Internal Ex-Post Evaluation for Technical Assistance under Finance and Investment Account

conducted by India Office: January, 2023

Country Name	**Capacity Development Project for Non Revenue Water Reduction in Jaipur**
Republic of India	

I. Project Outline

Background	The Public Health Engineering Department (PHED), in charge of the water supply business in Jaipur city, had been facing issues of intermittent water supply, low-cost recovery rates as well as high non-revenue water (NRW) ratio because of water leakage and malfunction and insufficiency of water meters, etc. With the assistance of the Japanese ODA Loan, namely "Bisalpur Jaipur Water Supply Project (signed March 2004)," water transmission and supply facilities from the Bisalpur Dam were constructed. This made it possible to improve the ground water reliance rate of Jaipur city, which is associated with increase in water supply hours. In 2011, the population with access to safe water including through water tanks and wells reached approximately 3 million. However, the number of populations with domestic water supply service connections was only approximately 2.2 million. In order to cope with management issues in water sectors, JICA continued the assistance to conduct the detailed analysis and to facilitate the sector reform, by "Special Assistance for Project Implementation (SAPI) for Jaipur Water Supply Project (2004)" and technical assistance by experts (2011-2013). To improve the water supply service, PHED implemented the pilot project of 24-hour water supply in some areas in Jaipur city, by installation of bulk meters, procurement of water meters, as well as development of Geographic Information System (GIS) and customer information data and achieved increase in tariff revenues and 24-hour water supply as well as reduction of the NRW ratio. However, the countermeasure was limited to leakage appearing on the ground surface since PHED did not have sufficient techniques for detecting underground water leakage.		
Objectives of the Project	In Jaipur city, through improvement of planning capacity for NRW countermeasures, development of technical and operational capacity and operationalizing the internal trainings on NRW reductions, the project aims to strengthen the PHED staff's capacity to reduce NRW, thereby contributing to the reduction of the NRW ratio in target city. 1. Overall Goal: The NRW ratio in Jaipur city is reduced. 2. Project Purpose: PHED staff's capacity to reduce NRW in Jaipur city is strengthened.		
Activities of the Project	1. Project Site: Jaipur city, the state of Rajasthan *Pilot areas[1]: (1) Project target areas: Mansarovar, District Metering Area (DMA) 1&2 in Adarsh Nagar (2) Technical support activity areas: Adarsh Nagar (excluding DMA1&2), Banipark, Chitrakoot 2. Main Activities: (1) Improvement of planning capacity for NRW countermeasures by development of annual program for NRW reduction in the pilot areas and formulation of execution plan for the Jaipur city based on the practices of pilot areas (2) Development of technical and operational capacity through NRW reduction activities in pilot areas, preparing the Standard Operating Procedures (SOPs) in on-the-job trainings (3) Operation of internal trainings on NRW reduction based on the practices in the pilot areas 3. Inputs (to carry out above activities) Japanese Side 1) Experts: 12 persons (Short-term) 2) Trainees received: 25 persons 3) Equipment: Equipment for leak detection survey and training activities, such as Sonic leak detectors, Ultrasonic flowmeter, Self-recording water pressure gauge, Metal detector, Portable engine generator, GIS software, PC, and copier, etc. 4) Local expenses Indian Side: 1) Staff allocated: 37 persons (Accumulated number: 51 persons) 2) Land and facilities: Office space for JICA experts, meeting rooms, a training room and training yard facilities 3) Equipment: Water meter, valve, etc. 4) Local costs: construction of training yard and training room, and isolation of the pilot areas (including installation of boxes for flow meters)		
Project Period	(ex-ante) July 2013 – January 2017 (actual) August 2013 – January 2017	Project Cost	(ex-ante) 409 million yen, (actual) 291 million yen
Implementing Agency	Public Health Engineering Department (PHED), Government of Rajasthan (GOR)		
Cooperation Agency in Japan	CTI Engineering International Co., Ltd. Yokohama Water Co., Ltd.		

II. Result of the Evaluation

<Constraints on Evaluation>

・Due to the effects of COVID-19, data collection was made through questionnaire and interviews with staff of PHED including branch offices and headquarters. The site visit and the interview with users were not conducted.

< Special Perspectives Considered in the Ex-Post Evaluation >

[Evaluating the continuation status of the Project Purpose]

[1] Pilot areas include (1) project target areas in which the pilot project was implemented with combined efforts of counterparts and JICA experts and (2) technical support activity areas in which PHED planned and implemented the project activities with its own initiatives, JICA experts provided technical advisory supports to PHED within the project period. For the achievement of the Project Purpose, achievements of project target areas are considered.

・The indicator 1 for the Project Purpose, "A draft execution plan for NRW reduction is approved by the Administrative Department of PHED" is not used to examine the continuation status of the Project Purpose since this indicator was applicable only at the project completion.

[Evaluating other impacts]

・In this ex-post evaluation study, the achievement at the time of ex-post evaluation of Super Goal, "The NRW ratio in Jaipur city is reduced to 20%" was treated as a reference.

・As a technical assistance under finance and investment account project, this project aimed to maximize the benefits generated through related projects. Therefore, the ex-post evaluation study examines the synergy effects with Japanese assistances as described in "Background" above.

1 Relevance

<Consistency with the Development Policy of India at the Time of Ex-Ante Evaluation >

At the time of ex-ante evaluation, this project was consistent with "Twelfth Five Year Plan (2012-2017)," in which the water sector was considered as one of priority areas, aiming to achieve the total urban coverage by the fiscal year of 2017. This agenda also included the target to achieve a 24-hour continuous and equitable water supply, cost recovery for water companies and promotion of public-private partnership (PPP).

<Consistency with the Development Needs of India at the Time of Ex-Ante Evaluation >

At the time of ex-ante evaluation, this project was consistent with India's development needs to strengthen the capacity to reduce NRW as described in "Background" above.

<Consistency with Japan's ODA Policy at the Time of Ex-Ante Evaluation>

The project was consistent with "Japan's Country Assistance Program for India (May 2006)" which set "the improvement of poverty and environmental issues" as one of priority areas, which included "Environmental issues" as the sector's priority target and "Assistance for Water Supply and Sewage Systems" as a sub-sector target. It was stated that when implementing this assistance, Japan was aiming to actively provide the intellectual cooperation to ensure the improvement of policies and systems including decentralization to ensure the adequate operation and management system, organizational management capacity building and effective utilization of water resources (water conservation and water leakage countermeasures).

<Evaluation Result>

In light of the above, the relevance of the project is high.

2 Effectiveness/Impact

<Status of Achievement of the Project Purpose at the time of Project Completion>

By the time of project completion, the project achieved its purpose, "PHED staff's capacity to reduce NRW in Jaipur city is strengthened." As presented in the table below, four indicators set to examine the achievement of the Project Purpose showed the satisfactory performance. A draft Execution Plan for NRW Reduction in Jaipur was prepared by January 2017 and approved in February 2017 by PHED Minister (Indicator 1). NRW ratios in the pilot areas were reduced compared to the initial values (Indicator 2), and internal trainings were held more than twice during the project period (Indicator 3). NRW reduction activities were implemented based on annual program for NRW reduction (Indicator 4).

<Continuation Status of Project Effects at the time of Ex-post Evaluation>

After the project completion, the project effects have partially continued. It was confirmed by the study that implementation of NRW reduction activities and internal trainings have been continued except the period affected by COVID-19. However, NRW ratios that were once reduced have become reinstated. There are two major contributing factors. One is the drastic increase of household connections which made it difficult to take proper control of the measurement of water consumption amount due to the rapid expansion of management work. The number of household connections increased 15 times in Mansarovar (from 2014 to 2020), 3 times in Adarsh Nagar DMA1 during the same period and 5.1 times in Adarsh Nagar DMA2 (from 2015 to 2020). Another factor is the effects of COVID-19, in 2020 and 2021 which entailed difficulty of equipment replacement and lack of man-power resources. It is expected that the activities will be resumed once the effects of COVID-19 are diminished.

<Status of Achievement for Overall Goal at the time of Ex-post Evaluation>

It is observed that the Overall Goal, i.e. "The NRW ratio in Jaipur city is reduced." has been partially achieved. It was observed that most of the NRW reduction activities under the Execution Plan have been in general implemented (Indicator 1). In this connection, the coverage of NRW reduction activities has been expanded such that new NRW zones were developed at eight supply centers under AMRUT Project[2]. As for Indicator 2, "NRW ratio in Jaipur city is accurately calculated," it was examined by two aspects. NRW ratios in Jaipur city have been calculated according to the procedures described in SOPs developed by the project in both project target areas and technical support activity areas. However, the number of flow meters, which were mandatory to properly measure the NRW ratios, have only been installed in about 22% of tube wells connected to the distribution network in the whole Jaipur city. It can be said that the area covered by the project is only a part of the city of Jaipur, and its effect was limited. Therefore, it is difficult to judge that "NRW ratio in Jaipur city is accurately calculated."

<Other Impacts at the time of Ex-post Evaluation>

According to the achievement at the time of ex-post evaluation of Super Goal "NRW ratio in Jaipur city is reduced to 20%[3]," the NRW ratio has shown a slight improvement from 42.19% (2012) to 38.34% (2021). It is anticipated that the replacement program of flow meters under smart city program to be initiated by state government will improve the situation. It was observed that the project has also contributed to supporting the outcome of the Japanese ODA Loan, "Bisalpur Jaipur Water Supply Project (2004 -2011) (signed in March 2004)," in which NRW reduction was identified as one of the crucial issues in terms of the efficient use of safe water and its administration.

Therefore, the effectiveness/impact of the project is fair.

[2]AMRUT Project is known as "Atal Mission For Rejuvenation And Urban Transformation" facilitated by the Government of India.

[3]Though not specified in the ex-ante evaluation sheet, the target year of Super Goal is estimated 3 to 5 years after the ex-post evaluation.

Achievement of Project Purpose and Overall Goal

<table>
<tr><th>Aim</th><th>Indicators</th><th>Results</th><th>Source</th></tr>
<tr><td rowspan="4">(Project Purpose)
PHED staff's capacity to reduce NRW in Jaipur city is strengthened.</td><td>Indicator 1
A draft execution plan for NRW reduction is approved by the Administrative Department of PHED.</td><td>Status of the Achievement: achieved
(Project Completion)
・A draft Execution Plan for NRW Reduction in Jaipur was prepared by January 2017 and approved in February 2017 by PHED Minister.</td><td>Hearings from PHED</td></tr>
<tr><td>Indicator 2
NRW ratios are reduced in the pilot areas compared to the initial value.</td><td>Status of the Achievement (Status of the Continuation): achieved (partially continued)
(Project Completion)
・In all three project target areas, the NRW ratios were reduced compared to the initial values as shown below.
(Ex-post Evaluation)
・In Mansarovar, the NRW ratio has been reinstated from 10.5% to around 20%, but maintained some improvement compared to the baseline of 52.8%. In Adarsh Nagar, the NRW ratios have been nearly back to the baseline values. Two factors attributable to the results are, the drastic increase of household connections and the effect of COVID-19.
<table>
<tr><th>Area Name</th><th>Baseline (1)
2014/2015</th><th>Terminal Evaluation (1)
2015/2016</th><th>Target year
2020</th><th>Ex-post evaluation
2021</th></tr>
<tr><td rowspan="2">Mansarovar</td><td>52.8%
(May 2014)</td><td>10.5%
(Apr. 2015)</td><td>19.8%
(Apr. 2020)</td><td>21.1%
(Apr. 2021)</td></tr>
<tr><td colspan="4">The number of household connections increased from 139 in 2014 to 2,093 in 2020 (about 15 times).</td></tr>
<tr><td rowspan="2">Adarsh Nagar DMA1</td><td>22.6%
(Nov. 2014)</td><td>13.3%
(Feb. 2015)</td><td>20.7%
(Apr. 2020)</td><td>20.7%
(Apr. 2021)</td></tr>
<tr><td colspan="4">The number of household connections increased from 230 in 2014 to 700 in 2020 (about 3 times).</td></tr>
<tr><td rowspan="2">Adarsh Nagar DMA2</td><td>21.8%
(May 2015)</td><td>10.2%
(Averaged % from Apr. 2016 to Jul. 2016)</td><td>21.3%
(Apr. 2020)</td><td>21.3%
(Apr. 2021)</td></tr>
<tr><td colspan="4">The number of household connections increased from 794 in 2015 to 4,041 in 2020 (about 5.1 times).</td></tr>
</table>
Note: (1) The timing of measurement varied. The data is from the Terminal Evaluation Report.</td><td>MIS-generated data provided by PHED</td></tr>
<tr><td>Indicator 3
Internal trainings are held more than twice during the project period.</td><td>Status of the Achievement (Status of the Continuation): achieved (partially continued)
(Project Completion)
・First trial internal training was held on 5th to 9th December, 2016. From the experience of first trial, the improved training of second series was held on 15th to 19th December 2016.
(Ex-post Evaluation)
・The internal trainings have been continued after the project as shown below. In 2020, PHED's activities were limited due to the effect of COVID-19. It is expected that the activity is to be resumed once the situation is improved.

Internal training conducted for the staff of PHED Jaipur after the project
<table>
<tr><th>Year</th><th>Topics of the training</th><th>Training period</th><th>Number of participants</th><th>Training results</th></tr>
<tr><td>2017</td><td rowspan="3">DMA Isolation, Equipment Use NRW Calculation</td><td>3-4 days</td><td>20</td><td rowspan="3">Effective. It is expected that more days should be spent on each training.</td></tr>
<tr><td>2018</td><td>3-4 days</td><td>32</td></tr>
<tr><td>2019</td><td>3-4 days</td><td>27</td></tr>
<tr><td>2020</td><td colspan="4">Not conducted due to COVID-19</td></tr>
</table></td><td>MIS-generated data provided by PHED
Hearings from PHED</td></tr>
<tr><td>Indicator 4
NRW reduction activities are implemented based on annual program for NRW reduction.</td><td>Status of the Achievement (Status of the Continuation): achieved (partially continued)
(Project Completion)
・As for pilot areas, NRW reduction activities were implemented based on the annual programs for NRW reduction Action Team of PHED.
(Ex-post Evaluation)
・It was confirmed by the study that in all three project target areas, NRW reduction activities, such as isolation, customer identification, water meter replacement as well as other countermeasures had been implemented according to the annual programs for NRW reduction. In 2020 and 2021, due to COVID-19, some activities have been affected.</td><td>MIS-generated data provided by PHED</td></tr>
</table>

<table>
<tr>
<td rowspan="2">(Overall Goal)
The NRW ratio in Jaipur city is reduced.</td>
<td>Indicator 1
NRW reduction activities are conducted in accordance with the Execution Plan for NRW reduction.</td>
<td>(Ex-post Evaluation) achieved
・Although there are some delays and change of schemes in the Execution Plan due to the effects of COVID-19, most of the activities have been in general implemented.

(1) Action Plan I: April 2017 – March 2020
<table>
<tr><th>Type</th><th>Planned Activities</th><th>Progress</th></tr>
<tr><td rowspan="5">Infrastructural Improvement</td><td>Investigation for DMA isolation flow meters of clear water reservoir & service reservoir and tube well condition</td><td>Work executed under the area in Adarsh Nagar</td></tr>
<tr><td>DMA isolation in Division and Sub-Division Area</td><td>Subdivision divided in supply zones</td></tr>
<tr><td>Repair/installation of flow meters in clear water reservoir & service reservoir and part of tube well</td><td>Done under AMRUT Project</td></tr>
<tr><td>Preparation, replace/install service meter (priority area)</td><td>45,590 replaced under AMRUT Project</td></tr>
<tr><td>Feasibility Study for rehabilitating/extending aged distribution pipeline</td><td>In progress</td></tr>
<tr><td rowspan="8">Organizational & Institutional Improvement</td><td>Establishment of NRW Cell</td><td>Established</td></tr>
<tr><td>Strengthen of Division Office</td><td>In progress</td></tr>
<tr><td>Preparation of correct pipeline drawings</td><td>Completed</td></tr>
<tr><td>Establishment of DMA operation</td><td>8 supply centers were added.</td></tr>
<tr><td>Management of unbilled authorized consumption</td><td>In progress</td></tr>
<tr><td>Management of apparent real losses</td><td>In progress</td></tr>
<tr><td>Preparation of equipment/capacity for detection of real losses</td><td>Deferred due to COVID-19</td></tr>
<tr><td>Preparation of localized standard/manual of Operation and Maintenance (O&M)</td><td>Circulars/orders for O&M issued</td></tr>
<tr><td>Improved skill of pipe repair and installation (set internal training)</td><td>Not done</td></tr>
</table>
(2) Action Plan II: April 2020 – March 2025
<table>
<tr><th>Type</th><th>Planned Activities</th><th>Progress up to April 2021</th></tr>
<tr><td rowspan="4">Infrastructural Improvement</td><td>DMA isolation in distribution zone</td><td>8 new supply centers identified, work in progress</td></tr>
<tr><td>Repair/installation of flow meters in remaining tube wells</td><td>In progress</td></tr>
<tr><td>Preparation for replacement/installation of service meter (remained area)</td><td>In progress</td></tr>
<tr><td>Detailed Project Report, tender, implementation for the rehabilitation/extension of aged distribution pipeline in priority area</td><td>Pipe replacement done regularly</td></tr>
<tr><td rowspan="4">Organizational & Institutional Improvement</td><td>Preparation of correct pipeline drawings (continue)</td><td>In progress</td></tr>
<tr><td>Management of apparent & real Loss (continue)</td><td>Outsourced</td></tr>
<tr><td>Management of real loss (detection & countermeasure)</td><td>In progress</td></tr>
<tr><td>Update of internal meeting</td><td>Completed</td></tr>
</table>
</td>
<td>Information provided by PHED through the survey</td>
</tr>
<tr>
<td>Indicator 2
NRW ratio in Jaipur city is accurately calculated.[4]</td>
<td>(Ex-post Evaluation) not achieved
・It was confirmed by the study that the method of calculation of NRW ratio given in SOP developed by the project has been followed in all pilot areas. However, the number of properly functioning flow meters, which were mandatory to accurately measure the NRW ratios, are set for only 21.5% of total number of tube wells connected to the distribution network.
<table>
<tr><th>Items</th><th>2016</th><th>2020</th><th>change</th></tr>
<tr><td>Total number of tube wells connected to the distribution network</td><td>1,800</td><td>2,533</td><td>141%</td></tr>
<tr><td>Tube wells with functioning flow meters</td><td>300</td><td>545</td><td>182%</td></tr>
<tr><td>% of functioning flow meters against total number of tube wells connected to the distribution network</td><td>16.7%</td><td>21.5%</td><td>4.8 points</td></tr>
</table>
</td>
<td>MIS-generated data provided by PHED and Hearings from PHED</td>
</tr>
</table>

[4] For NRW ratio to be calculated accurately, it is necessary to set the flow meters to the tube wells connecting to the distribution network.

3 Efficiency

Both of project period and project cost were within the plan (ratio against plan: 100% and 71%, respectively). The low ratio against the planned project cost is because the scope of pilot activities was decreased due to PHED's delay in procurement of water meters. The pilot area was limited and the remaining areas were treated as the technical support activity areas where PHED independently carried out activities and the support from Japanese experts was limited to giving technical advices. The Outputs of the project were produced as planned.

Therefore, the efficiency of the project is high.

4 Sustainability

<Policy Aspect>

Jal Jeevan Mission (JJM), a central government initiative was launched in 2019 aiming to achieve 100% household connections in entire India by 2024. It is said that the central government subsidizes at most 50% of the cost for water supply projects implemented by the state government.

< Institutional/Organizational Aspect>

PHED headquarter is under the Government of Rajasthan (GOR) and assumes the overall responsibilities to provide water and sewage services in collaboration with cities and local communities in the State. The total number of engineers[5] was 2,114 and other staff 37,022 in 2013[6]. In 2016, PHED headquarters created the NRW cell as the inter-department entity to promote the NRW reduction activities and has made it integrated into the department in charge of the operation and maintenance (O&M). The NRW cell has 3 tiers of staff, such as Chief Engineers (CE), overseeing urban monitoring, Additional Chief Engineers (ACE) and Regional Officers (RO) overseeing monitoring in district level and Executive Engineer (EE) of the divisional level. No segregated funding is available for the cell, thus it is either funded by the state or independently sponsored depending on the case. IT cell, which manages GIS map, has been established and activities have been centralized at PHED HQ. At the time of ex-post evaluation, it is observed that the status of NRW cell as the inter-departmental entity has made it difficult for each staff to engage in its operation with full commitment. As described in the above, national policies including smart city program and JJM stipulate the importance of NRW reduction. Although NRW reduction is just one of the components of the policies, it might be effective to appoint officers dedicated to NRW reduction.

PHED Jaipur is in charge of overall water management for Jaipur city. ACE is heading the PHED of Jaipur region with 2 SEs who supervise City Circle and District Circle respectively. Under SEs there are EEs who are in charge of sub-division. At the time of ex-post evaluation, it is observed that the number of staff is not sufficient to proceed the Execution Plan, so that recruitment of junior level engineer is in process and outsourcing the O&M related works is under consideration.

<Technical Aspect>

Internal trainings have continuously been conducted except the period affected by COVID-19 in 2020. Staffs of PHED Jaipur have sustained the knowledge and skills and have transferred their expertise to others by cascading effects. SOPs, various manuals and materials developed by the project have been continuously utilized and have been reviewed and revised at some intervals. Operation and maintenance of water leakage detector have been managed properly except the period affected by the COVID-19. It is expected that those activities affected by COVID-19 will be resumed accordingly.

<Financial Aspect>

It was observed that the NRW reduction activity is one of the key areas of the government policy, thus certain amount of budget has been continuously allocated under the big scheme including AMRUT Project or Urban JJM. The independent fund is not prepared by the state government, but it is a part of the upgradation of the regular operation and maintenance measures. Hence, there will be no concerns over budget allocation or its shortage.

<Evaluation Result>

In light of the above, slight problems have been observed in terms of the institutional/organizational, technical aspects of the implementing agency. Therefore, the sustainability of the effectiveness through the project is fair.

5 Summary of the Evaluation

By the project completion, the project achieved the Project Purpose, "PHED staff's capacity to reduce NRW in Jaipur city is strengthened." The effects of the project have partially continued after the project completion, and the Overall Goal, "The NRW ratio in Jaipur city is reduced" has been partially achieved. Major contributing factors are the drastic increase in household connections and the effects of COVID-19 in 2020 and 2021. In addition, the insufficiency of functional flow meters has made it difficult to accurately measure the NRW ratios.

As for the sustainability, some problems have been observed in terms of the institutional/organizational, technical aspects. As for the efficiency, both the project cost and the project period were within the plan.

Considering all of the above points, this project is evaluated to be satisfactory.

III. Recommendations & Lessons Learned

Recommendations for Implementing Agency: PHED

・It is recommended that by fiscal year 2023, in all urban cities in Rajasthan state, in order to strengthen the expertise for NRW reduction, the NRW Cell should be reorganized with new personnel allocation plan. Currently, it is functioned as the inter-departmental entity, however due to comparatively less commitment by each staff towards the NRW cell, it is recommended to deploy the intensively engaged units.

Lessons Learned for JICA:

・In order to examine the achievement of the project targeting to reduce the NRW ratio, it should be considered to use the set of indicators such as Water Losses, Apparent Losses, Real Losses etc., as the NRW ratio can be easily influenced by external factors. In this project, the

5 Engineers from upper level includes, Chief Engineer (CE), Additional Chief Engineer (ACE), Superintending Engineer (SE), Executive Engineer (EE), Assistant Engineer (AE) and Junior Engineer (JE).

6 The number of engineer and other staff at the time of ex-post evaluation is not available.

overall amount of water provided in city should have been tracked as the amount has great influence on its NRW ratio. In Adarsh Nagar, after the project completion, the NRW ratio has almost reverted back to what was started. This can be largely attributed, apart from the influence of COVID-19, to the expanding number of household connections which entailed difficulty of measuring the appropriate water consumption amount. In this project, the effectiveness and sustainability of the intervention would have been justified more clearly if some other indicators to examine the extent of NRW reduction had been originally factored in.

Picture

Training equipment provided by the project has been well maintained and utilized in the internal trainings.

Practices for engineers of PHED Jaipur have been conducted in the training yard.