

CHAPTER-4

Post-Operational Management and Sustainability

The Chapter covers the key aspects needed for long-term rural water sustainability, including source recharge, timely scheme handover, capacity building, water audits, water pricing mechanisms, and enhanced use of technology.

4.1 Decreasing groundwater table status in the State

The blocks in the State are categorised based on the annual replenishment of groundwater into five categories: over-exploited, critical, semi-critical, safe, and saline. The year-wise distribution of these categories is presented in **Table 4.1** below:

Table 4.1: Year-wise status of Ground Water Resources in Rajasthan

Particulars	2017	2020	2022	2023	2024
Over-exploited blocks	185	203	219	216	214
Critical blocks	33	23	22	23	27
Semi-critical blocks	29	29	20	22	21
Safe blocks	45	37	38	38	37
Saline	3	3	3	3	3
Total	295	295	302	302	302

Source: Report on Dynamic Ground Water Resources- 2017, 2020, 2022, 2023 and 2024

The data from the above **Table** indicates a significant deterioration in groundwater status over the years. The number of over-exploited blocks increased from 185 (62.71 *per cent*) in 2017 to 214 (70.86 *per cent*) in 2024, representing a worrying trend. Concurrently, the number of safe blocks decreased from 45 (15.25 *per cent*) to 37 (12.25 *per cent*) in this period, further emphasising the declining availability of sustainable groundwater sources.

Although there was a moderate reduction in critical and semi-critical blocks over the same period, this has not offset the increase in over-exploited areas. This indicates a very alarming situation regarding the groundwater level of the State. With only a small proportion (12.25 *per cent*) of blocks remaining in the safe category (as of the year 2024), the State faces heightened risks to long-term water security, underscoring the need for strengthened groundwater recharge, regulated abstraction, and systematic monitoring to support sustainable water use.

The State Government, while accepting the facts in replies (August and November 2025), detailed the efforts to improve the groundwater table status, such as management and monitoring through *Atal Bhujal Yojana*, IEC activities, capacity development programme and the introduction of the Rajasthan Groundwater (Conservation & Management) Authority Bill 2025.

4.2 Use of innovative technologies in the implementation of JJM

Clause 3.5 (xv) of the Operational Guidelines of JJM suggested for adoption of innovative technologies to ensure equitable distribution of water as a strategy to achieve the objectives of JJM. Further, Chapter 8 of the Operational Guidelines of JJM stipulated the use of emerging technologies like Artificial Intelligence, Data Analytics, Block-chain technology, Machine learning, Nanotechnology, *etc.*, to ensure safe availability of water and the functionality of water supply systems.

However, audit scrutiny of the records of the Department on the use of innovative technologies revealed several gaps in its adoption and implementation, which are given as under:

- During the finalisation of AAP for the year 2021-22, the DDWS instructed the incorporation of Internet of Things (IoT) based sensors and *iCloud* to monitor service delivery at the household level under JJM. The State planned to incur an expenditure of ₹ 301 crore on innovation/IoT *under* AAP for the year 2022-23. However, the audit observed that a proposal for the Hackathon- 'JJM innovation challenge-2023' was proposed by the Department, but the activity could not be taken up as the related agency did not respond on time. Later, under AAP 2023-24, the provision for innovation/R&D activity was not approved by the GoI.
- As per Clause 8.4 of the Operational Guidelines of JJM, the use of Hydro-Geo-Morphological (HGM) maps for the location of groundwater sources, the use of village digital contour maps for the location of drinking water infrastructure, digital inventory of existing assets for planning of additional infrastructure required were also suggested for smart management and better services. Audit observed that the above three utilities were not utilised in any of the schemes of JJM in the State.
- The rejected water from the Reverse Osmosis (RO) treatment plant installed in a village is substantial, estimated at around 60 *per cent* of the feed water, based on the recovery ratio of the plant. This rejected water is often disposed of either in an open drain or discarded nearby. As per Clause 8.2.1 of the Operational Guidelines of the JJM, it is essential to manage this rejected water properly; it must be stored separately in specifically designed structures and utilised for non-potable and non-agricultural uses.

Audit observed that the RO plants were not sanctioned in Rajasthan under JJM except for the Barmer district. Moreover, the rejection management policy was not formulated by the State for the proper utilisation of rejected water.

- Clause 8.1 of the Operational Guidelines of JJM provided that a standalone water supply system powered by solar energy with minimum O&M costs was to be explored in scattered/isolated/tribal/hilly villages. Audit observed

that no such systems were sanctioned in six¹ out of seven test-checked districts. In PHED Division Rajgarh (District Alwar), although 19 standalone water supply systems based on innovative technologies were sanctioned during 2021-22 but none of them were installed.

- Under Clause 8.2 of the Operational Guidelines of JJM, for providing immediate relief in Arsenic, Fluoride, Iron and other heavy metal affected habitations, installation of Community Water Purification Plant (CWPP) was suggested as a short-term measure to provide 8-10 lpcd water for drinking and cooking purposes. However, it was observed that CWPP installations were neither planned nor sanctioned in any of the selected Districts, except in Alwar, where three CWPPs were installed.

Despite clear guidelines, the State failed to leverage technological advancements for improving the efficiency, monitoring, and sustainability of water supply systems under JJM. This limited the Mission's ability to provide equitable and reliable water services across rural Rajasthan.

The State Government stated (November 2025) that innovative technologies are being used, and an IoT-based monitoring system would be created. Reply is not tenable as no details/evidence were provided regarding the adoption of innovative technologies.

4.3 Lack of Water and Energy Auditing in Rural Water Supply Schemes

The Operation and Maintenance Manual for Rural Water Supply Systems (May 2013), issued by the Ministry of Drinking Water and Sanitation, GoI, envisaged regular water audits of the rural water distribution system and water accounting practices. Further, as per Clause 8.7 of the Operational guidelines of JJM, to improve the efficiency of the water supply systems, the States are advised to regularly take up a water audit of identified systems for effective improvement.

Similarly, energy audits were to be conducted as a systematic process of accounting and reconciliation between actual energy consumption and calculated energy requirements, considering the rated efficiency and the power losses in all energy-utilising equipment and power transmission systems.

Audit observed that water and energy audits were not conducted by the Department for any of the rural water supply schemes. As a result, critical insights into water losses due to leakages, unauthorised or illegal withdrawals and inefficiencies in energy usage could not be identified and prevented.

This hindered efforts to improve operational performance and ensure the sustainability of the water supply infrastructure.

¹ Baran, Pali, Jodhpur-Rural, Jaisalmer, Sirohi and Hanumangarh.

The State Government, while accepting the facts, stated (November 2025) that the work of Water and Energy audit would be done as per the O&M policy of the Department, after completion of the schemes.

4.4 Lack of fixing Water Pricing/Tariffs and collecting Water Revenue in rural water supply schemes

As per Clause 8.1.1 of the State Water Policy, all water rates were to be determined in a way that reflected the scarcity value of water and encouraged economical usage of water. Additionally, Clause 8.1.2 further provided that water tariffs would be set for progressively moving towards the full cost of O&M. It also recommended the implementation of a metering program for all significant water uses, regardless of source or ownership.

Further, Clause 3.5 (xxvi) of the Operational Guideline of JJM, emphasised the need to incorporate incentive and disincentive mechanisms in the policy to discourage wastage of water and to cover recurring expenditure on bulk water transfer, treatment, distribution network and household level supply. The State Government was to facilitate VWSCs to make decisions on user charges for providing household connections as well as water supply.

However, audit scrutiny of records of the Chief Engineer (JJM) revealed the following inefficiencies:

- No water tariff structure and billing system was established for rural water supply schemes to recover O&M costs.
- Metered connections were not included in the scheme design.
- The Department did not set any annual target for revenue collection from water supply schemes.

This lack of financial planning undermined the ability of VWSCs to manage and maintain village water supply systems effectively post-commissioning. As a result, the sustainability of regular water supply remains at risk due to the absence of assured operational funding. During the beneficiaries' survey of 560 beneficiaries of selected villages, 407 beneficiaries (72.68 *per cent*) expressed their willingness to pay monthly user charges for O&M of in-village infrastructure, while 153 beneficiaries (27.32 *per cent*) denied paying so.

The State Government, while accepting the facts, stated (August and November 2025) that the aspect of fixing the water tariff and collection of the water revenue would be taken care of in the upcoming O&M policy.

4.5 Lack of undertaking Source Sustainability Measures in JJM Implementation

One of the core objectives of the JJM is to ensure the sustainability of water supply systems, including the water sources. As per Clause 3.5 (xvi) of the

Operational Guidelines of the JJM, source recharging, such as dedicated bore well recharge structures, rainwater recharge, *etc.*, should be adopted using watershed/springshed principles. The NJJM also advised (March 2023) to plan direct source recharge in groundwater-based schemes.

Audit observed that the Department did not plan any scheme under AAP during 2019-24 to address direct source recharge.

During the audit of records of in-village infrastructure in the selected 28 villages, it was observed that:

- Infrastructure in 19 villages was based on surface water sources. Hence, source sustainability measures were not required.
- The remaining nine villages relied on groundwater (tube wells).
 - Out of these, seven villages had no provision for the construction of recharge structures.
 - In two villages (Jawali and Ratawali), although provisions for recharge structures were included in the DPRs, these were not executed.

The absence of planning and implementation of source sustainability measures under the JJM, particularly for groundwater-based schemes, reflects non-adherence to the prescribed guidelines. Not providing recharge structures in villages dependent on tube wells, including non-execution of approved provisions, exposes water supply systems to the risk of source depletion. This undermines the long-term reliability of the drinking water supply, increases vulnerability to seasonal shortages, and compromises the sustainability objectives of the Mission.

The State Government stated (August 2025) that wherever possible, the recharge structures have been constructed in JJM, and the related work is also being done by the Groundwater Department and the Watershed Department. It was further stated (November 2025) that to manage and preserve the groundwater, the Rajasthan Groundwater (Conservation & Management) Authority Bill 2025 has been introduced. The reply is not tenable as the recharge structures were not found constructed during the audit in any of the selected villages dependent on groundwater.

4.6 Completed Water Supply Schemes not handed over to VWSCs

As per the Guidelines of JJM, the in-village water supply schemes constructed under the Mission were to be handed over to the respective VWSCs for Operation & Maintenance (O&M).

However, data from the JJM-IMIS Reports (2019–2024) revealed that out of 2,785 in-village water supply schemes constructed in the State under JJM, only 858 schemes (30.81 *per cent*) were handed over to the respective VWSCs for

further O&M. The situation was worse in the selected seven districts, where only 39 out of 682 schemes (5.72 *per cent*) had been handed over to the respective VWSCs. Notably, the remaining 643 schemes had not been transferred to VWSCs, despite a lapse of a period of nine to 57 months since their completion.

Specific issues in selected districts include:

- In Jaisalmer district, the concerned VWSCs refused to take over the scheme for further O&M in case of 12 completed schemes, as the District Sarpanch Union, Jaisalmer, decided not to take over any completed scheme under JJM.
- In Sirohi district, 42 completed schemes were not handed over as the VWSCs cited lack of trained manpower and non-availability of budget for O&M as reasons for refusal.

Additionally, in the Baran district, it was observed that electricity bills amounting to ₹ one crore pertaining to 71 electric connections for schemes handed over to VWSCs, remained unpaid.

These findings indicate a significant gap in the post-implementation framework of JJM. The absence of a clear and effective O&M policy, coupled with a lack of preparedness at the VWSC level, undermined the core objective of JJM being a decentralised, community-managed and demand-driven programme.

The State Government, while accepting the facts, stated (November 2025) that the absence of a clear O&M policy led to uncertainty and reluctance at the village level, and therefore, the VWSCs did not agree to take over the schemes; however, the O&M Policy is under approval and post-approval, the schemes would be handed over to the VWSCs and the process of scheme handover would be expedited.

4.7 Non-reporting/non-certification of villages with 'Har Ghar Jal' status

The Operational Guidelines of JJM envisaged Har Ghar Jal (HGJ) certification as a means of obtaining confirmation from the village community regarding the coverage and functionality of Functional Household Tap Connections (FHTCs) provided under the Mission.

HGJ certification was to be pursued only after:

- All households in the village received FHTCs,
- Tap connections were provided to all schools and *anganwadi* centres,
- The scheme was completed in all respects,
- Community contributions were deposited,
- The Panchayat expressed willingness to take over the scheme,
- Training for O&M was completed, and
- Financial closure of the scheme was achieved.

The Director, Department of Drinking Water and Sanitation (DDWS), NJJM, issued an advisory in May 2023, urging the States to expedite HGJ certification of villages where 100 *per cent* FHTC coverage had been achieved. Further, the Secretary, DDWS, raised concerns in October 2023 regarding the slow progress of certification and asked for a review and report the village as HGJ certified with 100 *per cent* FHTCs coverage and to expedite the certification process for HGJ-reported villages.

Audit findings from the test-checked seven districts, having 6,485 villages, revealed that:

- Out of 890 villages with 100 *per cent* FHTC coverage, only 661 villages (74.27 *per cent*) were reported for HGJ certification, and
- Merely 306 villages (34.38 *per cent*) were actually certified with HGJ status as on 01 April 2024.

This reflects a significant shortfall in achieving HGJ certification, despite physical infrastructure being in place, and highlights the need for administrative follow-up and community engagement to fulfil the certification process as envisaged under JJM.

The State Government, while accepting the facts, stated (November 2025) that regular directions are being given to all field officers of the Department to fill the gap in certification, in coordination with Sarpanch and officials of PRIs and the process of HGJ certification is expected to improve after implementation of the O&M policy.

The fact remains that the HGJ certification is not merely a formal process between the PHED and village community, but it also provides assurance for coverage and functionality of in-village water supply infrastructure in all respects.

4.8 Certification of villages without fulfilment of essential conditions

As per the directions of the NJJM issued in May 2023, certain essential conditions were to be fulfilled before a village could be certified with ‘Har Ghar Jal (HGJ)’ status. These included the provision of FHTCs to all households and public institutions (such as schools and *anganwadis*), and completion of the Scheme in all respects.

However, scrutiny of records, joint physical inspections, beneficiary surveys, VWSC surveys, and focus group discussions conducted in the 28 selected villages revealed significant deviations.

In 11 of the selected villages, one or more of the essential conditions had not been met, yet these villages were marked certified with HGJ status (*details provided in Appendix-2*).

This indicates serious lapses in the certification process and raises concerns about the reliability and integrity of the HGJ status granted under the JJM framework.

The State Government did not state (August 2025) the reasons for certification of the villages without fulfilment of essential conditions.

4.9 Partial implementation of Nal Jal Mitra Program under JJM

Recognising the need for trained human resources to enable GPs/VWSCs to efficiently manage O&M of the water supply schemes created under JJM, Clause 9.4 of the Operational Guidelines of JJM emphasised training efforts.

To meet this requirement, the DDWS, in collaboration with the Ministry of Skill Development and Entrepreneurship (MSDE), launched the Nal Jal Mitra Programme (NJMP). This initiative aimed to multi-skilling of local rural residents in various essential skills such as plumbing, electrical work, masonry, pump operation and other allied skills.

The training curriculum was designed by the Water Management and Plumbing Skill Council (WMPSC), and the NJMP. It was to be implemented with the convergent efforts of SWSM and the State Skill Development Mission (SKDM). At least one and preferably two persons were to be trained and certified for each GP under the NJMP. An MoU was signed with the Rajasthan Skill and Livelihood Development Corporation (RSLDC) in June 2020 for providing multi-skill training to 45,000 persons of the State.

Audit observed that:

- Nal Jal Mitras were selected by the Department in 8,842 GPs only (78.89 *per cent*), out of a total 11,208 GPs of the State, upto June 2024.
- A total of 25,890 persons (57.53 *per cent*) were selected as Nal Jal Mitras, well below the targeted 45,000.
- Further, in the test-checked Baran and Hanumangarh district, no persons were trained as Nal Jal Mitra.

Information with respect to the remaining five test-checked districts was not provided by the Department. This shortfall in skilled manpower will compromise the sustainability of O&M for rural water supply schemes and would defeat the objective of providing employment opportunities to rural youth.

The State Government, while accepting the facts, stated (November 2025) that the matter is being pursued regularly with the PRI Department for finalising the selection and nomination of eligible candidates, and once the list is received, their training would be conducted by the Skill, Employment and Entrepreneurship Department through Government ITIs.

4.10 Summary of Findings

This Chapter revealed that Groundwater depletion continues at an alarming rate, with over 70 *per cent* of blocks in the over-exploited category, yet source sustainability measures were largely absent in schemes. Completed schemes were not handed over to VWSCs in most cases due to a lack of policy clarity, funding, and trained manpower. The Har Ghar Jal certification process was weak, with instances of delays, partial reporting, and certification without meeting essential conditions, undermining its credibility. Further, the absence of water and energy audits, non-fixation of water tariffs, and low adoption of innovative technologies reflected weak operational planning. Partial implementation of Nal Jal Mitra training further added to sustainability concerns. Collectively, these issues threaten the long-term reliability, functionality, and financial viability of JJM schemes in the State.

4.11 Recommendations

- *The State Government may systematically involve Gram Panchayats and VWSCs in planning, certification, and post-implementation O&M, supported by structured capacity-building programmes, clear delineation of roles, and hand-holding during transition to community-managed systems, to improve sustainability and uptake of Har Ghar Jal certification.*
- *The State Government may mandate and fund source sustainability measures, including recharge structures and rainwater harvesting, in all groundwater-dependent JJM schemes, with physical completion linked to scheme commissioning and recorded in IMIS.*
- *The State Government may finalise and notify a comprehensive O&M policy with clear roles, funding arrangements, and timelines, and ensure time-bound handover of completed schemes to VWSCs after certifying readiness in terms of manpower, finances, and training.*
- *The State Government may institutionalise periodic water and energy audits for rural water supply schemes, beginning with high-consumption and groundwater-based schemes, and use audit findings to reduce losses and optimise operating costs.*
- *The State Government may introduce a graded water tariff framework for rural water supply schemes, supported by metering or proxy measurement mechanisms, and set annual targets for the collection of O&M charges by VWSCs.*
- *The State Government may accelerate training and certification of Nal Jal Mitras to cover all Gram Panchayats, and link their deployment to post-handover O&M support to ensure uninterrupted and sustainable water supply services.*