of the JalDoot Programme in Assam—developing school students as youth messengers; empowering frontline workers through technology with WhatsApp pilots in Nalbari and Jhabua; and training health workers in Churu for fluoride management. Technologies such as PDA, iECHO, Glific, WhatsApp chatbot, and speaking walls remained key lever for efficient and scalable implementation.

The Five Crosscutting Insights

The five insights that have emerged from our work in Water Quality landscape over the past 25 years are as follows:

1	Scale is an ecosystem property, not an organisational target: the water quality network's value lies in the connections it enabled, not just the capacities it built.
2	Government institutionalisation is the only durable form of scale, but quality and sustainability once government takes over remain unproven and must be tracked.
3	The current strategy to develop a proof-of-concept on the ground and then build the ecosystem's capability to scale has always shown a gap while transferring ownership to government or local organization.
4	Human infrastructure is the binding constraint that the sector has underinvested in. While the equipment and platforms have scaled, the workforce required to operate them has not.
5	The pilot-to-scale handoff is the hardest part and the most underfunded.

Way Forward

Arghyam's forward framework organises the work across three pillars: Diagnostic (making contamination visible), Curative (ensuring visibility triggers response), and Preventive (addressing contamination at source through policy and regulation). The first two decades were predominantly diagnostic and curative — the preventive pillar remains largely unaddressed and is where Arghyam's cross-sector positioning is most suited to contribute. The pieces of the architecture have been built. The next challenge is making them work together reliably, at the scale the problem demands, and for the communities living with it.

Chapter 1

Water Quality in India: Status and Evolution of Policy

Before tracing Arghyam's journey, it is essential to understand the landscape into which it entered. India's water quality crisis is not a recent emergency: it is a decades-long, geographically vast, and institutionally under-acknowledged problem that sits at the intersection of geology, public health, governance, and poverty. This chapter provides the national context: the scale of contamination, the evolution of policy, and the structural gaps that created the need and urgency for civil society action.

68.3 L

Annual cases of water borne diseases

9 L+

People living in iron affected habitations

2 L+

People living in fluoride affected habitations

3 L+

People living in arsenic affected habitations

16 L+

People living in salinity affected areas

3.5 L+

People living in nitrate affected habitations

1.1

The Contamination Landscape: Geogenic and Anthropogenic Threats

India's two primary drinking water sources, groundwater and surface water, have both faced significant contamination. Hydrochemical assessments by the Central Ground Water Board (CGWB)[4] show that contaminants such as fluoride, arsenic, iron, and nitrate remain widespread and persistent, with recent detections of elevated uranium levels in several states. Surface water is also under stress: in 2022, the Central Pollution Control Board identified 311 polluted river stretches across 279 rivers in 30 states and Union Territories[5]. Together, this highlights a critical gap between improving access and ensuring safe, sustainable water quality.

1.1.1 Bacteriological contamination

Waterborne diseases remain a major public health challenge, driven by high levels of biological contamination. Each year, around 56 lakh people are affected. Diarrhoeal disease[6] is the third leading cause of childhood mortality in India, responsible for 13% of all deaths in children under five annually[7] Typhoid and viral hepatitis A and E, both linked to drinking water contaminated with untreated sewage, are widely reported, with 12 lakh and 1.7 lakh cases recorded annually, respectively. In the latest available data, waterborne illnesses have led to over 3,000 deaths in a single year, with viral hepatitis accounting for the highest share of fatalities.

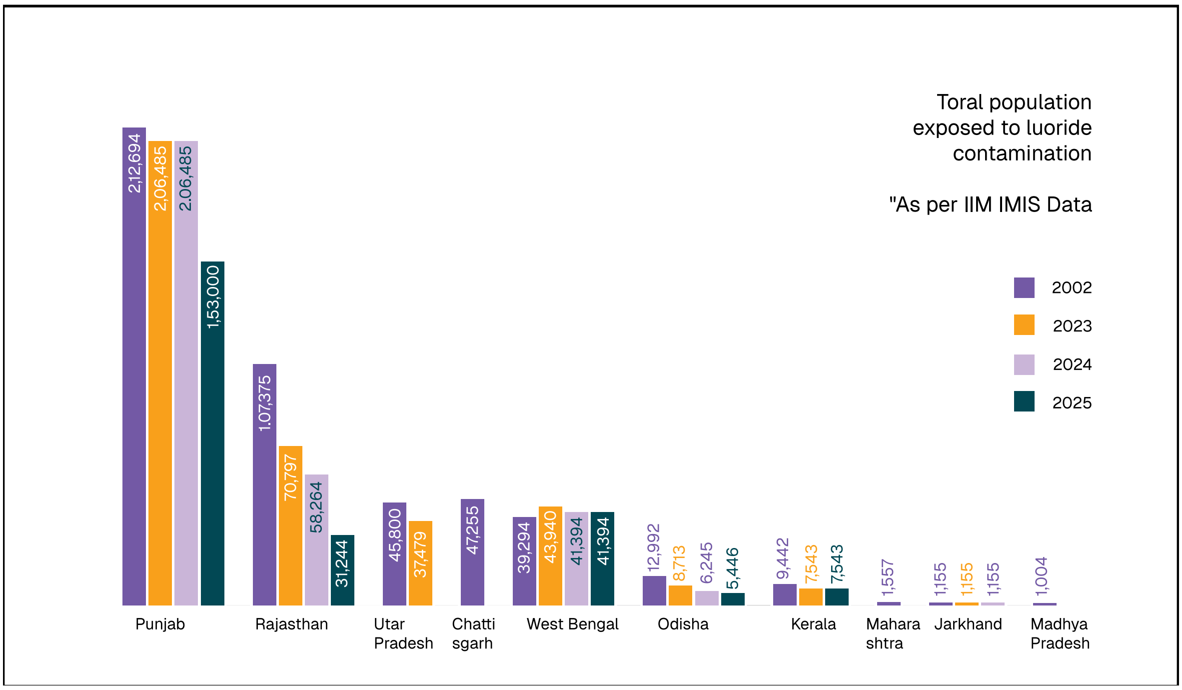
---

4. https://cgwb.gov.in/cgwbpnm/public/uploads/documents/17628543752626804475file.pdf
5. https://www.pib.gov.in/PressReleseDetailm.aspx?PRID=1941065&reg=3&lang=2
6. https://cbhidghs.mohfw.gov.in/sites/default/files/NHP/NHP-2023-Last-Final.pdf
7. https://www.researchgate.net/publication/271713883_Diarrheal_diseases_among_children_in_India_Current_scenario_and_future_perspectives

1.1.2 Fluoride: The Invisible Epidemic

Fluoride contamination is one of the largest sources of contamination nationally, affecting over 2 lakh+ people; nearly half of India's districts exceed WHO guidelines, with the highest concentrations in the northwest and south. As nearly 90% of the rural population depends on groundwater for drinking, a large fraction faces the health hazards of fluorosis.

States with highest fluoride concentration



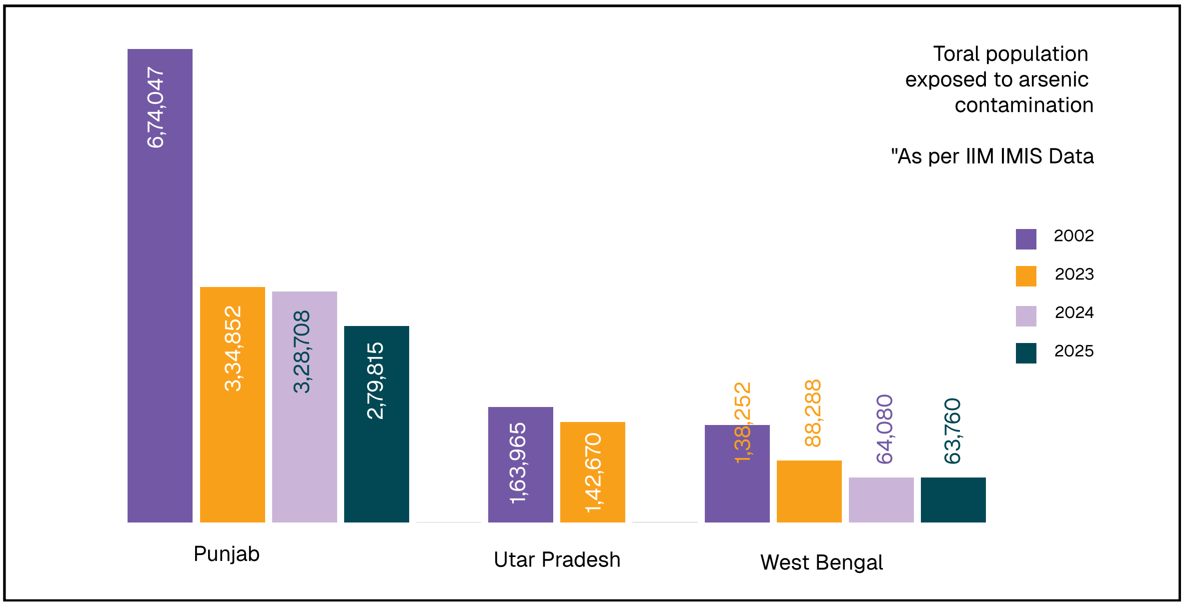
* The JJM datasets show some sudden decline in reports of fluoride for Uttar Pradesh, and Chhattisgarh, that may be because of shifting in water sources, i.e. surface water replacing ground water, treatment at scheme level or data reporting gaps.

The occurrence of high fluoride is associated with crystalline and hard-rock aquifers such as granite and gneissic formations, where prolonged water-rock interaction dissolves fluoride-bearing minerals[8]. Fluorosis is a disease of invisibility: dental fluorosis is visible but often not recognised as a disease; skeletal fluorosis develops over years and is frequently misdiagnosed[9]. Communities may be wholly unaware that their water source is the cause of their children's bent limbs and their own chronic pain. This invisibility was the central public health and communication challenge that shaped Arghyam's approach. As per JJM, Punjab has the highest concentration of affected population, followed by West Bengal, Rajasthan, and Odisha[10]. CGWB records fluoride exceeding 1.5 mg/L in many additional states including Andhra Pradesh, Gujarat, Karnataka, Madhya Pradesh, and Assam[11].

1.1.3 Arsenic: The Indo-Gangetic Crisis

Arsenic is primarily associated with alluvial formations in the Ganga and Brahmaputra river basins. Contamination occurs mainly in intermediate aquifers at depths of 20–100 metres — the precise depth range used for hand pumps across rural India — while deeper, generally arsenic-free aquifers require drilling costs beyond the reach of most rural communities. Unlike fluoride, which causes chronic disease over years, high arsenic exposure can cause acute poisoning, alongside cancers of the skin, bladder, and lung. Punjab has the largest exposed population (2,79,815 people beyond permissible limits).[5] CGWB records elevated arsenic in Assam, Bihar, Chhattisgarh, Haryana, Jharkhand, Karnataka, Punjab, and Uttar Pradesh, though state-level JJM WQMIS reporting does not always reflect this full picture.

States with highest fluoride concentration



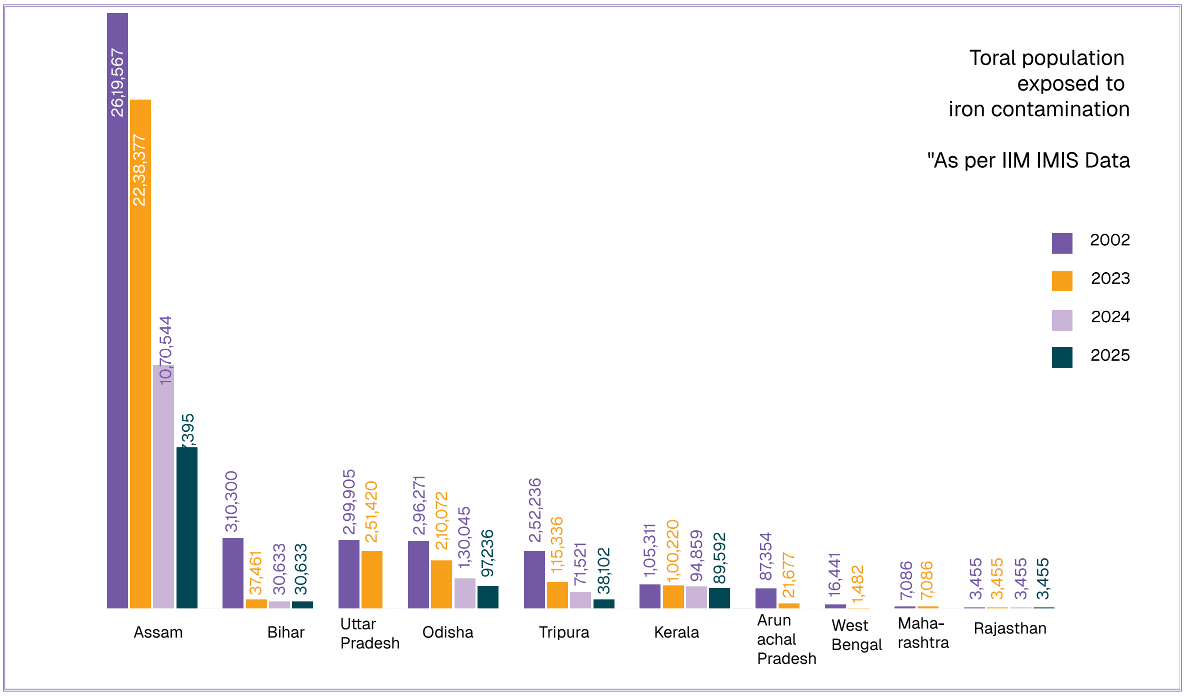
*The JJM datasets show some sudden decline in reports of arsenic for Uttar Pradesh, as was observed for fluoride. This could be due to a shift in the source from groundwater to surface water, or a shift in the reporting methodology.

8. https://cgwb.gov.in/cgwbpnm/public/uploads/documents/1762854375262680475file.pdf
9. https://ncdc.mohfw.gov.in/wp-content/uploads/2024/05/CD-Alert-on-Fluorosis-Final-28-Apr-2022.pdf
10. Central Bureau of Health Investigation, National Health Profile, 2023 https://cbhidghs.mohfw.gov.in/sites/default/files/NHP/NHP-2023-Last-Final.pdfCentral Bureau of Health Investigation, National Health Profile, 2023 https://cbhidghs.mohfw.gov.in/sites/default/files/NHP/NHP-2023-Last-Final.pdf
11. Central Ground Water Board, ‘Annual Ground Water Quality Report 2024’, https://cgwb.gov.in/cgwbpnm/public/uploads/documents/17363272771910393216file.pdf

1.1.4 Iron, Nitrate, and Salinity: The Broader Contamination Spectrum

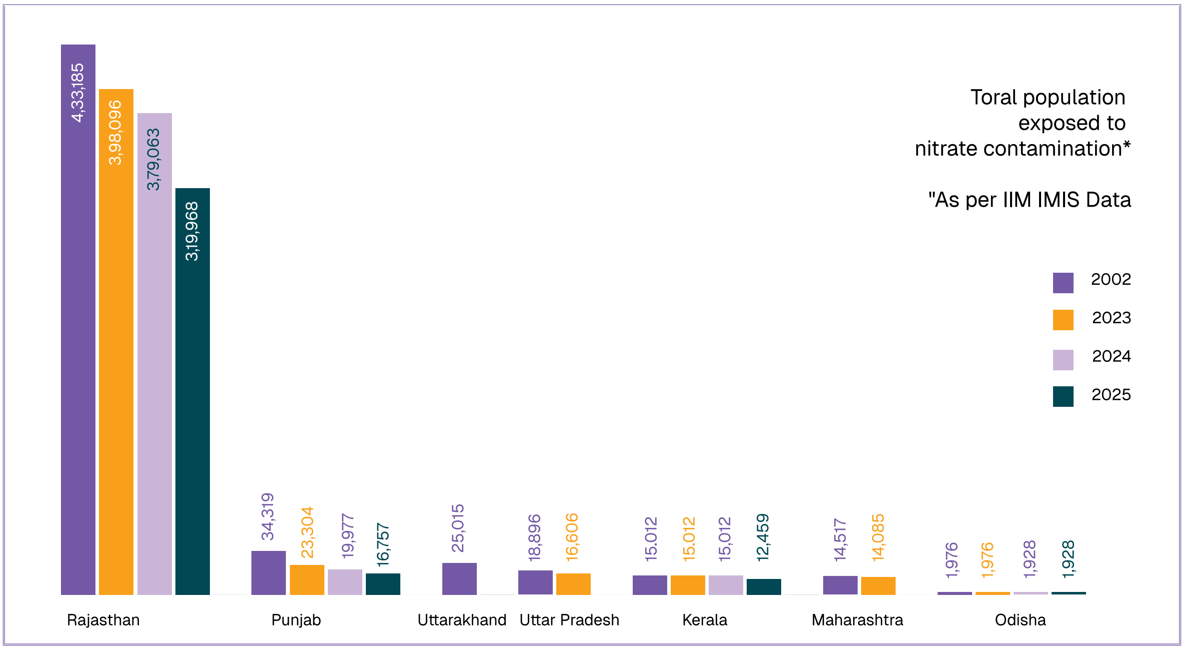
Iron contamination affects more than 9.66 lakh people nationally, dominated overwhelmingly by Assam. High iron makes water visually unacceptable but is often not recognised as a serious health risk. A sharp reported decline from ~26 lakh (2022) to ~7 lakh (2025) likely reflects both targeted interventions and data or source-reporting corrections, a pattern that recurs across multiple contaminants.

States with highest arsenic concentration



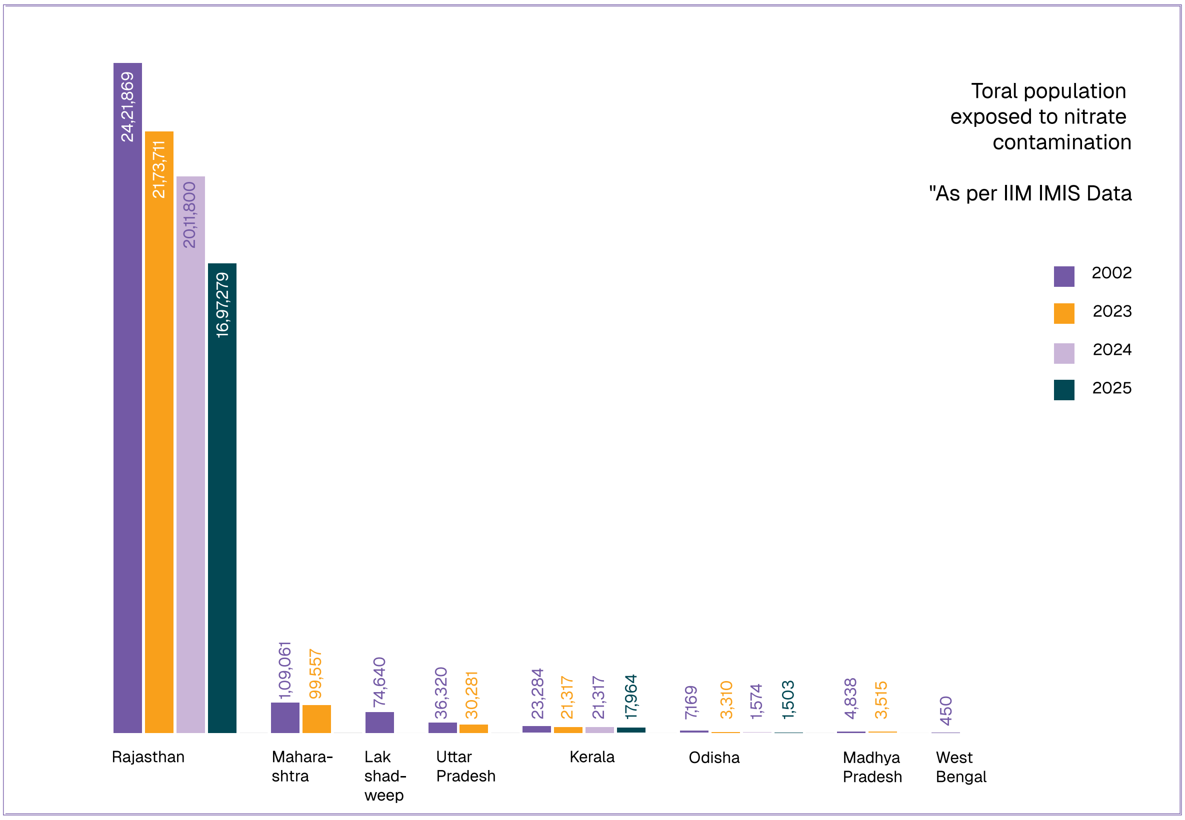
Nitrate originates primarily from agricultural fertilisers and inadequate sanitation. High nitrate levels can cause the blue baby syndrome in infants. Nitrate contamination is deeply concentrated—Rajasthan carries the largest burden, but inconsistent reporting across states raises concerns about monitoring reliability, with CGWB samples frequently showing contamination in states (Uttarakhand, Uttar Pradesh, Maharashtra) that have not reported it since 2023.[8]

States with highest nitrate contamination



Inland salinity results from arid conditions and flood irrigation; coastal salinity from seawater intrusion driven by over-pumping. Together, they affect both inland states (Rajasthan, Uttar Pradesh, Madhya Pradesh) and coastal aquifers (Kerala, Maharashtra, Odisha, West Bengal), with approximately 2 lakh sq. km estimated to be affected.

Toral population exposed to nitrate contamination



1.1.5 The unaddressed Tier: Emerging contaminants

While fluoride, arsenic, and biological contamination have dominated India's rural water quality agenda for decades, a second tier of contaminants—uranium, manganese, and microplastics—is now emerging. Each is documented by researchers but largely unaddressed by policy or programme.

Uranium leaches into groundwater through natural rock-water interaction, accelerated by over-extraction and fertiliser-driven nitrate inputs[12]. A 2020 pan-India survey found 151 districts across 18 states partly affected, with Punjab worst hit; the primary health risk is nephrotoxicity[13].

Manganese, a naturally occurring contaminant worsened by industrial pollution, may affect nearly 60 million people consuming groundwater exceeding India's BIS standard,[14,15] with neurological effects including lower IQ, behavioural changes, and impaired motor coordination, with infants at greatest risk[16]. Microplastics enter water through waste and degrading packaging; concentrations up to 1,889 particles/litre have been documented in Indian groundwater[17], with most affected households unaware of the contamination.

What unites all three is the absence of a response architecture—no BIS standards, no dedicated national programmes and no systematic rural surveillance. The pattern echoes what happened with fluoride and arsenic: communities were exposed for decades before institutions mobilised.

12. https://www.indiawaterportal.org/drinking-water/uranium-drinking-water-growing-concern-india
13. https://www.chemistryworld.com/news/the-subterranean-chemistry-that-explains-indias-groundwater-contamination/4017578.article
14. https://eartharxiv.org/repository/view/7574/
15. https://www.nature.com/articles/s41598-024-78478-0
16. https://wqa.org/resources/manganese/
17. https://www.sciencedirect.com/science/article/abs/pii/S2468584425000145
18. https://jaljeevanmission.gov.in/sites/default/files/guideline/JJM_Operational_Guidelines.pdf
19. https://dmeo.gov.in/sites/default/files/2019-10/Evaluation%20Study%20on%20Rajiv%20Gandhi%20National%20Drinking%20Water%20Mission%20%28RGNDWM%29.pdf

1.2

The Policy Response: From ARWSP to Jal Jeevan Mission

India's rural water policy has evolved from infrastructure provision to a convergent, service delivery model that integrates access, quality, sustainability and local governance.

Phase

Early Infrastructure Phase

Core Focus

Safe drinking water to all habitations via boreholes, hand pumps, and managed schemes.

Policy / Mission (Year)

Accelerated Rural Water Supply Programme (ARWSP)[18] (1972–73)

Key observations

No specification of parameters to define or measure 'safe' water

---

Phase

Mission Mode & Quality Awareness

Core Focus

40 lpcd within 1.6 km; community involvement in O&M

Policy / Mission (Year)

National Drinking Water Mission (NDWM) → Rajiv Gandhi National Drinking Water Mission (RGNDWM)[19] (1986)

Key observations

Focused on water quality and community participation

Phase	Core Focus
Development of Policy Framework	2002: water quality standards and monitoring; 2012: IWRM basin-planning, mandatory sewage treatment
Policy / Mission (Year)	**Key observations**
National Water Policy (1987, revised 2002 and 2012)[20]	Water quality evolved from a peripheral concern to being central to water security

Phase	Core Focus
Decentralisation	Drinking water responsibility devolved to Panchayati Raj Institutions
Policy / Mission (Year)	**Key observations**
73rd Constitutional Amendment (1992)	Shifted rural water management to a decentralised governance framework

Phase	Core Focus
Community Ownership	Demand-driven, community-led planning; GP responsible for WQ testing and response
Policy / Mission (Year)	**Key observations**
Sector reform pilot projects (SRPP) (1999) [21] Swajaldhara Programme (2002) [22]	Laid the institutional foundation for later programmes; distinct shift from supply-driven approach

Phase	Core Focus
Integrated Programme	Tap water connections to every rural household; quality, sustainability
Policy / Mission (Year)	**Key observations**
National Rural Drinking Water Programme (NRDWP) (2009)	Comprehensive programme covering access, quality, and sustainability

Phase	Core Focus
WQ Standards & Surveillance	National benchmark for potable water; multi-tier lab monitoring; fluorosis surveillance; arsenic and fluoride mitigation
Policy / Mission (Year)	**Key observations**
BIS IS 10500 (1991, 2012 revision); NRDWQM&SP (2006) [23]; NPPCF (2008–09)[24]; National Water Quality Sub-Mission (NWQSM) (2017) [25]	Multi-tier monitoring system established; FTKs distributed at village level

20. https://www.pib.gov.in/newsite/PrintRelease.aspx?relid=70832&reg=3&lang=2#:~:text=Other%20features%20of%20the%20policy%20include:%20*,**National%20perspective%20for%20water%20sharing%20and%-20distribution**
21. https://www.ircwash.org/sites/default/files/James-2004-India.pdf
22. https://archive.pib.gov.in/release02/lyr2002/rdec2002/25122002/r251220021.html
23. https://master-jalshakti-ddws.digifootprint.gov.in/static/uploads/2024/07/78ef5d700d21ab557773a5cdb490bd3a.pdf
24. https://ncdc.mohfw.gov.in/wp-content/uploads/2024/05/1-NPPCFnewguidelinebyGOI.pdf
25. https://jaljeevanmission.gov.in/sites/default/files/guideline/Guidlines%20Arsenic.pdf

Phase	Core Focus
Service Delivery	Functional Household Tap Connections (FHTC); 2% of budget for WQMS
Policy / Mission (Year)	**Key observations**
Jal Jeevan Mission (JJM) (2019–2025)	FHTC coverage rose from 19% to 81%; high focus on water quality monitoring

Phase	Core Focus
Systems Thinking	Sustainability, O&M, water quality assurance; long-term service reliability
Policy / Mission (Year)	**Key observations**
Jal Jeevan Mission 2.0 (2026–2028)	Shift from coverage to service delivery

The Jal Jeevan Mission, launched in 2019, represented a qualitative shift in ambition and funding. Its 2% budget allocation for Water Quality Monitoring and Surveillance (WQMS), and the institutional architecture this created—mandating community-level testing, data reporting, and convergence between PHED and health departments—provided the framework within which INREM's WQM Course, Guided Mentoring, and the JalDoot Programme would be embedded. With JJM 2.0's shift toward service delivery, there is a need to strengthen comprehensive WQMS systems and reinforce village-level testing mechanisms for regular and reliable surveillance.

26. https://jaljeevanmission.gov.in/sites/default/files/guideline/JJM_Operational_Guidelines.pdf

1.3

The Governance Challenge: Federalism and Fragmentation

India's federalist system gives states primary authority over water allocation. Only 16 of 36 states and territories have aligned their water policies with the National Water Policy (2012). For water quality specifically, this fragmentation produces four structural consequences.

Siloed data systems:	CGWB monitors groundwater through 23,000 observation wells; CWC monitors surface water at 500+ stations; CPCB monitors effluent compliance—but these datasets are rarely integrated at the district or block level where action must occur. Most data reported by different institutions paint a different picture.
Fragmented responsibility:	PHED oversees water supply systems, the Health Department addresses contamination-related health outcomes, and Panchayati Raj Institutions manage local operations. While PHED serves as the nodal agency under JJM, no single institution is responsible for the full chain from source to safe consumption.
Capacity gaps:	More than 2,184 laboratories, including 1,654 NABL-accredited facilities, operate across states and UTs, each staffed with lab technicians, chemists, consultants, and data managers. With emerging contaminants and evolving challenges, continuous efforts to strengthen the capacity of the people involved in water quality management and surveillance are essential.

Weak community feedback loops:	Even when water quality is tested, information often does not reach communities in time, leaving households unaware of risks and unable to take preventive action.

It was precisely these governance gaps that Arghyam explored, envisioning Digital Public Infrastructure that can enable interoperable systems and inter-departmental collaboration, investing in capacity development, and deploying school children as JalDoots who carry the message of water quality surveillance to their communities.

1.4

The Space for Civil Society

By the early 2010s, the cumulative evidence was clear. India's water quality crisis was geographically vast, institutionally neglected, and invisible to the communities most affected. Technical knowledge existed—in the CGWB and a small network of dedicated NGOs and researchers—but it was not reaching frontline workers, panchayat officials, and communities who needed it most.

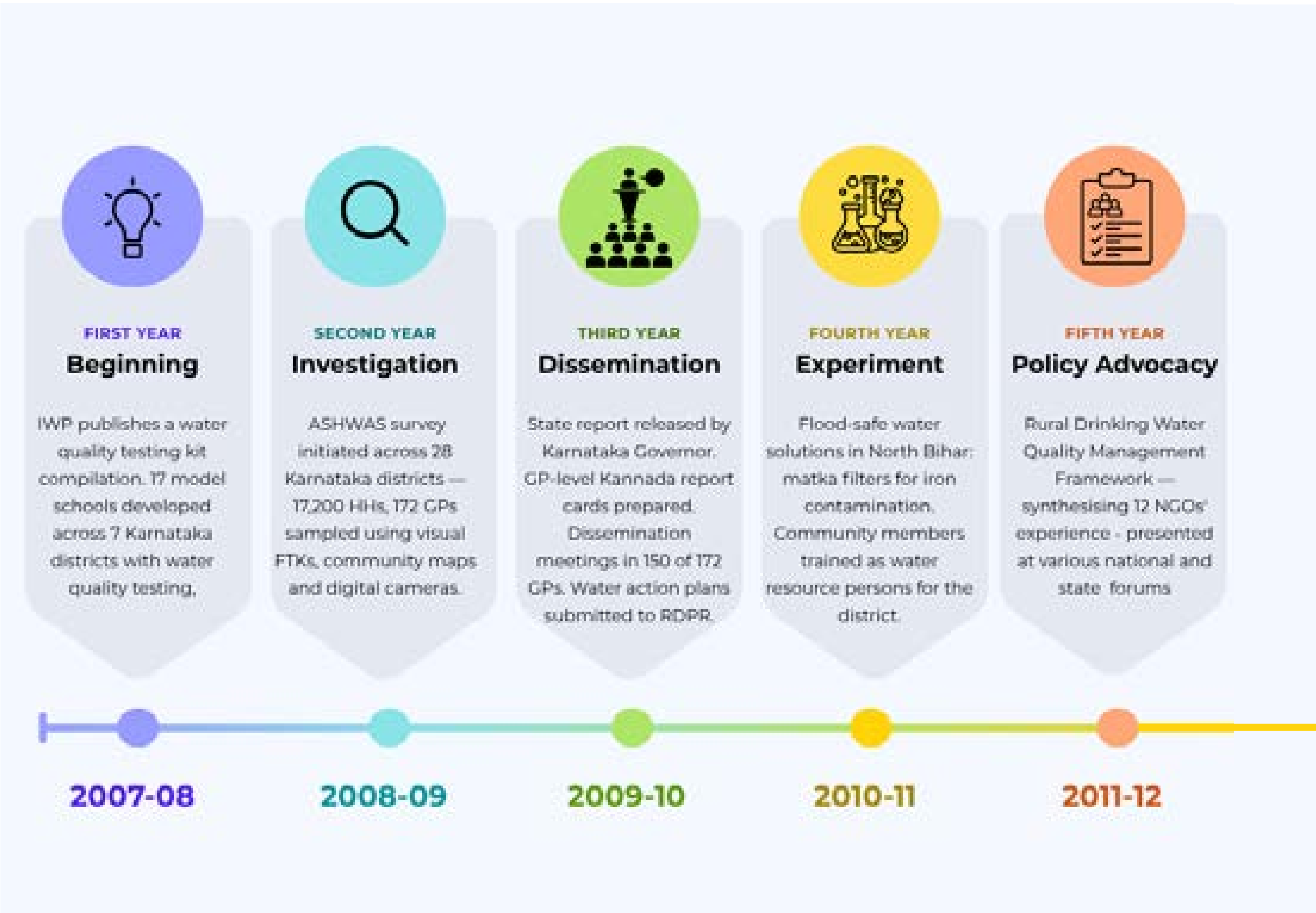
The publication of Arghyam's WQM Framework in 2011, synthesising the experiences of 12 NGOs and presenting it to the Ministry of Drinking Water and Sanitation, was a first attempt to make this distributed knowledge legible to the government. The seeding of the Fluoride and Arsenic Knowledge and Action Networks in 2013 was the more ambitious response. Rather than compiling knowledge for the government, it sought to build a living ecosystem of practitioners who could generate, share, and act on knowledge in their own geographies.

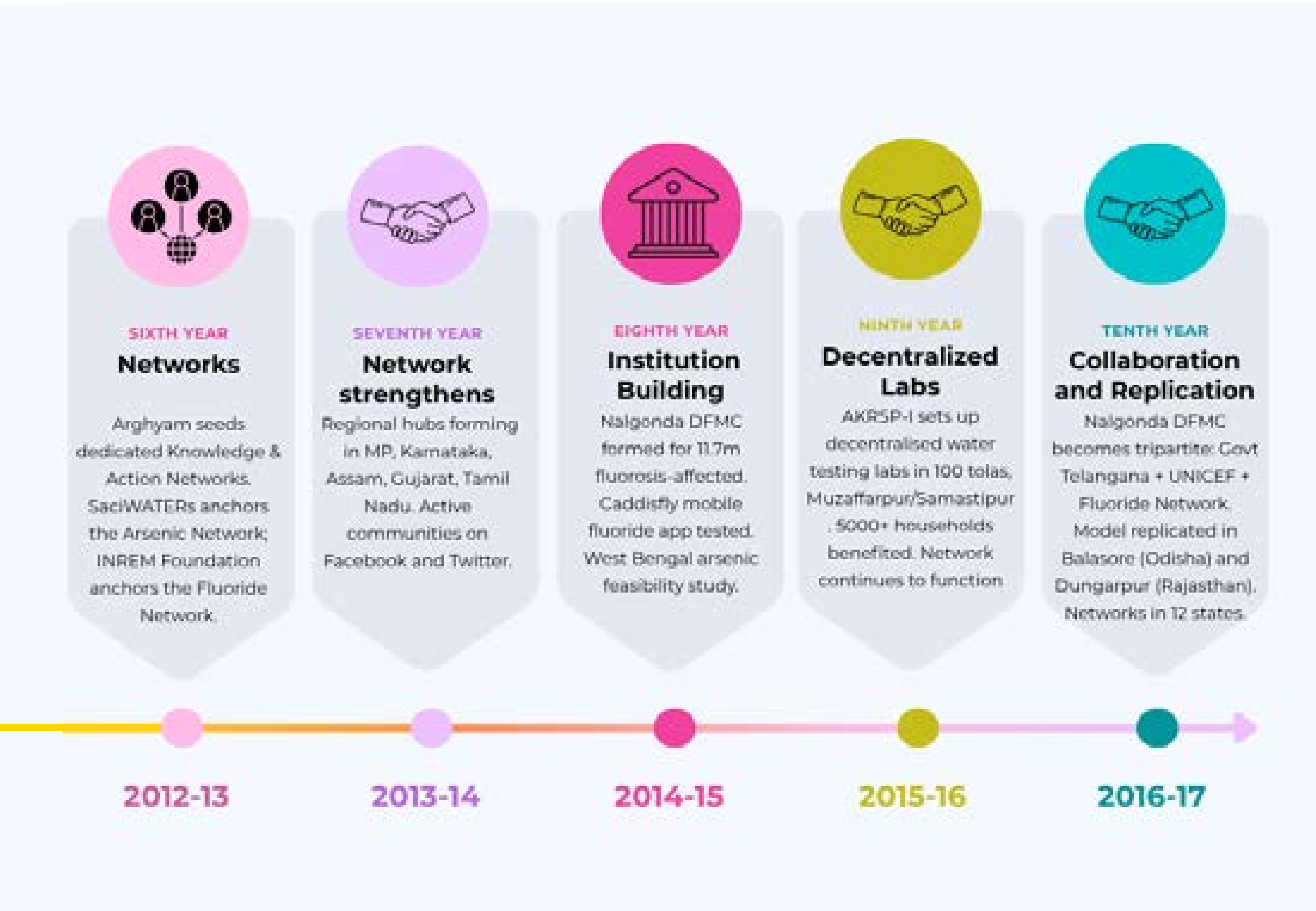
This choice to invest in ecosystem infrastructure rather than individual projects defines the entire Arghyam-INREM partnership and its most durable achievements. The chapters that follow document how that choice played out, and what it produced.

Chapter 2

Journey of Arghyam (2007–17)

The engagement of Arghyam with water quality did not begin with a grand strategy. It began with curiosity, a few grants, and the growing realization, confirmed by field data, that access to water and access to safe water were very different things. This chapter traces the first seventeen years: from scattered early experiments in Karnataka and Bihar, to the seeding of India's first dedicated water quality knowledge networks, and the emergence of district-level institutions that would carry that work forward.




SIXTH YEAR
Networks
Arghyam seeds dedicated Knowledge & Action Networks. SaciWATERs anchors the Arsenic Network; INREM Foundation anchors the Fluoride Network.
SEVENTH YEAR
Network strengthens
Regional hubs forming in MP, Karnataka, Assam, Gujarat, Tamil Nadu. Active communities on Facebook and Twitter.
EIGHTH YEAR
Institution Building
Nalgonda DFMC formed for 11.7m fluorosis-affected. Caddisfly mobile fluoride app tested. West Bengal arsenic feasibility study.
NINTH YEAR
Decentralized Labs
AKRSP-I sets up decentralised water testing labs in 100 tolas, Muzaffarpur/Samastipur. 5000+ households benefited. Network continues to function.
TENTH YEAR
Collaboration and Replication
Nalgonda DFMC becomes tripartite: Govt Telangana + UNICEF + Fluoride Network. Model replicated in Balasore (Odisha) and Dungarpur (Rajasthan). Networks in 12 states.
2012-13
2013-14
2014-15
2015-16
2016-17

ASHWAS:	First citizen-led survey of water & sanitation in rural Karnataka, covering 17,200 households, 28 districts, and 172 GPs; results returned to every sampled panchayat.
WQM Framework:	First sector-wide synthesis document prepared, circulated to all state Principal Secretaries.
Water Quality Networks seeded (2013):	India's first dedicated Knowledge & Action Networks on fluoride (INREM) and arsenic (SaciWATERs), reaching 12 states by 2016.
Nalgonda DFMC (2014):	First dedicated District Fluorosis Mitigation Centre, tripartite model with Govt/UNICEF/Network serving 11.7m people. Replicated in Balasore and Dungarpur.
Safe Water Learning Cards:	Modular, card-based capacity building tool, a foundational design philosophy that prefigured the later WQM Course content architecture.
Schools Fluoride Testing Programme:	~1,500 schools involved in fluoride testing and awareness nationwide, through the IWP/Oracle Education Foundation.
Establishment	Establishment of 2 decentralized labs in the districts of Muzaffarpur and Samastipur in Bihar where 12 parameters were tested, including nitrate, bacterial contamination, and iron with an attempt to generate demand and bring testing closer to the communities.
Balasore IMIS entry (2016-17):	Bottom-up evidence from field assessments by teachers and community members drove villages' inclusion on government IMIS, enabling the NPPCF programme.
EU + UNICEF funding	EU + UNICEF funding secured for 8 districts in Bihar and Assam validating networks' credibility and positioning INREM for the next phase.

2.1

Making Water Quality Legible: ASHWAS (2008-10)

The ASHWAS survey was Arghyam's most ambitious early statement about evidence-driven water quality action. Inspired by Pratham's ASER, it covered 17,200 households, 172 GPs, and 28 districts. The findings were sobering: 60% of water samples exceeded permissible fluoride limits, 38% had bacteriological contamination, yet 58% of respondents were fully satisfied with water quality, a striking indicator of the invisible nature of chemical contamination.

The GP-level dissemination process, which returned results to communities in Kannada and facilitated action planning meetings in 150 GPs, was one of the programme's most important innovations. Water action plans were submitted to the RDPR department, completing the feedback loop.

2008–2010

ASHWAS: A Survey for Household Water and Sanitation

Key Achievements

- 17,200 households surveyed across 172 GPs in 28 Karnataka districts
- State report released by the Governor of Karnataka, July 2009
- GP-level Kannada report cards prepared and shared at 150 action planning meetings
- Water action plans from 150 GPs submitted to the RDPR department
- Key finding: 60% fluoride exceedance + 38% bacteriological contamination, yet 58% satisfaction

Learnings

- Satisfaction with water quality is not a proxy for safety. Chemical contamination is invisible; awareness must precede behaviour change.
- Returning data to communities in local language and actionable form is as important as collecting it.
- FTK availability and utilisation gap (only 49% of GPs with FTKs used them) foreshadowed a problem that would persist throughout the decade.

2.2

The Network Insight: From Linear to Ecosystem (2012-17)

By 2012, Arghyam had reached a strategic inflection point. No single project could cover 200+ contaminated districts. The missing ingredient was an ecosystem, a network of actors who could share knowledge, learn from each other, and act in their own geographies. The seeding of the Fluoride Knowledge Action Network (FKAN) with INREM Foundation, and the Arsenic Knowledge Action Network (AKAN) with SaciWATERs, was Arghyam's most consequential strategic decision of this period.

2012–2017

Fluoride Knowledge and Action Network (FKAN): Anchored by INREM Foundation

Key Achievements

- Network presence expanded to 12 states including AP, Assam, Bihar, Gujarat, Jharkhand, Karnataka, MP, Odisha, Rajasthan, Telangana, UP, and West Bengal.
- Nalgonda DFMC, India's first dedicated District Fluorosis Mitigation Centre, a tripartite budy involving the government, UNICEF and Network, serving 11.7m people in Telangana.
- Safe Water Learning Cards: Modular, flashcard-based capacity building tool prefiguring the later WQM Course content philosophy.
- Caddisfly mobile app prototype tested in Nalgonda and Jhabua (2014), early experiment with community-facing technology for fluoride testing.
- EU and UNICEF support secured for interventions in 8 districts across Bihar and Assam (2017-18).

Learnings

- Networks need a dedicated secretariat (INREM's role), regular convening, and a clear theory of change. The first two years were largely about building trust.
- Government institutionalisation (DFMC model) is the point at which a network's work becomes durable. The Nalgonda DFMC outlasted the initial project funding.

What the network era actually built

The FKAN and AKAN years produced a knowledge commons, shared frameworks, peer relationships, and a set of tools (Safe Water Learning Cards, LEARN platform, DFMC model) that would outlast the network structure itself. They built individual and organisational depth through fellowship and peer exchange. What they did not build was a standard quality floor, a structured learning pathway, or any mechanism for a practitioner to demonstrate recognised competence. The network's deliberately open architecture was its strength and its limit simultaneously.

What the DFMC model showed us

At its best, the DFMC demonstrated that communities could be genuine institutional co-owners of a contamination response, not just recipients of government action. But when network support withdrew, several DFMCs went quiet. The institutional architecture remained. The energy that sustained it had been partly INREM's to provide. We had built platforms without fully building the conditions for communities to sustain them independently. That learning would take years to name clearly.

Key Learnings & Insights

Making data legible to communities (ASHWAS) and making community data legible to government (Balasore/IMIS) are two different, equally important problems. Both require dedicated design.

District Fluoride Mitigation Centres demonstrated success of embedding civil society institutions into government mechanisms (with co-design and co-ownership of government since inception) yet also created dependability on its presence for sustainability.

The knowledge framework and tools (such as safe water learning cards) created by the Knowledge and Action Networks remained relevant beyond the network itself.

Chapter 3

Journey of Arghyam (2018–26)

The second phase of Arghyam's water quality journey is defined by acceleration and institutionalisation. COVID-19 forced a pivot to digital learning that created conditions for national scale. The Jal Jeevan Mission provided an unprecedented government mandate. INREM Foundation evolved from a knowledge convener into the JJM's thematic lead on Water Quality Management, shaping national capacity building architecture.

2018-19
Platform Thinking & Digital Learning (LMS/ForWater)

INREM integrates the ForWater LMS. 'Fluoride ABC' course launched. Safe Water Learning Cards digitised. Suno-Bolo, speaking walls with QR codes enabling two-way community communication tested.

2019-20
Jalagara Training + PDA Deployment: Chikkaballapur

290 Jalagara trained across 13 batches on water quality testing. PDA (Participatory Digital Attestation) deployed. ~100 drinking water sources tested in 22 GPs.

2020-21
COVID Pivot: Virtual Training + IFM + Churu Health Workers

900 health workers in Churu (Rajasthan) trained virtually on fluorosis, a watershed moment in digital training. IFM Course Batch 2 for 36 NGOs across 12 states. Guided Mentoring pilot.

2021-22
WQM Course Launched + INREM as JJM Sector Partner

WQM Course launched with UNICEF, Gram Vikas, Tata Trusts, WaterAid. 700 participants from 28 states in the first year. INREM selected as JJM Sector Partner and RWPF Thematic Lead on WQM.

See Chapter 4

For detailed learning insights across five sections: (1) Building Communities of Practice, (2) Making Contamination Visible: Who Carries the Message, (3) Leveraging Technology to Scale, (4) Working With the Government, (5) Findings of the Study on WQMS HR Structure.

See Annexures

Annexure A: Development Solutions Impact Study Key Findings (WQM Course & Learning Groups) · Annexure B: JalDoot Cause Analysis Survey Findings · Annexure C: INREM as a Changemaking Network (Ashoka Case Study)

2022-23
WQM Scales to 1,545 Participants + JalDoot Design + WQMS MP

14 batches of the WQM Course, 1,545 participants across 28 states and 350 districts. MP moves from 14th to 4th position nationally in FTK tests. NJJM Learning Groups in 29 States/UTs. JalDoot Programme in Assam designed. WQMS work launched in Jhabua, MP.

2023-24
JJM Digital Academy + Jharkhand Hub + JalDoots

WQM Course integrated into the JJM Digital Academy (DDWS, Sep 2023). Jharkhand runs the first independent State WQM Hub. JalDoot: 500 JalShalas, 20,000 students across 33 districts in Assam.

2024-25
FLW Whats App Pilots + 53,360 JalDoots + State Hubs

WhatsApp bot pilots in Nalbari (190 FLWs) and Jhabua (150 FLWs). BCC experiment: ASHA+doctor video = highest adoption. 53,360 cumulative JalDoots. 168 MP PMU officials trained. JalDoot wins Water Digest + Asian Water Awards 2024.

2025-26
Study on 'The human infrastructure behind water quality'

INREM Foundation and Arushya Foundation map the HR structures underpinning WQMS across 5 states to identify where critical gaps lie, and to understand what conditions enable or constrain effective water quality surveillance on the ground.

Chapter 4

Learning and Insights from WQ Related Work (2018–2026)

Understanding the Pathways to Change

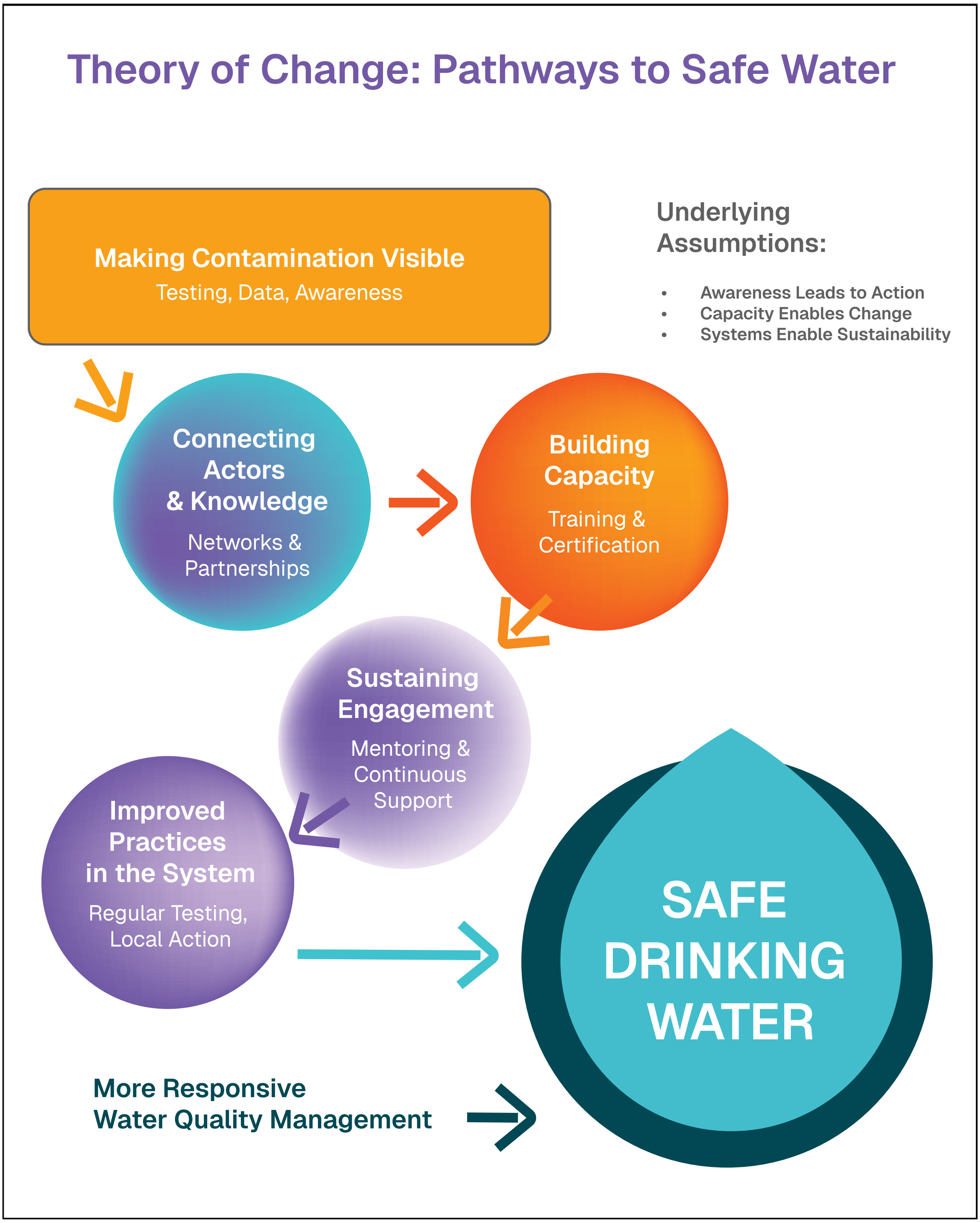
Arghyam's work on water quality, over the years, has been guided by an evolving understanding of how change takes place within complex systems. Rather than a single intervention, the approach has combined multiple pathways that together enable awareness, action, and response.

At its core, this Theory of Change brings together four key elements: making contamination visible, connecting actors through networks, building capacity, and sustaining engagement over time. These pathways are interlinked and reinforce each other, enabling actors within the system to engage more effectively with water quality challenges.

The sections that follow build on this framing. They examine, in detail, five key aspects of the ecosystem where these pathways have been applied, highlighting how different approaches have evolved, what has worked across contexts, and where further strengthening is required.

LogFrame

Level	Elements	Description
Impact (Goal)	Safe drinking water	Households consistently access safe drinking water through improved water quality management
Outcomes	System responsiveness	• Timely identification of contamination • Improved response and corrective actions • Increased community engagement and demand for safe water
Intermediate Outcomes	Behaviour & system shifts	• Frontline workers regularly test and report water quality • Communities recognise and respond to contamination risks • Institutions use data for decision-making • Institutional capacity built for taking actions
Outputs	Immediate results of interventions	• Trained frontline workers and practitioners • Functional networks and knowledge platforms • Increased availability of water quality data • Ongoing engagement mechanisms (mentoring, peer learning)
Key Activities	What is done	• Community awareness and testing initiatives • Formation of networks and knowledge exchanges • Capacity-building programmes (courses, certifications) • Continuous engagement (mentoring, digital platforms)
Inputs	Resources used	Technical expertise, partnerships, digital platforms, training systems, institutional collaboration
Assumptions	Conditions required	• Awareness leads to engagement when supported by systems • Capacity translates to action with sustained engagement • Networks enable adoption across contexts • Institutional alignment supports continuity and scale



These learnings emerging from the body of work done over the years can also be viewed through a Diagnostic–Curative–Preventive lens. At a broad level, the diagnostic dimension relates to making contamination visible through testing, data, and awareness; the curative dimension focuses on enabling appropriate response once risks are identified; and the preventive dimension looks at addressing contamination at source and reducing long-term risks.

Much of the work over time has contributed to strengthening the diagnostic aspects, while also engaging, in different ways, with curative and preventive elements. Seen in this light, the insights that follow cut across these dimensions, with different interventions contributing in overlapping ways.

As outlined in the Theory of Change section, this chapter synthesises learnings across five thematic sections:

4.1	Building Communities of Practice	Connecting Actors and Knowledge (primary); Sustaining Engagement; Building Capacity
4.2	Who Carries the Message	Making Contamination Visible (primary); Improved Practices in the System; Sustaining Engagement
4.3	Leveraging Technology to Scale	Building Capacity (primary); Making Contamination Visible; Sustaining Engagement; Connecting Actors and Knowledge
4.4	Working with the Government	Improved Practices in the System (primary); Connecting Actors and Knowledge; Sustaining Engagement
4.5	Findings of the Study on WQMS HR Structure	Sustaining Engagement (primary); Building Capacity; Improved Practices in the System

4.1

Building Communities of Practice

This section traces how practitioners and experts were developed within the system for comprehensive Water Quality Management and Surveillance through virtual courses, guided mentoring, and trainer's certification.

4.1.1 Integrated Fluorosis Mitigation (IFM) training programme

Working with district consultants, ASHAs, ANMs, and Medical Officers across Churu, INREM Foundation, in partnership with UNICEF, developed and delivered an Integrated Fluorosis Mitigation (IFM) training programme. Over 900 health workers were trained across three blocks in a virtual modality, an approach unprecedented for this cadre at the time. The training was designed to make fluorosis and its connection to drinking water legible to frontline health workers who had not previously engaged with the issue.
The training was conducted virtually during the COVID period, when physical delivery was impossible. Content was designed to function independent of physical delivery: as reusable learning objects, with voice-overs in local languages, simplified visual formats, and practitioner-oriented material. The multi-language format, encompassing Hindi and English, was a critical inclusion feature that enabled participants to engage in the language in which they were most comfortable.

This experience is widely regarded internally as a formative moment in INREM's approach to digital training, not because of the technology, but because it demonstrated that frontline health workers, often assumed to be technology-averse, could engage deeply with virtual learning when content was relevant, experts were accessible, and the learning connected directly to their job responsibilities. The Churu experiment provided the confidence and methodology that later informed the WQM Course design.

Several lessons emerged from this engagement. Working within existing government systems, rather than creating a parallel cadre, proved significantly more scalable. By building the capacity of ASHAs, ANMs, and Medical Officers already embedded in the health system, INREM reached frontline workers with existing community trust and institutional backing. The postponement of the third module due to an ASHA strike offered an early illustration of a recurring challenge: the scheduling of government health worker engagements requires flexibility as a design requirement, not an afterthought.

The NPPCF programme in Rajasthan was scaled from 12 to 30 districts with INREM's strategic support, including PIP planning and programme expenditure guidance. This contributed to a significant increase in programme expenditure from 4–7% in 2019–20 to approximately 50–70% in 2022–23. A total of 137 Master Trainers for NPPCF were trained across three Rajasthan districts in the process.[27]

4.1.2 Water Quality Management Course: Building systemic capacity

The Water Quality Management (WQM) Course, co-imagined by INREM Foundation and Arghyam, launched was in August 2021 with 9 modules and 22 sub-sections, built specifically around the Jal Jeevan Mission context. Its timing proved consequential: the course arrived precisely when JJM's Water Quality Monitoring and Surveillance framework was being activated, giving state officials a compelling institutional reason to participate.

2300
WQM Course participants

350
Districts covered

28
States reached

85%
Skill retention at 2 years [Ashoka2025]

The participant profile reflects the programme's cross-sectoral reach. 46% of participants came from government agencies, while 35% were from civil society organisations; the remaining participants were drawn from research, academic, and private sector contexts. 67% of respondents were working directly in the Jal Jeevan Mission; 68% reported using the course content in further training; and over 83% indicated they would recommend the course to colleagues.

States including Madhya Pradesh, Chhattisgarh, Haryana, and Maharashtra issued official notifications directing JJM water quality functionaries to attend the WQMS Course and provided dedicated time for participation. Certificates issued upon completion added formal recognition to participants' qualifications. The course also produced measurable field-level outcomes.

27. https://inremfoundation.org/project/institutionalizing-systems-for-water-quality-and-health-linkages/

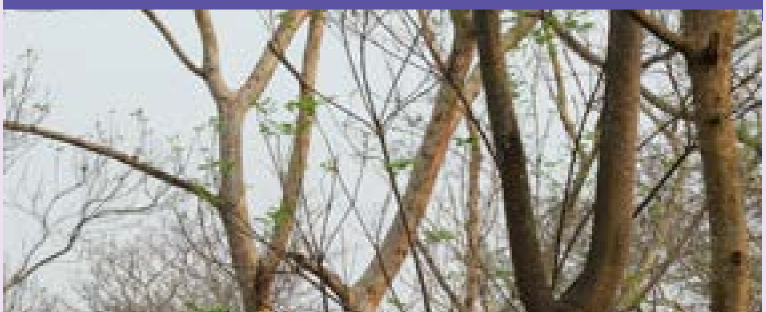
In Chhattisgarh, FTK tests exceeded 8,80,000 in FY 2021–22, making the state the national leader in FTK testing and accounting for 27.4% of all FTK tests across the country that year. Madhya Pradesh improved from the 14th to the 4th position nationally in FTK tests in FY 2023, with volumes increasing from 1.6 lakh in FY 2022 to 3.6 lakh in FY 2023. Taken together, the WQM Course reached an estimated 9% of the 25,000–28,000 WQ practitioners nationally.

An honest evidence gap

Participants acknowledged the capabilities built through the WQMS course, applying course knowledge in further training, and FTK test volumes increased across most participating states. However, improved outcomes in terms of safe water being supplied and community behaviours being positively affected remained difficult to track and measure. These numbers and perceptions do not tell a complete story, a challenge that is inherent to large-scale capacity-building interventions, where counting participants is not the same as counting outcomes.

"Highly interactive, mind-boggling, well-structured course with the best of experts onboard. This course helped me to get curious, gain knowledge, and reconnect with water to become a part of the National Water Quality Network."

Rupakshi S. Mathur,
IPE Global: Batch 2, WQM Course



4.1.3 Scaling the Water Quality Management Course Through Trainer Certification and State Hubs

It became evident early on that reaching the envisioned 40,000 practitioners across 766 districts was impossible through direct delivery alone. The Trainer Certification Programme was developed as a deliberate response, converting WQM Course graduates into credentialed trainers capable of independently replicating the course within their own states. Conducted virtually in Hindi and English, each batch was customized to local water quality issues. Beyond technical content, the programme equipped participants with adult learning principles: how to engage audiences empathetically, encourage participation, and build confidence in the subject. To date, 205 WQM Course participants have been enrolled in the Trainer Certification Programme, of whom 100 have completed the programme and are being certified as Water Quality Trainers.[28]

"As a participant-turned-trainer, I was exposed to new modes of training using innovative methodologies. My confidence and delivery skill improved as I began training and support was provided to me to turn the lectures into an engaging, interactive experience. This was the best train-the-trainer course from a team of seasoned professionals I have attended so far."

Noopur Rai,
UP Jal Nigam,
Water Quality Trainer

"Initially, when I began training for the first time, I used to choose courses that were of particular interest to me or that I was comfortable delivering. My conviction has improved, and I am able to take up any course selected by the team. From a person with limited training experience, I have turned into one who is a better trainer and facilitator now."

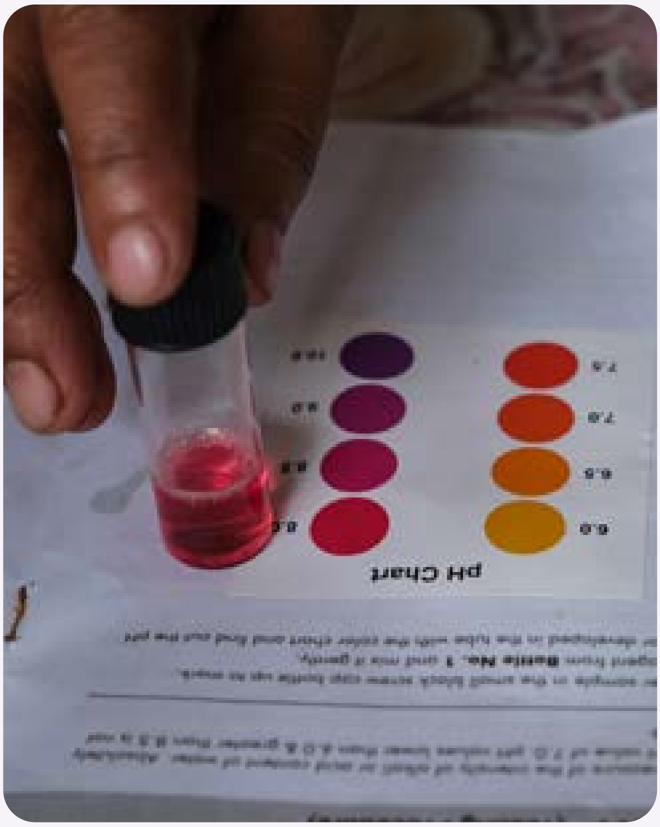
Anuja Kalra,
a PhD scholar at Indraprastha University, IFM Alumni and Water Quality Trainer

28. https://www.indiawaterportal.org/articles/creating-pool-water-quality-trainers-scale

The first WQM Hub was initiated in Jharkhand in March 2023, where a variation of the WQM Course was designed to build capacities of laboratory staff in support of the NABL accreditation process. Key officials from all districts of Jharkhand were identified for the first batch. Sugandha Ganguly, State Coordinator for WQM&S in Jharkhand and a graduate of Batch 12 and the Trainer Certification Programme, customised the WQM content for Jharkhand's specific needs of NABL accreditation for 29 water quality laboratories and ran the first independent State WQM Hub. Jharkhand thereby became the first state to conduct the course entirely on its own initiative.

Key challenges in establishing state hubs

Interest in the State Hub model emerged across Madhya Pradesh, Jammu & Kashmir, and Chhattisgarh, but did not translate into activation. Jharkhand was the exception precisely because a water quality champion existed within the system, a motivated state official who took ownership. Elsewhere, states expected INREM to take the lead, but resource constraints made it impossible to replicate the depth of effort across multiple states simultaneously. This represents a misalignment of expectations rather than a failure of intent. An NGO with local presence within the state water system and a substantive interest in water quality is the missing institutional anchor in most contexts. The lesson that emerges is consistent with evidence from other capacity-building programmes: the State Hub model requires a local actor, inside or closely allied with the government system, to own it. The identification and nurturing of that actor is the real replication strategy.



4.1.4 Guided Mentoring to Build Communities of Practice

INREM Foundation introduced guided mentoring in 2021 as a form of post-course support to address the complex and contextually variable challenges associated with water quality management. Adapted from Project ECHO (ECHO India) and redesigned for the water sector, Guided Mentoring creates a structured space for practitioners to present real field challenges, receive expert and peer input, and learn in small breakout groups where psychological safety is high. As participants brought their own local issues into discussion, it became evident that the group itself carried significant contextual knowledge. Over 52 guided mentoring sessions, 800 participants and officials from 29 states have worked through real problems from their own implementation contexts. The environment is largely free from the professional risks present in formal review settings, encouraging participants to be open and candid, including acknowledging their own mistakes. 98% of the participants surveyed indicated that guided mentoring improved their understanding of field challenges and that they had benefited from the experience of peers and experts. The multi-language format, with Hindi and English breakout rooms, was identified as a critical inclusion feature that enabled participants to engage in substantive discussions in their preferred language.

I was heartened by the openness of these discussions, where participants even admitted their mistakes without fear. In a review meeting, this space is not there. Here, people were ready to accept that there was a problem, they were ready to address them, they were seeking solutions."

Water Expert/ Learning Group Mentor

"The most engaging were the break-out rooms because the discussions were more open, everyone participated, gave their inputs, and shared their experiences."

Chief Chemist,
State PHED

Key Learnings & Insights from WQM Course and Guided Mentoring

Development Solutions' assessment identifies three concrete knowledge outcomes from Guided Mentoring: a standardised FTK result-reporting format, whose absence only became visible through cross-state Learning Group discussions; adaptation of carbon filtration technology for Dal Lake (J&K), drawn from another state's field experience; and a GIS-based offline workaround for WQMIS uploads, surfaced when 23 states collectively flagged that poor internet connectivity was blocking FTK data submission entirely.

Gap in sustaining the guided mentoring

The key challenges ahead are ensuring complete ownership transfer from INREM to the states or to the National Jal Jeevan Mission, along with systematic documentation of guided mentoring discussions in formats that can be translated into practical, user-friendly manuals. Introducing international case studies to build awareness of global best practices remains a further priority.

4.1.5 Key Learnings and Insights from WQM Course, Trainer Certification, and Guided Mentoring

All three—WQM Course, Trainer Certification and Guided Mentoring—were ideas that had scale embedded in them and leveraged digital tools. They produced system capacities and outputs that were valued by the participants and the ecosystem. The scale depended on the ecosystem actors; the states and local actors taking the ideas, making it their own and scaling it with their own resources supported by INREM.

Capacity-building impact is real but hard to trace to outcomes.
FTK tests increased, knowledge was applied in further training, and skill retention at two years was strong. Yet the link between trained practitioners and safe water actually reaching communities remained difficult to measure. Counting participants is not the same as counting outcomes.

Adult learning principles matter as much as technical content.
Both the Trainer Certification and Guided Mentoring programmes embedded facilitation skills—empathy, language inclusion, audience engagement, and breakout group design—alongside water quality knowledge. Participants consistently cited these elements as transformative. The format, not just the content, was what changed how people learned and taught.

A model without a local owner does not replicate.
The State Hub was activated in Jharkhand because an internal champion took ownership, on the other hand, it remained dormant in Madhya Pradesh, Jammu & Kashmir, and Chhattisgarh. The scaling strategy is not the hub architecture; it is a network architecture with multiple local nodes, inside or closely allied with the government system, that will own it.

4.2

Making contamination visible: Who Carries the Message

Every successful water quality intervention ultimately depended on a person. This section traces the evolution of thinking about who these messengers are, how they are identified, what enables them, and what the experience has collectively revealed about the human infrastructure required for effective water quality change.

4.2.1 The JalDoot Programme: Students as Messengers

53,360
Students reached
By Feb 2025

953
Jal Shalas

33
Districts of Assam

11,515
Activities completed

The JalDoot Programme, co-designed with JJM Assam, trained school students as water ambassadors through two-day JalShalas and post-JalShala activities. Students in classes 9 and 11 across all 33 districts of Assam were trained as water quality messengers, JalDoots, equipped to carry messages about safe water from their JalShala sessions back into homes and villages. The programme also aimed to develop civic capacities, including critical thinking, creativity, problem-solving, and awareness of community issues. JalDoots were envisaged to amplify community involvement, conduct assessments of water supply schemes under JJM, and encourage communities to transition from handpumps to safe tap water.

A WhatsApp JalDoot Chatbot was tested as a means of engaging JalDoots and sustaining their motivation to take action. The programme operated without financial incentives, relying instead on a carefully designed recognition ladder in which JalDoots were recognised at successive levels: from Sarpanch to Collector to Chief Minister. A sense of belonging, the novelty of JalShala's extracurricular activities, and digital engagement kept JalDoots consistently motivated.

A Cause Analysis Survey conducted by Reap Benefit provided granular data on the message-to-action gap: 49.4% understood chatbot messages as activity-based, while 32.2% reported being prompted to take action. Reap Benefit Foundation was additionally engaged to design and support field engagement activities under the JalDoot Premier League. The WhatsApp chatbot experiment could not be sustained, however, due to funding constraints and procurement challenges within the government process. Operational difficulties with the JalDoot WhatsApp bot over more than three months affected new registrations and ongoing engagement.

The JalDoot Programme was recognised as a best practice in water management and education, leading to its adoption by the Central Board of Secondary Education (CBSE)[29]. It also received the 'Water Education and Awareness Initiative of the Year — India' award at the Asian Water Awards, and was honoured at the Jal Prahari Samman Samaroh in 2024, supported by NITI Aayog and the Ministry of Jal Shakti.

> "Getting students involved in this program was smart because they can help us reach every household and family. Each student can connect with one family so that we can reach up to 5,000 families this way."
>
> **District Official, Assam —**
> Development Solutions Impact Study

29. https://cbseacademic.nic.in/web_material/Circulars/2024/38_Circular_2024.pdf

Activities Leaderboard - Phase 1

18,515 Total jaldoots Engaged with Chatbot

71.6% | 25848

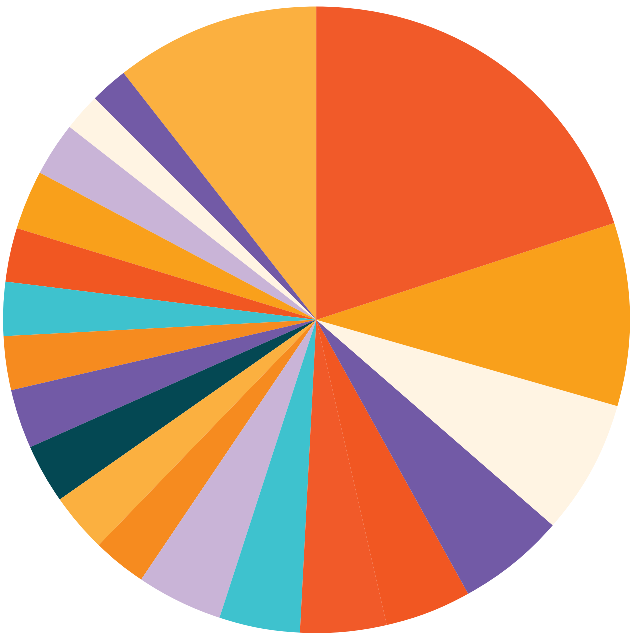
Total Actions 25,572

8,120 Action Takers

55.3% | 14686

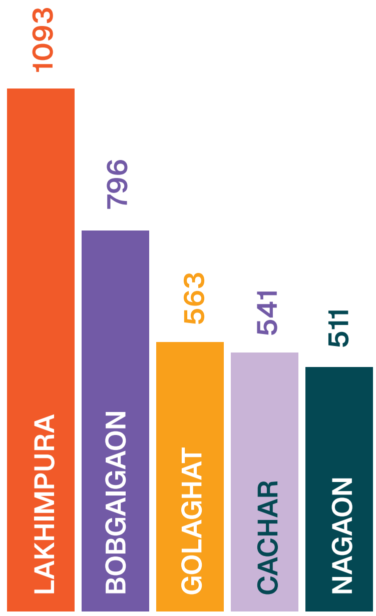
Multiple Action Takers 4,643

Activity Index



WSS Audit
JPL-Activity 1
JPL-New Activity 1
JPL-Activity 10
Republic Day
JPL - Activity 5
Magh Bihu
JPL-Activity 4
JPL-Hand Washing:
JPL-World Toilet Day
JPL-Activity 2
JPL-Activity 6
JPL-Activity 11
JPL-Activity 7
JPL-Activity 21
Plant a tree......

Top DIsticts



No. of Unique action taken-district wise

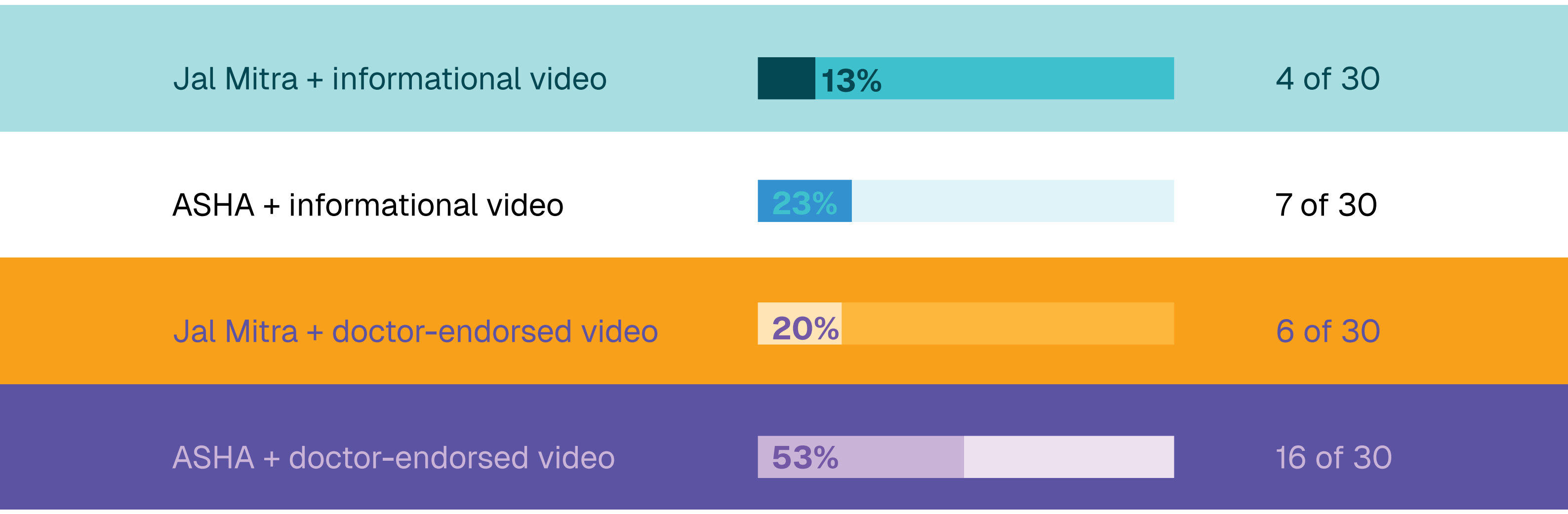
Gap in Sustained Institutionalisation and Long-Term Ownership

A critical gap in the programme has been its inability to translate strong initial design and early momentum into sustained scale and long-term impact. While the initiative achieved wide outreach, positive early response, and integration into formal systems such as the CBSE curriculum, scaling remained constrained. In Assam, the WhatsApp chatbot could not be sustained due to funding constraints and procurement challenges. Interest from other states could not be pursued, as implementation capacity was stretched too thin to support simultaneous multi-state rollouts.

This points to a broader and recurring gap: recognition and interest, even at the national level, do not automatically translate into the resources, institutional ownership, or implementation support that scaling actually requires

4.2.2 Doctors and Asha workers as messengers

Building upon earlier efforts on water quality awareness, a focused behaviour change communication study was conducted between October and December 2025 to understand what drives shifts in household water practices. 4 cohorts of 30 households each, across 4 villages in Nalbari district of Assam, each received a different combination of messenger and message: either a Jal Mitra (water operator) or an ASHA (health worker), paired with either a simple informational video or a doctor-endorsed video about arsenic risk and mitigation.



Source: INREM Foundation BCC Experiment Report, Oct–Dec 2025

The results were statistically significant and the pattern was clear. The ASHA worker, already embedded in households' health conversations and trusted with sensitive discussions about bodies and vulnerability, produced meaningfully higher behaviour change when she carried a doctor-endorsed message. Neither a trusted messenger alone nor authoritative endorsement alone was sufficient: the combination proved decisive.

The behaviour change communication pilot helped build clearer insight into what works in communicating water quality risks, particularly the importance of pairing a trusted messenger with credible, relatable messaging. However, the scale of this pilot is too limited to further validate these findings before recommending the model to the government as a replicable, evidence-based public health intervention.

4.2.3 Village Representatives: Making the Contamination Visible

A total of 183 frontline workers (Jal Mitra, Jal Doot, SHG Groups, ASHAs, 5 women for water testing, etc) in Nalbari, Assam, and 150 in Jhabua, Madhya Pradesh, were onboarded onto a Glific platform. The logic was that if village representatives could report water contamination issues directly to PHED through a digital channel, reporting would be faster and more traceable than verbal pathways, enabling PHED to respond more quickly. The pilot produced concrete outputs: a comprehensive district water quality scenario report for Nalbari, generated from frontline worker-sourced data; a Rapid Assessment WQMS toolkit for village-level use; and a District Level Assessment toolkit for officials.

Key Achievements at a Glance

- A comprehensive report on Nalbari district's water quality scenario was generated using data collected directly from frontline workers.
- 183 frontline workers in Nalbari and 150 in Jhabua were onboarded onto the Glific WhatsApp platform.
- In partnership with Tata Trusts and CML, training was conducted for frontline workers in Nalbari on identifying arsenic contamination and its health impacts; the Jhabua engagement was supported in partnership with UNICEF.
- A Rapid Assessment for WQMS toolkit for village-level use by frontline workers, and a District Level Assessment toolkit for officials, were developed and prepared.

What the pilot also surfaced is that frontline workers can report, and data can be compiled into a district-level report, but what happens next depends entirely on whether PHED officials have the mandate, resources, motivation, and authority to act. Building a better reporting channel does not create those conditions; it makes their absence more visible.

Three structural constraints emerged from the evidence. The first is an institutional trust deficit: fewer than 40 % of the officials trust what communities report about water quality. Community-generated data, however accurately collected, is not treated as credible evidence. The second is the mandate structure: responding to community contamination reports may not fall within PHED officials' authorised mandate when reports originate from non-government sources. The third challenge is adapting to the evolving priorities of state government partners. In Jhabua, plans to engage Community Health Officers were stalled due to delays in state-level approvals, reflecting a shift in departmental focus. In Assam, evolving needs required a refocusing of engagement from one set of stakeholders to another. As a result, the hypothesis that community-generated data leads to faster problem-solving could not be fully validated, as corrective actions on reported issues had not yet been taken at the time of review.

Gap in Incentive Structures and Community Demand

Three underlying constraints became visible during implementation. First, the absence of an enabling environment for sustained engagement. Second, a weak incentive architecture offering limited recognition or reinforcement from the government system—conditions that made sustained engagement and motivation difficult to maintain. Third, and more fundamentally, community demand for water quality as a priority remained low, reducing the pull for regular testing and accountability. The absence of a strong demand environment—where communities actively value and act on water quality information—further constrains impact, highlighting the need to move from isolated excellence to sustained, collective uptake. A gap that current programmes consistently overlook is the important role that Water User Committees (WUCs) and Village Water Sanitation Committees (VWSCs) can play in creating community awareness and generating demand for water quality testing.

Key Learnings & Insights

- The messenger and the institutional system supporting them are equally important. Individual champions fail without institutional backing, tools, and recognition.
- Chatbot message design must prioritise clarity of call-to-action above all other considerations. Unclear instructions were the single largest cause of activity non-completion (32.9%) for the JalDoot programme.
- Recognition and gamification sustain motivation where financial incentives are not possible, but must be backed by consistent administration and responsive institutional systems.
- Frontline workers are highly trusted voices within their communities. Their engagement is crucial for bridging the gap between villages and decision-makers.
- The absence of action on community-generated data reflects an institutional trust deficit and the absence of a mandate for PHED officials to act on community-sourced reports.
- Evolving government priorities can delay programme outcomes, underscoring the importance of building flexible response mechanisms into programme design from the outset.

4.3

Leveraging technology to scale

Building the Channel: Five Technologies, Five Lessons

2018-19 **ForWater LMS+ KoBo** IContent telemetry, first digital feedback loop	2019-20 **PDA Platform** Trained workers made visible; credentials in field	2021-22 **Speaking Wall Suno-Bolo** Two-way community channel via QR walls
2022-25 **WhatsApp + Glific+ Gupshup** Communication channel to share nudges for call to action	2012-25 **PDA Platform** iECHO and JJM Academy	**A recurring challenge was the gap between information and action. This section traces Arghyam's decade-long experimentation with technologies, formats, and systems designed to support INREM's initiatives.**

4.3.1 ForWater platform LMS+KoBo

INREM Foundation created a course called 'Fluoride ABC', providing learners with a foundational understanding of fluorosis and its connection to drinking water. The ForWater platform was built on SunbirdED's codebase, an open-source learning management system originally developed by EkStep and deployed nationally under the DIKSHA programme. INREM integrated the platform within a model of engagement built around four pillars.

The first was education: to generate awareness of safe water among different actors, short-form content such as Safe Water Learning Cards (SWLCs) was designed as small information capsules to support the flexible creation of learning content. The second was partnerships: to scale and design need-based training and data tools, partnerships were progressively developed and onboarded to support the broader platform approach. The third was data: KoBo, an open-source data collection tool, was deployed to gather relevant information from project sites and assess field-level impact. Telemetry data on content consumption from the LMS was also used to understand which content gained most traction and with which audiences, enabling more targeted content repurposing. The fourth was platform integration, through which these elements were connected into a coherent engagement and learning architecture.

ForWater was later found to be operationally cumbersome: content creation was difficult, telemetry and badging did not work reliably, offline delivery was constrained, and dependence on EkStep created technical fragility. By 2019–20, Arghyam was actively planning to wind down the ForWater Sunbird platform and transition partners to a newer capacity-building package built on SOCION's PDA-based system.

4.3.2 PDA Platform

PDA was developed by SOCION specifically for the non-profit and development sector. Its core purpose was to make trained frontline workers visible and connectable, creating a credential layer linking trained practitioners to government programmes that needed them. In the context of Arghyam and INREM's water quality work, it functioned as the technology backbone for tracking who had been trained, what they had learned, and providing access to course content from the field.

The platform is best described as a hybrid system: an LMS with features of cohort-based and MOOC-style learning. Relative to standard LMS platforms, its distinguishing features included dynamic rather than static content delivery, scheduled content release, extensive learning analytics, minimal digital literacy requirements for participation, and the potential to build communities of practice when combined with virtual session formats.

In practice, participants scanned QR codes at the start and end of training sessions to register attendance. Upon scanning, they received a digital record of attendance, topic coverage, and access links to curated content available for field reference. The system tracked both attendance and engagement with content. Attestations, rather than formal certificates, were issued, recording presence and participation rather than assessed outcomes. The platform also allowed content to evolve over time, unlike static LMS environments.

Several limitations emerged through deployment:

- Technical issues with QR scanning and OTP expiry complicated field rollout.
- Because the platform issued attestations rather than formal certificates, its credibility within government systems that required recognised credentials was reduced.
- The platform offered no community features or peer discussion forums, unlike MOOC or cohort-based systems.
- Learning analytics were extensive, but the absence of authoring tools within the platform meant content had to be created through external systems.

4.3.3 Speaking Wall: Suno-bolo

Suno-Bolo (literally "Listen-Speak") was a speaking wall concept tested in 2018 as part of community communication experiments. It was a two-way communication tool embedded in a physical wall, combining a visual map of the village's water sources with embedded audio messages accessible via QR codes. Unlike a standard information, education, and communication (IEC) wall painting, it was designed to enable communities not only to receive information but also to send voice messages or complaints — hence the name "listen and speak."

Two documented cases illustrate both the concept's potential and its limitations. In Dungarpur, Rajasthan, a community member interacted with a wall map and changed the source from which he drew drinking water—one of the few documented instances of a community-generated visual prompt directly changing water-sourcing behaviour. In Chakulia Baharda, Odisha (the more significant case) an audio complaint embedded in a speaking wall reached a Sub-Collector at a district meeting, who subsequently ordered the repair of a Defluoridation Unit (DFU). These were isolated positive incidents. While the concept was innovative, it was ahead of available operational systems and required significant resources to achieve scale.

4.3.4 WhatsApp ChatBot

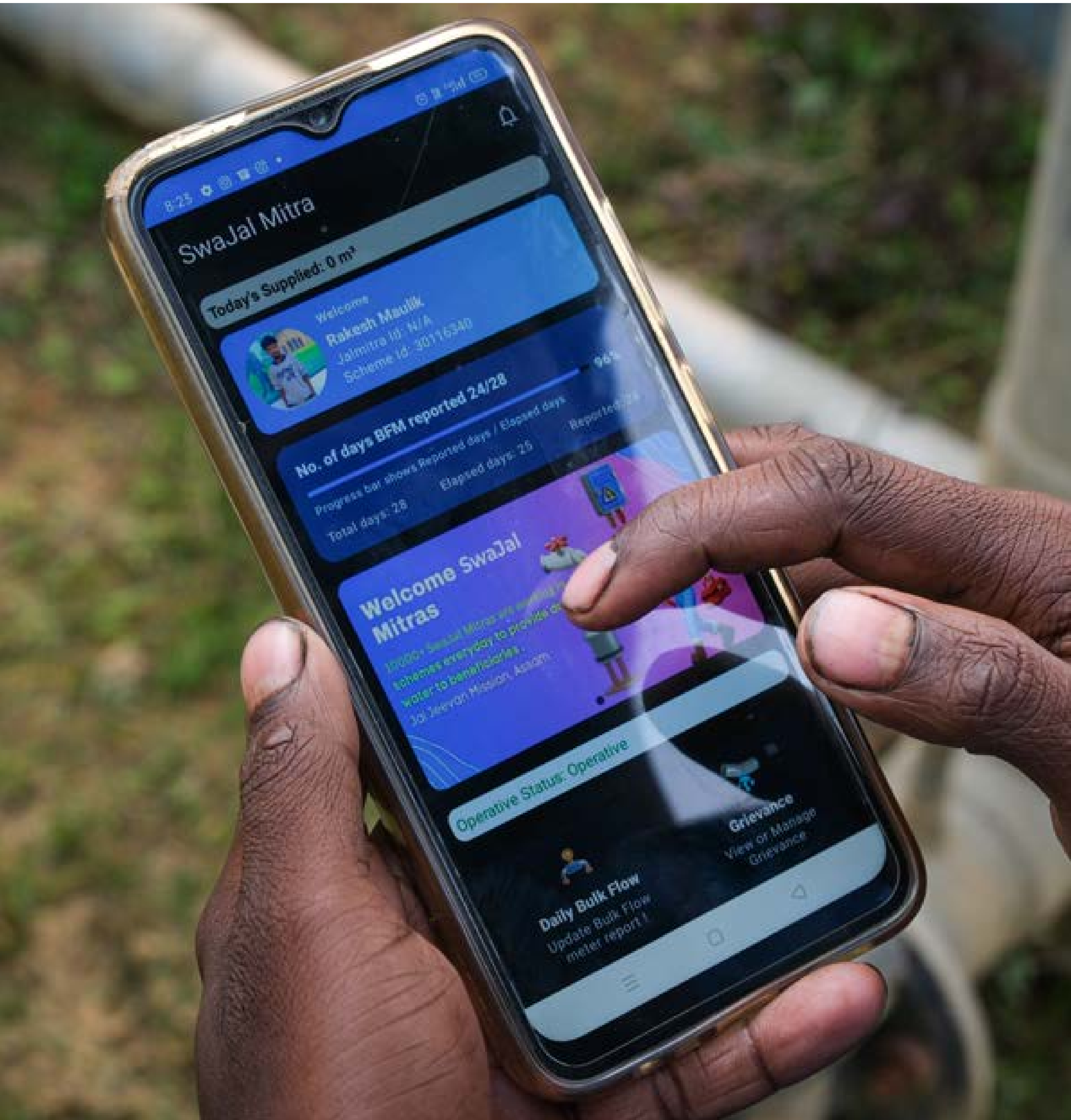
Glific is an open-source WhatsApp communication platform that enables simultaneous two-way messaging with large numbers of individuals, using Gupshup as its underlying conversational infrastructure. Glific was deployed as the primary engagement and participation-tracking tool for JalDoots across 33 districts of Assam. Within the programme, it served several functions: enabling JalDoots to register and participate in the JalDoot Premier League (a gamified activity leaderboard); delivering structured post-JalShala nudges to students, prompting them to take micro-actions on water conservation, WASH practices, water supply scheme assessment, and awareness generation; and supporting a nudge calendar designed by Reap Benefit with recurring prompts on Jal Jeevan Yojana, safe drinking water awareness, and letter-writing to PHED about water supply scheme issues.

A separate Glific-based WhatsApp bot, branded as OurWater, was tested with Community Health Officers (CHOs) in Jhabua as part of the WQMS programme. CHOs who had received UNICEF and INREM training were designated as WhatsApp bot users on the ground. Their intended functions included sharing water quality data collected during field surveys, receiving knowledge support on interpreting water quality test results, and building community-level understanding of water quality issues. A key challenge was that the effort to onboard CHOs onto the WhatsApp bot was not approved by district officials in Jhabua, requiring state-level coordination that was not secured within the programme period. As an interim measure, other available frontline workers across villages in Jhabua were subsequently onboarded.

4.3.5 iECHO and JJM Academy

Project ECHO (Extension for Community Healthcare Outcomes) is a model originally developed for medical education and collaborative healthcare delivery, using technology-enabled knowledge sharing to improve access to specialised expertise. ECHO India is its Indian institutional arm. INREM Foundation adapted this model for the WASH sector, redesigning the format and running sessions on the iECHO platform developed by ECHO India. The core adaptation reimagined the guided mentoring format to leverage civil society experiences, individual expertise, and participant engagement for cross-learning and challenge resolution in the water quality context.

INREM deployed the iECHO-modelled guided mentoring format within the Water Quality Champions Programme, an initiative co-developed with Arghyam from 2021 to build systemic capacity for water quality management. Across a series spanning more than a year, 45 case studies were shared with participation from 800 individuals working in the water sector. The format enabled meaningful exchange of ideas and mentorship support and provided INREM with the confidence and institutional evidence to extend the model to JJM state and UT representatives.



4.4

Working With Government

Every significant achievement in the water quality programme ultimately depended on a government system. This section reflects on the experience of engaging with government, the enabling conditions that made engagement productive, the persistent challenges that recurred across contexts, and the lessons accumulated over time.

4.4.1 Entry Strategy: Rural WASH Partnership Forum

Entry into government programmes requires a formal institutional mechanism. For the Jal Jeevan Mission, the Department of Drinking Water and Sanitation (DDWS) created the Rural WASH Partnership Forum (RWPF) to engage non-governmental organisations in providing technical capacity to the centre and state governments, complementing government efforts to ensure safe water supply in adequate quantity for every rural household. INREM Foundation and Arghyam are both lead partners under the RWPF: INREM for water quality and Arghyam for Digital Public Infrastructure and Artificial Intelligence.

4.4.2 The JJM Digital Academy: Institutionalisation at National Scale

In March 2023, the National Jal Jeevan Mission (NJJM), INREM Foundation, and ECHO India jointly launched the “Water Quality Guided Mentoring Learning Group for NJJM”, a co-learning platform for representatives from all states and Union Territories to share water quality challenges through a case-study format and receive peer and mentor support. Sessions were conducted fortnightly, with the iECHO platform hosting planning, capacity building, and monitoring of participants’ learning progress.

In early May 2023, DDWS reviewed the learning group’s effectiveness, appreciated its scope, and decided to extend the model to all JJM and Swachh Bharat Mission thematic areas. This directly catalysed the establishment of the JJM Digital Academy: a partnership between DDWS, ECHO India, and UNICEF.

Following INREM's proposal to integrate the WQM Course into JJM, the first accredited WQM Course batch was launched in September 2023 on the iECHO platform under the JJM Digital Academy, with a Trainer Certification Programme following in October 2023 to build state-level capacities to sustain the learning process within WQM Hubs. Approximately 12 states expressed an interest in running their own versions of the WQM Course. The iECHO dashboard was used to track cohort progress.

The WQM Course has remained voluntary, driven by individual interest rather than a mandatory requirement for new responsibilities within the WQMS framework. As a result, officials struggled to balance work commitments with course participation, and some sessions were conducted during regular working hours, posing difficulties given demanding workloads.

4.4.3 Multi-departmental JalDoot Co-Design Model

The JalDoot programme was designed as a multi-departmental collaboration from the outset. PHED Assam served as the nodal department responsible for programme design, strategy, and monitoring; the Axom Sarba Shiksha Abhiyan Mission (SSA) provided institutional access to schools and the education system; and ASTEC contributed through its trainer network, whose resources, including schools and trained personnel, were used directly for JalShala delivery.

This multi-stakeholder architecture, while necessary for reach and legitimacy, created persistent coordination friction. The lack of effective communication and collaborative mechanisms between departments hindered the seamless flow of information and joint decision-making, most visibly between PHED and the education department, where coordination gaps caused implementation delays. Inventory dispatch and material distribution were particularly affected. JJM Assam's development of a dedicated monitoring module within its JJM Brain system, to which District JalDoot Cells were given direct access, was a direct response to the need to hold this multi-department structure together through a common information backbone.

The practical resolution that emerged was to distribute ownership clearly: District JalDoot Cells were designated as the coordination nodes at the district level, with quarterly meetings introduced in 2024–25 to keep all stakeholder groups aligned. The ASTEC trainer network was treated as an existing resource to be leveraged rather than a partner to be actively managed, a distinction that significantly reduced coordination overhead.

The core lesson from this experience is consistent across similar multi-departmental programmes: a programme spanning multiple departments requires an explicitly designated coordination function, not simply goodwill across departments. Where that function was carried by the State JalDoot Cell and supported by a shared digital monitoring system, programme implementation moved forward effectively.

4.4.4 Key Learnings and Insights

The voluntariness of the WQM Course is a sustainability risk. Without a formal mandate, those who most need the training are least likely to find time for it.

Securing nominations from nodal departments is as important as course quality. Multi-departmental programmes require an explicitly designated coordination function. Goodwill across departments is insufficient. Where coordination was carried by the State JalDoot Cell and supported by a shared digital monitoring system, the programme moved ahead.

Civil society's role is to demonstrate, build evidence, and transfer. The goal is government ownership, not civil society permanence.

4.5

Findings of study on WQMS HR structure

The Jal Jeevan Mission has catalysed substantial investment in water quality monitoring and surveillance (WQMS) infrastructure: laboratory equipment, field test kits, digital platforms such as WQMIS, and water treatment technologies. Yet the human resource dimension of WQMS has evolved far more unevenly across states, and far less visibly. Water quality monitoring is inherently people-intensive, relying on trained laboratory professionals, field staff for sample collection, engineers for oversight, data personnel for reporting, and frontline workers who translate test results into community action. A gap at any point in this human chain can compromise the entire surveillance system, regardless of equipment or funding. It is this gap, between the infrastructure built and the human capacity required to operate it, that INREM Foundation and Arushya Foundation set out to examine through this study, mapping the HR structures underpinning WQMS across 5 states: Haryana, Maharashtra, Madhya Pradesh, West Bengal, and Assam, identifying where critical gaps lie, and understanding what conditions enable or constrain effective water quality surveillance on the ground.

4.5.1 Infrastructure outpaces human capacity

Lab buildings, equipment, field test kits, and digital platforms have expanded significantly under JJM. Yet, human systems have not kept pace. Vacant posts, role overloads, and training gaps mean that machines often sit underutilised. In states like MP and Assam, labs are unable to meet monthly testing targets, not because of equipment shortfalls, but because the workforce cannot sustain the load.

4.5.2 The bacteriology gap is universal

Not a single state studied has filled all sanctioned bacteriologist posts. Across all five states, chemists perform microbiological testing as a workaround, creating professional boundary violations and quality assurance risks at precisely the moment when states are moving toward NABL accreditation for microbiological parameters.

4.5.3 Role ambiguity dilutes accountability

Water quality functions are, in most states, layered onto engineering cadres whose primary mandate is infrastructure construction and maintenance. Engineers serve as lab in-charges without lab training. Chemists report to engineers who cannot evaluate their work. When something goes wrong in the surveillance chain, it is rarely clear who is accountable.

The contrast with states that have created dedicated WQ chains is instructive. In Haryana, a Chief Chemist-led chain with a defined reporting structure correlates with measurably stronger performance and accountability. The architecture of roles, not the calibre of individuals, drives the difference.

4.5.4 Sample collection is the most neglected link in the chain

Despite being the entry point of the entire surveillance system, sample collection is an informal add-on in four of the five states studied. There is no dedicated logistics, no timing norms, no reliable incentives. Where collection is delayed beyond 24 hours, bacteriological results are directly compromised, yet this is routine in most states.

West Bengal is the exception. The Jal Bandhu model, GP-anchored, with a dedicated collector provided with a bicycle and smartphone, remunerated through the GP, demonstrates that formalising this function is feasible, affordable, and consequential for data quality.

4.5.5 Digital tools need HR to function, they do not replace it

A consistent pattern visible across states with strong digital ecosystems is that breakdowns occur not in the technology, but in the human layer beneath it. Vacant Data Entry Operator posts create backlogs. Overloaded labs upload inaccurate results. Chemists responsible for both testing and data entry default to one or the other.

Technology amplifies the HR system that operates it. When that system is fragile, digital investments compound rather than compensate for the fragility. The WQMIS portal, designed to generate a national picture of water quality surveillance, is only as reliable as the people entering data at district and sub-divisional labs.

4.5.6 Financial control is divorced from WQ operations

Across all five states, financial authority for WQMS-related expenditure rests with district executive engineers whose primary mandate and performance incentive is infrastructure construction. Operational WQ expenditures (chemicals, instrument calibration, sample transport, and consumables) compete with construction budgets and consistently lose.

No technical capacity at the lab level can compensate for this structural misalignment. Until financial authority over WQ operations is separated from the infrastructure engineering chain, operational gaps will persist regardless of what is funded from outside.

4.5.7 What States Can Learn from Each Other

Four models emerged from this study that are both evidence-based and transferable across state contexts with appropriate adaptation:

- API-linked state dashboards that eliminate duplicate data entry, reduce transcription errors and enable real-time performance monitoring at the state level as demonstrated in Haryana, Maharashtra, and West Bengal.
- Performance recognition systems, such as West Bengal's Shrestha Jal Parikhagar lab award, boost workforce morale at negligible cost and reinforce a quality culture within the lab workforce.
- The PPP lab model, in which an NGO provides physical space and HR while the government covers operational costs, has enabled West Bengal to expand its network without proportionate capital expenditure.
- Apprenticeship pipelines for fresh science graduates, piloted but not institutionalised in Haryana, offer a structural solution to the recurring cycle of vacant posts and unqualified contractuals.

4.5.8 Caution flags

1. Contractualisation of the entire lab workforce: When all lab staff, including technical leads, are on short-term contracts, moonlighting and attrition become endemic even where headcount appears adequate. Contractualisation is, in several states, a short-term fiscal convenience that creates long-term system fragility.
2. Training without role differentiation: Generic training sessions, not differentiated by role, are broadly ineffective. A session designed for chemists will not equip Jal Mitras; a module for DEOs will not help lab assistants. The sector has invested significantly in training without investing in curriculum design matched to role requirements.
3. Scaling lab networks without HR strategies: Expanding the number of labs without commensurate HR planning creates ghost capacity, labs that are counted in national dashboards but cannot perform their designated function. Several states have built more labs than they can staff.
4. Financial authority concentrated in infrastructure engineering chains: WQMS expenditure managed by infrastructure engineers will consistently lose out to construction priorities. This is a governance architecture problem, not a resource problem and it recurs regardless of how much is invested from the outside.

The structural change required across all states is to make water quality management a governed, accountable public health service, with dedicated cadres, financial autonomy for operational expenditure, and state-owned data systems. In the short term, dedicated sample collectors in high-burden districts must be deployed immediately. In the medium-term, apprenticeship pipelines must be institutionalised to end cycles of vacant posts. For funders and NGOs, the reorientation is from infrastructure to HR systems: fund diagnostic studies before equipment grants, support role-differentiated training, and help communities translate lab results into actionable local information.

Chapter 5

Reflections and Consolidation

Over the past two and a half decades, Arghyam's engagement with water quality has evolved from early exploratory efforts to a more deliberate attempt at shaping the field. What began as a set of dispersed experiments gradually moved towards building networks, developing shared knowledge, and, more recently, working in closer alignment with government systems to enable scale.

The partnership with INREM Foundation marks an important phase in this journey. It brought continuity, deepened the focus on practitioner-led learning, and enabled a shift from designing individual interventions to strengthening the systems that sustain them. The last decade, in particular, reflects both an expansion in scale and a clearer understanding of what enables that scale to hold.

Seen together, the journey does not point to a single model, but to a set of recurring patterns: how efforts take root, how they travel, and where they require further strengthening. The reflections below bring these patterns together.

5.1

From projects to platforms

A defining shift across the journey has been the movement from standalone interventions to approaches that enable others to participate and build further. Early efforts such as ASHWAS and district-level models helped make water quality issues visible and grounded in evidence. The subsequent development of Knowledge and Action Networks expanded this into a broader ecosystem of practitioners.

In the more recent phase, this has taken the form of structured platforms such as the WQM Course, trainer certification, and their integration into the JJM Digital Academy. These have enabled wider reach and continuity beyond direct programme implementation.

At the same time, experience suggests that while platforms can be established, their long-term effectiveness depends on how they are adopted and sustained within the system. In some cases, this transition has been organic; in others, it has required continued support. Strengthening this transition remains an important area for the future.

It has also become clear that long-term scale is most likely to be sustained when efforts are embedded within government systems. Moreover, the transition from externally supported models to fully institutionalised processes often brings new questions, particularly around consistency, quality, and sustained ownership across contexts.

5.2

Expanding Capacity, and Tracing its Effects

Capacity-building has been one of the most consistent strands of the work. Across formats (virtual courses, guided mentoring, and field-based programmes), there has been a steady increase in the number and diversity of practitioners engaging with water quality.

This has contributed to visible shifts within the system, including increased testing activity, wider participation across states, and the emergence of trained practitioners who are able to take on facilitation roles themselves. The emphasis on peer learning and practitioner exchange has also shaped how knowledge is applied in different contexts.

At the same time, linking these capacities consistently to improvements in service delivery and safe water access remains complex. While system-level indicators show progress, the pathways from training to field-level outcomes continue to evolve and require further strengthening.

5.3

Making Contamination Visible: And Strengthening Response

Efforts to make water quality issues more visible have been central to the journey. From early survey work to programmes like JalDoot, and more recent digital tools, there has been a steady expansion in how information is generated and shared across communities and institutions.

These approaches have demonstrated that awareness can be built across different actors (students, frontline workers, and officials), and that information can travel effectively when designed appropriately.

However, the experience also highlights that visibility is one part of a larger chain. The processes that follow—validation, escalation, and corrective action—often involve multiple actors and systems. Strengthening these linkages so that information leads more consistently to response remains an area of continued focus.

A recurring insight across different interventions has been that behaviour change is most effective when trust and institutional credibility come together. Community-led efforts create relatability and trust, while alignment with formal systems lends authority and continuity. Approaches that are able to combine both tend to travel further and sustain longer.

5.4

The Centrality of People in the System

Across different interventions, the role of people has remained central. Investments in infrastructure and technology have expanded, but their effectiveness continues to depend on the capacities, clarity, and engagement of those who operate them.

Programmes such as the WQM Course, Trainer Certification, and guided mentoring illustrate how individuals, when supported appropriately, can extend their roles and contribute to system strengthening. At the same time, findings from the study on human resources for water quality management point to areas where role clarity, capacity, and continuity can be further strengthened. This suggests that building human capability will remain as important as expanding physical and digital systems.

5.5

Technology as a Supporting Layer

The increasing use of technology has enabled the work to reach wider audiences and geographies. Digital platforms for learning, communication, and data collection have improved efficiency and expanded access.

At the same time, their effectiveness has depended on how well they are integrated into existing systems and processes. In contexts where users are supported and systems are aligned, technology has amplified impact; in others, its adoption has been more gradual.

As digital tools continue to evolve, their role is likely to remain closely linked to the broader system within which they are deployed.

5.6

Working Within Government Systems

Engagement with government systems, particularly through the Jal Jeevan Mission, has been central to enabling scale. Collaborations such as the JJM Digital Academy and co-designed programmes like JalDoot demonstrate the potential of aligned efforts between civil society and the government.

At the same time, the experience reflects the diversity of contexts across states and the need for approaches that can adapt accordingly. Progress has varied, shaped by differences in capacity, leadership, and institutional readiness.

Sustained engagement, flexibility, and alignment continue to be important in working within large public systems. Across multiple efforts, the transition from pilot to scale has required a distinct set of conditions that go beyond demonstrating proof of concept. While initial models have often shown strong results, their replication and sustained adoption depend on factors such as local ownership, institutional alignment, and availability of ongoing support. Strengthening this transition remains an area of continued learning.

5.7

Strengthening the System's Building Blocks

The work over the past two decades has contributed to building several elements of a water quality ecosystem—knowledge, people, platforms, and partnerships. The next phase lies in strengthening how these elements work together in practice.

The Diagnostic–Curative–Preventive framework provides a way to organise this effort:

- Diagnostic: Continued focus on making contamination visible through reliable testing, data systems, and community awareness, with greater emphasis on consistency and accessibility.
- Curative: Strengthening the chain from detection to response—improving coordination, clarifying roles, and enabling timely action across institutions.
- Preventive: Expanding attention toward addressing contamination at source, including groundwater management, regulation, and cross-sectoral engagement.

Across these pillars, the emphasis will be on improving coherence within the system, ensuring that information, people, and processes are better aligned.

The journey so far suggests that the individual components required for a responsive water quality system are now more clearly in place than before. The task ahead is to ensure that these components interact more reliably and consistently across contexts.

This will require continued attention to the less visible aspects of the system: how responsibilities are shared, how information moves, and how actions are followed through over time. It also calls for strengthening the capacities and confidence of those who operate within the system, so that processes are sustained beyond specific programmes or partnerships.

Chapter 6

What Lies Just Beyond

As this body of work comes together, it reflects a journey of building understanding, strengthening practice, and shaping pathways for action on water quality across diverse contexts. Over time, this has helped surface what it takes to make contamination visible, to build a field of practitioners, and to work alongside systems that operate at scale.

At the same time, the work also brings into view areas that require deeper and more sustained attention. While significant progress has been made on the diagnostic front in making contamination visible, the next phase of the journey will involve carrying the underlying Theory of Change more fully forward—by strengthening the pathways that connect awareness to action, and extending the focus more deliberately towards the preventive and curative dimensions.

One such area lies in the space between awareness and action. Across multiple contexts, awareness around contamination has improved, and detection has become more accessible. Yet, the pathways that translate this awareness into sustained mitigation, whether through infrastructure reliability, behavioural shifts, or institutional follow-through, remain uneven.

> "The question is no longer only about identifying risk, but about ensuring that safe alternatives are consistently within reach and actively used."

A similar pattern is visible in the role of technology. Digital tools have strengthened the ability to collect, visualise, and share water quality information. They have made reporting more immediate and more visible. However, the movement from reporting to response has not always kept pace. This points to a need to think more deliberately about how such systems can also enable, prompt, and sustain institutional action, rather than primarily supporting data flows.

There is also a question of scale in how change is carried forward. Individual champions across communities and institutions have demonstrated what is possible when knowledge, trust, and initiative come together. At the same time, the scale of the challenge calls for many more such actors to emerge, be supported, and remain engaged over time. Building this continuity, beyond individual stories, remains an ongoing area of attention.

Lastly, the experience of working with government systems has shown both the potential and the limits of alignment. Integration within national and state programmes does enable reach and legitimacy. Yet, sustaining momentum beyond initial adoption demands more strategic mandate, institutional capacity, and organic will.

These interconnections point toward the next phase of the work; one that engages more deeply with solutioning pathways, strengthens the link between data and response, invests in building and supporting a wider base of practitioners, and continues to work with systems in ways that enable sustained action.

If the past years have been about learning how to see and understand the challenge more clearly, the years ahead will need to carry that understanding forward into more consistent and enduring responses.

Arghyam

Bhawna Badola is a development professional with almost 2 decades of working at the intersection of water governance, geospatial science, and government partnerships. She brings deep expertise in GIS and remote sensing, policy analysis, and programme management, built across stints in government missions, conservation organisations, academic research centres, and civil society. Drawing on her grounding in environmental science and geo-information, she translates spatial data and field evidence into actionable insights for water and river governance. In her current role as Senior Manager – Government Partnerships at Arghyam, she leads the organisation's engagement with the Department of Drinking Water and Sanitation, Ministry of Jal Shakti, working to strengthen implementation of the Jal Jeevan Mission.

Kapil Dhabu is a public policy professional working at the intersection of technology, natural resources, people, and climate. He takes active interest related to works on policy research initiatives focused on sustainability and governance. Leveraging data insights and research, he integrates innovative and systemic approaches, drawing on his interests in governance, sustainability, geopolitics, and economic and legal discourses to deliver impactful solutions. In his current role, he is leading Arghyam's engagement in Assam and contributing towards building responsible tech for water.

arghyam.org
Arghyam
@arghyamindia