

Country Name	The assistance related to Delhi water supply improvement project
Republic of India	

I. Project Outline

Background	<p>In the National Capital Territory (NCT) of Delhi, the water supply time was only limited hours per day due to the fact that there were insufficient water sources and high non-revenue water (NRW) rates which were mainly caused by the leakage and water theft through aging facilities and inadequate operation and maintenance. The high NRW ratio caused by various factors worsened the financial situation and prevented the necessary investment in facilities, which further worsened the NRW ratio, creating a vicious cycle.</p> <p>Under this situation, Delhi Jal Board (DJB) was expected to implement projects based on the Delhi Urban Planning 2021 developed by Delhi Development Authority in 2008, in which measures to reduce non-revenue water and the need for equal water supply were pointed out, especially for the water sector. In this regard, through “Study on the Delhi Water Supply Improvement Project (2009-2011)”, JICA contributed to the formulation of the Master Plan (M/P). According to the M/P, with the prospect of reducing NRW and achieving equitable distribution, the project areas were divided into three blocks: 1. from the treatment plant to the distribution reservoir, 2. from the distribution reservoir to district metered areas (DMAs) and 3. within DMAs. Then these three blocks were proposed to be controlled and managed by the Supervisory Control and Data Acquisition (SCADA) system and the plan for the necessary facilities and equipment was developed. After completion of the plan, the Government of India (GOI) requested the Japanese ODA Loan project named “Delhi Water Supply Improvement Project (signed on October 29, 2012)”, which aimed to improve the water supply service by rehabilitation and improvement of the facilities under Chandrawal Water Treatment Plant (WTP) command area which was given high priority for implementation in M/P. After the conclusion of the Loan Agreement on the above project between the two governments, JICA dispatched the Detailed Planning Survey Team to India to accelerate the project and strengthen DJB's capability on the project implementation. As a result, JICA and the GOI reached an agreement on establishing a technical cooperation project in order to maximize the result of the Japanese ODA Loan project by strengthening the technical capacity of DJB.</p>				
Objectives of the Project	<p>Through capacity development of DJB on the management of data and information for water supply facilities in Chandrawal Command Area and monitoring and controlling equitable water distribution and NRW management and the preparation of a draft of scenarios for stage-wise development of GIS/RMS application in DJB, in the NCT of Delhi, the project aims to strengthen DJB's capacity to implement, operate and maintain the main project, “Delhi Water Supply Improvement Project”, thereby contributing to providing 24-hour continuous, equitable, and stable water supply services.</p> <ol style="list-style-type: none"> Overall Goal: To achieve equitable and continuous water distribution in the National Capital Territory of Delhi, by improving the water supply network including service network to customers, thereby contributing to upgrading citizen's living standard. Project Purpose: DJB's capacity to implement, operate and maintain the “Delhi water supply improvement project” is strengthened. 				
Activities of the Project	<ol style="list-style-type: none"> Project Site: Chandrawal WTP Command Area, NCT of Delhi Pilot project site: Pitampura area Main Activities: <ol style="list-style-type: none"> To strengthen DJB's capacity to manage data and information on water supply facilities in Chandrawal Command Area To upgrade DJB's capacity to monitor and control equitable water distribution and NRW management through the implementation of a pilot project To prepare a draft of scenarios for stage-wise development of GIS/RMS application in DJB *GIS: Geographical Information System, RMS: Revenue Management System Inputs (to carry out above activities) <table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> Japanese Side 1) Experts: 15 persons 2) Trainees received: 8 persons 3) Equipment: Pipe locators, Pipe thickness gauges, SCADA system, wiring, pressure gauges, flow meters, control valves, personal computers., etc. 4) Local Cost: </td> <td style="width: 50%; vertical-align: top;"> India Side 1) Staff Allocated: 33 persons 2) Land and facilities: Project Office in DJB HQ and Pitampura Office, and SCADA control room set up for the pilot project in Pitampura 3) Local cost </td> </tr> </table> 			Japanese Side 1) Experts: 15 persons 2) Trainees received: 8 persons 3) Equipment: Pipe locators, Pipe thickness gauges, SCADA system, wiring, pressure gauges, flow meters, control valves, personal computers., etc. 4) Local Cost:	India Side 1) Staff Allocated: 33 persons 2) Land and facilities: Project Office in DJB HQ and Pitampura Office, and SCADA control room set up for the pilot project in Pitampura 3) Local cost
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Project Period	(ex-ante) May 2013 to April 2016 (actual) June 2013 to March 2018	Project Cost	(ex-ante) 397 million yen, (actual) 579 million yen		
Implementing Agency	Delhi Jal Board (DJB)				
Cooperation Agency in Japan	TEC International Co., Ltd., TSS Tokyo Water Co., Ltd.				

II. Result of the Evaluation

<Special Perspectives Considered in the Ex-Post Evaluation>

[Evaluating the Effectiveness/Impact]

• The Overall Goal, “To achieve equitable and continuous water distribution in the National Capital Territory of Delhi, by improving the water supply network including service network to customers, thereby contributing to upgrading citizen’s living standard”, contains the outcome “to upgrading citizen’s living standard” which is to be attained after the equitable and continuous water distribution in the NCT of Delhi. In this ex-post evaluation, “to upgrading citizen’s living standard” is treated as one of “other positive impacts”.

• The structure of the project is such that the outputs of the loan project and this technical cooperation project together are to lead to the outcomes of the loan project. Considering such nature of this project and the fact that the implementation of several components (packages) of the loan project has not been fully started by the time of ex-post evaluation, and that this technical cooperation project cannot possibly achieve its Overall Goal independently from the loan project, the effectiveness /impacts rating will be weighted toward the achievement status of the project purpose, continuation status of the project effects as well as “other impacts”, instead of putting an equal emphasis on the achievement status of the Overall Goal. Accordingly, whether this project has contributed to some service improvements independently from the loan project has been examined under “other impacts”.

1 Relevance/Coherence

[Relevance]

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

The project was consistent with the development policy of India at the time of the ex-ante evaluation. In the “12th Five-Year Plan (2012-2017)”, the water sector was identified as an important sector to be actively addressed, with the goal of supplying drinking water to the entire urban population by the fiscal year of 2017. In addition to the realization of a 24-hour continuous and equal water supply, the Plan also included the achievement of cost recovery and promotion of Public Private Partnership (PPP) projects in terms of management of the water utility. In the NCT of Delhi, the “Delhi Urban Plan 2021” formulated by the Delhi Development Authority in 2008 pointed out the necessity of NRW measures and equal water supply, especially in the water supply sector. DJB would promote the implementation of projects based on this plan.

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

The project was consistent with the development needs of India to strengthen the capacity of DJB to implement, operate and maintain the “Delhi water supply improvement project” at the time of ex-ante evaluation as stated in “Background” above.

<Appropriateness of Project Design/Approach>

The project design/approach at the time of ex-ante evaluation was appropriate as described in the ex-ante evaluation sheet. However, when it became clear that the implementation of the main project would be significantly delayed, the logical framework of the project, such as the Overall Goal and its indicators were not revised. (A proposal for the revision of the Overall Goal was made by the Overseas Office just prior to the Terminal Evaluation Study, but it was not reflected.) As a result, the project was evaluated with the original indicators on a stand-alone basis, which resulted in lowering the evaluability.

<Evaluation Result>

In light of the above, the relevance of the project is ③. (④ : very high, ③ : high, ② : moderately low, ① : low * To be the same afterwards.)

[Coherence]

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

The project was consistent with the Japan’s ODA policy to India at the time of ex-ante evaluation. In the Country Assistance Program for India (May 2006), Japan positioned its support for water supply and sewerage systems as part of its response to environmental problems. To prevent or reduce contamination of rivers, soil, and groundwater and to improve the sanitary environment for residents, Japan would provide assistance to the water supply and sewage systems sector. When implementing this assistance, on the basis of perspectives of ensuring sufficient and safe water resources and a stable water supply, Japan would actively provide intellectual cooperation for 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).

<Collaboration/Coordination with other JICA’s interventions>

Any collaboration/coordination between the project and JICA’s other interventions, except for the ODA Loan of the “Delhi Water Supply Improvement Project”¹ was not clearly planned at the time of ex-ante evaluation.

<Cooperation with other institutions/ Coordination with international framework>

Asian Development Bank was considering supporting the Wazirabad Water Treatment Plant in Delhi at the time of ex-ante evaluation; however, it was not implemented.

<Evaluation Result>

In light of the above, the coherence of the project is ②.

[Evaluation Result of Relevance/Coherence]

In the light above, the relevance/coherence of the project is ③.

2 Effectiveness/Impact

The main project, known as the “Delhi Water Supply Improvement Project” contains the following six packages; (1) Chandrawal WTP & Central Water Management Center, (2) Water Supply, DMA and NRW reduction under Chandrawal Command Area – West, (3) Water Supply, DMA and NRW reduction under Chandrawal Command Area – Central, (4) Water Supply, DMA and NRW reduction under Chandrawal Command Area – East, (5) Updating GIS infrastructure, and (6) Public outreach program. DJB prepares the Detailed Project Report (DPR) for each package in accordance with the Detailed Design (DD) developed based on activities through the project and submitted to the Approval Committee for examination and approval. After the approval followed by the endorsement by the Ministry of Urban Development, DJB can start the tender process.

With this framework, this project was to provide technical assistance to DJB to ensure the smooth implementation of the main project, by preparing DPRs, conducting the pilot project in the Pitampura area to establish and practice the SCADA system, and preparing GIS/RMS utilization application.

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

At the time of project completion, the Project Purpose to strengthen DJB’s capacity to implement, operate and maintain the main project was mostly achieved as planned. Through training by the project, the knowledge and skills needed to operate the SCADA system were acquired by DJB officers to some degree. As a result, basic information on pipe networks was reflected in DPR for Package 2 through

¹The results and experiences of a trial for equitable water distribution under this technical cooperation project were reflected in the designs of distribution packages (Package 2, 3, 4) of the ODA Loan project.

Package 4 of the main project and it was expected to obtain the final approval (indicator 1). Guidelines for the introduction of asset management based on scenarios for stage-wise development of GIS/RMS application were also reflected in DPR for Package 5 of the main project (Indicator 3). As for the gap among DMAs in water pressure and volume based on DMA's demand of pilot project, a trial for equitable water distribution was conducted in January and February 2018. As a result, it was confirmed that the gaps in water pressure and volume between the highest and the lowest DMAs were narrowed down according to the set target (Indicator 2).

<Continuation Status of Project Effects at the Time of Ex-Post Evaluation>

After the project completion, the project effects continued. The revised draft DPRs of three packages of the main project were approved by DJB through an approval committee including the Ministry of Urban Development. The practice and results of a trial for equitable water distribution in the SCADA system of the pilot project have been reflected in the tender documents of the Loan Project. The SCADA system of the pilot project is currently not in use due to network and signal issues for proper synchronization between software and hardware. The main reasons are the high operation and maintenance (O&M) cost and lack of technical knowledge at DJB.

<Status of Achievement of the Overall Goal at the Time of Ex-Post Evaluation>

Since the main project is still procuring contractors for some packages at the time of ex-post evaluation, meaning the condition required for the target year of the Overall Goal is not met, it is too early to make an evaluation judgment for the achievement of the Overall Goal.

<Other Impacts at the Time of Ex-Post Evaluation>

Experiences of pipeline survey and the implementation of pilot SCADA controlled network management system improved the capacities of DJB staff, which contributed to the formulation of other projects/schemes, such as Delhi Water Supply Improvement Investment Program in Wazirabad Command Area. The pilot SCADA system had been referred by Water Treatment plant at Dwarka, when DJB prepared the scope of the works and technical specification of the Project. In addition to above, it has been learnt that Bangalore Water Supply and Sewerage Board consulted with DJB, while framing Bangalore Water Supply and Sewerage Project (Phase 3), especially on the improvement of distribution system in 3 core city zones.

<Evaluation Result>

In light of the above, the effectiveness/impact of the project is ③.

Achievement of Project Purpose and Overall Goal

Aim	Indicators	Results	Source
(Project Purpose) DJB's capacity to implement, operate and maintain the "Delhi water supply project" is strengthened.	Indicator 1: Basic information on pipe-networks is reflected in DPR for components (Packages) 2-4 of "Delhi Water Supply Improvement project" prepared by DJB.	Status of the Achievement (Status of the Continuation): mostly achieved as planned (continued) (Project Completion) • Basic information on pipe networks obtained through project activities was reflected on the draft Detailed Project Reports (DPRs) for Packages 2-4 of the main project. • The draft DPRs were revised mainly on pipe material and class and were expected to be submitted to DJB for their approval by the end of the project period. (Ex-Post Evaluation) • After the project completion, the revised draft DPRs of three packages were approved by DJB through an approval committee including the Ministry of Urban Development on December 21, 2018, for Package 3 and January 21, 2019, for Package 2 and 4.	Source : Questionnaire to DJB
	Indicator 2: The gap among DMAs in water pressure and volume based on DMA's demand (of pilot project) is reduced. (Pressure: from X meters to Y meters Volume: From X m ³ per connection to Y m ³ per connection)	Status of the Achievement (Status of the Continuation): mostly achieved as planned (not continued) (Project Completion) • Through the training, DJB staff acquired the knowledge and skills in operating the SCADA system to control water pressure and volume and the gap values were determined. • As for the gap among DMAs in water pressure and volume based on DMA's demand of the pilot project, a trial for equitable water distribution was conducted in January and February 2018 and it was confirmed that the gaps in water pressure and volume between the highest and the lowest DMAs were narrowed down according to the set target. (Ex-Post Evaluation) • Due to the absence of an O&M contract for the pilot project, the existing software, and some hardware equipment have not been in use once it started malfunctioning. Hence, at the time of ex-post evaluation, there is no data available for checking pressure and volume among DMAs under the pilot project. • It should be noted that the results and experiences of a trial for equitable water distribution in the pilot project were reflected in the designs of distribution packages (Package 2, 3, 4) of the ODA loan.	Source : Questionnaire to DJB, JICA documents
	Indicator 3: Guideline for introduction of asset management based on scenarios for stage wise development of GIS/RMS application is reflected in DPR for component (Package)5 of "Delhi Water Supply Improvement Project" prepared by DJB.	Status of the Achievement (Status of the Continuation): mostly achieved as planned (continued) (Project Completion) • "GIS and RMS utilization application and development scenarios" and "Asset Management Guidelines", were developed and reflected in DPR for Package 5. DJB decided to divide Package (5) into (5.A) for upgrading GIS infrastructure, and (5.B) for strengthening GIS mapping and asset management plan in order to respond to the items added as essential for the improvement of DJB's business management (e.g., Installation of GIS terminal PCs at zonal offices, GIS filing system, consumer mapping survey, and long-term asset management plan). (Ex-Post Evaluation) • Revised draft DPRs of Package (5.A) and (5.B) were approved by DJB through an approval committee including the Department of Revenue, DJB in 2020. The implementation of the main project based on the revised DPR for Package 5 has not progressed since the award of works for Package 2-4 has not been implemented yet.	Source : Questionnaire to DJB

(Overall Goal) To achieve equitable and continuous water distribution in the National Capital Territory of Delhi, by improving the water supply network including service network to customers, thereby contributing to upgrading citizen's living standard. * Target year: Two years after the completion of the main (loan) project	Indicator 1: Service hours in Chandrawal WTP command area to customers(hours/day) is 24 hours.	(Ex-Post Evaluation) Not Verifiable • The condition required to examine the indicator is not fulfilled.	Source: NA
	Indicator 2: NRW ratio in Chandrawal WTP command area is less than 15%.	(Ex-Post Evaluation) Not Verifiable • The condition required to examine the indicator is not fulfilled.	Source: NA
	Indicator 3: Tariff collection ratio in Chandrawal WTP command area is more than 90%.	(Ex-Post Evaluation) Not Verifiable • The condition required to examine the indicator is not fulfilled.	Source: NA

3 Efficiency

The project cost exceeded the plan (the ratio against the plan: 146%) and the project period considerably exceeded the plan (the ratio against the plan: 161%). Due to the delay in the construction of chambers that house flow meters, valves, etc., and installation of the SCADA system, the duration of activities to upgrade the DJB's capacity to monitor and control the water distribution for equitable distribution and NRW management was extended. With the operation cost for the extended period, the project cost exceeded the plan. Outputs were produced as planned.

In light of the above, the efficiency of the project is ①.

4 Sustainability

<Policy Aspect>

The following policies have ensured the sustainability of the policy aspect. The Master Plan of Delhi (Scheme/Programme/Projects 2020-21 (Write Up) Volume II.) has promoted the realization of a 24-hour continuous water supply and NRW reduction.

<Institutional/Organizational Aspect>

The organizational structure has remained the same as that at the time of the ex-ante evaluation. There is no dedicated division established for managing the SCADA system for the distribution network; however, those who worked on the pilot project in Pitampura areas have concurrently been in charge of maintenance of the water supply system in Pitampura area. According to DJB, the existing team for the area is expected to be responsible for the management of the system when the facility becomes functional.

<Technical Aspect>

The basic training to operate the SCADA system was done during the project period. The training on SCADA utilizing the SCADA system located in Pitampura as the training facility has not been implemented by the Training Cell on a regular basis according to the long-term training plan on SCADA developed for the main project. DJB staff found the manuals/guidelines/materials useful and they used them at the time of operation when the system was functional. When the facility becomes functional, the original staff trained during the project period are expected to demonstrate their capacity to manage the system.

<Financial Aspect>

According to DJB, the repair and maintenance costs of the pilot project are planned to be integrated into DJB's own budget or with the loan project, in order to effectively sustain the established system. DJB initiated to revive the system with the support of the project management consultant of the loan project for technical and financial scrutinizing in order to secure the budget.

<Environmental and Social Aspect>

No issue with environmental and social aspects has been observed and it has not been necessary to take any countermeasures.

<Evaluation Result>

In light of the above, some problems have been observed in terms of the institutional/organizational, and financial aspects of the implementing agency. Therefore, the sustainability of the project effects is ②.

5 Summary of the Evaluation

The project mostly achieved the Project Purpose as planned to strengthen the capacity of DJB to implement, operate and maintain the "Delhi water supply improvement project". The project effects have mostly continued. Since the loan project is still procuring contractors for some packages at the time of ex-post evaluation, it is too early to make an evaluation judgment for the achievement of the Overall Goal. However, it has been confirmed that the project produced other positive impacts such as improvement in the capacity of DJB staff, which contributed significantly to the formulation of similar projects in different areas.

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

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

III. Recommendations & Lessons Learned

Recommendations for Implementing Agency:

According to the DJB, the management of the SCADA system established by the project will be used and the staff to operate the system will be available when the facility becomes functional. However, there is currently no dedicated division established, and no staff assigned solely for managing the SCADA system for the distribution network. Therefore, it is recommended for DJB and the State Government to appoint the dedicated staff and allocate an appropriate budget to recover and sustain the SCADA system on an urgent basis.

Lessons Learned for JICA:

This project was designed to achieve the Overall Goal through the implementation of the main project, taking advantage of the characteristics of the project scheme, “Technical Assistance under Finance and Investment Account”, which is to provide technical assistance for the smooth implementation of the loan project (main project). However, due to delays in the implementation of the main project, it was judged that the verification of the Overall Goal is premature at the time of the ex-post evaluation. In principle, the evaluation of the Technical Assistance under Finance and Investment Account should be conducted with the main project.² However, if it becomes clear that the main project will be significantly delayed or not implemented, so that there is a possibility that the Technical Assistance under Finance and Investment Account will be evaluated on its own, the Overall Goal of the project should be re-set.



Control Panel at Pilot Project Site in Pitampura.



SCADA Control Center.

² The ex-post evaluation of this project was conducted on a stand-alone basis. This was because three years had already passed since its completion when the project was selected for ex-post evaluation, and the implementation of the main project was considerably delayed and its prospects were still uncertain.