Sustaining the

FLOW

Financing **L**ifecycle-cost **O**f **W**ater-supply Systems:
A Sustainable, Inclusive, and Resilient Financing Strategy for the Rural Drinking Water Supply Programme in Assam

Department of Public Health Engineering
State Government of Assam, India

water for people
INDIA

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Department of Public Health Engineering
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Water for People, India

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Report Published:
December 2025

Suggested citation:
Jal Jeevan Mission Assam (2025). Sustaining the Flow. A Sustainable, Inclusive, and Resilient Financing Strategy for the Drinking Water Supply Programme in Rural Assam. Guwahati, PHED Assam and Water for People India.

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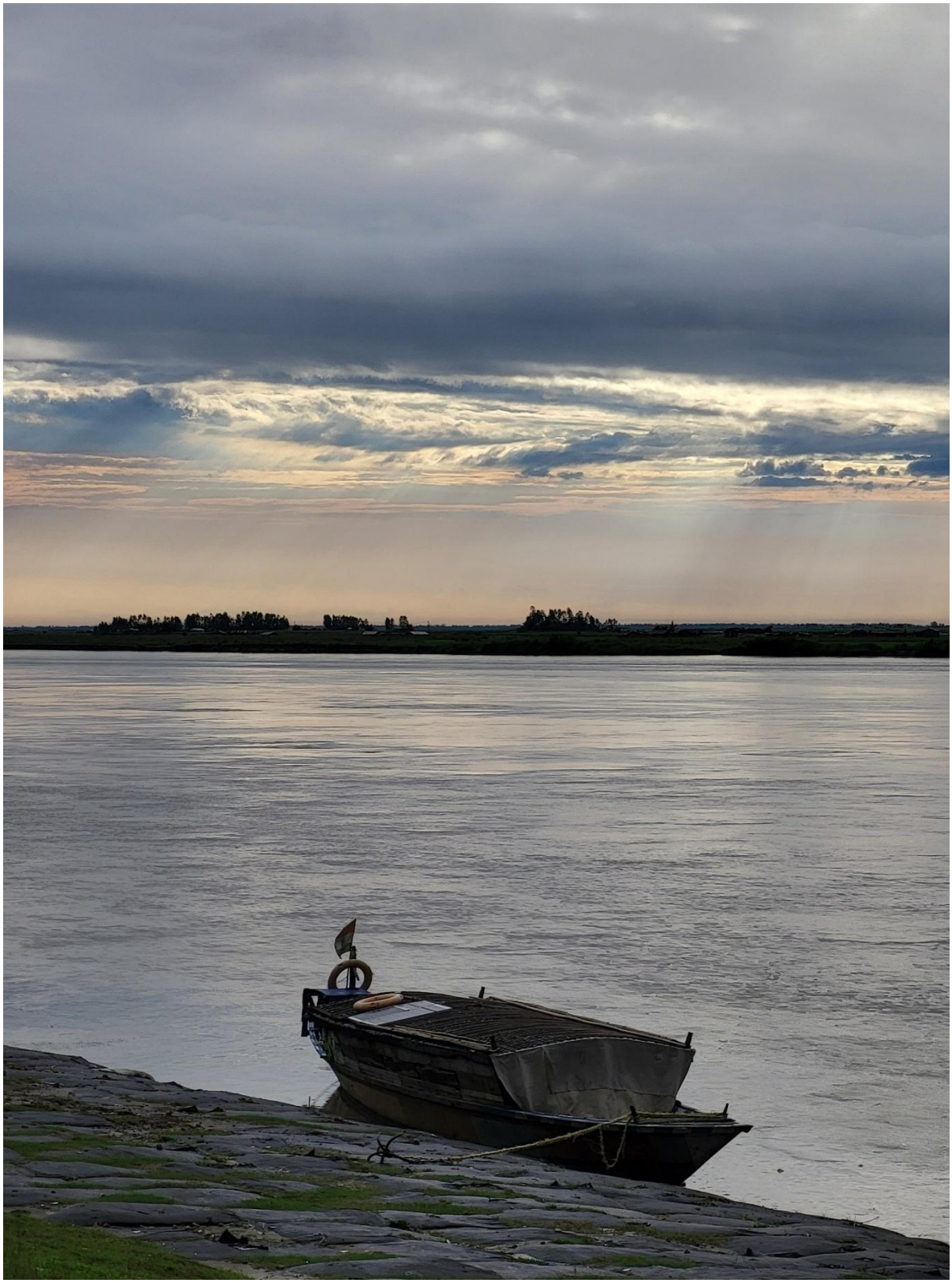


Executive Summary

Assam is at a critical transition point in its rural water supply journey. Over the past five years, the Jal Jeevan Mission (JJM) has expanded piped water coverage to more than 81 per cent of rural households, representing one of the fastest improvements in access anywhere in the country. Between 2019 and March 2025, combined central and state investments in JJM exceeded ₹20,000 crore. This has brought piped water within reach of millions of households that previously relied on hand pumps and other informal sources.

The challenge that now emerges is not expansion but sustaining reliable service delivery. Field assessments and administrative data reveal that while physical assets have been created at scale, functionality remains uneven. District-level functionality varies from below 50 per cent in highly flood-prone and riverine areas to over 85 per cent in some hilly districts with stronger local management. Frequent breakdowns, irregular chlorination, and delayed repairs point to a systemic under-provisioning of funds for operations and maintenance.

The purpose of the strategy

This report proposes a Lifecycle Cost-Based Financing Strategy for Rural Water Supply in Assam, developed collaboratively by the Public Health Engineering Department (PHED) and Water for People, with technical inputs from IRC WASH. The purpose of the strategy is to shift the focus of water financing in Assam from one-time construction to sustained service delivery. It aims to:

- quantify the full lifecycle costs of rural piped water systems, including operations, asset maintenance, direct and systemic support, and resilience;
- identify financing gaps and institutional challenges within current JJM and state practices; and
- recommend a realistic and equitable financing framework that can be integrated into Assam's O&M policy and future state budgets.

Approach and evidence base

The strategy draws on a mix of quantitative and qualitative evidence.

- Field research was undertaken across five districts-Chirang, West Karbi Anglong, Jorhat, Tinsukia, and South Salmara Mankachar - by observing scheme operations, collecting cost data, and engaging with PHED officials, Jal Mitras, and community members (Annexure 1.1).
- A dataset of over 96,000 rural water supply schemes was analysed to understand variations by type, source, size, and geography (Annexure 1.2).
- The costing exercise applied a lifecycle cost framework with six components: capital expenditure, operations and minor maintenance, capital maintenance, direct support, indirect or systemic support, and a contingency reserve.
- Validation workshops were conducted with PHED divisions and district representatives to test findings and refine assumptions (Annexure 1.3).

Together, these processes confirmed that the primary constraints are the nature, structure, and timing of allocations and the untapping of potential sources. Current norms allocate about two per cent of capital expenditure annually to O&M. The study finds that actual requirements will average between eight and nine per cent once routine operations, periodic asset replacement, community training, and risk mitigation are taken into account.

Key findings

1. The financing gap is systemic
    - The 2 per cent O&M norm significantly underestimates the actual cost of keeping systems functional.
    - Lifecycle analysis indicates a need for at least 8-9 per cent of CapEx annually, which would cover all essential cost centres.
2. Geographic diversity drives cost variation
    - Costs in hilly and flood-prone districts are 5-15 per cent higher due to transport, energy, and maintenance challenges.
    - District Localisation Factors (DLFs) are proposed to reflect this variation in future budgeting.
3. Underfunded support systems affect sustainability
    - Direct and indirect support activities such as Jal Mitra training, community awareness, and water quality testing are under-budgeted or nominally budgeted, weakening institutional capacity and accountability.
4. Evidence links higher O&M spending to better functionality
    - Districts with dedicated maintenance provisions and active technical supervision consistently show higher functionality rates.

Proposed lifecycle allocations

Cost Centre	Proposed Allocation (% of CapEx)	To be Spent on
Operations and Minor Maintenance	3.5 - 5.0	Electricity, chemicals, minor repairs, and staff; minor repairs and maintenance
Capital Maintenance	1.0 - 2.5	Major repair, annual maintenance and Replacement of pumps, motors, other equipment, pipes, and tanks as necessary
Direct Support	0.8 - 1.2	Training, IEC, and Jal Mitra honoraria
Indirect/Systemic Support	0.3 - 0.6	Labs, monitoring, and technical supervision
Contingency/Reserve	0.25	Emergency repairs, insurance, etc.

Together, these components translate to an estimated annual requirement of ₹1,800-₹2,000 crore for the state, beginning FY 2026-27. This equates to roughly ₹5,400 per household per year, a modest investment for maintaining and sustaining safe, reliable, inclusive and climate-resilient piped drinking water supply services.

Policy and Strategic Directions

To ensure sustainability beyond the current JJM cycle, the FLOW strategy proposes the following directions:

- **Institutionalise lifecycle financing** by embedding LCC norms into PHED's operational policies and integrating them with the Finance Commission's tied grants.
- **Establish district-level maintenance and reserve funds** to cover asset replacement and disaster recovery costs, by way of risk-pooling.
- **Establish an Equipment Maintenance Enterprise to address the skill gaps in this direction and a pool of backup equipment at the district or block level,** to ensure uninterrupted processes for rural water supply.
- **Getting the School Education, Women and Child Development and Health departments to allocate annual funds** for the operation and maintenance of the water supply schemes established within their institutional premises.
- **Differentiate allocations** through district-specific localisation factors to account for additional costs due to challenges of geography, disaster risks, and demographic characteristics.
- **Strengthen local institutional arrangements** by formalising Jal Mitra and FTK women's groups and ensuring predictable and timely remuneration for frontline maintenance and monitoring work.
- **Integrate resilience and inclusion** in all financing frameworks, ensuring that flood-proofing, protection of the infrastructure and processes from disasters through measures like insurance, costing/ funding accessibility provisions from the outset, and keeping priorities and added allocations for the most vulnerable locations and user groups.
- **Introduce phased transition plans and implementation as necessary,** to find time for ensuring adequate resources.

The way forward

Adopting a lifecycle cost approach represents a pragmatic shift in how Assam manages its water sector finances. It will allow the state to protect past investments, improve functionality, and ensure that the benefits of safe drinking water reach every household sustainably. The framework proposed here is ready for adoption within Assam's forthcoming O&M policy and can inform budget planning for the 16th Finance Commission period.

With structured financing, differentiated support, and clear institutional responsibilities, Assam can move from infrastructure creation to enduring service assurance-anchoring water security, resilience, and equity for the long term.

1. Context and Strategic Rationale

Background

The Jal Jeevan Mission (JJM) has transformed the scale and ambition of rural water supply in India. In Assam, the mission's rollout has been particularly significant. Within five years, the state has expanded Functional Household Tap Connection (FHTP) coverage from less than two per cent of rural households in 2019 to more than 81 per cent by March 2025 (PHED Assam, 2025). This rapid expansion has been supported by unprecedented financial commitments: combined central and state investments under JJM have crossed ₹20,000 crore, marking the largest-ever public investment in the state's water sector (Ministry of Jal Shakti, 2024).

While this achievement demonstrates the state's capacity to deliver at scale, it has also brought new challenges. The next phase of the water supply programme must focus on ensuring that the systems built will remain functional, inclusive, and resilient. Evidence from earlier national assessments shows that more than one-third of rural water supply schemes in India face service disruption within five years of commissioning, mainly due to inadequate operation and maintenance (IRC WASHCost, 2012; CPHEEO, 2023).

The Public Health Engineering Department (PHED) and the Government of Assam have recognised this transition. The draft Operations and Maintenance (O&M) policy currently under preparation emphasises the importance of sustainability and dedicated maintenance funding (PHED Assam, 2024). This strategy builds further on that policy direction and provides a detailed framework for financing the lifecycle costs of rural water supply schemes.

The Need for a Lifecycle Financing Approach

The conventional financing pattern in the rural water sector is heavily weighted towards capital expenditure. Once schemes are commissioned, the flow of funds for maintenance, asset renewal, and community engagement diminishes. Studies from India and other low- and middle-income countries have shown that focusing solely on infrastructure development leads to premature system failure and higher long-term costs (World Bank, 2019; IRC WASHCost, 2012).

A lifecycle financing approach recognises that water systems require different forms of expenditure at varying stages of their life. It accounts for the total cost of service delivery, which includes:

- regular operational expenses such as energy, chemicals, and caretaker payments;
- periodic capital maintenance or renewal, including pump and pipeline replacement;
- technical and institutional support for supervision, monitoring, and community mobilisation; and
- contingency funds for emergencies, disasters, and insurance (CPHEEO, 2023).

Planning for all these costs from the outset ensures that systems remain functional throughout their design life, rather than depending on intermittent repairs or short-term infusions of funds.

Assam's Water Systems

Assam's water geography is among the most complex in India. The Brahmaputra and Barak River systems shape a landscape characterised by fertile plains, flood-prone chars, and hilly terrains. More than half of Assam's districts are classified as flood or erosion-prone (Assam State Disaster Management Authority, 2024). Others face iron, fluoride, or arsenic contamination in groundwater, or logistical constraints due to remoteness and poor road access. These significantly influence the cost of maintaining and operating water supply systems.

Institutionally, the Public Health Engineering Department (PHED) is responsible for rural water supply in Assam. However, long-term service delivery depends on its coordination with Panchayati Raj Institutions (PRIs), Water User Committees (WUCs), and village-level governance systems (PHED Assam, 2024). The financing ecosystem includes several streams:

- JJM central and state shares, primarily for capital expenditure;
- Finance Commission tied grants to PRIs, earmarked for drinking water and sanitation O&M;
- State-Owned Priority Development (SOPD) funds, which can be flexibly used for O&M or small capital works; and
- District-level funds such as the District Mineral Foundation (DMF) and Compensatory Afforestation Fund (CAMPA).

Despite multiple funding avenues, fragmentation and lack of ring-fencing often prevent sustained O&M spending (Comptroller and Auditor General of India, 2023).

Key Challenges in the Current Financing System

Several systemic challenges contribute to the gap between investment and sustained service delivery:

1. **Uniform financing norms**: Current norms allocate a flat percentage for O&M across all schemes, overlooking differences in terrain, risk exposure, and population served (PHED Assam, 2024).
2. **Limited capital maintenance provision**: There is no structured mechanism for asset replacement or rehabilitation. Infrastructure failures due to worn-out components often result in extended downtime until new project funding is approved.
3. **Underfunded institutional support**: Functions such as water quality testing, community mobilisation, and technical supervision receive minimal allocations, even though they are essential for sustained service delivery (JJM, 2023).
4. **Fragmented fund flow and accountability**: Finance Commission grants, SOPD allocations, and donor resources are managed by different departments without clear mandates and precise coordination, leading to underutilisation and reporting delays (Department of Finance, Assam, 2023).
5. **Exposure to climate and disaster risks**: Assam experiences recurrent floods, landslides, and lightning strikes, which regularly damage infrastructure. The absence of risk-informed budgeting, insurance, or reserve mechanisms leads to recurring expenditure burdens (Assam SAPCC, 2023).

The Strategic Moment

The timing for adopting a lifecycle financing framework in Assam is opportune. With physical coverage substantially achieved and infrastructure in place, the state can now focus on functionality, equity, resilience, and sustainability. This approach aligns with the ongoing O&M policy revision, the State Action Plan on Climate Change (SAPCC), and the Disaster Risk Reduction Roadmap (Government of Assam, 2023). It also supports India's commitments to water and sanitation under SDG 6 and to the National Water Mission under the National Action Plan on Climate Change (Ministry of Environment, Forest and Climate Change, 2023).

By adopting lifecycle costing norms and district localisation factors, Assam can:

- protect over ₹20,000 crore of public investment already made in rural water infrastructure and processes;
- nullify the rate of scheme slippage and non-functionality;
- promote equity by aligning financing with geographical and demographic needs; and
- strengthen local institutions and accountability for long-term service delivery.

The FLOW strategy marks a shift from viewing rural water supply as a series of construction projects to treating it as an essential public service requiring ongoing financial and institutional commitment. In doing so, Assam can lead the way in demonstrating how sustained service delivery can be achieved through realistic, evidence-based, and context-sensitive financing.

2. Objectives and Analytical Approach

Purpose

The FLOW financing strategy aims to guide the Government of Assam in transitioning from ad hoc, project-based financing to a predictable, service-oriented fiscal framework.
Its central purpose is to define what it actually costs to operate, maintain, and renew rural water-supply systems, and to embed those costs within regular state and local budgets.

Specific Objectives

1. **Estimate Lifecycle Costs:** Quantify capital, O&M, capital-maintenance, direct-support, indirect-support, and resilience-reserve requirements for each scheme typology.
2. **Develop a Sustainable Financing Architecture:** Integrate PHED budgets, FC grants, community contributions, and other sources into a transparent funds flow process.
3. **Apply District Localisation Factors (DLFs):** Adjust lifecycle cost requirements to reflect the variations related to factors such as terrain, disaster risk of the location, and remoteness.
4. **Establish Fiscal Instruments:** Create Maintenance Funds, Sinking Funds, and a Resilience Reserve for predictable O&M and rehabilitation.
5. **Clarify Institutional Roles:** Define responsibilities for the local actors of the Public Health Engineering Department, Panchayati Raj Department or the Scheduled Area Council, and other departments such as School Education, Women and Child Development and Health & Family Welfare, in planning, budgeting, monitoring, operations and maintenance.
6. **Define Accountability Processes:** Link expenditure tracking with functionality outcomes via a Lifecycle Dashboard.

Analytical Framework

The FLOW Strategy uses a Lifecycle Cost Approach (LCCA) adapted from the IRC (2020) model and calibrated for Assam's context. Each scheme's annual lifecycle requirement is derived as a percentage of its capital Expenditure (CapEx).

Lifecycle Costing (LCC) in this strategy covers the complete set of financial requirements for each piped water supply scheme, from construction through to long-term operation. The method considers six cost centres that together determine the total cost of ownership:

1. **Capital Expenditure (CapEx)** – the upfront investment for source development, treatment units, pumping, storage, electro-mechanical infrastructure, distribution systems and household connections.

2. **Operational Expenditure (OpEx)** – recurring annual costs for running the system, such as electricity, chlorine, caretaker honoraria, consumables, minor repairs and routine servicing.

3. **Capital Maintenance Expenditure (CapManEx)** – intermittent but essential costs for major repairs, structural rehabilitation, pump replacement, rising main replacement, and repair of major leakages or failures.
4. **Direct Support (DS)** – costs incurred at district and block levels to ensure scheme-level functionality, such as training for Jal Mitras and Water User Committees, water quality testing support, and routine supervision.
5. **Indirect Support (IDS)** – systemic costs at the state and district levels for planning, monitoring, auditing, updating SOPs, supporting laboratories, and strengthening institutional capacities.
6. **Resilience Reserve Funds** – contingency funds at the scheme, block and district levels for meeting additional requirements around unexpected events such as disasters or climate shocks.

Typically, government budgeting focuses heavily on **CapEx**, with the other four centres receiving very limited or ad-hoc allocations. This causes schemes to deteriorate prematurely and reduces the return on investment. The LCC methodology adopted here addresses this gap by quantifying the actual resource needs across all cost centres and developing realistic benchmarks for Assam's operating context.

To ensure accuracy, a study was held in preparation for this strategy integrated:

- State SORs for engineering rates;
- PHED norms for O&M;
- Field data from five districts (Chirang, West Karbi Anglong, South Salmara, Tinsukia, Jorhat);
- DPRs of the projects visited;
- Validation workshop inputs from district engineers, lab staff, Jal Mitras, WUCs and administrative staff;
- Historical energy and chemical consumption;
- District Localisation Factors (DLFs) based on terrain, floods, logistics and market conditions.

The LCC model here is thus not a theoretical estimate but a grounded and field-validated costing tool that reflects Assam's diverse operating conditions.

Data Sources and Evidence Base

The analysis integrates quantitative datasets with qualitative field intelligence, ensuring triangulation between administrative and ground realities. Details of all the data types are provided as Annexures.

Data Type	Primary Source	Analytical Use
Scheme inventory (96 000 schemes)	JJM BRAIN Dashboard + PHED records	Baseline coverage and typology definition
Technical specifications & BoQs	PHED SoR (2023-24) + market rates (-30 %)	CapEx estimation by scheme type
Household & population data	Census 2011 + PHED norms	Demand and design population
Financial flows and allocations	PHED budget books + Finance Dept + PRI ledgers	O&M funding trend and gaps
Field validation	Ten district consultations & division reviews	Verification of assumptions and DLFs
Energy tariffs	APDCL (2024)	Annualised electricity costs

All costs are normalised to FY 2023-24 prices and cross-checked with the *Abstract Cost Workbook* and *Revised FLOW Presentation (24 Sept 2025)*.

Methodological Steps

1. **Data Cleaning and Classification:**
   Duplicate or inactive schemes were removed from the JJM BRAIN dataset. Each active scheme was tagged as SVS (Groundwater or Surface) or MVS (Groundwater or Surface).
2. **Representative Scheme Derivation:**
   A 214-household SVS-Groundwater scheme (CapEx ₹ 1.26 crore) was selected as the reference model, yielding ₹ 57,976 per FHTC.
3. **O&M Cost Computation:**
   Based on field observations - pump head 70-90 m, runtime 8-12 h/day, efficiency 45 per cent - annual energy consumption equals 10-16 MWh. With tariffs of ₹ 6.8-7.5/kWh, the annual electricity cost ≈ is ₹ 0.9-1.3 lakh per scheme.
4. **Lifecycle Aggregation:**
   CapEx, O&M, CapManEx, DS, IDS, and RR are combined to yield the total lifecycle cost. Annual requirement ≈ : 8-9 per cent of CapEx before DLF.
5. **District Localisation Factor (DLF):**
   DLFs (1.00-1.15) adjust lifecycle costs based on terrain and hazards. For example, flood-prone Dhemaji = 1.08; hilly Dima Hasao = 1.15.
6. **Fiscal Modelling and Gap Estimation:**
   Comparing required ₹ 1,950-2,250 crore with current ₹ 340 crore O&M spending reveals a funding gap of ₹ 1,400-1,800 crore per year.
7. **Stakeholder Validation:**
   Results were validated through PHED Finance Wing workshops and district-division reviews (see Annexure 3.2).

Analytical Assumptions

Parameter	Value / Range	Basis
Design population per HH	5	Census 2011 and PHED norm
Service level	55 LPCD	JJM Guideline
Non-Revenue Water (NRW)	20 - 25 %	Field validation
Pump head (H)	70 - 90 m	Average district DPRs
Pump efficiency (η)	0.40 - 0.50	Empirical range
Runtime (R)	8 - 12 h/day	Observed operation
Electricity tariff	₹ 6.8 - 7.5 / kWh	APDCL (2024)
Discount rate	6 %	Financial analysis standard
Inflation	5 %	RBI average

Core Outputs and Deliverables

The FLOW exercise produced four core deliverables:

1. **Lifecycle Cost Model:** An Excel-based dynamic tool projecting annual costs by district and scheme type.
2. **Financing Architecture:** A map of institutional responsibilities and fund flows across State, District, and PRI levels.
3. **District Localisation Index (DLI):** A composite index translating vulnerability into fiscal weighting.
4. **Implementation Roadmap:** A five-year phasing plan integrating lifecycle financing into the Medium-Term Fiscal Framework (MTFF).

Analytical Integrity and Validation

Every cost calculation was verified using PHED SoR-based DPRs from Goalpara, Nagaon, and Karbi Anglong, cross-checked against the actual O&M ledgers, and peer-reviewed by the PHED Finance Wing.

Field energy logs confirmed average daily pump runtimes of 10-12 hours. The resulting model is replicable, transparent, and adaptable for future budget cycles.


GOVT. OF ASSAM
JAL JEEVAN MISSION
NAME OF DRINKING WATER SCHEME:LSM FARM PWSS
TOTAL COST : 95.37 LAKHS
CENTRAL SHARE : 81.46 LAKHS
STATE SHARE : 9.05 LAKHS
COMMUNITY CONTRIBUTION : 4.76 LAKHS
CONTRACTOR : M. S. RONGPI
NAME OF IMPLEMENTING AGENCY : PHE DEPERTMENT
SOURCE : DTW
EATMENT PLANT : RSF-4 SQM
L LENGTH DISTRIBUTION : 1827 MTRS.
NO OF FHTC PROVIDED : 157 NOS
VILLAG NAME : LSM FARM PWSS
HABITATION : MAIMARO
Mr. PAWAN KUMAR, Hon'ble MAC KOPILI CONSTITUENCY
BLOCK : RONGKHANG
DIST : WEST KARBI ANGLONG, STATE : ASSAM
NAME OF KEYPERSON :
1. GRAM PRADHAN : SURES SANGMA
2. CHAIRMAN OF USERS COMMITTEE : JABINDRA MARAK
3. SECRETARY USERS COMMITTEE : SURES SANGMA
4. EXECUTIVE ENGINEER : MORNING KEEY PHANGCHO
5. ASSTT. EXECUTIVE ENGINEER : LUCKY RANJUNG
6. SECTIONAL OFFICER : NIRMOL GOYARI
JAL JEEVAN MISSION ASSAM
SAVE EVERY DROP

3. Sector Status and Financing Trends

JJM Progress and Sector Overview

Assam's rural water sector has undergone a remarkable transformation under the Jal Jeevan Mission (JJM). When JJM began in 2019, fewer than 2 percent of rural households had a functional household tap connection (FHTC). By March 2025, over 81 percent of the state's 99 lakh rural households were covered, representing an extraordinary expansion in just six years.

This rapid progress was achieved through a strong implementation push by PHED and district-level agencies, supported by sustained investments totalling ₹ 20 496.96 crore. The state now has approximately 96 000 rural water supply schemes (RWSS), a mix of Single Village Schemes (SVS) and Multi Village Schemes (MVS), relying on both groundwater and surface-water sources, which includes the mini schemes that were provided and handed over to the Anganwadi Centres and Schools of the state.

Despite this infrastructure success, the sustainability of service delivery remains uncertain. Functionality surveys indicate that approximately three-fourths of installed tap connections supply water regularly, but many smaller and remote schemes face intermittent operation, particularly during power outages or post-flood rehabilitation periods. The sector thus faces a new challenge - shifting focus from expanding coverage to sustaining continuous, safe, and equitable water supply services.

Scheme Typologies

A clear understanding of scheme typologies is essential for designing realistic financing systems. The 96 000 rural piped water supply schemes in the state of Assam can be broadly grouped as follows (Annexure 3.1):

- **Single Village Schemes (SVS):** About 87 percent of all schemes, primarily groundwater-based, catering to up to 400 households each.
- **Multi Village Schemes (MVS):** About 13 percent, mainly surface-water-based, with higher CapEx but greater efficiency per household.

Typology of this distribution is as follows:

Type of Scheme	Ground water based	Surface water based
% of Single Village Scheme (SVS)	78	9
% of Multi Village Scheme (MVS)	8	5

The dominance of SVS-Groundwater systems is both an opportunity and a risk. While easier to construct and locally managed, they tend to have higher per-household O&M costs due to fragmented governance and small-scale energy use. Groundwater security is also an issue that needs attention in the future. One more vital point to note is that over one third of the SVS are mini schemes exclusively built for and handed over to schools and Anganwadi centres in across the state. MVS schemes, on the other hand, though more complex to build, offer greater economies of scale and operational efficiency once established. However, these are fewer in number, and a large proportion of such schemes in Assam are groundwater-based.

Institutions for Rural Water Supply and Strategies to Strengthen Them

Assam's rural water governance operates through two administrative systems:

- Districts governed by Scheduled Area Councils (SAC) under the Fifth Schedule of the Indian Constitution:
    - Bodoland Territorial Council (BTC): Chirang, Baksa, Kokrajhar, Udalguri and Tamulpur
    - Karbi Anglong Autonomous Council (KAAC): Karbi Anglong, West Karbi Anglong
    - North Cachar Hills Autonomous Council (NCHAC): Dima Hasao
- General districts governed under Panchayati Raj Institutions (PRIs)
    - All remaining districts than listed above

The SACs do function with higher autonomy and parallel administrative structures to the state departments, resulting in:

- dual layer of approvals – both from the state PHED and concerned Autonomous Councils;
- slower fund flows;
- limited technical staffing;
- weaker coordination with PHED divisions;
- challenges in procurement and contractor mobilisation;
- poor access to specialised repair and maintenance services.

While such autonomy is essential to maintain, these delays translate into higher costs, slower response times, and challenges posed by prolonged supply disruptions in water supply systems. These structural differences further justify the application of DLFs and the need for differentiated financing strategies for the districts under SACs, which already require higher allocations due to terrain, isolation, and shortage in essential infrastructure and facilities.

While preparing the FLOW strategy, an institutional mapping was conducted to list out all key institutions that need to be strengthened as part of the strategy. The Flow strategy has prioritised strengthening these institutions and their functions through institutional support mechanisms tailored to the actors at each level.

A table of all key institutions at different levels, with their key actors and specific functions, is provided below.

Level	Institutional Structure	Key Actors	Key Functions
State Level	State Water & Sanitation Mission Apex Committee	Headed by the State Chief Secretary, Mission Director PHED, Secretaries of relevant departments, and Experts	Policy guidance; approve planning & implementation roadmap; finalise State Action Plan; financial planning; supervision
	State Executive Committee	Senior PHED Secretary (Chair), Mission Director, Chief Engineer PHED, Dept Representatives, Experts	Lead Implementation of JJM in the state, Support DWSMs, lead training, IEC and monitoring; review & approve progress; empanel vendors & NGOs; manage funds
	State Programme Management Unit	Mission Director,	Run systems for Planning, implementation, monitoring,

Level	Institutional Structure	Key Actors	Key Functions
		Addl. Mission Directors (Programme& Technical), Deputy Mission Directors Finance Manager, PMU Consultants	R&D support; capacity building; finance management; coordination with sector partners
	State Level Apex Public Health Laboratory	Head, Chief Engineer (QC), Scientists and Research Officers, Lab Technicians and Support Staff	Research on Water Quality and related public health issues, advanced testing, and training on water quality processes
District Level	District Water & Sanitation Mission (DWSM)	Zila Parishad President (Chair), Deputy Commissioner (Vice Chair), CEO Zila Parishad (Member Secretary)	Approve district plans; Policy Guidance; convergence; monitoring; financial approvals.
	District Water & Sanitation Committee (DWSC)	Deputy Commissioner (Chair), CEO of the Zila Parishad (Member), Executive Engineer PHED (Member Secretary), Senior Accountant PHED (Treasurer), Members from line departments and NGOs	Prepare and implement the district's annual plan; manage finances, payments and auditing; coordinate with Implementation Support Agencies; and ensure the proper functioning of the Water Quality Labs.
	District Level (water quality testing) Laboratory	District Level Officer in charge of the Lab, Chemist, Laboratory Assistant, Microbiologist and data entry officer	Apex lab at the district level for testing and verifying proportionate samples from SDLLs; water quality testing of samples from commercial entities, etc.
	Implementation Support Agency	NGOs or the NRLM functionaries selected for the purpose	Field-level mobilisation and capacity building of functionaries, conducting IEC and awareness campaigns, supporting functionality of the community-level structures
Block Level	Block Programme Management Unit	PHED Assistant Executive Engineer, Block Development Officer, ZP Members, Block Education & Health Officers, NGOs	Bridge between district and village levels; IEC & training; monitoring physical & financial activities; overseeing O&M;
	Sub-divisional Level (Water Quality) Laboratory	Lab-in-charge officer from the PHED, Chemist, Microbiologist, Laboratory Assistant and data entry officer, Block level WASH coordinators	Verification of Water Quality Monitoring and Improvement through FTK women; periodic sample collection, testing and reporting from villages; Testing WQ at Educational Institutions and Anganwadis
Gram Panchayat Level (only in General Districts)	Gram Panchayat Water & Sanitation Committee	Chair (GP President), Vice Chair, Secretary (PHED Engineer), Members	Finalise beneficiary lists and construction plans; certify completion; supervise activities.

Level	Institutional Structure	Key Actors	Key Functions
Village Level	Village Water & Sanitation Committee in the General villages, under the GPs	Elected Member of the GP from the Village (Chairperson), Villager elected by the people (Secretary), Members including ASHAs, AWWs, etc.	Prepare Village Action Plan; approve construction activities; plan, design, operate & maintain the water supply structures and processes; mobilise the community; and implement tariff collection.
	Village Council Dev. Committee (VCDC) for Scheduled area villages	As per existing structures under the scheduled area councils	
	Women's Group for Water Quality Testing	5 women selected by the community in each village, provided with Field Testing Kits	Conducting testing of 5 water points in a month, referring to Sub-Divisional Level Labs if anomalies are found
Scheme Level	Water User Committee (WUC)	The community elects all office bearers and members. The Jal Mitra of the scheme convenes the committee under the chair's guidance.	Approve individual connections; oversee scheme operation; collect user fees, pay & manage scheme staff such as Jalmitras; hold awareness campaigns.
	Jal Mitras, Jal Mitra Sahayaks or Scheme Operators	Individuals selected as Jal Mitras, or a community volunteer for mini schemes	Managing water supply, ensuring day-to-day maintenance, updating data on the JJM Brain app, and coordinating the WUC.
	Tea Garden Management for schemes in the tea garden areas	Manager, administrative and technician support staff available at the tea gardens	Supporting the scheme to fulfil their legal mandate of providing water services to the tea garden workers

Based on the analysis of the functions, functionaries, and finances of these institutions, the FLOW strategy will focus on the following key areas for strengthening the institutional performance.

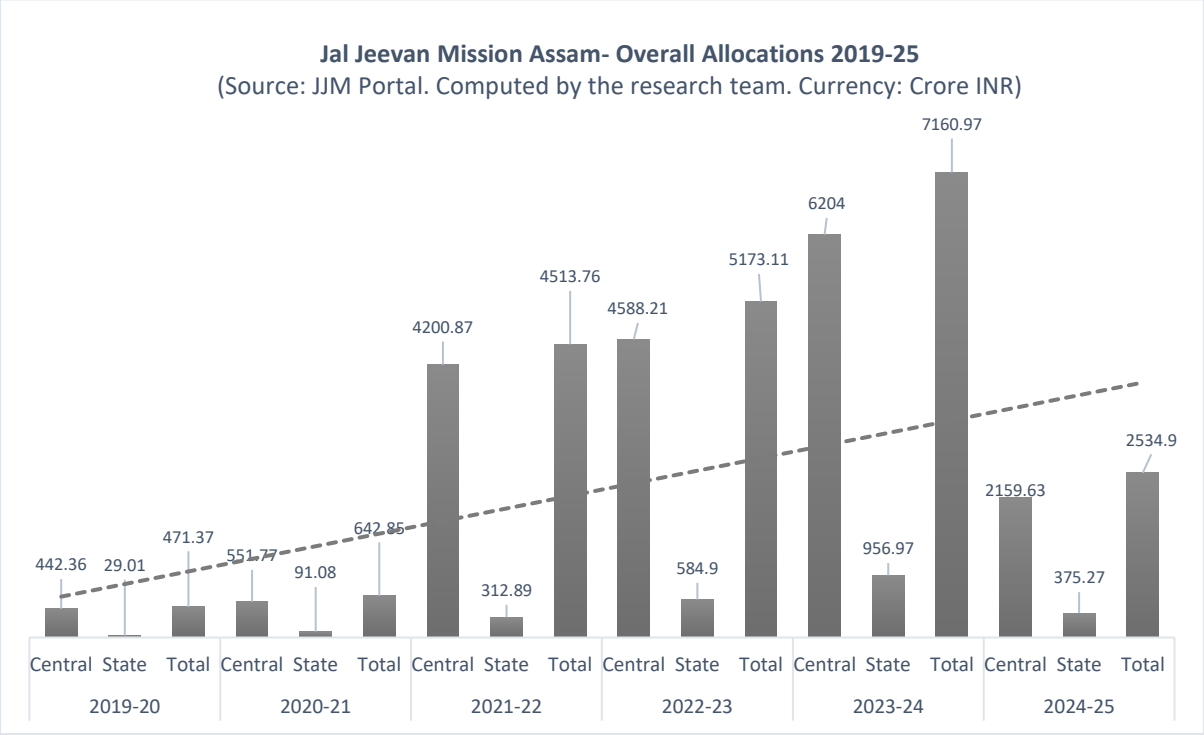
- Improving ownership of the schemes by the respective village-level institutions so that the community ensures their sustainability. In-depth training and capacity building for these village-level structures will be undertaken to strengthen their leadership and ownership of the schemes.
- A systematic approach for grievance redressal will be put in place at different levels. This would help foster community and village-level institutional ownership of the schemes. Additionally, stronger mechanisms will be developed for reporting and problem-solving, with inbuilt systems for record-keeping and institutional memory, to ensure a clear understanding of the root causes of challenges and solutions for other schemes, in addition to addressing the immediate problem.
- Dedicated instruments and templates will be developed for the implementation of schemes in scheduled areas, specific to the systems and processes of governance therein. This will foster ownership by the local system and people and leave no role ambiguity, which is required for accountability.

- In Tea Garden areas, the local-level committees will be reconstituted in accordance with the structures prescribed for these areas, including the management of tea garden companies, to ensure greater inclusivity and efficiency.
- Jal Mitras will be selected by focusing on their ability to coordinate between families and office bearers, given their central role in the day-to-day O&M of the scheme. Further, they will be oriented not only in technical skills but also to serve the purpose of inclusivity and universal coverage. Jal Mitras will be prioritised from women or those from the neediest segments of the user communities, in areas where the scheme's functionality is limited due to inactive Jal Mitras. Jal Mitras or Jal Sahayaks, as appropriate, will be brought in for the mini-water supply schemes as well.
- Capacity building of Jal Mitras will go beyond theoretical classroom learning to more practical knowledge, with the use of the tools and instruments in their task and exposure to the real-world situation. Their role in the village-level organisations such as GPWSC, VWSC, and the WUCs will also be strengthened.
- Given that the PHED is involved in all aspects of the scheme, all the PHED Engineers at the sector level will be trained in leadership, conflict resolution and community management.
- The number of human resources assigned for the O&M of a scheme will be commensurate with the size of the scheme. For instance, a Jal Mitra may be sufficient for a mini or small single village scheme. However, a large single-village scheme or a multi-village scheme would require more people to assist the Jal Mitras.
- For surface water-based multi-village schemes, while apex committees of the GPs or SAC leadership will manage the scheme, the technical and financial responsibilities will remain with the PHED department, not with the community-level structures. Jal Mitras under these schemes will be responsible only for community-level water supply and minor repairs to the supply network.
- Given the number and scale of PWS schemes in Assam, a new Institutional mechanism will be formed and strengthened for attending to the repair and maintenance needs of all schemes regularly, responding to phone calls. Such teams will have the skills and competencies needed for electrical, plumbing, and civil repairs, as well as related servicing. Such Repair and Maintenance teams will be constituted at the block or district level, appropriately, based on the overall number of schemes within a location.
- Those schemes in disaster-prone geographies would undergo some retrofitting and modification to make them resilient to the potential challenges.
- Given the workload on water quality testing labs, their number will be increased gradually such that there is one DLL for each district of the State, and one SDLL for each of the blocks. All SDLLs to have one Mobile Laboratory attached to them as well, to conduct water quality testing demonstrations across the district, as a regular behaviour-change measure to promote the use of good-quality water, which many people are not currently doing. Adequate staff availability will be assured in all these labs.
- The Institution for regular field-level water quality will be strengthened by way of constructively engaging the FTK women in a revised manner. Their financial benefits will be re-examined, expenses and coverage of out-of-pocket costs for travel, etc will be introduced, recognising the cardinal role that they play for the JJM.

- There will be a systematic approach to community mobilisation, with identification of the proper and sustainable arrangement, to move from the current ad hoc way. The role assignment should be based on an individual's motivation and ability to work amongst the community.
- A comprehensive and robust monitoring system will be introduced. It is equally essential that the monitoring data is available and usable by members of the community institution.
- There is a need to formulate regulatory mechanisms going beyond procurement-related issues to include areas such as finance utilisation, decision-making processes, infrastructure safety, water quality, water resource management, and environmental impact. This will be introduced gradually.

Investment Patterns and Budget Allocations

Between FY 2019-20 and FY 2024-25, total investments under JJM Assam amounted to nearly 20,500 crore, with around 90 per cent from central funds and 10 per cent **from the State Government**. As shown in *the chart below*, annual spending grew rapidly until FY 2022-23, peaking at 7160.97 Cr in 2023-24, and then began to decline in 2024-25. Ideally, 2024-25 should have higher allocations, but they were halted for administrative reasons, which are still being resolved. The chart below shows the allocation and investment trends for the JJM in Assam.



An analysis of how the above allocations were spent over the years was conducted to understand investment patterns, clubbing the expenses into five lifecycle cost components. These show that while capital investments have been substantial, O&M and support expenditures remained minimal and gradually declined. The FLOW strategy realises that such an imbalance can risk the very infrastructure gains achieved under JJM.

Financing Patterns and Current Fund Flows

Rural water-supply financing in Assam operates across three tiers - State, District, and Panchayati Raj Institutions (PRIs) - but these layers are not yet fully integrated.

At the State level, PHED manages major capital projects and rehabilitation work through budget head 4215-01-102.

At the District level, Divisional Engineers manage minor capital maintenance and energy expenditures, often using convergence or reallocated funds (Annexure 3.4).

At the PRI level, Gram Panchayats receive Finance Commission-tied grants for water and sanitation, and are responsible for day-to-day O&M, including electricity payments and minor repairs.

At the Scheduled Area Council level, these councils receive their own budgets and run independent water supply programmes. The SACs also receive the FC grants. However, the lack of a unified budgeting framework leads to inconsistent fund flow, underutilisation, and weak accountability.

The table below summarises the receipt and utilisation of funds specifically allocated for JJM, drawing on the JJM finance data portal and the state's budget expenditure data.

Year	Central Share	State Share	Total	Utilisation (%)
2019-20	442.36	29.01	471.37	78
2020-21	551.77	91.08	642.85	91
2021-22	4200.87	312.89	4513.76	94
2022-23	4588.21	584.9	5173.11	89
2023-24	6204	956.97	7160.97	86
2024-25	2159.63	375.27	2534.9	54
Total	**18146.84**	**2350.12**	**20496.96**	**88 (average)**

The utilisation of these funds was mainly for the creation of capital or water supply infrastructure. As no money has been allocated for the regular operations and maintenance of this infrastructure, a heavy reliance has naturally developed on PRI-level funds and community collections. Despite this situation, the systems for user fee collection remain very weakly institutionalised - only a small proportion of GPs collect regular tariffs, and most do not maintain separate O&M ledgers. The absence of predictable institutional financing has emerged as the largest and significant challenge to sustainability.

Reviewing the Finance Commission Grants, it has been found that utilisation is much lower than optimal. The FC-tied grants, meant to support basic water services, are often spent on general sanitation and drainage needs, and a large proportion of these funds is not spent at all. Field observations show that in considerable cases, electricity payments and minor repairs are delayed, directly affecting the schemes' functionality. Looking at the 15th FC funds data for Assam, it is found that the average annual utilisation of these grants is less than a third of the available grants. A good proportion of this unspent money could be used for the operation and maintenance of the JJM schemes, provided there is clear guidance and understanding at the local level.

The table below provides a clear picture of the 15th FC's financial situation, as drawn from the Gram Swaraj Portal of the Union Government.

In Crore INR	2021-22	2022-23	2023-24	2024-25
Opening Balance	301.49	1298.85	1770.55	1366.19
Allocation received during the year	1211.34	1377.60	802.38	800.87
Total Grants available	1512.83	2676.45	2572.93	2167.06
Expenses	213.98	905.90	1206.74	789.43
Balance	1298.85	1770.55	1366.19	1377.63
Unspent Balance as %	85.86	66.15	53.10	63.57

Functionality and Fiscal Efficiency

The efficiency of spending varies widely across districts. Districts like Sonitpur, Goalpara, and Jorhat have functionality rates above 80 per cent, while flood-prone Dhemaji and Barpeta average below 60 per cent. This divergence reflects both physical vulnerability and critical differences in fiscal management. A key insight from district reviews is that functionality strongly correlates with O&M expenditure per connection. Schemes that allocate more than ₹ 700 per FHTC per month for O&M tend to maintain steady service, while those below ₹ 400 per FHTC show frequent downtime. These findings underline the need for a lifecycle-based financing framework that institutionalises regular spending proportional to scheme size and vulnerability - exactly what FLOW sets out to achieve.

Overall, the analysis of the current situation of institutions and finances suggests several vital areas of improvement, which the FLOW strategy has taken into consideration.

4. FLOW Assam: Lifecycle Costing

Introduction

This chapter outlines the analytical evidence underpinning Assam's lifecycle financing requirements. It explains how unit costs, annual energy and maintenance expenditures, and district localisation factors were derived and validated. The results forms the quantitative backbone of the FLOW strategy.

Representative Scheme Model

After reviewing the database of existing schemes, a 214-household Single Village Groundwater Scheme (SVS-GW) was selected as the reference model (Annexure 4.1). This was derived from field data and DPRs from the Chirang, West Karbi Anglong, Tinsukia, Jorhat, and South Salmara districts.

The scheme's infrastructure includes a deep borewell (90 m), a 20,000 overhead reservoir, a 5 HP submersible pump, 2.5 km of PVC distribution line, and 214 functional household tap connections. Using PHED's 2023-24 Schedule of Rates and verified market rates (adjusted -30 per cent for bulk procurement), the capital expenditure (CapEx) is estimated at ₹ 1.26 crore, or ₹ 57,976 per FHTC.

This model serves as the baseline for deriving annual O&M, CapManEx, and total lifecycle cost for similar SVS schemes statewide.

Lifecycle Cost Components

The lifecycle cost structure integrates all recurring and periodic expenditures required to sustain reliable services. The lifecycle cost framework is built on six expenditure heads that collectively represent the full cost of sustainable service delivery. These cost heads are aligned with both the IRC WASHCost Framework (2020) and JJM's sustainability guidelines, and have been customised for Assam's institutional and physical context. Following Table provides an overview of the Lifecycle Cost Framework used for the FLOW Assam.

Cost Component	Abbreviation	Definition / Scope
Capital Expenditure	**CapEx**	Infrastructure creation - source, storage, treatment, distribution
Operating Expenditure	**OpEx**	Routine expenses - electricity, chemicals, caretaker wages, minor repairs
Capital Maintenance	**CapManEx**	Major renewals - pump, pipeline, motor replacement, structural repair
Direct Support	**DS**	Technical assistance, VWSC capacity building, water quality testing, training
Indirect Support	**IDS**	Monitoring, MIS management, supervision, administration
Resilience Reserve	**RR**	Contingency for flood, drought, power or disaster events

Integrating the Lifecycle Costing into the FLOW

The framework builds upon the **214-Household SVS-Groundwater scheme** used as the representative model in Chapter 5. The reference CapEx of ₹ 1.26 crore includes borewell construction, storage, treatment (where applicable), pumping equipment, supply pipeline and household connections. From this base, the annualised lifecycle cost is derived by calculating electricity, routine maintenance, and capital renewal needs over a 15-year horizon.

Annual Electricity Requirement and Energy Efficiency

Electricity expenditure dominates O&M budgets, accounting for roughly 60 per cent of total O&M costs. For sustainability, accurate estimation and budgeting of energy requirements are crucial.

Using empirical field data:

- Average runtime: 11 hours/day
- Total head: 80 m
- Efficiency: 45 percent
- Annual energy consumption: 12-14 MWh

At APDCL tariffs (₹ 6.8-7.5 per kWh), the annual energy cost ≈ is ₹ 1.05 lakh per scheme (conservative).

Introducing modest efficiency improvements (correct pump sizing, power-factor correction, leak control) can yield 10-12 per cent energy savings, equating to ₹ 120-180 crore annually statewide (Annexure 4.2). The LCCF explicitly includes an energy-efficiency adjustment factor in its fiscal projections (Annexure 4.3).

When we estimated the annual lifecycle cost requirements for the reference 214 household single village scheme, with an overall capital cost of 1.26 Crore INR, we found the following:

Component	Total Estimated Expenses (INR)	% of the CapEX Incurred for the Scheme
CapEx	1.26 Crore	100
OpEx	5.67 Lacs	4.50%
CapManEx	2.77 Lacs	2.20%
DS	1.26 Lacs	1.00%
IDS	0.63 Lacs	0.50%
RR	0.32 Lacs	0.25%
Total	**10.65 Lacs**	**8.45%**
Per FHTC Lifecycle sustainability cost per annum	**4976.64 INR**	**0.04%**

As projected, the Per FHTC lifecycle sustainability costs for these water supply assets are approaching INR 5000 per annum. On a per capita basis, this will be around INR 1000 per annum. The overall cost will require a minimum annual increase of 2%.

Building on these, the overall Lifecycle costs emerge as:

- Average annual O&M requirement: ₹ 5.0 – 6.5 lakh per scheme
- Average annual capital maintenance: ₹ 2.5 - 3.0 lakh per scheme
- Direct and indirect support: ₹ 0.6 lakh per scheme
- **Resilience reserve:** ₹ 0.1 lakh per scheme

Hence, the total annual lifecycle cost per scheme = ₹ 3.5 - 4.0 lakh, representing about 8.5 per cent of CapEx. The table below provides a glance at this.

Cost Component	Definition / Scope	Indicative Share of CapEx (%)
Capital Expenditure (CapEx)	Systems for infrastructure hardware at Source, storage, treatment, quality assurance and distribution works	Already in place, hence not costed again (100)
Operating Expenditure (OpEx)	Routine electricity, staff costs, chemicals and reagents, and minor repairs of the infrastructure hardware	3.5 to 5.0
Capital Maintenance (CapManEx)	Major repairs, replacement of capital, and structural restoration (pooled cost)	1.5 to 2.0
Direct Support (DS)	Technical training, community mobilisation, and field supervision	0.8 to 1.0
Indirect Support (IDS)	Monitoring, policy, and administrative costs	0.4 to 0.6
Resilience Reserve (RR)	Contingency for disasters or climate shocks	0.25

Together, these heads represent 8 to 9 per cent of CapEx per year before adjustments to include District Localisation Factors (DLF). Details of the calculations are provided in Annexure 4.4.

District Localisation Factors (DLFs)

To account for varying operational challenges, DLFs were computed using a weighted matrix combining flood frequency, terrain, remoteness, and groundwater depth (see Annexure 4.4). The factor adjusts the standard lifecycle percentage by 0-15 per cent. Based on this, we have calculated the additional costs for specific terrain, considering the reference scheme for plain, stable terrain. The table below shows the levels of cost variation across geographies and in example districts where differential costing would be required (Annexure 4.5 & 4.6).

Terrain / Typology	Cost Proportion/ DLF Value)	Districts
Plains / Stable	1.00	Sonitpur, Darrang, Hojai
Char / Remote with moderate flood	1.05	Baksa, Bajali, Barpeta, Biswanath, Bongaigaon, Cachar, Charaideo, Chirang, Dibrugarh, Golaghat, Hailakandi, Jorhat, Kamrup, Kamrup (Metro), Karimganj, Kokrajhar, Nalbari, Sivasagar, Tinsukia, Udalguri, Tamulpur
Flood-prone	1.08	Majuli, Dhemaji, Dhubri, Goalpara, Lakhimpur, South Salmara–Mankachar, Morigaon
Hilly terrains	1.12-1.15	Karbi Anglong, West Karbi Anglong, Dima Hasao

The overall cost proportion for each terrain has been calculated as the District Localisation Factor (DLF) to help finalise the actual costs to be allocated to each district. This factor will be applied to scale the lifecycle budgets for each district, ensuring vulnerability-sensitive allocation.

It is ideal to use the DLF value for each scheme based on the ground situation, rather than applying the same at the district level, which will be done gradually, as the data required for such scheme-level classification has been progressively built. At the current level, those schemes in a vulnerable district may receive more allocation, regardless of whether the vulnerability applies to their actual location.

Scaling the DLF to the State Level

Applying scheme-type distributions and DLF-weighted multipliers across Assam's 96,000 schemes (covering about 80 lakh households) as seen in Annexure 4.7, this yields a total annual lifecycle financing requirement of ₹ 1,950 - ₹ 2,250 crore.

This incorporates:

- ₹ 1,250 - ₹ 1,450 crore for O&M,
- ₹ 350 - ₹ 400 crore for CapManEx,
- ₹ 200 - ₹ 250 crore for direct and indirect support,
- ₹ 50 crore for resilience reserves.

These numbers represent the minimum sustained budget envelope required to maintain service functionality across the entire state. Given the current spending levels and other factors, **the overall requirement will be rounded off to ₹ 2000 Crore,** which will also include the Lifecycle maintenance costs for the large surface-water-based multi-village water supply schemes managed by the PHED, upkeep and maintenance of the Water Quality Testing Laboratories and the water supply schemes within the rural institutional premises of the education, women and child development, and health departments.

Key Insights and Implications

- **Electricity costs dominate O&M** and must be planned through dedicated budget heads, not contingent FC funds.
- **Community participation is vital** for SVS sustainability, but requires training, incentives, and digital transparency tools.
- **District Localisation Factors institutionalise equity**, ensuring that high-cost districts receive proportionally higher support.
- Lifecycle costing should guide future budget estimates, linking engineering data with fiscal policy.
- **Predictable funding at all tiers** (State, District, PRI) is essential to sustain Assam's ₹ 20,000 crore infrastructure base.

5. Flow Assam: Financing Strategy

The Flow Lifecycle costing process demonstrated in the previous chapter examined the actual requirements for maintaining Assam's water supply infrastructure and processes. **The overall need is projected as INR 2000 crore per annum**.

Gap Analysis and strategies to fill these gaps

- PHED and PRI records for FY 2024-25 indicate roughly ₹ 340 crore available for O&M and minor repairs. The previous allocations for the National Rural Drinking Water Programme were close to INR 550 crore from the centre. However, this is entirely contingent upon the central policies and the understanding between the centre and state. In the future, **we are assuming a conservative INR 450 Crore per annum from the centre**.
- The PRI department or the scheduled area councils, for direct expenditure at the scheme level, are using the Finance Commission grants. Again, the FC grant needs to be earmarked for this process, as done by the 14th and 15th CFC. **We estimate that the Finance Commission Grants will be able to allocate close to 600 Crore per annum.**
- School and Anganwadi level PWS Schemes, which are handed over to concerned departments, needs to be brought back for the purpose of ensuring quality water supply. Similarly, the water supply schemes within the rural health facilities also need a similar approach. Here, the Education Department would be requested to provide INR 90 Crore, and the Women & Child Development INR 72 crore, and the Health department for 12 Crore, to the Lifecycle maintenance pool every year for the upkeep of the schemes in their premises, considering around 45000 rural Schools, 36000 Angan Wadi Centres, and 6000 rural health institutions, wherein the electricity charges and the Jal Mitra Salaries won't be needed for these institutions. **This scheme, if realised, would bring around INR 174 Crore to the kitty.**
- Nine districts in Assam fall under high flood prone areas and another 21 face mid flood situations. A share from the Disaster Management budgets can be earmarked for taking care of the CapManEx for these schemes, which will be frequently required due to the disaster situation. **Overall, an allocation of 50 Crore could be sought for the schemes in these districts**.
- Local level mobilisation from the own budgets of Scheduled Area Councils, MP/MLA LADs, District Mineral Funds, work contributions from the NREGS/ VBGRAMG, direct support from the Tea Garden Managements for the schemes within their premises, one can expect around one crore INR per district overall, **which comes to around INR 35 Crore annually at the state level**.
- Given the current situation, there are close to 60 lakh FHTCs across the state and we can expect them to make a maximum contribution of INR 50-75 per month, gradually from the current expectation of INR 30 per month, which can potentially generate a maximum of 100 crore initially and to reach 420 crores gradually within 5 years, considering defaulters and other socio-economic factors. **We are considering an average of 250 Crore per annum from user communities**, although this may result in some shortages until community-level collection reaches optimum level.

Taking all the above considerations into account, **the overall expected annual gap will be around INR 500 Crore.** Contingent upon the Central Allocations, this can grow up to 1000 Cr.

Key Strategies for Addressing Gaps

As the key strategy for filling the expected financing gap of close to INR 450 Crore, **The Flow proposes a state government budget grant of INR 450 Crore per annum for the FLOW strategy,** over and above the sources discussed above**.** The expectation is that the central grants, finance commission grants and other sources of money will work as estimated. In case there are any challenges in this regard, we have put in place contingency measures, as outlined below. The overall financial allocation has been projected in the table below:

Sl	Resource Pool	Expected Share per annum	Expected Allocation (In crore INR)	Key Purposes
1	**Overall Need**	**100**	**2000**	**All components of Flow**
Source of Funds				
1	Community Contribution	10-30	250	Part of OpEx
2	Local Sources	1.8	35	Part of CapManEX
3	Education, Women/Child Dev and Health Departments	8.7	174	All rural Institutional Schemes
4	SAC/PRI through FC Grants	30	600	Part of OpEX
5	Grant from Central Govt	22.5	450	DS, IDS, WQ Lab maintenance
6	Disaster Management Funds	2.5	50	CapManEX for schemes in disaster prone areas
6	State Government Grant	25	450	CapManEx, RR and flexible for filling other gaps
	Total		**2009**	

Contingency measures to address expected delays or gaps in approvals and allocations:

Given PHED's current limited capacity to finance long-term O&M, FLOW proposes a phased five-year transition plan that enables communities to assume financial responsibility for routine operations progressively. The table below presents the phased transition Plan, along with the share of resources that the state and communities will contribute to meet the lifecycle costs of these systems. By Year/stage 5, communities are expected to contribute around 30% of the overall costs and to manage electricity and minor repair costs through their own contributions. At the same time, the funds from public sources will continue to cover expenses, including human resources, capital maintenance, replacements, and resilience (refer to Annexure 4H). The overall share from public sources and communities is projected for each scenario in the table below, assuming an overall number of FHTCs in Assam of 60 lacs.

The table below suggests the incremental plan for enhanced and optimised community contributions towards covering the costs for the FLOW strategy.

Year/ stage	Scenario	Share from identified public sources (in Crore INR)	Ideal Community Contribution (in Crore INR)	Per FHTC Contribution Per Annum (in INR)	Per month per family share (adjusted to a round figure- in INR)	Expected Total (Incremental from 50% to 75% Crore INR)
1	90:10	1800	200	333	30	100
2	85:15	1700	300	461	40	165
3	80:20	1600	400	615	50	240
4	75:25	1500	500	769	65	325
5	70:30	1400	600	923	75	420

Risk-Pooling of CapManEx to reduce the overall investments towards capital

Given the fact that all the infrastructure hardware need not be replaced at a given year, the costing has already undertaken a measure of pooling a proportion of costs from all schemes every year, which could be used for fulfilling the requirements emerging at specific schemes. Here, the overall costs will be less and every scheme can go for capital renewal or replacements as per the emerging actual needs. The pooled money would be serving only a limited proportion of all schemes in a given year, but all those schemes require attention during that year will be fulfilled too. This helps to reduce the annual increments and to fulfil the needs of all schemes in an incremental manner.

Insurance of Allowable Infrastructure against losses and damages

The possibility of Insurance for all permissible infrastructure hardware will be explored to reduce CapManEx costs.

Annual/ Periodic Preventive Maintenance of All Assets

Institutions will be created at block and district level for ensuring timely repair and maintenance of all assets, as an entrepreneurship model under the NULM, with necessary skills. Preventive maintenance by these teams will ensure added life of systems and will reduce costs.

Building Incremental Stages for Implementing the Strategy

Since the overall life-cycle costs are around INR 2000 Crore per annum, there may be delays in mobilising essential resources. The time needed to optimise community-level contributions may also be slightly longer than the suggested five years; in this light, the FLOW Strategy in Assam may be implemented in three stages, if required. Such an incremental implementation has been proposed based on inputs during consultations with Engineers and State Officials in Assam, after reviewing available evidence on the Lifecycle cost frameworks and their implementation. Each of these stages may take one to two years to complete.

Initial Stage: Bare Minimum (3–5% of CapEx annually)
This range reflects what is essential to prevent avoidable breakdowns. It covers electricity, caretaker honoraria, chlorine/consumables and short-term emergency repairs. It is a little higher than the status quo, however, not very high compared to the current O&M estimates. Schemes supported at this level remain functional but are vulnerable to system shocks, especially in flood-prone and hilly districts.

Stage 2: Realistic / Achievable (5–7% of CapEx annually)
This scenario incorporates planned maintenance, water quality testing, periodic repair and limited direct support at district and block levels. It is the level at which functionality improves noticeably, major repairs are less abrupt and community confidence stabilises. This range is financially achievable for Assam through a mix of Finance Commission grants, modest state contributions and convergence with MPLADS, MLALADS, SOPD and other available funds.

Stage 3: Optimal SRI (7–9% of CapEx annually)
This is the level needed to ensure sustainability, climate resilience and inclusion. It includes structural strengthening, pump replacement cycles, deeper water quality surveillance, direct support for WUCs, and the necessary indirect/systemic support for district laboratories, monitoring systems, SOP updates and operator capacity building. For highly vulnerable districts—such as those with DLF 1.10 or 1.15—this level is the most prudent long-term investment.

These revised ranges reflect what is both technically justified and practically feasible within Assam's administrative and fiscal context.

There is a need for institutional mechanisms to realise this, such as State Maintenance Pools and District Sinking Funds, as discussed later in Chapter 8.

6. Sustainability, Inclusion, and Resilience

This chapter focuses on embedding Sustainability, equity, inclusion and resilience within Assam's water financing framework. A sustainable system must not only function technically but also equitably distribute financial resources, responsibilities, and risks across communities. To operationalise the FLOW strategy, a multi-level financing architecture has been designed, integrating all funding sources - PHED budget, Finance Commission tied grants, and user contributions - into a coherent and accountable framework. This architecture enables predictable fund flows and clear accountability across State, District, and PRI levels.

Current O&M Financing Reality

At present, the majority of O&M expenses for SVS schemes are financed through 15th Finance Commission tied grants under the water and sanitation head. While this has provided temporary relief, it is not a long-term mechanism. Only about 15 percent of GPs collect user fees consistently. PHED covers electricity costs for a limited set of multi-village and high-energy schemes. This fragmented structure makes O&M funding highly uneven and often delayed. Given that the historic ₹550 crore state allocation as part of the erstwhile NRDWP is no longer assured, Assam must turn to a wider range of financing sources. Our analysis shows low utilisation rates in several state financing windows:

Fund Source	Typical Annual Outlay	Current Utilization	Potential for Water Systems
MPLADS	~₹200 Cr	50–60%	Solar retrofits, pump replacements
MLALADS	~₹350 Cr	45–55%	Local repairs, minor infrastructure
SOPD	~₹450–500 Cr	70–80%	Bridging small CapEx gaps
District Mineral Fund (DMF)	~₹800 Cr	<40%	Resilient infra in mining districts
State Own Revenue	Variable	–	Possible ring-fencing for OpEx

A structured convergence strategy could generate **₹500–900 crore annually**—enough to cover 30–50% of the Moderate SRI financing requirements.

Proposed Sustainability Measures

Three Tier Financing Architecture

The FLOW strategy proposes a three-tier architecture that ensures **ring-fenced, transparent, and predictable** fund management. The table below suggests the outlook on these structures.

Level	Fund Instrument	Funding Sources	Primary Purpose
State	Capital Maintenance & Resilience Funds	PHED Budget, State Plan, Disaster Mitigation Allocations	Major rehabilitation, climate adaptation
District/ SAC	District Maintenance & Sinking Fund (DMSF)	Pooled FC Grants + PHED Transfers	CapManEx, minor rehabilitation, monitoring
GP/ VCDC	Water Services Sub-ledger	FC Tied Grant + User Fees	Routine O&M, electricity, caretaker incentives

These three instruments together form the **financial backbone of FLOW**.

Staged Financing

Assam's annual lifecycle financing requirement for rural piped water supply can be meaningfully assessed using three scenarios that reflect different levels of service ambition and fiscal space.

Stage 1: Bare Minimum Financing (3–5% of CapEx annually)

This scenario aligns most closely with the state's current practice, where O&M is largely dependent on the central and state Finance Commission grants, intermittent user fees and partial support from PRI funds. Under this band:

- Systems remain operational but experience frequent service interruptions.
- Water quality testing remains irregular.
- Major repairs are deferred until failures occur.
- Pump replacement and rising-main rehabilitation often come too late.
- Inclusion and resilience measures are largely absent.
  This level is insufficient to safeguard assets in DLF 1.10 and 1.15 districts.

Stage 2: Realistic / Achievable Financing (5–7% of CapEx annually)

This range is the **most viable for Assam in the medium term**. It incorporates:

- Routine O&M, caretaker honoraria, electricity, chlorine and minor repairs.
- Periodic capital maintenance (CapManEx) including pump replacement cycles.
- Regular water quality surveillance, especially in iron-, fluoride- and flood-affected districts.
- Minimum DS support for Jal Mitras, FTK groups and WUCs.
- Selective resilience measures (e.g., raised plinths in recurrent flood zones).

This band is practical and fiscally manageable through a combination of Finance Commission funds, SOPD allocations, DMF contributions in eligible districts and the structured use of MPLADS/MLALADS for capital-maintenance purposes.

Stage 3: Optimal Sustainable, Resilient and Inclusive (SRI) Financing (7–9% of CapEx annually)

This scenario represents the investment level required for systems to remain functional, safe, climate-resilient and inclusive over decades, particularly in high-vulnerability districts. It includes:

- Proactive capital maintenance
- Flood and lightning protection
- Robust water quality surveillance
- Investments in safety gear, training and operator incentives
- Structured DS and IDS support for planning, monitoring and technical troubleshooting
- Inclusion measures for tail-end households, left-out families and women's groups
- Strengthened district labs, digital monitoring and supervisory systems

This stage ensures the full return on capital investments made under JJM. Introducing this framework could help the state:

- Rationalise annual allocations, taking the necessary time in a phased manner;
- Prioritise high-risk districts for higher financing bands;
- Clearly communicate resource requirements to state finance departments;
- allows phased transitions from stage 1 to stage 2 to stage 3 over five years.

It also allows local governments and autonomous councils to understand the difference between what is possible with the current envelope and what is required to protect assets worth thousands of crores created under JJM.

State-Level Funds

(a) Capital Maintenance Pool:
A state-managed revolving fund for rehabilitation of major assets (cost > ₹ 2 lakh per scheme). Annual allocation: ₹ 350-400 crore.

(b) Resilience Reserve Fund:
Dedicated 0.25 percent of CapEx (~₹ 50 crore annually) for climate and disaster-related rehabilitation. Managed jointly by PHED and the State Disaster Management Authority (SDMA).

Both funds will be operated under PHED Finance Wing, with quarterly utilisation reports to the Finance Department.

District Maintenance & Sinking Funds (DMSF)

Each district will establish a DMSF under the District Water and Sanitation Mission (DWSM).

- Funding mix: 70 percent FC tied grant, 30 percent state PHED top-up.
- Fund utilisation priorities:
    1. Capital maintenance and major repairs <2 lacs;
    2. Technical supervision and field monitoring;
    3. Emergency restoration in coordination with PRIs.

Disbursements will be performance-linked, rewarding PRIs with timely reporting and high functionality scores.

VCDC/PRI-Level Sub-Ledger and Community Financing

At the village level, every GP will maintain a Water Services Sub-ledger, linked to the tied grant head and managed by the VWSC.

- User contributions are to be deposited directly into the sub-ledger.
- Minimum 80 per cent of collections are earmarked for electricity and minor repairs.
- The remaining can be used for necessities related to water supply that are not covered by other heads, including incentives for the performance of the Jal Mitras, etc, or to fill specific gaps.
- All such income and expenditures will be reported quarterly via the the FLOW/Lifecycle Dashboard.

Budget Head Mapping

Lifecycle expenditure heads are mapped to existing PHED budget codes, ensuring seamless integration with state financial systems. The following table provides the FLOW/Lifecycle budget heads mapped with the state's budget codes.

Lifecycle Head	Budget Code	Responsible Agency
CapEx	4215-01-102	PHED
O&M	2215-01-101	PRI / GP
CapManEx	2215-01-102	District DWSM
Direct Support	2215-01-190	PHED Training Cell
Indirect Support	2215-01-800	PHED HQ
Resilience Reserve	2215-01-789	PHED + SDMA

Fiscal Flow Summary

Required Annual Fiscal Flow (₹ crore) summary is provided below.

Level	Allocation Range (₹ crore)	Purpose
State	400-450	Major rehabilitation and resilience
District	350-400	CapManEx and supervision
PRI / GP	1,200-1,400	Routine O&M and electricity
Total	1,950-2,250	Annual Lifecycle Requirement

Strengthening Financial Management Systems

To translate LCC planning into operational financing, **the FLOW Strategy will ensure**:

- An integrated financial management/ tracking system for OpEx, CapManEx, DS and IDS;
- District-level WASH finance cells to aggregate scheme-level needs;
- Annual budgeting templates aligned with the 2–9% cost norms;
- Digital tools for monitoring expenditure against functionality;
- A dedicated window for climate resilience finance within district plans.
- Sound financial management is the backbone for achieving sustainable service delivery and ensuring that schemes built under JJM continue delivering for decades.

Accountability and Transparency Mechanisms

- Quarterly fund release schedules to eliminate delays.
- Performance-linked O&M grants to reward functionality.
- Lifecycle Dashboard to track fund use and functionality metrics in real-time.
- Annual district audits to ensure compliance with expenditure norms.

Gender and Social Inclusion

Women and marginalised communities play vital roles in maintaining scheme functionality. FLOW institutionalises this role through dedicated provisions under the Direct Support (DS) cost head.

- Jal Mitras (caretakers/operators): Monthly incentive ₹ 7,000 – 10,000.
- FTK (Field Testing Kit) Women's Groups: The Flow has allocated ₹ 1,500 – 2,000 per month per group for water quality testing and reporting.

- VWSC inclusion: Mandate 50 per cent women and marginalised community members' representation in Village Water and Sanitation Committees.
- Accessible grievance systems.
- Safe water handling and hygiene practices for women, adolescents and family members of children under the age of 5.

These allocations, while modest, formalise the gendered labour that underpins service reliability. (Refer Annexure 4H for O&M transition and community incentive structure.)

Embedding Equity through DLF

The DLF framework doubles as a tool for fiscal equity. By allocating proportionally higher lifecycle shares to flood-prone and hilly districts, the model compensates for higher cost burdens due to remoteness and climatic exposure.
For example, Dhemaji (DLF 1.10) automatically receives 10 percent more allocation than Sonitpur (DLF 1.00), ensuring cost parity in achieving the same service standard.

Resilience

Assam's vulnerability to floods, erosion, landslides and lightning directly affects water infrastructure. Field observations across South Salmara, Dhemaji, Majuli, Chirang and Tinsukia confirmed repeated damage to rising mains, pump houses, electrical panels and intakes. The cost of inaction—frequent system downtime, higher repair expenditure and declining community trust—far exceeds the incremental cost of preventive resilience measures.

Costs for resilience measures integrated into financing include:

- raised plinths and flood bunding;
- lightning protection;
- solar systems for power backup;
- flexible pipelines in erosion-prone stretches;
- structural strengthening of RSFs and pump houses;
- enhanced chlorination and water quality monitoring during post-flood periods.

Climate resilience is not an add-on but a core sustainability requirement, and key elements are integrated in the District Localisation Processes.

Resilience in Financing Design

Assam's rural water infrastructure is repeatedly exposed to floods, landslides, and power disruptions. In flood-prone districts, repairs after each event often consume significant portions of annual O&M budgets, undermining regular maintenance.

To mitigate this, FLOW introduces two resilience-oriented fiscal instruments:

1. **Resilience Reserve Fund (RR):** 0.25 percent of total CapEx, earmarked annually for emergency repairs and restoration.
2. **Capital Maintenance Pool:** A dedicated state-level fund (detailed in Chapter 7) that covers post-disaster rehabilitation beyond PRI capacity.

Together, these instruments ensure that disasters no longer derail functionality or burden PRIs with extraordinary repair costs.

Disaster and Climate Risk Reduction

Under the Resilience Reserve Fund, the following activities are prioritised:

- Pump and motor replacement after floods;
- Electrical rehabilitation after surges or transformer damage;
- Emergency water supply through mobile tankers;
- Chlorination and FTK replenishment during outbreaks.

Each district DWSM will maintain a resilience reserve sub-ledger, accessible upon the Deputy Commissioner's declaration of a disaster.

Outcomes of the Sustainability, Inclusion and Resilience Approach

1. Risk-responsive funding: Rapid repairs prevent prolonged service disruption.
2. Gender empowerment: Institutionalised incentives for women’s participation.
3. Equity mainstreaming: Vulnerability-adjusted allocation (via DLF) ensures fair resource distribution.
4. Fiscal resilience: Dedicated reserves prevent unplanned reallocation from routine O&M.

7. Phased Implementation Roadmap

Introduction

Having established the fiscal rationale and financing architecture, this chapter outlines the five-year roadmap for operationalising the FLOW strategy across Assam. The roadmap provides a structured, time-bound plan that enables the state to transition from infrastructure-led development to service sustainability through lifecycle financing.

Four principles guide the roadmap's design:

1. **Predictability:** Establish clear and recurring fund flows for each level of governance.
2. **Performance Orientation:** Link financial allocations to functionality and equity outcomes.
3. **Institutional Ownership:** Empower State, District, and PRI actors to manage distinct financing roles.
4. **Scalability:** Allow phased expansion while embedding learnings from pilot districts.

Phasing Structure

Implementation is divided into three broad phases aligned with Assam's planning horizon under JJM 2.0 (2025-2030). Each phase includes distinct institutional milestones, fiscal actions, and capacity-building goals. The table below provides a picture of the phased Implementation Framework

Phase	Timeline	Primary Focus	Key Outputs / Milestones
Phase I - Foundation	FY 2025-26	Pilot in 10 districts; policy notification and fund creation **Stage 1 of FLOW**	O&M Policy notified; DMSF operational in 10 districts; Lifecycle Dashboard prototype developed.
Phase II - Integration	FY 2026-28	Statewide rollout of financial instruments **Stage 2 of FLOW**	DMSF functional in all 35 districts; PRI sub-ledgers operational; capacity building for VWSCs completed
Phase III - Consolidation	FY 2028-30	Institutionalisation and automation **Stage 3 of FLOW**	Lifecycle budgeting integrated into MTFF; functionality > 90%; public reporting initiated

Each phase is designed to build on the previous one - ensuring institutional maturity and fiscal confidence before full-scale expansion.

The details of actions and priorities under each of these phases have been worked out as following.

Phase I: Foundation (FY 2025-26)

Phase I focuses on building institutional readiness through targeted pilots in ten diverse districts representing different typologies (flood-prone, hilly, and plains). These include Dhemaji, Nagaon, Dima Hasao, Karbi Anglong, Sonitpur, Jorhat, Goalpara, Dhubri, Barpeta, and Cachar. The stage 1 of the FLOW strategy will be implemented here.

Key activities under Phase I include:

- Notification of **Lifecycle Cost-Based O&M Policy**.
- Creation of **State Capital Maintenance Pool** and **Resilience Reserve Fund**.
- Establishment of **District Maintenance and Sinking Funds (DMSF)** in pilot districts.
- Development of **Lifecycle Dashboard** for real-time functionality and fund tracking.
- Training of district engineers, accountants, and PRI staff on lifecycle costing principles.

A baseline functionality and financial audit will be conducted for each pilot district (Annexure 6A).

Phase II: Integration (FY 2026-28)

Once operational systems are tested and refined, Phase II will focus on scaling to all 35 districts, with stage 2 level of financing and processes initiated as part of the pilot phase.
Major deliverables include:

- **Integration of lifecycle cost heads** into the annual PHED and Finance Department budget documents.
- **Expansion of the Lifecycle Dashboard** to cover all districts.
- **Activation of PRI sub-ledgers** in every VCDC and Gram Panchayat.
- **Consolidated reporting** through DWSMs to State PHED.

At this stage, Assam should be able to demonstrate consistent O&M expenditure tracking, predictable fund release schedules, and measurable improvements in functionality (target ≥ 85 percent).

Phase III: Consolidation (FY 2028-30)

By the final phase, FLOW transitions from a project initiative to a mainstream public-finance system, entering stage 3 of the FLOW strategy.
Key actions include:

- **Embedding lifecycle budgeting** into the State budget or the Medium-Term Fiscal Framework (MTFF) of the State as applicable.
- Regular functionality-linked grants through **performance scorecards**.
- **Annual *State of Water Services Report*** tabled before the Legislative Assembly.
- **Independent audits** validating fund utilisation and service performance.

By 2030, Assam will not only have achieved universal coverage but also institutionalised the financial systems required to maintain it sustainably.

Risk Management and Mitigation

The FLOW strategy has identified the following risks and mitigation measures for specific challenges.

Risk	Level	Mitigation Strategy
Delay in fund release	Medium	Advance quarterly release schedule; pre-loaded DMSF accounts
Limited PRI financial capacity	High	Targeted training and handholding via DWSMs
Data inconsistency in Dashboard	Medium	Integration with JJM BRAIN and routine validation
Low user-fee compliance	High	Incentive-linked community monitoring and public disclosure
Disaster disruptions	High	Use of Resilience Reserve and rapid repair SOPs

Capacity Building and Institutional Strengthening

Capacity development is integral to FLOW's success. A structured training plan will be executed across three levels:

1. **State:** Policy formulation, financial analytics, dashboard management.
2. **District:** Fund management, DLF application, and reporting.
3. **PRI/ Block:** Community budgeting, VWSC recordkeeping, tariff collection, and gender-inclusive participation.

The key priorities under institutional strengthening have been listed in chapter 2. Training modules will be developed by PHED's Training Cell in collaboration with the State Institute of Rural Development (SIRD) and hosted on the *Lifecycle Dashboard learning portal*. (Annexure 6D).

8. Accountability, Monitoring, and Governance

This chapter outlines the governance and accountability framework necessary for FLOW's long-term success. A financing strategy of this scale requires transparent fund management, clear institutional roles, and robust monitoring mechanisms linking expenditure to outcomes.

Institutional Roles and Responsibilities

The FLOW strategy has developed the following roles and responsibilities matrix to aid its smooth implementation.

Level	Core Functions	Key Deliverables
State (PHED + Finance)	Policy, fund allocation, dashboard oversight	Annual budget, lifecycle guidelines, fund release schedule
District (DWSM + Division)	Fund pooling, DLF application, technical support	DMSF operation, performance tracking, PRI training
PRI (VWSC + GP)	Routine O&M, electricity payment, community mobilisation	Functionality ≥ 90%, quarterly reporting, user-fee collection
Community	Monitoring, feedback, contribution	Local accountability, gender inclusion

This tiered structure ensures fiscal and operational accountability aligned to capacity and mandate.

Monitoring Framework

Monitoring will be built around three complementary systems:

1. **FLOW / Lifecycle Dashboard:** Digitally tracks fund allocation, expenditure, and scheme functionality at the village level.
2. **Quarterly Financial and Technical Reports:** Submitted by DWSMs to the State PHED Finance Wing.
3. **Annual Independent Review:** Conducted by a third-party auditor to assess financial and technical performance.

Suggested Key Indicators for monitoring are:

- Functionality rate (% of schemes supplying water ≥ 10 months/year)
- Annual O&M spending per HH
- Electricity payment compliance
- CapManEx utilisation ratio
- Gender representation in VWSCs
- Timeliness of fund release

Integration with JJM BRAIN and State Budget

The Lifecycle Dashboard will interface with JJM's BRAIN system via an Application Programming Interface (API), ensuring automatic data synchronisation. Financial heads (as defined in Chapter 8, Table 8.2) will be reflected in both the State's eKosh accounting portal and district treasury systems, ensuring that fund flow is both visible and traceable.

Accountability and Audit

Accountability will be reinforced through:

- **Concurrent audit** of DMSFs by district finance officers.
- **Annual social audit** at the GP level led by VWSCs, using simplified financial disclosure formats.
- **Third-party performance audit** covering 10 per cent of schemes each year, focusing on fund-use efficiency and functionality correlation.
- **Public disclosure:** Summary dashboards available on the PHED website with colour-coded performance maps.

Role of Community and Social Accountability

FLOW recognises that community trust is the cornerstone of financial sustainability.

- Each VWSC will hold biannual Gram Sabha water sessions to present expenditure statements and collect feedback.
- PHED will provide Water Audit Templates for PRIs to record user collections and expenditures.
- Community oversight mechanisms will be linked to incentive payments for Jal Mitras and FTK groups, encouraging transparency from the bottom up.
- Community-level Monitoring will be done through integration with the state mechanisms for accountability as well

Grievance Redress and Transparency

Each DWSM will operate a **Water Services Helpline** linked to the Dashboard for logging complaints on service failure, fund misuse, or delays.
All grievances will be time-bound:

- 48 hours - response acknowledgement
- 7 days - field verification
- 30 days - resolution or escalation

Quarterly grievance summaries will be published in the *State of Water Services Report* (Annexure 7B).

9. Way Forward

Core Policy Measures to be Initiated

The FLOW strategy culminates in 10 key policy measures to institutionalise lifecycle financing across Assam's rural water supply sector.

#	Policy Recommendation
1	Notify Revised Lifecycle Cost-Based O&M Policy - define cost heads and fund flow structure.
2	Create Dedicated Maintenance and Resilience Funds - operationalise State and District pools by FY 2025-26.
3	Establish VCDC/ PRI Water Sub-ledgers to ensure separate accounting for O&M funds.
4	Prepare the Infrastructure Maintenance Task Force in all districts with the necessary skill sets, systems and processes.
5	Integrate Lifecycle Costing into Annual Budget - include CapManEx, DS, IDS, RR heads.
6	Institutionalise DLF-Based Allocation: adopt a vulnerability-weighted formula.
7	Introduce Performance-Linked Grants - tie 10% of O&M allocation to functionality improvement.
8	Implement Energy Efficiency Programme - pump optimisation, leak control, power factor correction.
9	Formalise Gender-Inclusive HR Strategy - integrate Jal Mitra & FTK remuneration through DS.
10	Initiate Monitoring, Accountability and Grievance Redress Measures at Different Level
11	Publish Annual 'State of Water Services' Report - transparency and accountability.
12	Institutionalise Legislative Review Mechanism - biannual sector review by PHED & Finance Dept.

Fiscal Sustainability Outlook

If the FLOW framework is fully implemented, Assam will require approximately ₹ 10 000 crore over five years (FY 2025-30) to sustain its existing water infrastructure. However, with improved efficiency, tariff rationalisation, and DLF adjustments, the effective cost burden may reduce by 8-12 per cent, yielding cumulative savings of ₹ 800-1,000 crore.

This fiscal roadmap aligns with both the State's Medium-Term Fiscal Framework and JJM 2.0's sustainability mandate.

The Way Forward

In the short term (FY 2025-26), Assam's priorities should be:

1. Adoption and notification of the O&M Policy.
2. Operationalisation of the State and District Funds.
3. Digitalisation of O&M accounts through the Lifecycle Dashboard.
4. Launch of pilot district reviews to demonstrate the model's fiscal viability.

By FY 2026-30, the system should evolve into a self-correcting financing ecosystem with embedded transparency, community engagement, and fiscal discipline.

Concluding Perspective

FLOW represents a significant shift in the governance of rural water supply in Assam - from a focus on “how many taps are built” to “how long water flows from each tap.”
It is a strategy rooted in evidence, sustained by fiscal realism, and designed for inclusion and resilience.

By aligning finance with function, FLOW ensures that every rupee invested continues to deliver value - not just in infrastructure but in the dignity, health, and resilience of rural households across Assam.

References

- Assam State Disaster Management Authority (2024). *Flood and Erosion Management Report*. Government of Assam.
- Assam State Action Plan on Climate Change (2023). Department of Environment and Forests, Government of Assam.
- Comptroller and Auditor General of India (2023). *Performance Audit on Implementation of Jal Jeevan Mission in Assam*.
- CPHEEO (2023). *Manual on Water Supply and Treatment (4th Edition)*. Ministry of Housing and Urban Affairs, Government of India.
- Department of Finance, Assam (2023). *State Budget Analysis 2023-24*.
- IRC WASHCost (2012). *Life-Cycle Costs Approach for Sustainable WASH Services*. IRC International Water and Sanitation Centre.
- Ministry of Jal Shakti (2024). *JJM Annual Progress Report 2023-24*. Government of India.
- PHED Assam (2024). *Draft Operations and Maintenance Policy for Rural Water Supply Schemes*.
- World Bank (2019). *Costing Sustainable Water Supply Services in India*.
- Public Health Engineering Department (PHED), Government of Assam. *JJM BRAIN Dashboard Data (2019-2025)*.
- PHED. *Schedule of Rates (SoR) 2023-24*.
- IRC WASHCost Initiative (2020). *Lifecycle Cost Approach Framework*.
- Ministry of Jal Shakti (2023). *JJM Operational Guidelines, Phase 2*.
- Assam Power Distribution Company Ltd. (APDCL, 2024). *Tariff Notification and Energy Audit Reports*.
- Reserve Bank of India (RBI, 2024). *State Inflation Index*.
- State Finance Commission (2025). *Assam Tied Grant Guidelines for PRIs*.
- Field Consultations and Division-Level Budget Reviews, PHED Assam (2024-25).
- State Institute of Rural Development (SIRD, 2025). *Training Modules on Water Governance*.

Annexure Summary

Annexure No.	Annexure Title	Purpose / What it Supports	File Name with Link Embedded	Worksheet / Section Reference
Annexure 1.1	Study Districts and Typology Coverage	Provides spatial overview of study districts and typology (flood-prone, hilly, plains, Autonomous Councils) forming the basis for localisation	Assam Study Districts.pdf	Page 1 (map and classification)
Annexure 1.2	Scheme Universe and Typology Dataset	Defines the scheme universe analysed under the study, including SVS/MVS, GW/SW, mini and institutional schemes	Details of schemes.xlsx	All worksheets
Annexure 1.3	Selection Criteria for District Sets	Explains rationale for selection of districts used for fieldwork and validation	Selection Criteria for District Sets across Assam for the Validation Workshop (1).docx	Full document
Annexure 3.1	Analytical Assumptions and Parameters	Lists core technical and financial assumptions used in lifecycle costing	FLOW Costing_1.xlsx	Assumptions / Input parameters sheets
Annexure 3.2	Observations from Virtual District Workshops	Documents practitioner validation of costing norms, O&M challenges, energy and workforce issues	Observations And Takeaways From Virtual District Workshops.docx	Full document
Annexure 3.3	Practitioner Perception Analysis (Mentimeter)	Quantitative validation of cost ranges, DLF logic, depreciation and SRI staging	Menti Analysis.xlsx	All worksheets
Annexure 4.1	Water Service Levels and Functionality Analysis	Analyses service levels and functionality variations across districts	Assam FLOW - Water Service Levels Analysis (3).xlsx	All analysis worksheets
Annexure 4.2	Finance Commission Grants – Zila Panchayat Level	Presents FC tied grant allocations, utilisation and unspent balances	FC grant_Assam at Zila Panchayats and equivalent.xlsx	All worksheets

Annexure No.	Annexure Title	Purpose / What it Supports	File Name with Link Embedded	Worksheet / Section Reference
Annexure 5.1	Unit Costing – Representative 214 HH SVS (Groundwater) Scheme	Details CapEx derivation for the representative 214 HH SVS-GW scheme	FLOW Costing_1.xlsx	214 HH scheme / CapEx derivation sheet
Annexure 5.2	Unit Rates and Cost Norms Used	Documents Schedule of Rates and market rate assumptions used for costing	FLOW Costing Calculations 2.xlsx	SoR and market rate comparison worksheets
Annexure 5.3	Types of Schemes and Cost Variations	Explains cost variations across scheme typologies (SVS/MVS, GW/SW)	FLOW Costing Calculations 2.xlsx	Scheme typology and comparison worksheets
Annexure 5.4	Per FHTC Capital and Lifecycle Cost Analysis	Presents per-FHTC capital and lifecycle cost estimates	Per FHTC Analysis (1).xlsx	All worksheets
Annexure 5.5	Per FHTC Average – State and District Ranges	Summarises per-FHTC averages across districts and scheme types	FLOW Costing_1.xlsx	Per-FHTC summary worksheets
Annexure 5.6	Pumping Parameters and Design Assumptions	Documents pump head, runtime, efficiency and design assumptions	FLOW Costing_1.xlsx	Pumping and design parameter worksheets
Annexure 5.7	Electricity Cost Model and Tariff Assumptions	Explains electricity consumption calculations and tariff bands	FLOW Costing_1.xlsx	Electricity calculation worksheets
Annexure 5.8	Sensitivity of Electricity Costs	Analyses sensitivity of lifecycle costs to power tariffs and runtimes	FLOW Costing Calculations 2.xlsx	Electricity sensitivity / scenario worksheets
Annexure 5.9	Operations and Minor Maintenance (OpEx) Breakdown	Breaks down routine operational costs including chemicals and Jal Mitra honoraria	FLOW Costing_1.xlsx	OpEx worksheets

Annexure No.	Annexure Title	Purpose / What it Supports	File Name with Link Embedded	Worksheet / Section Reference
Annexure 5.10	Capital Maintenance (CapManEx) and Depreciation Logic	Details assumptions for major repairs, replacements and depreciation	FLOW Costing_1.xlsx	CapManEx and depreciation worksheets
Annexure 5.11	Direct Support (DS) Costing	Covers training, IEC, Jal Mitra incentives and FTK women's group remuneration	FLOW Costing_1.xlsx	Direct Support worksheets
Annexure 5.12	Indirect/Systemic Support (IDS) Costing	Covers monitoring, labs, MIS and supervisory costs	FLOW Costing_1.xlsx	Indirect Support worksheets
Annexure 5.13	Resilience Reserve and Contingency Provisioning	Explains disaster response, emergency repair and contingency logic	FLOW Costing_1.xlsx	Resilience / RR worksheets
Annexure 6.1	District Localisation Factor (DLF) Methodology	Explains construction of DLFs based on terrain, flood risk and remoteness	FLOW Costing_1.xlsx	DLF methodology worksheets
Annexure 6.2	District-wise DLF Values	Presents district-level DLF values	FLOW Costing_1.xlsx	District DLF tables
Annexure 6.3	Application of DLFs to Lifecycle Costs	Demonstrates adjustment of lifecycle costs using DLFs	FLOW Costing_1.xlsx	DLF-adjusted cost worksheets
Annexure 6.4	Statewide Scaling of Lifecycle Costs	Aggregates scheme-level costs to state-level requirements	FLOW Costing Calculations 2.xlsx	State aggregation worksheets
Annexure 7.1	Gender and Social Inclusion Costing	Details costing related to Jal Mitras and FTK women's groups	FLOW Costing_1.xlsx	Gender and inclusion worksheets
Annexure 7.2	Disaster Risk and Resilience Logic	Provides analytical basis for DRR and risk mitigation financing	FLOW Costing_1.xlsx	Resilience and risk worksheets
Annexure 7.3	Field Evidence on Sustainability Risks	Documents ground-level sustainability, O&M and governance risks	Notes from the Field_FLOW Assam_AM (2).docx	Full document

Annexure No.	Annexure Title	Purpose / What it Supports	File Name with Link Embedded	Worksheet / Section Reference
Annexure 8.1	SRI Financing Scenarios (3–5%, 5–7%, 7–9%)	Breaks down cost components under each SRI financing stage	FLOW Costing_1.xlsx	SRI / scenario worksheets
Annexure 8.2	Financing Gap Analysis	Compares lifecycle requirements with current funding availability	FLOW Costing Calculations 2.xlsx	Financing gap worksheets
Annexure 9.1	Strategic Data Gaps and Next-Step Requirements	Identifies remaining data gaps and actions required	Concise sheet_ Strategic information gap_data information activities required version 5 (1).xlsx	All worksheets

Sustaining the Flow - Financing Lifecycle-cost of Water-supply Systems: A Sustainable, Inclusive, and Resilient Financing Strategy for the Rural Drinking Water Supply Programme in Assam

Department of Public Health Engineering, State Government of Assam, India
Water for People, India
December 2025