CHAPTER III

WATER RESOURCES DEPARTMENT

Rural Water Supply Schemes implemented by Kerala Rural Water Supply and Sanitation Agency

Highlights

The World Bank approved Kerala Rural Water Supply and Environmental Sanitation Project (Jalanidhi) aimed to assist Government of Kerala in improving the quality of rural water supply and delivery of environmental sanitation services to achieve sustainability of investments. The Performance Audit focused on the implementation of Water Supply Schemes (WSS) and Ground Water Recharge (GWR) by the Kerala Rural Water Supply and Sanitation Agency (KRWSA). It revealed deficiencies in planning, procedural irregularities, failure in completion of projects on time.

Though 3139 new drinking water schemes were implemented against the original target of 2500, only 1,61,427 Households (65 *per cent*) benefited from the schemes against the envisaged target of 2,50,000 Households.

(Paragraph 3.6)

Thirty out of 88 small WSS costing ₹2.48 crore became defunct, forcing the beneficiaries to depend on alternate sources of water like neighbouring/public/own wells, rivers/streams/ponds, purchase of water from tanker lorries, etc.

(Paragraph 3.7)

In Vandana WSS in Vellarada, orders of the Ombudsman directing (November 2011) KRWSA to render necessary technical advice for installation of a 5 HP motor and repair of pipe lines to ensure supply of water before 28 February 2012 were not complied with.

(Paragraph 3.7.2.4)

In Kairali Beneficiary Group (BG) in Vellarada Grama Panchayat (GP) and Vadakkekara BG in Thachanattukara GP, Implementation Phase Completion Reports (IPCR) were signed and Exit orders issued, though the schemes were not completed.

(Paragraphs 3.8.1 and 3.8.2)

In two test-checked WSS, Exit orders were irregularly issued by KRWSA on the basis of IPCRs with forged signatures of elected members of BGs.

(Paragraphs 3.7.2.4 and 3.8.1)

An amount of ₹1.78 crore received in March 2014 by KRWSA from GOK for installation of Iron Removal Plant (IRP) in 10 schemes and Terrafil filters in 11 schemes remained unspent.

(Paragraph 3.9.1)

Against ₹22.76 crore to be utilised for artificial ground water recharge and sustainability, expenditure was only ₹5.89 crore. Due to the inadequate attention paid to sustain and recharge water sources, sources had dried up in 85 schemes of Jalanidhi Phase I.

(Paragraph 3.10.1)

3.1 Introduction

The World Bank approved Jalanidhi project was implemented in Kerala (2001) by KRWSA, an autonomous body established under the Travancore-Cochin Literary, Scientific and Charitable Societies Registration Act, 1955. The project integrates Water Supply with Sanitation, Health and Hygiene promotion, Environmental Management and GWR measures. All the WSS were designed to provide 70 lpcd[17] water to the project population. The project aimed at improving quality of Rural Water Supply and delivery of environmental sanitation services. It envisaged partial capital cost sharing and 100 *per cent* financing of Operation and Maintenance (O&M) costs of the Schemes by Beneficiary Groups (BGs) which were community institutions created to strengthen the ability of the users in planning, designing, implementing, operating and managing the components of the project. Capital cost sharing for WSS was in the ratio 75:10:15 between Government of India (GOI)/Government of Kerala (GOK)/KRWSA, GPs and BGs respectively for general schemes. In the case of tribal schemes, it was 80:10:10. The O&M cost of the scheme was to be borne fully by BGs.

The project was initially proposed to be implemented in 92[18] of the 358 GPs in Palakkad, Malappuram, Thrissur and Kozhikode districts. It was later (2003) scaled up to cover an additional 20 GPs in the remaining nine[19] districts. The project also envisaged rehabilitation of existing KWA water supply schemes by augmenting the source, protection of sources from pollution, construction of new facilities, repairs and replacement of the existing structures, machinery, equipment and pipelines to conform to the technical standards.

Agreement for Phase I of Jalanidhi project (Project cost ₹451.40 crore) was executed between GOI and World Bank on 4 January 2001. The scheduled date of completion was 30 September 2008[20]. Agreement for Phase II of Jalanidhi project, with an outlay of ₹1022 crore was executed for the period February 2012-June 2017 and was under execution. This Performance Audit focused on implementation of Water Supply Schemes and Ground Water Recharge in Phase I of Jalanidhi project.

[17] Litres per capita per day
[18] Eighty Nine as envisaged in Project Appraisal Document and additional three GPs were included.
[19] Alappuzha district was excluded due to disinterest of GPs.
[20] The scheduled date of completion was originally 31 December 2006 which was later extended.

3.2 Audit Objectives

The Performance Audit aimed at assessing whether:

- Rural WSS implemented, improved the accessibility of targeted population to stipulated quantity and quality of drinking water as envisaged;
- steps taken to improve the perenniality of drinking water source by promoting and implementing GWR schemes were effective; and
- policy of empowerment of BGs to make investment decision, planning and implementation of schemes and managing funds and scheme operations was effective.

3.3 Audit Criteria

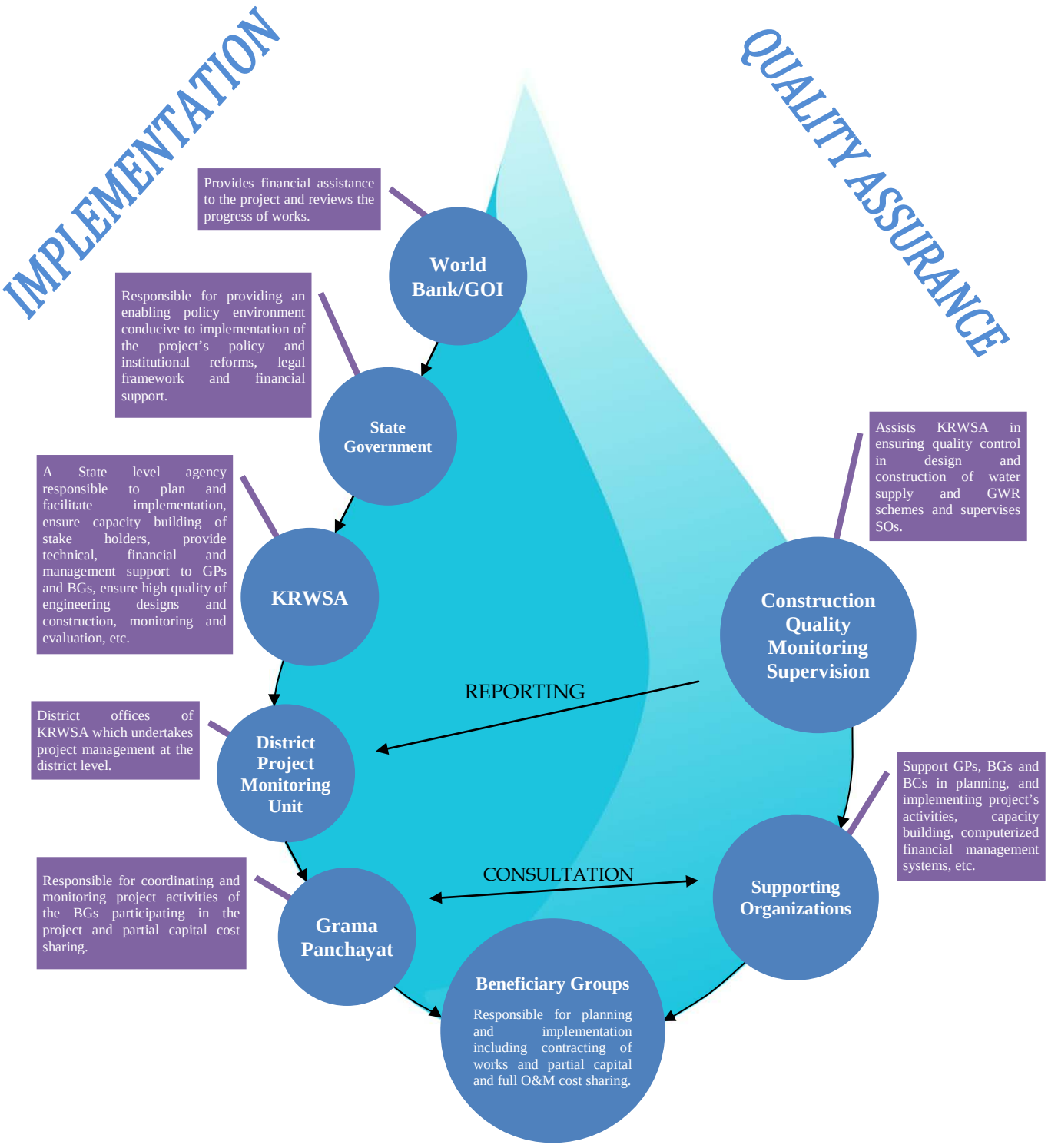
Audit Criteria for the Performance Audit are derived from

- The Development Credit Agreement between GOI and International Development Association (World Bank) for Phase I of the project;
- Project Implementation plan prepared by Government of Kerala and Project Appraisal Document of the World Bank; and
- Government Orders, Notifications, Manuals, Guidelines, etc.

The various stakeholders and their responsibilities in the implementation of the Scheme are given in the Organogram given in **Chart 1.1**.

Chart 1.1

IMPLEMENTATION CHART OF THE JALANIDHI SCHEME



3.4 Scope and Methodology of Audit

The Performance Audit attempted to evaluate the WSS and GWR conceived and implemented in Phase I of Jalanidhi. The selection of audit period 2008-2015 ensured that schemes completed by KRWSA with World Bank funding till September 2008 and spill over works taken over by GOK for completion after exit of World Bank have been covered in the Performance Audit.

The Performance Audit was conducted from April 2015 to September 2015 to assess whether the overall objectives have been achieved through implementation of the scheme by KRWSA. Records in the Government Secretariat, KRWSA and District Project Management Units (DPMU), GPs and BGs identified as stakeholders in selected schemes were test checked during the course of the Performance Audit.

Of the 110 GPs which implemented small WSS, 22 GPs were selected by applying stratified simple random sampling. Eighty eight small WSS (four from each GP) were selected for detailed study, through judgmental sampling. Three out of 16 comprehensive WSS were also selected for detailed scrutiny using stratified simple random sampling.

The number of schemes and the methodology adopted for selection of schemes for audit is given in **Table 3.1** below:

Table 3.1: Selection of GPs/Schemes

	Implemented	Selected	Method of Selection
Total number of GPs	110 GPs	22 GPs (four schemes from each GP)	Stratified simple random sampling method
Number of Comprehensive WSS	16 CWSS	3 CWSS	Stratified simple random sampling method

Besides, beneficiary survey of 25 beneficiaries from each selected scheme was also carried out.

Audit methodology included gathering of evidence by issue of audit enquiries, scrutiny of records, joint physical verification and conducting field survey among beneficiaries. Prior to commencement of audit, an Entry Conference was held on 26 May 2015 with the Executive Director, KRWSA who is also the Secretary, Water Resources Department. The Exit Conference was held with the Additional Chief Secretary, Water Resources Department on 14 January 2016, in which the findings of the audit were discussed.

3.5 Financial Management

The original project outlay of ₹451.40 crore[21] was downsized by the World Bank to ₹381.50[22] crore. The expenditure incurred on WSS and GWR under Jalanidhi Phase I upto 30 September 2008 was ₹232.05 crore. Eleven Works remaining incomplete in 10 GPs at the time of exit of the World Bank continued to be implemented by KRWSA as spill over works with the

[21] Community ₹54.50 crore, GP ₹34.30 crore, GOK/World Bank ₹362.60 crore
[22] Community ₹53.41 crore, GP ₹26.71 crore, GOK/World Bank ₹301.38 crore

assistance of GOK. As on November 2015, expenditure of ₹58.32 crore was incurred by GOK on spill over works.

Audit findings

3.6 Accessibility of targeted population to stipulated quantity and quality of drinking water

The project was originally targeted to implement 2500 new drinking WSS (inclusive of six large WSS) costing ₹205.60 crore, Audit observed that even though 3139 new drinking WSS (including 16 large WSS) costing ₹253.02 crore were implemented against the original target of 2500 WSS to benefit 2,50,000 Households (HH), only 161427 HHs (65 *per cent*) benefited from the schemes.

Of the 784 small WSS implemented in the test checked 22 GPs, 117 schemes had turned defunct and the remaining 667 schemes were either fully/partially functional. This has resulted in lower number of HHs benefitting under the scheme as brought out in the following paragraphs.

3.7 Reduced coverage due to defunct/partly functional water supply schemes

WSS under Jalanidhi were conceived with the objective of providing 70 lpcd of quality drinking water throughout the life cycle of the WSS through private connections and 40 lpcd if provided through public stand posts. Audit attempted to ascertain whether sufficient quantity of water was provided to the beneficiary HHs in test-checked Panchayats. It was noticed that water meters were not installed in HHs which made it difficult to assess the quantity of water supplied.

Audit observed that of the 88 small WSS test-checked, 30 schemes costing ₹2.48 crore became defunct (**Appendix 3.1**) forcing the beneficiaries of these schemes to depend on alternate sources of water. The results of a beneficiary survey conducted by Audit also revealed that 450 out of 539 beneficiaries depended on neighbouring/public wells, rivers/streams/ponds, own sources, etc. as an alternate option for water supply. Major instances of schemes becoming defunct/partially defunct due to reasons like failure of source, quality/technical issues, inactive BGs and other reasons are analysed below:

3.7.1 Failure of KRWSA in identification of water sources

The small WSS generally depended upon sources such as open wells, bore wells, streams, Rain Water Harvesting Structures (RWHS), etc., for supply of water. For the successful implementation of a WSS, the source had to be identified in peak summer i.e. in the months of March to May, quantum of supply from the source had to be ascertained by conducting yield test, wells constructed upto the required depth as recommended by hydrogeologist and RWHS constructed without defects. Audit observed that these pre-conditions were not complied with satisfactorily, which led to reduced coverage. Out of 88 schemes selected for scrutiny, Audit identified six schemes which became either non-functional or functioned sub-optimally due to failure of water sources as indicated below.

3.7.1.1 Thayamparambu BG in Vettom Panchayat

The scheme which was to benefit 326 beneficiaries was completed in March 2006. A joint site verification conducted by Audit and GP Secretary revealed that water was not available in the source well and the scheme was not functioning since its inception. According to Para 5 of Technical Manual, the yield of source had to be ascertained prior to construction of well. Though the Detailed Scheme Report (DSR) envisaged geophysical survey and yield test, these were not conducted. Audit observed that the KRWSA guidelines required the agency to affix its approval to an Implementation Phase Completion Report (IPCR) attesting to successful execution and functioning of the scheme. Exit orders signifying the handing over of the scheme to the intended beneficiaries were to be issued only after preparation of the IPCR.

The failure of KRWSA in monitoring the successful execution and functioning of the scheme is evident from the fact that though IPCR was not prepared, Exit order was issued by KRWSA (December 2006). It was replied to Audit (January 2016) that IPCR and Exit orders of the scheme were issued only after ascertaining that the scheme had been properly executed and sufficient water was supplied. The reply was not factually correct, as Project Manager, DPMU himself had stated in the Exit order that the IPCR had not been submitted. Thus, the action of KRWSA of issuing Exit Order without preparation of IPCR was a serious lapse which calls for investigation and fixing responsibility.

3.7.1.2 Nila and Jalavahini BGs in Vallathol Nagar GP

The WSS comprising 20 and 41 HHs respectively with a total cost of ₹7.78 lakh sourced water from bore wells with depth of 49 metre and 89 metre respectively as against 100 metre and 100 metre recommended by the hydrogeologist. The schemes became defunct due to insufficient water in the source. Failure of the Supporting Organisation (SO) to ensure that the depth of the well was maintained at levels specified by the Hydrogeologist led to the scheme turning defunct. The Government replied (January 2016) that digging of borewells were stopped at these depths as sufficient yield was noticed at these levels. The reply of Government is not acceptable since the scheme became defunct due to failure of KRWSA in ensuring depth of borewells as recommended by hydrogeologist and that technical parameters stipulated in the Technical Manual were not fully met while implementing the WSS. Thus, the case needs to be investigated for fixing responsibility of defaulting officers for ignoring recommendations of hydrogeologist and technical parameters.

3.7.1.3 Nellithara BG in Kavassery GP

The scheme consisted of 39 HHs. The work was completed and handed over to the BG in February 2006. The Scheme became partially functional due to inadequate water at source. Audit noticed that contrary to provisions contained in the Technical Manual of KRWSA which requires source selection to be made during peak summer, the hydrogeologist had identified the source in January 2004. Audit further observed that the recommendation to dig an open well with 10 metre depth was also not adhered to and the depth was restricted to 7.10 metre. The suggestion of the hydrogeologist to introduce rain pits, buried infiltration tanks and trenches on the upslope of the well as GWR

methods were also not executed resulting in the scheme becoming partially functional with pumping done in alternate days.

Failure of the SO and the Construction Quality Monitoring and Supervision (CQMS) agencies in discharging their responsibilities led to the scheme becoming partially functional. KRWSA stated (November 2015) that the identification of source was done in January to facilitate the pace of implementation and that depth was restricted only after ensuring availability of sufficient water for HHs. The reply was not acceptable in view of the failure of KRWSA to select source during peak summer as stipulated in the Technical Manual and failure to comply with recommendations of the hydrogeologist regarding depth of the wells, assessment of the adequacy of water by conducting yield test and implementation of GWR measures which eventually resulted in failure of the scheme, which calls for fixing of responsibility.

3.7.1.4 Thrithalaparambu BG in Pazhayannur GP

The scheme targeted to benefit 40 HHs, was handed over to the BG in December 2004. The Technical Manual stipulates that drilling of borewell as source shall be continued up to the depth recommended by hydrogeologist, and discharge shall be measured by diverting the water through a V-notch[23].

Scrutiny of Measurement Book and IPCR revealed that the recommendations of hydrogeologist to drill the borewell up to a depth of 100 metres was not adhered to and the actual depth executed was only 73.5 metres (September 2003). Survey of beneficiaries as well as BG conducted by Audit revealed that the beneficiaries of the scheme obtained less than sufficient quantity of water and that the scheme was functioning partially with supply on alternate days only. The number of beneficiaries also declined from 40 to 23 due to irregular supply of water.

Government replied (January 2016) that though yield at that time was sufficient to cater to the needs of the BG, the hydrogeological conditions based on climatic changes and lowering of water table reduced yield in course of time. Government also suggested that a reduced distribution of water was the only alternative to maintain water supply in acute summer.

The reply was not acceptable in view of the fact that had KRWSA drilled up to the recommended depth, the quantity of water available for consumption would have been much higher. Failure of KRWSA to adhere to the Technical Manual and instead requiring beneficiaries to adapt to lesser quantity of water was not acceptable.

3.7.1.5 Jalasree Narikkal BG in Thirunelli GP

The scheme which included 30 HHs was completed in September 2007 and the Exit order to own and operate the scheme by the BG was issued in March 2008. Audit noticed that ten HHs had opted out of the scheme for want of steady supply of sufficient quantity of potable water. Currently, water was being supplied for only one and half hours per day, two to three days in a week, which was hardly sufficient to fill the 6,000 litre capacity OH tank. The existing 20 HHs were also not getting required quantity of water for domestic

[23] V-notch is a triangular channel section used to measure discharge values of water flow.

purposes. The DPMU, Wayanad identified (December 2007) the presence of weathered rock at the bottom of the open well as the reason for low yield of the well. Audit noticed that yield test of the source was also not conducted to ensure adequacy of water.

Government stated (January 2016) that though sanction for additional source was accorded in December 2007, it could not be pursued as the target date of exit was March 2008. It also stated that new or rehabilitation schemes were not envisaged under spill over works. The reply was not acceptable since sanction accorded to the WSS without ensuring sufficient yield and reluctance in taking up the work afresh clearly exposes the laxity of KRWSA in ensuring adequate water to the beneficiaries.

3.7.2 Technical deficiencies in design and implementation by KRWSA

3.7.2.1 Deviation from Detailed Scheme Report - Irregular construction of tank

The Jaladhara WSS in Tanur GP envisaged providing potable water to 41 beneficiary HHs. The components of the scheme included construction of 5640 litre RCC[24] Overhead Service Reservoir (OHSR). Audit noticed during physical verification that instead of an RCC OHSR, a ferro-cement tank of 7000 litres was constructed, which developed cracks within a year, causing leakage of water resulting in short supply of water to the beneficiaries. Government stated (January 2016) that cracks in the tank developed due to poor workmanship and that Ferro cement tanks were not being used in Phase II of the scheme. The reply was not acceptable as the scheme was designed with a life span of 20 years and the decision to deviate from the originally envisaged RCC OHSR in favour of Ferro cement tanks was injudicious.

3.7.2.2 Valamthode Vikasana Samithy in Chaliyar GP

A WSS for Valamthode Vikasana Samithy in Chaliyar GP in Malappuram district to benefit 54 HHs was completed in June 2006. The Kuravanpuzha stream in the forest was identified as source for conveying water to an OHSR through gravity main laid in the stream. Beneficiaries surveyed, reported to Audit that they were not obtaining potable water during rainy season. A joint site verification conducted by Audit (October 2015) along with Secretary of Chaliyar Panchayat revealed that the sand filter constructed in the stream had got fully damaged. Due to the force of turbid water rushing down the hill side, the chamber for collection of water was frequently demolished in heavy rains and the PVC pipes carrying water to the OHSR were washed away.

Government replied (January 2016) that since it does not support the O&M part, the BG was to undertake minor repair and maintenance works to rectify damages in infiltration zone. Audit observed that had KRWSA, considering the heavy flow of water, incorporated suitable checks at the design stage itself, the sustenance of the scheme could have been ensured.

[24] Re-inforced cement concrete

3.7.2.3 Moothodath BG scheme in Vettom GP

The Moothodath BG scheme in Vettom GP in Malappuram district was commissioned (October 2004) to benefit 54 HHs. Audit noticed that 16 of the 54 HHs in elevated areas opted out of the scheme as water could not be pumped to these areas at sufficient pressure. It was observed that valves were not installed to regulate the supply of water for being pumped at the required pressure to elevated areas.

During the Exit Conference (January 2016), Government stated that the issue could have been easily resolved had the BGs installed valves to pump water to elevated areas at required pressure. The reply was not acceptable as the problem of adequacy of pressure to enable water to reach elevated areas should have been considered at the design stage itself.

3.7.2.4 Vandana WSS in Vellarada GP

The Vandana WSS in Vellarada GP in Thiruvananthapuram District was designed to benefit 42 HHs. As per the DSR, a 5 HP[25] motor was proposed for the scheme. However, only a 3 HP motor was installed. Audit noticed that though there was deviation from the original DSR, formal Exit order was issued by KRWSA (December 2008) citing completion of the scheme. A direction issued (November 2011) to KRWSA by the Ombudsman for Local Self Government Institutions, Thiruvananthapuram to render technical advice for installation of a 5 HP motor and to repair pipelines before 28 February 2012 was also not complied with (July 2015).

Audit also noticed that the signatures of the BG Secretary in the Memorandum of Association and IPCR of the scheme were different. It was confirmed to Audit by the BG Secretary, President, and Treasurer in writing that their signatures in the IPCR were forged. As such, the issue needs to be investigated and responsibility fixed for irregularly issuing Exit order on the basis of forged IPCR, to a scheme which failed to deliver on its objectives.

The Executive Director, KRWSA, during the Exit Conference (January 2016) agreed to investigate the issue.

3.7.2.5 Incomplete Comprehensive WSS in Pananchery GP

The Large Surface Based Comprehensive Water Supply Scheme (LSBCWSS) in Pananchery GP in Thrissur District was intended to provide piped water supply to 2500 HHs at an estimated cost of ₹4.97 crore. Administrative sanction and Technical Sanction was accorded (March 2006) by Pananchery GP and KRWSA respectively for ₹4.97 crore. Revised Administrative Sanction was accorded (October 2009) by Pananchery GP for ₹7.36 crore. KRWSA appointed M/s. Mahindra Acres Consulting Engineer Ltd. as technical consultant. As per the DSR, the scheme components included laying of gravity main from Peechi Dam off-take point to 2 MLD capacity Water Treatment Plant (WTP) near Mylatumpara, Pumping main, distribution system divided into three zones and service reservoirs at Palakkunnu for Zone I, Vilangannur for Zone II and Kuthiran for Zone III.

[25] Horse power

Site verification and scrutiny of records maintained by the Scheme Level Executive Committee (SLEC)[26] and KRWSA, revealed that the scheme was commissioned in June 2010, with water provided only to 1308 (52 *per cent*) beneficiaries against the target of 2500 HHs as shown in **Table 3.2**:

Table 3.2: Shortfall in coverage

Zone	No. of BGs (registered HHs)	No. of HHs supplied with water	No. of HHs deprived of water	Remarks of Government
I	13 (997 HHs)	652	345	Non-filling of gap in distribution line, pressure test not conducted etc.
II	21 (1041 HHs)	656	385	Leakages in distribution network, pressure test not conducted.
III	5 (311 HHs)	Nil	311	The contractor stopped the work due to dispute and is under Arbitration.
Total	**39 (2349 HHs)**	**1308**	**1041**	

(Source: Records of KRWSA)

Audit observed that poor quality of work resulted in depriving 1041 HHs of potable drinking water under the scheme. In the Exit Conference (January 2016), the Executive Director, KRWSA stated that the matter, being under adjudication, was still pending and that steps for completion of the scheme would be taken up after completion of adjudication process.

All the instances mentioned by Audit in Paragraphs 3.7.1 to 3.7.2 reveal laxity of KRWSA in designing and implementing WSS in violation of the provisions contained in its Technical Manual.

Recommendation No. 1: Government must ensure that KRWSA initiates measures to revive WSS which have gone defunct in order to mitigate hardships faced by the beneficiaries and strictly complies with provisions contained in the Technical Manual to prevent schemes from becoming defunct in future.

3.7.3 Deficiencies in Operation & Maintenance of schemes by Beneficiary Groups

As per project guidelines, the BGs were responsible for planning, technology selection, constructing WSS facilities, providing their part of the capital cost contribution, managing O&M of the improved facilities and levying and collecting sufficient user charges from the beneficiaries to fully recover the recurrent O&M costs. Audit scrutiny of records pertaining to the BGs in test-checked GPs and beneficiary survey revealed instances of schemes turning defunct due to failure of BGs to discharge their responsibilities envisaged in the Project Guidelines as shown in **Table 3.3**:

[26] The committee responsible for implementation of Large Surface Based Comprehensive WSS

Table 3.3: Schemes which turned defunct due to inadequate O&M by BGs

(₹in lakh)

Name of BG (Number of HHs)	Cost of scheme	Date of completion	Period of non-functioning	Reasons for non-functioning
Adukkamala Koolippara BG in Madavoor GP (56)	8.01	February 2005	Four years	Inability of BG to collect water charges regularly from beneficiaries.
Multi BG scheme in Thirunelly GP comprising five small BGs (376)	67.61	October 2007	Seven years	Since the pump set used was 35 HP submersible type, considerable expense was incurred to lift the pump set from well for each repair. BGs were reluctant to afford such amount during each repair.
Perumal Oothu BG/Moolagangal in Sholayur GP (37)	1.15	June 2004	Five years	Non-payment of monthly contribution by most of the beneficiaries, non-cooperation of beneficiaries, non-involvement of Beneficiary Committee in rectification of damages caused to distribution lines.
Vellakkulam BG in Sholayur GP (39)	2.08	June 2004	Eight years	Mud and silt got accumulated in the water collection chamber clogging the mouth opening of the pipe and arresting water flow. BG did not take measures to rectify this and negligence of BG resulted in stolen and damaged pipes.
Souhrudha BG in Thachanattukara GP (23)	2.75	December 2005	Eight years	Failure of BG to repair damaged pump set.
Pidavoor East BG in Thalavoor GP (30)	8.37	April 2008	Four years	Pump set got burnt as the pump operator failed to turn off the pump set. As majority of the HHs of BG had alternate sources of water, repairing/renewing of pump sets was not taken up.
Eravicode BG in Thalavoor GP (31)	7.95	September 2007	Two years	Pipeline laid along Panchayat road was damaged during road repairing/widening. BG did not initiate action to get the damaged pipes repaired.
Kandillapara ST BG in Chaliyar GP (28)	6.66	February 2008	Seven years	Installation of 10 HP diesel pump instead of 3 HP specified in DSR resulting in higher capital and O&M cost. No attempt was made to obtain electric power connection. Inability of the tribal BG to afford high O&M cost resulted in the scheme becoming defunct.

(Source: Beneficiary survey, audit queries and records of KRWSA)

Government replied (January 2016) that the schemes turned defunct due to technical, social and financial issues which were beyond the managerial capacity of BGs. It was further stated that there was no post exit support to BGs either from the GOK or KRWSA to address these issues.

Recommendation No. 2: Government may ensure that KRWSA offers post exit support to BGs and consider extending financial and technical support to BGs to ensure that the WSS do not further deteriorate and potable water is available to the beneficiaries. Government should also exhort the GPs to involve in post-exit management of schemes.

3.8 Declaration of completion of schemes

As per World Bank guidelines, KRWSA was to appoint Construction Quality Monitoring and Supervision (CQMS) agencies who were responsible for monitoring the quality of supervision by SO and to ensure quality of construction in the ongoing schemes. While the SOs were responsible for the day to day supervision of all procurement and construction activities, the CQMS agencies were responsible for concurrent monitoring of these activities through periodic reviews and inspections. KRWSA had also issued guidelines to be followed by CQMS agencies for discharging their works.

Exit order handing over the scheme to the BG is issued by KRWSA on the basis of IPCR after ensuring availability of adequate water to the beneficiaries. Audit noticed two instances where schemes for which IPCRs had been signed and Exit order issued, were not commissioned as detailed below.

3.8.1 Kairali BG in Vellarada GP

A BG comprising 50 HHs implemented the scheme. Audit noticed that formal Exit order was issued by KRWSA (December 2008) citing completion of scheme in September 2008. However, joint site inspection by Audit (June 2015) revealed that construction of ladders of OH tank, plastering of sides and surface of well and RCC were still incomplete. The Secretary of BG confirmed to Audit in writing (June 2015) that his signatures in the IPCR were forged.

Government stated (January 2016) that non-completion of various components of the scheme at the time of exit, as pointed out by Audit, had not come to their notice. It was also stated that since the completion report signed by the SO, BG Secretary, Team Leader, Accounts Officer and Project Manager of Thiruvananthapuram district had certified satisfactory completion of components of the work, the information now given by the BG Secretary after eight years of exit, that his signatures were forged in the IPCR, did not deserve any merit.

The reply of Government is not acceptable in view of the fact that passage of time does not minimise the gravity of an offence and that the Government cannot escape from its responsibility for ensuring right action when such schemes are implemented for common people by spending Government funds. As such, this instance of forgery pointed out by Audit needs to be investigated and appropriate action taken.

3.8.2 Vadakkekara scheme in Thachanattukara GP

The Scheme in Palakkad district, intended to benefit 20 HHs was not commissioned due to non-completion of inter connection between pumping main, reservoir and distribution line. IPCR was to be issued only on completion of the WSS, in all respects. However, KRWSA had wrongly issued Exit order (March 2006) ignoring the fact that the interconnection between pumping main and distribution line was incomplete.

Government stated in reply (January 2016) that the scheme was functioning with a new source constructed using GP fund and interconnections were done dismantling old pipes from the tank. Government further stated that the BG

should have intervened during the exit process to ensure availability of water. The reply was not acceptable as it is indicative of lack of responsibility. Placing the blame on BGs is inappropriate since KRWSA should have ensured completion of work before signing the IPCR, which calls for fixing of responsibility.

Recommendation No. 3: Government should frame stringent provisions to deter officials from issuing IPCRs and exit orders without ensuring completion of WSS. Action may be taken against officials violating such instructions.

3.9 Quality of drinking water

The project envisaged definite and comprehensive parameters to ensure the quality of water to be supplied to beneficiaries. It stipulated compliance to standards prescribed by Central Public Health and Environmental Engineering Organization (CPHEEO). As per CPHEEO standards, the water should be free from pathogenic organisms, low in concentration of compounds that were acutely toxic or that have serious long term effects, clear, free from salinity, free of compounds producing taste and odour, non-corrosive, non-staining, etc.

Beneficiary survey and joint site inspection with the officials of GP/BG revealed that 30 of 88 schemes test-checked had become defunct, of which nine (**Appendix 3.1**) turned defunct due to poor quality of water. Of the balance 58 schemes, beneficiaries of 11 schemes (**Appendix 3.2**) stated that water distributed could not be used for drinking purpose. In the remaining 47 schemes, beneficiary committees of four schemes certified that water was fit for drinking as per periodical quality tests. Audit noticed that the beneficiaries in the remaining 43 schemes consumed the water without periodical tests to ensure the quality of water.

3.9.1 Schemes defunct due to excess iron content

KRWSA had identified (November 2007) 108 WSS in the State catering to 4050 HHs (four in the test checked schemes)[27] having quality issues in water supplied owing to the presence of excess iron. KRWSA also identified (November 2013) fifty schemes as 'defunct' due to excess presence of iron. GOK, therefore, accorded sanction (February 2014) for the rehabilitation of 21 schemes by installation of Iron Removal Plants (IRP) and Terrafil filters at a cost of ₹1.78 crore.

Though KRWSA obtained ₹1.78 crore from GOK in March 2014 based on its proposal for installation of IRP in 10 schemes and Terrafil filters in 11 schemes, no expenditure was incurred and the amount was retained by the KRWSA. The KRWSA stated (December 2015) that expenditure was not incurred since 17 of the 21 schemes chosen for installation of IRPs and Terrafil filters had since been identified as non-functional. It was clarified that the possibility of installing new proven water purification natural technology with Zeolite based filtration plants in WSS was being explored.

[27] (1) Thiyarakunnummal in Tuneri GP, (2) Oottukkulam in Kadalundi GP, (3) Jalavahini and (4) Varsha in Vallathol Nagar GP

In the test-checked Varsha WSS in Vallathol Nagar GP, Audit observed (May 2015) that IRP which was installed after commissioning of scheme, had been removed and unusable water with excess iron was being distributed to beneficiaries. The Secretary of BG reported that though there was sufficient water in the source, functioning of IRP caused frequent breaking of pumping main and reduced flow of water from IRP to the tank, which forced the BG to detach the IRP. Government stated (January 2016) that improper maintenance by the BG resulted in idling of the IRP. Audit observed that KRWSA failed in addressing the problems associated with delayed installation of IRP. Government stated in the Exit Conference (January 2016) that the matter would be looked into.

Audit also noticed water quality issues in one out of three test-checked large WSS as detailed below:

3.9.2 Nenmeni Rural Water Supply Scheme

Nenmeni RWSS managed by KWA since 1993 was handed over to Nenmeni GP in April 2005. The scheme was rehabilitated at a cost of ₹42.93 lakh under Jalanidhi and commissioned in November 2007. The scheme was currently run by SLEC.

A report on water quality test conducted in October 2013 showed very high turbidity, presence of iron, and coliform bacteria rendering the water unfit for consumption. The Secretary, SLEC stated (January 2014) that a length of 12.34 kms of Asbestos Cement (AC) pipes used in the distribution line was damaged at various stretches resulting in deposit of slush in the distribution line. Even though KRWSA had accorded sanction (March 2014) for the construction of a Water Treatment Plant (WTP) and allied works and work was awarded (March 2015) for ₹1.94 crore, proposal to replace the damaged AC pipes had not been reckoned so far. It is evident that construction of the WTP without replacement of the AC distribution lines would still expose the beneficiaries to contaminated water. With a view to assess the current status of water quality of the scheme, Audit test checked (December 2015) water sample from the scheme which revealed high presence of iron, coliform bacteria (1100 times above desirable limit) and high turbidity.

Government stated in reply (January 2016) that turbidity of water and quality issues posed problems in implementation. It was agreed in the Exit Conference (January 2016) that this was an issue which needed to be addressed.

3.9.3 Vannanthura Tribal BG

The Vannanthura WSS in Sholayur GP for 67 tribal HHs was implemented in March 2005. The source of water was an open well (dug well) located very adjacent (three to four meters) to the Siruvani River.

As the water in the well had a foul smell of mud, yellow colour and bad taste of iron, the beneficiaries opted out of the scheme which became defunct within a month of inception, as the intrusion of river water into the well had caused contamination of water.

Audit observed that the stipulation in the Technical Manual which required conducting Hydro geological survey and construction of infiltration wells in

river beds was not adhered to. The KRWSA constructed an open well which resulted in seepage of river water and resultant contamination of water.

Government replied (January 2016) that openwell had been constructed as per the Technical Manual. It was admitted that the intrusions in the well could have been sealed as and when noticed and that pressure filter or infiltration gallery would be supplemented in revisits. The reply of Government that open well had been constructed as per the Technical Manual was not factually correct and was against the provisions contained in the Technical Manual.

3.9.4 Thazhe Sambarcode Tribal BG

The scheme was completed (March 2005) to benefit 68 tribal HHs in lower Sambarcode ooru in Sholayur GP.

The source was an open well located adjacent to the Siruvani River. The scheme had a filtering unit and a Ground Level Service Reservoir (GLSR) made of ferro-cement with a capacity of 10,000 litre. Result of water quality test conducted at KWA lab (September 2002), revealed presence of Iron and Fluoride above acceptable limit and high presence of e-coli and coliform bacteria making it unfit for drinking, which necessitated treatment before consumption. The Scheme turned defunct as the untreated water was unfit for consumption of beneficiaries.

As per Technical Manual, hydrogeological survey should be conducted before construction of the well and all recommendations made by Hydrogeologist were to be considered while constructing the well. But Audit observed that no such study was conducted.

Though a pressure filter was provided as a filter, it was not enough to provide safe water devoid of yellow colour, mud and taste of iron. In reply (September 2015) KRWSA stated that though a pressure filter could reduce turbidity, iron could be removed only by installing an IRP.

Lapses in design and conceptualization had resulted in the scheme being implemented without ensuring provision for purification of water. As such, KRWSA needs to install IRP for ensuring supply of pure drinking water.

Government assured in the Exit Conference (January 2016) that quality issues pointed out by Audit would be attended to on a war footing.

Recommendation No. 4: Government should hold KRWSA responsible for the failure to ensure quality of water supplied and to address the issues of water quality in the interest of the health of the beneficiaries. Government should, through KRWSA, install IRPs in WSS for ensuring purification of water to make the defunct schemes functional.

3.10 Sustainability of drinking water sources

Ground Water Recharge (GWR) is an important part of the hydrologic cycle in which water from surface works its way into the sub-surface replenishing ground water supplies. The recharge would be possible by adopting and implementing associated measures such as contour bunding/trenching, rain pits, rain water harvesting structures, percolation tanks, strengthening of terraces, check dams, etc. The following points were noticed in Audit.

3.10.1 Implementation of Sustainability measures by KRWSA

The Project envisaged setting apart eight *per cent* of the cost of water supply for implementing artificial GWR to augment and sustain the water sources. Accordingly, against ₹284.48 crore utilised for scheme implementation, ₹22.76 crore had to be spent for artificial GWR and sustainability of 3710 RWSS[28] under Jalanidhi Phase I project. However, the actual amount utilised on GWR was only ₹5.89 crore (two *per cent* of ₹284.48 crore). Due to inadequate attention paid to sustain and recharge water sources, they had dried up in 85 schemes (**Appendix 3.3**) of Jalanidhi Phase I. In order to meet the expenditure for extending sustainability support to Jalanidhi I schemes, Rupees five crore was received (February 2013) by KRWSA from NRDWP[29] funds for 2012-13. Expenditure incurred on actual recharge of the ground water schemes was only ₹6.40 lakh.

Laxity on the part of KRWSA in allotting adequate funds for sustainability and failure to spend even the meagre resources received for the purpose was a cause for concern. The KRWSA admitted (June 2015) that no study had been conducted to evaluate the effectiveness of GWR measures adopted by Jalanidhi as the GWR activities were wound up once the project funding was over and there was no mechanism in place to monitor the effectiveness of O&M. The reply of KRWSA was not acceptable as it does not explain as to why the agency had failed to allot adequate funds for sustainability measures. Audit observed that the implementation of WSS by KRWSA without paying adequate attention to ensure sustainability of sources had resulted in the sources drying up and schemes turning defunct as observed below.

3.10.2 Kanakooth and Peruvampadam ST Colonies in Chaliyar GP

The Guidelines of KRWSA stipulated that RWHS[30] as a technology option for WSS should be resorted to only if all other options were found costly and not feasible. It required that the beneficiaries should be living in isolated, scattered and quality affected habitations facing acute water scarcity where no conventional water supply systems were feasible. However, Audit noticed that in Chaliyar GP, 70 and 90 numbers of RWHS costing ₹25.74 lakh were constructed in Kanakooth and Peruvampadam ST Colonies respectively despite the fact that these areas were thickly populated and conventional water supply system with open well as source of water was feasible. The scrutiny of Measurement Books also revealed that filter units stipulated in the DSR were not installed in any of the RWHS.

Figure 3.1: Abandoned Rain Water Harvesting Structure, Peruvampadam ST Colony

[28] 3139 WSS, 251 GP rehabilitated schemes, 147 KWA rehabilitated schemes, 173 institutional schemes
[29] National Rural Drinking Water Programme
[30] Rain Water Harvesting Structures (RWHS)

Audit conducted a joint verification (June 2015) with the GP Secretary which revealed that only 23 out of the 160 RWHS were found existing and the remaining structures were found demolished. The existing structures were in abandoned condition. The inhabitants of both colonies used water either from the well constructed by the GP or from nearby streams. The beneficiary HHs stated that the RWHS were not used for collecting water since inception, due to leakages in tank. The installation of RWHS in areas where conventional WSS were feasible and defective construction including non-installation of filter units led to failure of scheme. Government stated in the Exit Conference that the issue will be examined.

3.10.3 The Padoor Manakkad BG in Kavassery GP

This scheme consisted of 38 HHs. Contrary to stipulations in the Technical Manual requiring the source to be identified during summer months, the Hydrogeologist had visited the site in December 2003 and also recommended GWR measures such as rain pits, buried infiltration tanks and trenches for sustainability of source for which a provision of ₹19,500 was made in the DSR. No GWR measures were implemented as recommended and the scheme became defunct due to insufficient water in source. Government stated that (January 2016) identification of wells was done using the scientific methods utilising the service of experienced hydrogeologists of the region and using geophysical survey equipments. The fact, however, remains that non-adoption of GWR measures as recommended led to the failure of the scheme.

Recommendation No. 5: KRWSA should undertake GWR activities before implementation of WSS to ensure that the schemes do not suffer for want of adequacy of water in the long run.

3.11 Empowerment of Beneficiary Groups

The Beneficiary Groups (BGs) were tasked to initiate project activities, collect money and other resources, choose the levels of service and technology options and implement the scheme. Lapses in execution of responsibility assigned to BGs resulted in poor quality of implementation as is evident from following audit findings emerging from the survey of BGs/beneficiaries conducted by Audit.

3.11.1 Registration of BGs

All the BGs were to be registered under the Travancore-Cochin Literary, Scientific and Charitable Societies Registration Act, 1955 (Act XII of 1955) to have legal recognition. However, 55 out of the 56[31] test-checked BGs admitted that they had not renewed their registration annually. Failure to renew registration carries the inherent risk of the BGs functioning without legal sanctity and non-compliance to legal provisions like maintenance of records, regular audit of annual accounts, etc.

[31] Of the 58 functional schemes in the test-checked schemes, two were RWHS which did not have BGs

3.11.2 Failure to provide safe drinking water

As per para 3.8 of O&M Manual of KRWSA, the water to be supplied should be free from bacteria/virus or other organisms, harmful elements/solvents/ chemicals, etc., and should not have any bad odour, taste or color. The CPHEEO have issued standards of physical, chemical parameters and bacteriological quality for the drinking water. The O&M Manual of KRWSA which required BGs to ensure chlorination with bleaching powder to be done at fixed intervals, the well and its surroundings to be kept clean and well maintained to ensure unpolluted water and cleaning of service reservoirs to be done at least once in a month, were not complied with. Technical Manual for Planning and Implementing Community Managed WSS requires analysis of residual chlorine daily, bacteriological analysis once in three months or as desired by the community and complete physio chemical and bacteriological analysis once in summer and monsoon or whenever deviation in water quality is observed. Beneficiary survey revealed serious irregularities in ensuring quality of water as given below:

- Fifty two of the 56 BGs did not conduct periodical testing of water to ensure quality.
- Out of 43 small WSS functioning with open well as source, 20 schemes reported yearly cleaning of source and six schemes reported monthly or bimonthly or quarterly cleaning. Seventeen schemes stated that the source was never cleaned.
- As per Operations and Maintenance Manual, the reservoir should be cleaned on monthly basis. Out of 56 small schemes, the reservoir was cleaned by the BGs fortnightly in three schemes, monthly in 18 schemes, bimonthly in six schemes, quarterly in 13 schemes, yearly in 14 schemes and was never cleaned in respect of two schemes.
- While 33 schemes adopted disinfection methods daily, two schemes conducted disinfection procedures occasionally or once in three months; 21 schemes had never adopted any disinfection method. The reasons stated included dislike of taste of chlorine, practical difficulty in adding chlorine, etc.
- Chloroscopes[32] were not provided for small WSS.

Had the BGs effectively discharged responsibilities pertaining to O&M of the schemes, many of the water quality issues pointed out earlier could have been mitigated.

3.12 Conclusion

Audit observed that even though 3139 new drinking water schemes (including 16 large WSS) were implemented against the original target of 2500 to benefit 2,50,000 HHs, only 1,61,427 HHs (65 *per cent*) benefited from the schemes. Almost 34 *per cent* of the schemes test checked had become defunct due to reasons like failure of source, quality/technical issues, inactive BGs, etc. which was a cause for concern. KRWSA disregarded provisions contained in

[32] An equipment to test residual chlorine in treated water

its Technical Manual resulting in schemes turning defunct. KRWSA also failed in rightly identifying water sources and in the design and implementation of WSS. Instances of KRWSA irregularly issuing Exit Orders on the basis of IPCRs with forged signatures of elected members of BGs, and handing over schemes to BGs without ensuring completion were noticed. Failure to sustain and replenish water sources, inability of BGs to rectify technical failures and faulty O&M management led to schemes becoming defunct.

Though the project stipulated norms for quantity and quality of water supplied, Audit noticed supply of insufficient and unsafe drinking water to the beneficiaries. Despite GOK providing ₹1.78 crore for installation of IRPs and Terrafil filters, KRWSA could not utilise the funds for the purpose. The expenditure on sustainability measures was very low resulting in sources drying up, defeating the objective envisaged. The policy of empowering BGs to usher in community participation to conceive, part-finance and implement WSS has not succeeded.