

CHAPTER-6

Water Quality Monitoring and Surveillance

Water is considered safe when it is free from biological contamination, such as guinea worm, typhoid, *etc.* and within permissible limits of chemical contamination, including excess fluoride, brackishness, iron, arsenic, nitrates, *etc.*, as per IS-10500 standard¹ of the Bureau of Indian Standards, as revised in 2012.

This Chapter reviews the spending and progress of Water Quality Monitoring & Surveillance (WQM&S) activities under JJM, including utilisation of resources for laboratory testing, community training, and remedial actions and coverage of water quality testing.

6.1 Expenditure on 'WQM&S activities' component

Under the Jal Jeevan Mission (JJM), up to two *per cent* of the total annual allocation to each state is earmarked for WQM&S activities. The funds allocated for WQM&S activities are intended for various activities such as water quality testing through laboratories, routine monitoring and surveillance, procurement of Field Testing Kits for community level testing, and providing guidance and training to personnel at multiple levels, *etc.*

During the period from 2019 to 2025 (up to 20 January 2025), the Department received a total of ₹ 486.23 crore. Of this, only ₹ 40.39 crore (8.31 *per cent*) was spent on WQM&S activities, and ₹ 445.84 crore (91.69 *per cent*) remained unspent. The position of total funds available and expenditure incurred there against during the year 2019-24, is given in **Table 6.1** below:

Table 6.1: Funds received and Expenditure incurred on WQM&S activities in Rajasthan

(₹ in crore)			
Year	Funds received	Expenditure incurred	Unspent amount (<i>percentage</i>)
2019-20	24.84	3.31	21.53 (86.67)
2020-21	104.84	6.53	98.31 (93.77)
2021-22	67.81	9.19	58.62 (86.45)
2022-23	173.66	6.45	167.21 (96.28)
2023-24	41.90	13.03	28.87 (68.90)
2024-25 (up to 20 January 2025)	73.18	1.88	71.30 (97.43)
Total	486.23	40.39	445.84 (91.69)

Source: Information provided by the Chief Chemist, JJM

During the approval of the Annual Action Plan (AAP) 2020-21 by the SLSSC, the Under Secretary to the Government of India (NJJM) advised increasing laboratory testing. The Director (NJJM) also expressed serious concern over the utilisation of less than seven *per cent* of the WQM&S plan funds for 2020-21.

¹ This standard prescribes the requirements and the methods of sampling and test for drinking water.

Despite the directions of the NJJM, the pace of incurring expenditure on WQM&S activities against the available funds remained very slow.

Audit attributed the under-utilisation of funds to several factors, viz., inadequate water quality testing, non-establishment of Block Level Laboratories (BLLs), and shortfall in conducting training programs for women, which are the key activities under the WQM&S framework.

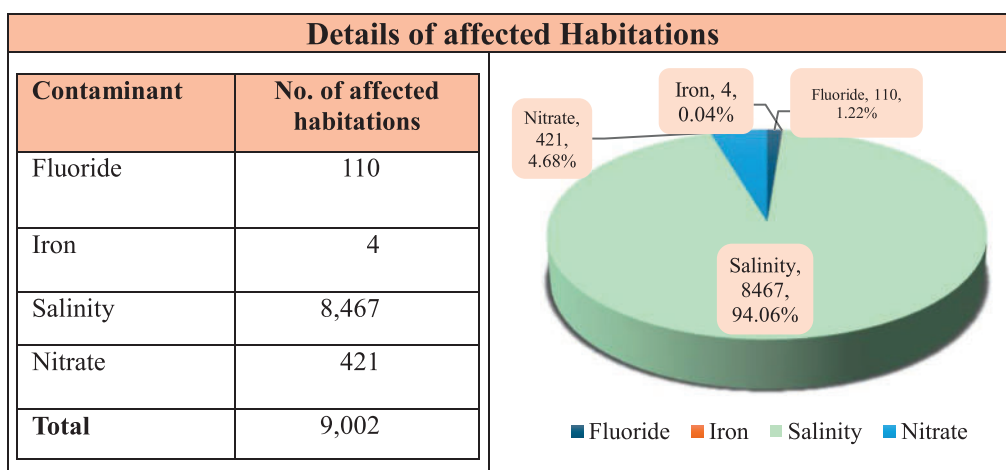
The State Government, while accepting the facts, stated (August and November 2025) that the office of the Chief Chemist (JJM and Rural) was established in February 2022, and staff was deputed in May 2022. The low expenditure was attributed to delays in obtaining administrative and financial sanctions, the imposition of the Model Code of Conduct during the Assembly and the Lok Sabha Elections, and the non-approval of the AAP 2024-25. It was further stated that the budget provision under AAP 2025-26 includes the establishment of 121 BLLs, and training in FTK testing for more than 90 *per cent* of the targeted women in the State has now been provided. However, the fact remains that the State Government could utilise only 8.31 *per cent* of funds received for the WQM&S activities up to January 2025.

6.2 Water Quality Scenario

As of April 2024, out of a total of 1,19,215 habitations of the State, 9,002 habitations were identified as Quality Affected (QA) habitations. These QA habitations covered 4,20,270 HHs (24,52,582 population).

The categorisation of these habitations based on the type of water contamination is presented (as of April 2024) in **Chart 6.1** below:

Chart 6.1: Number of habitations categorised based on the type of water contamination



As of June 2024, the State had one State Level Laboratory (SLL) and 33 District Level Laboratories (DLLs), which are functional. These are accredited by the ‘National Accreditation Board for Testing and Calibration Laboratories (NABL)’ for chemical parameters. The establishment of DLLs in eight newly created districts is still in progress. An office of Chief Chemist (JJM & Rural) was created (February 2022) for overall monitoring and supervision of WQM&S activities under JJM. The SLL is headed by the Chief Chemist and performs the work related to JJM.

Scrutiny of the records of the Chief Chemist revealed that the SLL could test only 41 out of the 78 parameters mandated under the ‘Uniform Drinking Water Quality Monitoring Protocol² (UDWQMP). Facility for testing of radioactive and virological parameters was also not available in the SLL. Similarly, DLLs were required to test at least 34 water quality parameters for water quality as per UDWQMP, but the DLLs, in selected districts, were equipped to test only nine to 22³ parameters.

A significant number of habitations in the State continue to be affected by water quality issues, predominantly due to salinity, exposing a large rural population to health risks. Although institutional arrangements for water quality monitoring under JJM have been put in place through the establishment of State and District Level Laboratories, the testing capacity remains inadequate. The inability of laboratories to test the full range of parameters prescribed under the UDWQMP, including critical radioactive and virological parameters, limits the comprehensive assessment of drinking water safety. This gap undermines assurance on water quality in affected habitations and constrains the State’s ability to effectively plan and implement remedial measures under the Mission.

The State Government, while accepting the facts, stated (August 2025) that at present the testing facilities for 69 and 22 parameters are available with the SLL and DLL, respectively. The total number of districts in the State has increased to 41, and proposals for establishing DLLs in eight new districts have been sent to the Finance Department for approval. The fact remains that the State is still significantly below the mandated target for the number of testing parameters prescribed under UDWQMP.

6.3 Inadequacy of staff in laboratories

The detail of sanctioned posts and working strength for technical posts in all the laboratories of the State is given in **Table 6.2** below:

² UDWQMP was developed by the Ministry of Drinking Water and Sanitation in February 2013 to standardize the requirements for setting up and functioning of laboratories at various levels.

³ Alwar (12), Baran-(10), Hanumangarh (17), Jaisalmer (9), Jodhpur (12), Pali (11) and Sirohi (22)

Table 6.2: Sanctioned Strength vs Men in Position in Laboratories Rajasthan

Posts	Sanctioned posts	Men in position	Vacancy (percentage)
Superintending Chemist	07	04	03 (42.86)
Senior Chemist	13	13	0 (0)
Zoologist	01	0	01 (100)
Junior Chemist	37	20	17 (45.94)
Sr. Laboratory Assistant	36	16	20 (55.55)
Jr. Laboratory Assistant	56	50	6 (10.71)
Laboratory Attendant	70	16	54 (77.14)
Sample Taker	03	02	01 (33.33)
Total	223	121	102 (45.73)

Source: Information provided by the PHED.

It is evident from the **Table 6.2** above that as of February 2024, there were 223 sanctioned technical posts across all laboratories in the State, of which only 121 were filled, resulting in a significant vacancy of 102 posts (45.73 *per cent*). Notably, positions such as Laboratory Attendant (77.14 *per cent* vacant), Senior Laboratory Assistant (55.55 *per cent*), and Junior Chemist (45.94 *per cent*) faced the highest shortages.

Despite the guidelines issued in October 2021 under the 'Drinking Water Quality Monitoring and Surveillance Framework (DWQM&SF)' by the Department of Drinking Water and Sanitation, GoI, the State Government had not sanctioned any posts for microbiologists or bacteriologists essential for effective water quality testing in State and District Level Laboratories.

Furthermore, audit findings revealed that only 24 technical staff were posted in the DLLs of selected districts against 43 sanctioned posts. Alarming, in Pali district, the charge of the District Laboratory was given to an Assistant Engineer (Civil), who lacks specialised training in water quality testing.

The acute shortage of technical manpower in water quality laboratories, coupled with the absence of sanctioned posts for specialised professionals such as microbiologists and bacteriologists, has significantly weakened the State's capacity for effective water quality monitoring. High vacancy levels across key technical positions and deployment of non-specialised personnel to head district laboratories compromise the reliability, timeliness, and scientific rigour of testing. These deficiencies undermine compliance with national water quality monitoring frameworks and limit assurance on the safety of drinking water supplied under the JJM, particularly in quality-affected habitations.

The State Government, while accepting the facts, stated (November 2025) that all posts of Superintending Chemists have now been filled, and the process of filling 17 posts of Junior Chemists and 54 posts of Laboratory Attendants is in progress. A request has been made to the CE & Additional Secretary, PHED, for filling one post of Zoologist. Further, the post of Microbiologist was outsourced in 2023-24 but was not continued in 2024-25 due to non-approval of AAP 2024-25. It was also mentioned that the charge of the District Laboratory in Pali District has now been handed over to a Senior Chemist. However, the fact

remains that vacancies of technical staff in the laboratories, except for the Superintending Chemist, persist.

6.4 Non-observance of provisions of DWQM&SF

6.4.1 Non-creation of Drinking Water Quality Commissionerate

Clause 5.1.2.2 of DWQM&SF mandated the creation of a ‘Drinking Water Quality Commissionerate (DWQC)’ to separate water quality testing from water supply delivery. The Commissionerate was to be financially empowered to carry out the DWQM&SF mandate, which includes strengthening of laboratories in terms of infrastructure and trained staff, and undertaking community engagement activities, etc.

As per the instructions of GoI, all States were required to establish the DWQC by 02 October 2022. Although a proposal for its establishment was prepared and submitted in July 2022 by the Chief Chemist (JJM & Rural) to the Mission Director (JJM), the DWQC had not been established as of August 2025.

The State Government, though accepted (August and November 2025) the facts, it did not provide any reason for not establishing the DWQC even after a lapse of more than three years.

6.4.2 Chief Chemist was not made independent in-charge of WQM&S

In pursuance of Clause 5.1.2.2 of the DWQM&SF, autonomy was to be given to water quality testing laboratories to develop trust, transparency and accountability in water quality assessment.

The Chief Chemist was to be designated as the nodal officer, responsible for overseeing the functioning of laboratories, water quality testing, monitoring and surveillance across all levels. Importantly, the Chief Chemist was to report directly to the Secretary of the Department responsible for rural water supply on all matters related to water quality.

However, the audit noticed that the Chief Chemist was not given independent charge of WQM&S and consequently, he was not reporting directly to the Secretary, PHED, for WQM&S issues, contrary to the intended framework.

The State Government, while accepting the facts, stated (November 2025) that the Government has decided not to grant independent status to the Chief Chemist in view of the possibility of administrative anomalies.

The reply is not tenable as DWQM&SF was enacted in October 2021 by the Ministry of Jal Shakti (GoI) to govern WQM&S activities under JJM and thereby improve the quality of life of people and enhance their ease of living, specially of women and children. The role of Chief Chemist as an independent functionary is designed to foster trust, transparency and accountability in water quality management, allowing them to focus exclusively on monitoring water quality. Accordingly, the Government’s refusal to grant him independent status

was inconsistent with the intent and principles of the DWQM&SF issued by the Government of India.

6.5 Shortfall in testing of sources for water quality

As per Clause 3.3 of DWQM&SF, all water sources were required to be tested twice annually for bacteriological analysis (before and after monsoon) and once for chemical analysis by the Department. The details of the testing of sources conducted by the Department are as follows:

Table 6.3: Quality tests of water sources conducted in Rajasthan

Year	No. of total sources			No. of tests required to be conducted			No. of tests actually conducted			Shortfall (percentage)
	Piped Water Supply	Non-Piped Water Supply	Total	Chemical (once a year)	Bacteriological (twice a year)	Total	Chemical	Bacteriological	Total	
2022-23	50,211	87	50,298	50,298	1,00,596	1,50,894	8,413	5,879	14,292	136602 (90.53)
2023-24	53,653	3650	57,303	57,303	1,14,606	1,71,909	37,191	50,341	87,532	84377 (49.00)
Total	1,03,864	3737	1,07,601	1,07,601	2,15,202	3,22,803	45,604	56,220	1,01,824	220979 (68.45)

Source: Information provided by the Chief Chemist (JJM & Rural)

The **Table 6.3** above highlights a significant shortfall of 68.45 *per cent* in testing of water sources during the year 2022-24. The information related to the year 2019-22 was not provided to the audit.

Further, during 2021-22, the Department supplied drinking water to rural HHs from 20,619 tube wells. However, no water quality tests were conducted by the Department in that year. In 2022-23 and 2023-24, only 1,869 tube wells (9.06 *per cent*) and 9,409 (45.58 *per cent*) were tested for water quality, out of the 20,640 tube wells.

Bacteriological tests, which are required to be conducted twice annually for all sources, recorded particularly low coverage, significantly increasing the risk of undetected microbial contamination in drinking water supplies.

Non-availability of testing data for 2019-22 further constrained assessment of compliance trends and suggests weaknesses in record-keeping and monitoring systems under JJM. The State Government stated (November 2025) that as per the DWQM&SF framework, each DLL is required to test 3,000 water sources/samples annually for each district (*i.e.* 99,000 samples across the State), and the Department nearly achieved the target during 2019-24. Further, the bid document for setting up Block Level Laboratories is under preparation.

The reply is not tenable as the audit contention is about the provision of mandatory annual bacteriological and chemical analysis of all water sources as mentioned in the DWQM&SF, not about the achievement of the targets set for the District Laboratory. The target of 99,000 samples for all 33 DLLs is insufficient to comply with the above provisions of DWQM&SF.

6.5.1 Remedial measures not taken in respect of contaminated samples

As per Clause 3.2 of DWQM&SF, remedial measures are required to be undertaken if the water quality parameters fall outside the prescribed limits. The details of samples tested for chemical and bacteriological contamination in laboratories and the corresponding remedial measures taken against them, during the year 2021-24, are presented in **Table 6.4** below:

Table 6.4: Water samples tested found contaminated and remedial measures

Year	No. of samples tested in laboratories		No. of samples found contaminated		Remedial measures taken	
	Chemical	Bacteriological	Chemical	Bacteriological	Chemical	Bacteriological
2021-22	1,10,574	64,285	33,486	89	354	0
2022-23	1,38,723	1,02,226	38,405	203	26,391	137
2023-24	1,91,341	1,72,292	34,222	180	26,989	162
Total	4,40,638	3,38,803	1,06,113	472	53,734	299

Source: Information provided by the Department.

The **Table 6.4** above shows that a total of 1,06,113 chemical and 472 bacteriological contaminations were detected during the period 2021-24; however, the remedial measures were taken in case of only 53,734 chemical (50.64 *per cent*) and 299 bacteriological (63.35 *per cent*) samples. This reflects a significant shortfall in the Department's response to contamination issues.

As a result, substantial resources invested in the collection and testing of water samples were rendered ineffective due to the inadequate follow-up. Moreover, the intended objective of ensuring the supply of safe and potable water to the rural population was not achieved, leaving large sections of the population exposed to chemical and bacteriological contaminants.

The State Government stated (November 2025) that remedial action for contaminated samples is a regular process, wherein measures such as the use of alternate sources, water supply through tankers and chlorination are undertaken until normal supply is restored. It was also mentioned that in terms of village-wise contaminated samples, 100 *per cent* remedial action has been taken by the Department.

The reply is not tenable as, according to the data provided by the Department itself, the remedial action was taken only in case of 50.64 *per cent* chemically and 63.35 *per cent* bacteriologically contaminated samples. The purpose of water quality testing is to identify contamination in the water for taking remedial action. Without appropriate remedial measures, the entire process of water testing loses its significance.

6.5.2 Water Quality Testing through Field Testing Kit (FTK) not conducted as per norms

As per Clause 6.3.6 of DWQM&SF, the GPs/VWSCs were required to ensure 100 *per cent* testing of drinking water sources, including private sources and water supply at schools, Anganwadi centres under their jurisdiction, using FTK at least once a month. The test results were to be uploaded regularly on the Water Quality Management Information System (WQMIS) portal.

It was observed that the Department planned to procure 28,15,000 FTKs in AAP 2020-21; however, it made a one-off exercise of procurement of 11,34,260 bacteriological FTKs (October 2021) and 12,029 chemical FTKs (July 2021). Water quality testing through FTKs was not done during 2019-20 and 2020-21 in any village. However, it was done in 2680, 7668 and 34,361 villages in the year 2021-22, 2022-23 and 2023-24, respectively, out of a total of 42,327 villages.

This shows very lethargic progress of the Department towards water quality testing through FTKs, which undermines the framework's objective of decentralised water quality monitoring and restricts the ability of local institutions to ensure safe drinking water at the grassroots level.

The State Government, while accepting the facts, stated (November 2025) that efforts are being made to enhance testing through FTKs. It, however, did not provide a reply on the procurement of fewer FTKs and their under-utilisation in water quality testing in the objected period.

6.6 Block Level Laboratories (BLLs) not established

As per Clause 10.1(i) of the Operational Guidelines of JJM, BLL were to be established to ensure 100 *per cent* testing of all water sources under its jurisdiction; once annually for chemical parameters and twice annually for bacteriological parameters (pre and post monsoon). Each BLL is required to test water from all sources in its block for at least 13 basic water quality parameters. The positively tested samples were required to be referred to the DLLs immediately.

In the year 2013-14, 165 BLLs were established in the State under the National Rural Drinking Water Programme. However, the contract period of these BLLs ended on 31 March 2016, and no new BLLs were established thereafter in the State. Subsequently, in the 19th SLSSC meeting (December 2019), approval was granted under the Annual Action Plan (AAP) 2019-20 for:

- ₹ 14.85 crore for upgradation of the existing 165 BLLs, and
- ₹ 24.03 crore for running 178 new BLLs for three years.

Again, in May 2021, a provision of ₹ 46.09 crore was made under AAP 2020-21 for the establishment of 102 new BLLs, and for conducting 3,06,000 tests annually for two years.

However, scrutiny of monthly financial reports on the JJM-IMIS portal revealed that only ₹ 2.94 crore was spent on the upgradation of BLLs during 2021-24, but no BLL was made functional as of July 2024.

In the absence of functional BLLs, the core objective of decentralised water quality testing at the block level could not be fulfilled. Moreover, the expenditure incurred on upgradation remained unfruitful, rendering the investment ineffective and unproductive.

The State Government stated (November 2025) that the Department is currently undertaking the procurement process for multi-parameter testing equipment to make the BLLs operational. It was also stated that at present, 149 buildings' upgradation work for the BLLs has been completed, and the remaining are in progress.

Reply is not tenable as since the very beginning of the JJM, the Department planned to establish 352, 102 and 250 BLLs under AAP 2020-21, 2021-22 and 2023-24, respectively, but no BLL was made operational till November 2025.

6.7 Non-achievement of objectives of the 'Swachh Jal Se Suraksha' campaign

To ensure the safety and quality of drinking water, the GoI launched a special campaign titled 'Swachh Jal Se Suraksha', which was implemented from 02 October 2022 to 26 January 2023.

Under the campaign, the GoI directed (September 2022) all State Governments to actively plan and implement the campaign in coordination with all relevant stakeholders. The campaign mandated the following:

- Testing of all drinking water sources for chemical and bacteriological contaminants through accredited laboratories in all villages.
- Field testing using FTKs and H₂S vials in all schools and Anganwadi centres.
- Marking contaminated water sources as 'not fit for drinking'.
- Geo-tagging of all water sources on the JJM-IMIS portal.
- Testing of at least three household (HH) samples in each village.

However, scrutiny of records maintained by the Chief Chemist (JJM) revealed serious implementation gaps, as of July 2024:

- Out of the total 60,282 water sources⁴, only 9,401 (15.60 *per cent*) were tested for chemical parameters, and 6,562 (10.89 *per cent*) were tested for bacteriological parameters.
- Out of the total 43,249 villages, the water quality testing was conducted in only 25,595 villages (59.18 *per cent*) for chemical parameters and in 20,268 villages (46.86 *per cent*) for bacteriological parameters. Whereas water quality was tested at HHs level only in 1,314 (3.04 *per cent*) villages.
- Out of the total 51,593 schools, only 5,252 (10.18 *per cent*) schools were covered under the water quality initiative.

⁴ Including schools, *anganwadis*, households in villages.

- Out of the total 41,680 *Anganwadi* Centres, only 3,776 (9.06 *per cent*) were tested for water quality.
- During the campaign, 40,757 samples were found contaminated, but remedial action was taken for only 7,905 samples (19.40 *per cent*). Consequently, all efforts made in collecting and testing 32,852 samples were rendered ineffective due to the absence of follow-up action.

This data indicates substantial shortcomings in coverage, implementation and response under the '*Swachh Jal Se Suraksha*' campaign, thereby undermining the campaign's intended outcomes of ensuring safe drinking water for all.

The State Government stated (November 2025) that the Department is already conducting testing of rural drinking water sources using FTKs under the '*Swachh Jal Se Suraksha*' campaign. Further, the water sources testing is also being done by the Implementation Support Agencies as part of support activities. The reply is factually incorrect as there was a significant shortfall in achieving the targets of the campaign.

6.8 Summary of Findings

This Chapter revealed very low utilisation of available funds on WQM&S activities, reflecting extremely poor financial management. A large number of habitations continue to remain quality-affected, mainly due to salinity and nitrate contamination, yet laboratory infrastructure remains inadequate, with the State and District labs unable to test the full range of parameters prescribed under UDWQMP. Acute staff shortages and the absence of microbiologists/bacteriologists have further weakened testing capacity. BLLs were not made functional, and testing through FTKs was negligible. Similarly, remedial measures were not undertaken for nearly half of the contaminated samples identified. Non-creation of the DWQC and lack of independence for the Chief Chemist undermined accountability. Major initiatives like the *Swachh Jal Se Suraksha* campaign were implemented only partially, with very low coverage of villages, schools, and Anganwadi centres. Collectively, these deficiencies not only compromised the State's ability to ensure safe drinking water but also exposed rural populations to serious health risks.

6.9 Recommendations

- *The State Government may establish and empower institutional mechanisms by establishing the Drinking Water Quality Commissionerate, giving independent charge to the Chief Chemist, and ensuring adequate recruitment of microbiologists, chemists, and support staff.*
- *The State Government may expedite utilisation of WQM&S funds by prioritising the establishment of BLLs, procurement and deployment of FTKs, and execution of remedial measures for contaminated sources.*

- *The State Government may conduct efficient planning under special campaigns, with clear timelines and accountability, ensuring 100 per cent coverage of villages, schools, and Anganwadis for water quality testing, along with proper geo-tagging and follow-up remedial measures.*