

India

FY2020 Ex-Post Evaluation Report of  
Japanese ODA Loan “Tamil Nadu Urban Infrastructure Project”

External Evaluator: Keishi Miyazaki, OPMAC Corporation

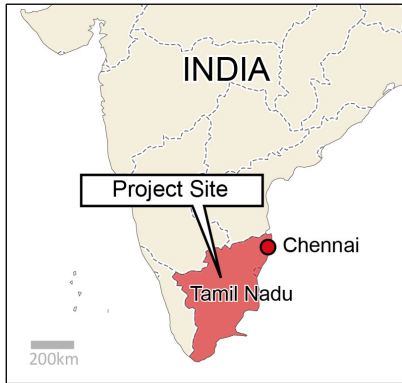
## **0. Summary**

The objective of this project was to provide a safe water supply and sewerage facilities for small and medium sized municipalities in Tamil Nadu in southern India, where the population is growing, by providing long-term funds through the Tamil Nadu Urban Development Fund (TNUDF), thereby contributing to the economic development of small and medium sized municipalities as well as to the improvement of the living conditions of residents.

The project was highly relevant and fully consistent with the development plan and development needs of India at the time of appraisal and of the ex-post evaluation, and with Japan's ODA policy at the time of the appraisal. Although the project cost was within the plan, the project period exceeded the plan, and therefore the efficiency of the project is fair. The reasons for the delay in the project period were due to delays in the start of each sub-project caused by the re-selection of the target sub-projects, the delay in land acquisition, the time required to obtain the necessary permits for laying water pipes, the delay in contractor selection due to unsuccessful bidding, and the delay in construction progress due to deterioration of the contractor's financial base. The operation and effect indicators for the nine completed target sub-projects were generally achieved. It seems that a certain level of project effect was realized in the improvement of the financial and facility operation and maintenance capacity of the target municipalities. Through a qualitative survey of 50 beneficiary households of the project, it was recognized that the increase in water quantity following the implementation of the project had led to an improvement in the convenience of daily life. There were generally no problems with water quality, water supply volume, water supply time, or water charges, and the overall evaluation of the water supply service was very high. No negative impact on the natural environment was observed, most of the land acquired was public land, and there was no resettlement of residents. Therefore, the effectiveness and impact of this project are high. No problems were observed in terms of the institutional/organizational, technical, financial aspects and current status of the operation and maintenance system. Therefore, the sustainability of the project is also high.

In light of the above, the project is evaluated to be highly satisfactory.

## **1. Project Description**



Project Location



Water Purification Facility constructed by the Project (Thoothukudi)

### 1.1 Background

The State of Tamil Nadu, located in southeast India, had a total population of 62.11 million in 2001. The urban population ratio of Tamil Nadu was 44% in 2001 compared to an average urban population ratio in India of 28%, making Tamil Nadu one of the most urbanized states in the country. Although the contribution of the cities in Tamil Nadu amounted to 70% of the state's GDP, the water supply and sewerage networks could not keep up with the surge in the urban population. Small and medium sized municipalities in Tamil Nadu (157 municipalities) were unable to supply the target amount of water defined by the state. In addition, only 11 municipalities had sewerage treatment facilities, which led to a deterioration in the sanitary environment.

For this reason, the State Government of Tamil Nadu set the goal of raising the water supply from seven days a week to 24 hours a day by 2012. Regarding sewerage, by 2012, 157 municipalities with a population of 30,000 or more in the state had established a policy to improve sewerage facilities, aiming to improve the urban sanitary environment. Despite this effort, although there was an abundance of support schemes for large cities and municipalities offered by the central and state governments, small and medium sized municipalities lacked budgets and were financially weak due to insufficient support by the central and state governments for urban infrastructure development. Therefore, it can be said that there was a pressing need to strengthen the financial capacity of small and medium sized municipalities and to promote the development of water and sewerage facilities.

### 1.2 Project Outline

The objective of this project was to provide a safe water supply and sewerage facilities for small and medium sized municipalities in Tamil Nadu in southern India where the population is growing, by providing long-term funds through TNUDF, and thereby contributing to the economic

development of small and medium sized municipalities as well as to the improvement of the living conditions of residents.

Loan Approved Amount/ Disbursed Amount	8,551 million yen / 6,818 million yen
Exchange of Notes Date/ Loan Agreement Signing Date	March 2008 / March 2008
Terms and Conditions	Interest Rate 0.45% (Sewerage) 1.20% (Water supply) Repayment Period 30 years (Grace Period 10 years) Conditions for Procurement General untied
Borrower / Executing Agency(ies)	The President of India / TNUDF
Project Completion	November 2021
Target Area	10 municipalities in Tamil Nadu State
Main Contractor(s) (Over 1 billion yen)	P&C Project Pvt. Ltd (Water supply subproject in Dindigul)
Main Consultant(s) (Over 100 million yen)	None
Related Studies (Feasibility Studies, etc.)	None
Related Projects	None

## 2. Outline of the Evaluation Study

### 2.1 External Evaluator

Keishi Miyazaki (OPMAC Corporation)

### 2.2 2 Duration of Evaluation Study

This ex-post evaluation study was conducted with the following schedule.

Duration of the Study: December 2020 – March 2022

Duration of the Field Study: September 12 – September 26, 2021

### 2.3 Constraints during the Evaluation Study

Due to the COVID-19 pandemic, the first field survey scheduled for May 2021 was delayed by four months and the duration of the field survey was shortened. The second field survey was canceled for the same reason. Therefore, site surveys were conducted by either an evaluator or an Indian local consultant in 6 out of 10 target municipalities in Tamil Nadu. For the remaining 4 municipalities, information was gathered by the local consultant through telephone interviews. In addition, the COVID-19 pandemic required that the staff of the executing agency and the target 10 municipalities work from home for an extended period, which also caused some restrictions on data collection.

Furthermore, it was expected that the values of the operation and effect indicators would be reviewed and revised after the target subprojects were completed, but this did not take place during project implementation. Therefore, in this ex-post evaluation, it was necessary to analyze the quantitative effect of the project based on the value of the operational and effect indicators set by each target municipality, rather than the value of the operational and effect indicators agreed by JICA and the executing agency.

## 3. Results of the Evaluation (Overall Rating: A<sup>1</sup>)

### 3.1 Relevance (Rating: ③<sup>2</sup>)

#### 3.1.1 Consistency with the Development Plan of India

At the time of appraisal, the Government of India's *11th Five-Year Plan* (April 2007-March 2012) included the following: (1) Sustainable access to drinking water throughout India based on the standard minimum drinking water quantity, (2) Purification of major contaminated rivers and improvement of their basin environment, (3) Early development of waste landfills and drainage canals necessary for urban sanitation and environmental conservation, (4) Financial soundness of operation and maintenance organizations that are the premise of sustainable water and sewerage projects, (5) Strengthening the capacity of local governments at the municipal level, which is a prerequisite for promoting the transfer of authority for water and sewerage projects to local areas. In addition, in its *National Water Policy* (April 2002), the Ministry of Water Resources aimed to prioritize the allocation of water resources in the order of drinking water, irrigation, and hydropower generation, to limit groundwater pumping according to water retention capacity, and to provide sufficient and safe drinking water to all citizens. Furthermore, the Ministry of Environment and Forests was working on water quality conservation through sewerage system development based on *the National River Conservation Plan* (July 1995), and *the Jawaharlal Nehru National Urban Renewal Mission* launched in December 2005, planning

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<sup>1</sup> A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

<sup>2</sup> ③: High, ②: Fair, ①: Low

to support urban infrastructure development, including water supply, sewerage and sanitation facilities.

At the time of the ex-post evaluation, the Government of India's *Three-year Action Agenda (2017/18-2019/20)*<sup>3</sup> included the promotion of the sustainable use of water resources by improving groundwater management, introducing smart water meters, and strengthening environmental regulations. *The Jal Jeevan Mission*, a water supply development program launched in August 2019 by the Ministry of Water and Environment, incorporating the existing *National Rural Water Supply Program*, aims to provide a safe and adequate water supply to all households in rural India through house service connections by 2024. This policy has also been included in the budget proposal of the Central Government of India for fiscal year 2021.

In addition, Tamil Nadu's strategic plan for infrastructure development, *Vision Tamil Nadu 2023* (formulated in March 2012), has the goal of providing a 24-hour daily water supply service and of developing sewerage systems to raise the infrastructure of the Chennai metropolitan area and major regional cities to a world-class standard. Therefore, the development of the water supply and sewerage systems in the rural cities of Tamil Nadu is considered to have been consistent with the development plan at the time of ex-post evaluation.

### 3.1.2 Consistency with the Development Needs of India

The delay in water supply and sewerage infrastructure development in small and medium sized municipalities in Tamil Nadu at the time of appraisal was as described in “1.1 Background”. In order to support the development of urban infrastructure by small and medium sized municipality governments in the state, TNUDF was established in 1996 by a joint capital investment between the state government and private financial institutions. TNUDF has promoted the development of water supply and sewerage systems by local governments.

At the time of the ex-post evaluation, as shown in “3.3.1 Effectiveness” below, of the ten water supply sub-projects implemented under the project, the water supply volume had increased in all nine municipalities where the sub-projects were completed, and 88,787 households were newly provided with water supply services in these nine municipalities. Meanwhile, the Tamil Nadu government set the target for all households in the state to have access to water supply at least two hours every day. Two of the nine target municipalities have only been able to provide water services for 4 hours once every 3 days or 1 hour every day. The other seven municipalities have achieved the 2-hour daily water supply service but have yet to achieve a 24-hour daily water supply service. In the water supply sector of the state, the daily water supply per capita in

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<sup>3</sup> The Government of India decided to terminate the existing National Development Five-Year Plan with the 12th Five-Year Plan (April 2012-March 2017), and instead set up a new framework of the 15-Year Vision (2017/18-2031/32), the 7-Year Strategy (2017/18-2023/24) and the 3-Year Action Agenda (2017/18-2019/20) starting in 2017. According to information provided on the website of the National Institution for Transforming India Commission (former Planning Commission), the 15-Year Vision and the 7-Year Strategy were in the draft stage at the time of ex-post evaluation.

Municipal Corporations (four of the ten target municipalities are classified in this category) is 135 liters, and the daily water supply per capita in Municipal Councils (6 target municipalities are classified in this category) is 135 liters (if a sewerage system is in place) or 90 liters (without a sewerage system). They are the achievement rates for the daily water supply per capita set by the state. However, some of the target municipalities do not meet the above achievement standards. Therefore, the need for waterworks improvement in the target municipalities of this project continues to be recognized.

### 3.1.3 Consistency with Japan's ODA Policy

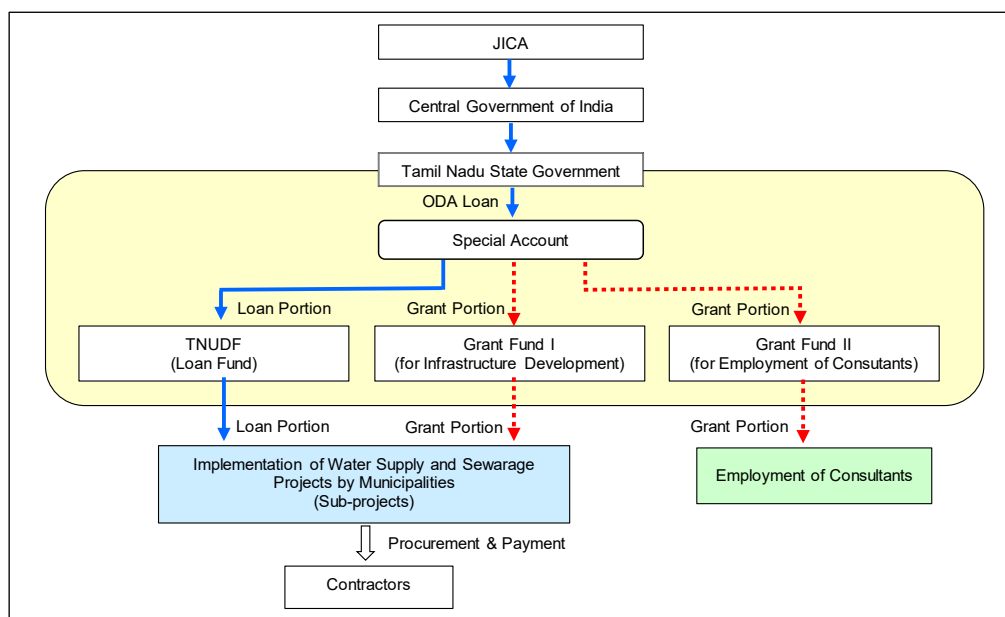
At the time of appraisal, Japan's *Country Assistance Program for India* (May 2006) listed three priority objectives: (1) promotion of economic growth, (2) improvement of poverty and environmental problems, and (3) support for human resource development and expansion of human exchange. (2) Improvement of poverty and environmental problems included "support for water supply and sewerage systems". In addition, "development of economic infrastructure", "local development that benefits the poor", and "response to environmental issues" were positioned as priority areas for assistance to India in JICA's *Medium-Term Strategy for Overseas Economic Cooperation Operation*.

### 3.1.4 Appropriateness of the Project Plan and Approach

This project provided long-term funds (loans) and grants to small and medium sized municipalities with weak financial foundations and insufficient access to funds for infrastructure development through TNUDF to support the development of water and sewerage infrastructure (Figure 1).

In addition, unlike conventional project-type loans, this project was a two-step loan, similar to a sector loan, in which eligible sub-projects were determined based on the selection criteria given and the eligibility requirements for projects in the water supply and sewerage sector. At the time of appraisal, the Indian side shortlisted one water supply sub-project and six sewerage sub-projects as candidate projects for assistance, and it was assumed that these would be implemented. However, at the first Project Coordination and Monitoring Committee held in the September after the signing of the loan agreement in March 2008, one water supply sub-project and three sewerage sub-projects were selected for the loan, while the remaining three sewerage sub-projects were excluded from this project due to the difficulty in land acquisition and the submission of a feasibility study report called DPR (Detailed Project Report). Subsequently, five water supply sub-projects were newly selected in 2010, and four water supply sub-projects were newly selected in 2011. On the other hand, the three sewerage sub-projects selected in September 2008, which were still under implementation, were excluded from the loan in 2011 due to unsuccessful bidding and delays in land acquisition, as well as the possibility of support from

other donors and the Indian central government. As a result, 10 water supply sub-projects and no sewerage sub-projects were finally implemented under this project.



Source: Prepared by the evaluator with reference to materials provided by JICA.

Note 1: Depending on the profitability of each sub-project, the state government was to provide funds to municipalities by setting a grant ratio of up to 20% for water supply projects and 40% for sewerage projects out of the ODA loan funds.

Note 2: In this project, the municipalities borrowing funds were to bear at least 10% of the sub-project cost, and the rest was to be covered by loans from TNUDF and grants from the state government.

Figure 1: Fund Flow of ODA Loans for this Project

In the selection of sub-projects, projects that met the eligibility requirements of the target municipality, such as population size, financial soundness criteria, target sectors, confirmation of water demands, proration of DPR, etc., were selected as the targets of loans, and the selection process was conducted in a proper manner.

Based on the above, it is considered that the changes in the target sub-projects that occurred during the implementation of this project were appropriate for the following reasons: the project was supported by a two-step loan similar to a sector loan, the sub-projects were selected through an appropriate selection process, and the selected sub-projects also met the project objective of improving water supply and sewerage in municipalities in Tamil Nadu.

This project has been highly relevant to India's development plan and development needs, as well as to Japan's ODA policy. Therefore, its relevance is high.

## 3.2 Efficiency (Rating: ②)

### 3.2.1 Project Outputs

At the time of appraisal, it was assumed that one water supply sub-project and six sewerage sub-projects would be implemented in seven municipalities, but in the end, ten water supply sub-projects were implemented in ten municipalities (Tiruchirappalli, Palani, Coonoor, Idappadi, Devakottai, Thoothukudi, Dindigul, Mettupalayam, Udumalpet, Madhavaram), with no sewerage sub-project implemented. As of September 2021, when the field survey for this ex-post evaluation was conducted, the water storage facility (water tower) of the Madhavaram water supply sub-project had not been completed (scheduled for completion in November 2021), but the water supply sub-projects in the other nine municipalities had been completed. These water supply sub-projects were implemented mostly as planned (see “Comparison of the Original and Actual Scope of the Project” on the last page of this report for details). At the time of appraisal, Madhavaram was a municipality<sup>4</sup>, but was subsequently merged into the Greater Chennai Corporation (i.e. Chennai Metropolitan City) as the latter expanded and the project there is currently being implemented as a project of the Greater Chennai Corporation.

At the time of appraisal, six sewerage sub-projects (Chidamnaram, Pattukottai, Rameswaram, Ambur, Madhuranthagam, Peranampat) and one water supply sub-project (Tiruchirappalli) had been presented by India as candidates for support. However, at the first Project Coordination and Monitoring Committee held in the September after the signing of the loan agreement in March 2008, one water supply sub-project (Tiruchirappalli) and three sewerage sub-projects (Chidamnaram, Pattukottai, Rameswaram) were selected for the loan. The remaining three sewerage sub-projects (Ambur, Madhuranthagam, Peranampat) were excluded, as it was difficult to submit DPR due to the lack of prospects for land acquisition. In 2010, five water supply sub-projects (Madhavaram, Palani, Coonoor, Idappadi, Devakottai) were selected as targets for the loan, and in 2011, four water supply sub-projects (Thoothukudi, Dindigul, Mettupalayam, Udumalpet) were also selected. On the other hand, the three sewerage sub-projects that had been selected and were being implemented were removed from the target projects of the loan in 2011 due to unsuccessful bidding and delays in land acquisition, as well as the possibility of support from other donors and the central government of India. The project budget for the sewerage sub-project was reallocated to the water supply sub-projects.

Regarding the six sewerage sub-projects that were eventually excluded, three have been completed, two are under implementation, and one is under preparation for implementation<sup>5</sup>

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<sup>4</sup> Local governments in India have different systems for urban and rural areas, and the urban municipalities targeted by this project are the Municipal Corporation (Nagar Nigram) in large cities, the Municipal Council (Nagar Palika) in small cities, and the City Council (Nagar Panchayat) in areas undergoing rural-urban development.

<sup>5</sup> (1) The Chidambaram sewerage project under the Urban Infrastructure Development Scheme for Small and Medium Sized Towns (UIDSSMT) (Central Government of India scheme) completed in December 2020; (2) The Pattukkottai sewerage project by the Integrated Urban Development Mission (IUDM) (Tamil Nadu Flagship Scheme) completed in November 2021; (3) The Rameswaram sewerage project is being implemented (to be completed in June 2022) by the Atal Mission for Rejuvenation and Urban Transformation (AMRUT) (central government of India scheme); (4) The



with the support of the central government of India, the Tamil Nadu state government, or other donors.

The municipalities implementing the water supply sub-projects under the project were provided with loans through TNUDF and grants from the state government. These municipalities were selected for financing if they met eligibility requirements, such as population size, financial soundness criteria, target sectors, confirmation of water demand, and the preparation of DPR. DPR also includes environmental and social considerations screenings, financial analysis of the municipality, and water tariff simulation.

In addition, a quality assurance consultant and an environmental management consultant were hired to assist in the preparation of the DPR for the sub-projects covered by this loan, to confirm environmental and social considerations, and to provide advice. In the plan, it had been assumed that the quality assurance consultant would be hired under the budget of this project and that the environmental management consultant would be hired under the project budget of the World Bank. In the end, however, both consultants were hired under the project budget of the World Bank.

Meanwhile, TNUDF hired a water supply engineer from the Tamil Nadu Water Supply and Drainage Board (TWADB) on a contract basis and conducted regular monitoring of the project progress, including site visits. Monthly monitoring meetings (participating members: TNUDF, the project management consultant, TWADB, and municipality representatives) were held once a month for each sub-project. A Project Coordination and Monitoring Committee, consisting of state government officials, municipality chiefs, the executing agency, and representatives of related organizations, also met quarterly to assist in expediting procedures for obtaining land use permits from the National Highways Authority of India and Indian Railways, and for environmental clearances.

#### Implementation Structure/System of the Sub-Projects

The implementation structure of the sub-projects differs depending on the municipalities. Three large municipalities (Tiruchirappalli, Thoothukudi, and Dindigul) hired project management consultants to implement the project, while four municipalities (Palani, Coonoor, Devakottai, and Idappadi) implemented the project by commissioning TWADB<sup>6</sup>. Two municipalities (Udumalpet, Mettupalayam) did not hire consultants but implemented the project directly as the scope of the project (including transmission and distribution pipes, water towers, house service connections) was relatively small. Sub-project of Madhavaram, which has been

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Ambur sewerage project is being implemented with the support of AMRUT and the Asian Development Bank (ADB) (to be completed in March 2022); (5) The Madhuranthagam sewerage project by IUDM completed in December 2019; and (6) The Peranampat sewerage project is under planning and preparation for implementation.

<sup>6</sup> The municipality pays a commission to TWADB, and TWA performs the same services as a project management consultant, such as designing, bidding assistance, and construction management.

merged into the Greater Chennai Corporation, is being implemented by the Chennai Metropolitan Water Supply and Sewerage Board (CMWSSB).

### Water Supply Facilities Constructed by this Project



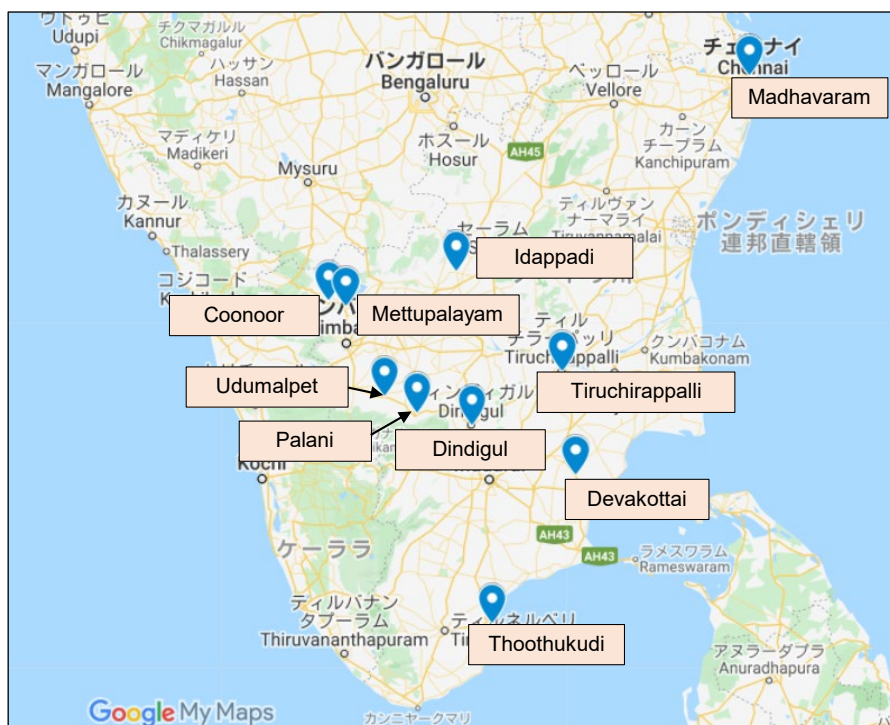
Water Intake Facility (Dindigul)



Pumping Facility (Tiruchirappalli)



Water Storage Facility (Devakottai)



Source: Prepared by the evaluator using the Google Map.

Figure 2: Location Map of Sub-projects Covered by the Project

## 3.2.2 Project Inputs

### 3.2.2.1 Project Cost

The project cost at the time of planning was 9,824 million yen. This was calculated on the premise that the one water supply sub-project and six sewerage sub-projects shortlisted by the Indian side as candidate projects for assistance at the time of appraisal would be implemented. However, the actual number of sub-projects covered by the loan was ten, which exceeded the number of sub-projects assumed at the time of the appraisal, and these only included the water supply sector. In principal, if, during the project implementation, the sub-projects for which

loans are to be provided change in size or number from the time of appraisal (i.e. if the planned output changes), the planned project cost should be revised to reflect the project cost of the sub-projects that are finally selected (according to changes in the planned output), and the revised planned cost will be compared with the actual project cost. However, no discussions were held between JICA and TNUDF regarding the revision of the planned project cost in accordance with the above change in output.

This project was designed to determine eligible sub-projects based on the prescribed selection criteria and eligibility requirements, and JICA agreed to the selection of individual sub-projects, including the project cost, based on the formal procedures. In addition, when the decision was made to exclude three sewerage sub-projects from the loan in 2011, it was agreed with TNUDF that the project budget of the sewerage component would be reallocated to the water supply portion. In the ex-post evaluation, it was determined that it would be appropriate to revise the planned project cost to reflect the cost of the ten selected water supply sub-projects and compare this with actual project cost.

The actual project cost was 10,507 million yen (including ODA Loan 8,551 million yen) against the revised planned project cost of 13,433 million yen (including ODA Loan 6,181 yen), which was within the plan (78% of the plan) (see Tables 1 and 2).

Table 1: Planned and Actual Project Cost

Unit: Million yen

Item	Plan (2008)				Revised Plan	Actual
	Foreign currency	Local currency	Total	ODA loan	Total	Total
Loan Portion						
- Water Supply facilities	0	3,840	3,840	3,840	11,416	9,688
- Sewerage facilities	0	3,967	3,967	3,967	0 (No sewerage)	0 (Same as left)
Sub-total	0	7,807	7,807	7,807	11,416	9,688
Technical support & training	0	302	302	0	302	0
Price escalation	0	337	337	337	337	-
Physical contingency	0	407	407	407	407	-
Interest during construction	240	0	240	0	240	626
Commitment charge	68	0	68	0	68	-
Land acquisition	0	83	83	0	83	-
Administration	0	238	238	0	238	193
VAT	0	342	342	0	342	-
Total	308	9,516	9,824	8,551	13,433	10,507

Source: Documents provided by JICA

Note 1: Funding will be provided for the sub-project costs, excluding the costs to be borne by each municipality (minimum 10% of the project costs).

Note 2: Exchange rate: Planned: 1 rupee = 2.85 yen (October 2007); Revised (post-revision): 1 rupee = 1.93 yen (2009); Actual: 1 rupee = 1.72 yen (average of 2009-2021)

Note 3: The planned project cost after the revision was assumed to be the same as that at the time of planning (2008) except for the water supply and sewerage facility cost items.

Note 4: The actual amount of administration expenses was calculated as 2% of the same funding (total of water supply and sewerage facility costs) as the plan (post-revision).

Note 5: In the actual project cost, except for the interest during construction and administration expenses, all other expenses were included in the funding (total of water supply and sewerage facilities costs).

Table 2: Planned and Actual Project Cost of Sub-projects

Sub-project	Planned					Actual				
	ODA Loans		Municipal Self-financing	Total	Total	ODA Loans		Municipal Self-financing	Total	Total
	Loans	Grants				Loans	Grants			
	Mill. Rp	Mill. Rp	Mill. Rp	Mill. Rp	Mill. yen	Mill. Rp	Mill. Rp	Mill. Rp	Mill. Rp	Mill. yen
Tiruchirappalli	1,112.5	664.3	437.4	2,214.2	4,273.4	933.0	534.5	380.4	1,847.9	3,075.4
Palani	129.6	64.8	21.6	216.0	416.9	129.6	64.8	21.6	216.0	359.5
Coonoor	83.1	41.6	13.8	138.5	267.3	74.9	37.4	12.4	124.8	207.7
Idappadi	100.0	66.7	18.5	185.2	357.4	88.0	55.9	18.9	162.8	270.9
Devakottai	49.9	25.0	8.3	83.2	160.6	45.0	20.5	8.3	73.8	122.8
Thoothukudi	706.1	706.1	1,412.2	2,824.4	5,451.1	706.1	1,835.9	282.4	2,824.4	4,700.5
Dindigul	211.5	141.0	352.5	705.0	1,360.7	211.5	141.0	352.5	705.0	1,173.3
Mettupalayam	27.5	18.3	45.8	91.6	176.8	27.5	18.3	45.8	91.6	152.4
Udumalpet	53.6	35.7	89.4	178.7	344.9	53.6	32.0	87.0	172.6	287.3
Madhavaram	330.0	165.0	55.0	550.0	1,061.5	198.7	99.4	77.3	375.4	624.8
Total	2,803.8	1,928.50	2,454.5	7,186.8	13,870.6	2,467.9	2,839.7	1,286.6	6,594.3	10,974.6
Excluding state and local self-financing					11,416.0					9,688.0

Source: Documents provided by JICA and response to questionnaires by 10 targeted municipalities

Note 1: Depending on the profitability of each sub-project, the state government provides municipalities with construction funds and funds for hiring consultants by setting a grant ratio of up to 20% for water supply projects out of the ODA loan.

Note 2: For Thoothukudi, the municipal self-financing of Rs. 1,412.2 million includes grant of Rs. 1,129.8 million from Tamil Nadu.

Note 3: The exchange rate at the time of planning was 1 rupee = 1.93 yen (2009), and 1 rupee = 1.72 yen (2009-2021 average) at time of evaluation.

The main reasons why the actual project cost was lower than the revised planned project cost was due to some changes in scope in sub-projects such as Tiruchirappalli, Coonoor, Idappadi, and Madhavaram, to reduced project cost due to cancellations, to possible non-expenditure for technical assistance and training, and to changes in the foreign currency exchange rates used at the time of planning and ex-post evaluation.

### 3.2.2.2 Project Period

The planned project period was 64 months (March 2008 to June 2013), while the actual project period was 165 months (March 2008 to November 2021). However, for the water supply sub-project in Madhavaram, the tender for selection of the contractor could not be announced for 12 months due to COVID-19. Therefore, in the ex-post evaluation, the actual project period is 153 months, which is 165 months minus above 12 months. Therefore, the revised actual project period was 153 months, which significantly exceeded the plan, compared to the planned project period of 64 months (239% of the plan). The project completion date for the actual project period is November 2021, when the Madhavaram water supply sub-project is scheduled to be completed (see Table 3 and Table 4).

Table 3: Planned and Actual Project Period

Item	Planned	Actual
L/A signing	March 2008	March 2008
Sub-project selection	October 2007-February 2008	July 2008-April 2015
Bidding/Contract	February 2008-June 2008	April 2009-November 2021 (scheduled)
Construction	April 2008-June 2013	
Technical support/Training	April 2008-March 2010	N.A.

Source: Documents provided by JICA and response to the questionnaires by 10 targeted municipalities

Table 4: Planned and Actual Project Period for Sub-projects

Sub-projects	Planned	Actual
Tiruchirappalli	April 2009-January 2013	April 2009-February 2014
Palani	February 2012-February 2013	February 2012-October 2019
Coonoor	February 2011-February 2013	February 2011-March 2015
Idappadi	February 2012-February 2013	February 2012-February 2015
Devakottai	January 2012-January 2013	January 2012-November 2013
Thoothukudi	June 2013-August 2015	June 2013-December 2020
Dindigul	February 2015-August 2016	February 2015-January 2019
Mettupalayam	May 2015-November 2016	June 2015-May 2018
Udumalpet	January 2015-June 2016	February 2015-December 2016
Madhavaram	August 2012-August 2014	April 2013-November 2021 (scheduled)

Source: Documents provided by JICA and response to questionnaires by 10 targeted municipalities

Note: For Madhavaram, as of September 2021, the construction was scheduled to be completed in November 2021.

As described in “3.2.1 Project Outputs”, the reasons for the delay were that the sub-projects for the loan were selected again after the signing of the loan agreement, and that the three sewerage sub-projects that had been selected were subsequently excluded from targets of the loan. Due to this, the start of each sub-project was delayed by one to seven years from the planned start dates. The implementation of sub-projects was also delayed due to delays in land acquisition, time taken to obtain the necessary permits from the National Highway Authority of India (NHAI) and Indian Railways for the laying of water pipes, delays in contractor selection due to unsuccessful bidding, poor performance due to deterioration of the contractor's financial base, and the consequent delays in construction progress. It has been pointed out by the executing agency that in parallel with the implementation of this project, other regional water supply and sewerage improvement projects were being implemented in Tamil Nadu with the support of the Government of India, the state governments, the World Bank, and Asian Development Bank (ADB), and this concentration of projects being carried out at the same time led to a shortage of contractors and unsuccessful bidding.

Although the project cost was within the plan, the project period significantly exceeded the plan. Therefore, efficiency of the project is fair.

### 3.3 Effectiveness and Impacts<sup>7</sup> (Rating: ③)

#### 3.3.1 Effectiveness

##### 3.3.1.1 Quantitative Effects (Operation and Effect Indicators)

At the time of appraisal, the operation and effect indicators of the water supply and sewerage sub-projects were set on the basis of the candidate projects for support presented by the Indian side, but the values were to be reviewed after the sub-projects were confirmed. However, JICA and TNUDF did not review the operation and effect indicators during project implementation. Therefore, in this ex-post evaluation, the nine target municipalities, excluding Madhavaram which is still under implementation, were asked to provide the baseline, target, and actual values of the operation and effect indicators for each sub-project set by each municipality, and the quantitative effects were measured with these figures. These operation and effect indicators were prepared based on the project plan at the time that the DPR were prepared for each sub-project. However, it should be noted that these operation and effect indicators cover not only the water supply facilities constructed and/or replaced by this project, but also all the water supply facilities of each municipality. The table below shows the operation and effect indicators of the nine completed target water supply sub-projects.

Table 5: Operation and Effect Indicators for 9 Completed Target Water Supply Sub-projects

(1) Tiruchirappalli

Indicators	Baseline	Target	Actual	
	2008	2013	2014	2021
		Project Completion	Completion Year	7 Years After Completion
Population served (no. of persons)	920,660	1,111,570	1,111,570	1,306,000
No. of house service connections (nos.)	81,225	111,513	111,513	111,513
Water supply amount (m <sup>3</sup> per day)	85,000	150,000	150,000	150,000
Water supply amount per day/capita (liters per capita/day)	92	135	135	115
Water supply service time (hours)	2 hours every other day	2 hours daily	2 hours daily	2 hours daily

Source: Response to the questionnaire from Tiruchirappalli.

<sup>7</sup> Sub-rating for Effectiveness is to be put with consideration of Impacts.

## (2) Palani

Indicators	Baseline	Target	Actual	
	2008	2013	2019	2021
		Project Completion	Completion Year	3 Years After Completion
Population served (no. of persons)	79,519	90,069	90,069	100,620
No. of house service connections (nos.)	7,401	10,601	9,140	10,601
Water supply amount (m <sup>3</sup> per day)	7,157	8,106	8,106	8,106
Water supply amount per day/capita (liters per capita/day)	90	90	90	81
Water supply service time (hours)	2 hours every other day	2 hours every other day	2 hours every other day	2 hours every other day

Source: Response to the questionnaire from Palani.

## (3) Coonoor

Indicators	Baseline	Target	Actual	
	2008	2015	2015	2021
		Project Completion	Completion Year	6 Years After Completion
Population served (no. of persons)	50,196	49,134	49,472 (2017)	54,221
No. of house service connections (nos.)	5,784	8,654	7,664	8,654
Water supply amount (m <sup>3</sup> per day)	3,000	7,000	7,000	7,000
Water supply amount per day/capita (liters per capita/day)	60	142	118	129
Water supply service time (hours)	2 hours every three days	3 hours every three days	4 hours every three days	4 hours every three days

Source: Response to the questionnaire from Coonoor.

## (4) Idappadi

Indicators	Baseline	Target	Actual	
	2008	2013	2015	2021
		Project Completion	Completion Year	6 Years After Completion
Population served (no. of persons)	53,062	56,670	56,670	58,460
No. of house service connections (nos.)	4,203	10,682	9,526	10,682
Water supply amount (m <sup>3</sup> per day)	2,000	5,600	5,600	5,600
Water supply amount per day/capita (liters per capita/day)	38	99	99	96
Water supply service time (hours)	1 hour daily	1 hour daily	1 hour daily	1 hour daily

Source: Response to the questionnaire from Idappadi.

## (5) Devakottai

Indicators	Baseline	Target	Actual	
	2008	2013	2013	2021
		Project Completion	Completion Year	8 Years After Completion
Population served (no. of persons)	43,136	51,865	51,865	58,800
No. of house service connections (nos.)	6,910	9,010	7,566	9,167
Water supply amount (m <sup>3</sup> per day)	3,260	4,180	4,180	4,180
Water supply amount per day/capita (liters per capita/day)	76	81	81	71
Water supply service time (hours)	2 hours daily	2 hours daily	2 hours daily	2 hours daily

Source: Response to the questionnaire from Devakottai.

## (6) Thoothukudi

Indicators	Baseline	Target	Actual	
	2008	2015	2019	2021
		Project Completion	Completion Year	3 Years After Completion
Population served (no. of persons)	794,228	848,104	848,104	957,382
No. of house service connections (nos.)	39,932	62,960	58,207	62,960
Water supply amount (m <sup>3</sup> per day)	65,000	110,000	110,000	110,000
Water supply amount per day/capita (liters per capita/day)	82	130	130	115
Water supply service time (hours)	2 hours daily	2 hours daily	2 hours daily	2 hours daily

Source: Response to the questionnaire from Thoothukudi.

## (7) Dindigul

Indicators	Baseline	Target	Actual	
	2008	2016	2019	2021
		Project Completion	Completion Year	3 Years After Completion
Population served (no. of persons)	215,105	217,075	217,075	226,925
No. of house service connections (nos.)	28,446	58,446	55,746	58,446
Water supply amount (m <sup>3</sup> per day)	12,000	16,000	16,000	16,000
Water supply amount per day/capita (liters per capita/day)	56	74	74	71
Water supply service time (hours)	2 hours daily	2 hours daily	2 hours daily	2 hours daily

Source: Response to the questionnaire from Dindigul.



(8) Mattupalayam

Indicators	Baseline	Target	Actual	
	2008	2016	2018	2021
		Project Completion	Completion Year	3 Years After Completion
Population served (no. of persons)	68,620	74,206	74,206	76,454
No. of house service connections (nos.)	8,864	9,151	10,744	11,734
Water supply amount (m <sup>3</sup> per day)	6,480	8,360	8,360	8,450
Water supply amount per day/capita (liters per capita/day)	94	113	113	111
Water supply service time (hours)	2 hours daily	2 hours daily	2 hours daily	2 hours daily

Source: Response to the questionnaire from Mattupalayam.

(9) Udumalpet

Indicators	Baseline	Target	Actual	
	2008	2016	2016	2021
		Project Completion	Completion Year	5 Years After Completion
Population served (no. of persons)	58,880	61,900	61,900	62,650
No. of house service connections (nos.)	8,790	10,236	10,236	10,794
Water supply amount (m <sup>3</sup> per day)	6,480	8,360	8,360	8,450
Water supply amount per day/capita (liters per capita/day)	110	135	135	135
Water supply service time (hours)	2 hours daily	2 hours daily	2 hours daily	2 hours daily

Source: Response to the questionnaire from Udumalpet.

Water Taps and Water Storage Tanks in Households (Tiruchirappalli)



Water Tap



Underground Water Storage Tank



Rooftop Water Storage Tank

As shown in Table 5, it is considered that the target values for the nine target sub-projects already completed under this project had been generally achieved at the time of project completion, although there were constraints on evaluation as mentioned earlier. Even if some of the indicators had not been achieved earlier, they had all been achieved by the time of ex-

post evaluation in 2021. After the implementation of the project, the water supply volume increased in all nine target municipalities, and the total number of households supplied increased from 191,555 households before the project to 280,342 households, with 88,787 households being newly served thanks to the project. On the other hand, while Tamil Nadu has the target of providing water supply services for at least two hours daily, the two municipalities of Palani and Coonoor have not reached this target. Each household is equipped with underground and rooftop water storage tanks, and during the hours when water is supplied, water is stored in the tanks and used for domestic purposes.

Table 6: Comparison of Population Served, Number of House Service Connections, and the Water Supply Amount in the Nine Target Municipalities at the Time of Planning and the Ex-Post Evaluation

Municipality	Population served (persons)		Number of house service connections (nos.)		Water supply amount (m <sup>3</sup> /day)	
	2008	2021	2008	2021	2008	2021
Tiruchirappalli	920,660	1,306,000	81,225	111,513	85,000	150,000
Palani	79,519	100,620	7,401	10,601	7,157	8,106
Coonoor	50,196	54,221	5,784	8,654	3,000	7,000
Idappadi	53,062	58,460	4,203	10,682	2,000	5,600
Devakottai	43,136	58,800	6,910	9,167	3,260	4,180
Thoothukudi	794,228	957,382	39,932	62,960	65,000	110,000
Dindigul	215,105	226,925	28,446	58,446	12,000	16,000
Mettupalayam	68,620	76,454	8,864	11,734	6,480	8,450
Udumalpet	58,880	62,650	8,790	10,794	6,480	8,450
Total	2,283,406	2,847,291	191,555	294,551	190,377	317,786

Source: Prepared by the evaluator based on questionnaire responses from the nine target municipalities.

Comparing the status of the nine target municipalities with completed sub-projects at the time of planning (2008) and the ex-post evaluation (2021), the population served had increased 1.25 times from 2,283,406 (2008) to 2,847,291 (2021). The number of units connected to water supply facilities increased 1.54 times from 191,555 (2008) to 294,551 (2021), and the water supply volume expanded 1.67 times from 190,377 m<sup>3</sup>/day (2008) to 317,786 m<sup>3</sup>/day (2021) (see Table 6). However, even since the completion of the project, each municipality has continued to improve water supply systems, including the expansion of the number of house service connections by utilizing the schemes of the Tamil Nadu government, etc. The actual values of each indicator at the time of ex-post evaluation include the contribution of these factors.

### 3.3.1.2 Qualitative Effects (Other Effects)

#### (1) Enhancement of the financial, and facility operation and maintenance capacities of municipalities

At the time of appraisal, it was assumed that the training for the enhancement of financial capacity, including the collection of water bills, and the operation and maintenance capacity for municipal engineers and facility operators would be provided through the Directorate of Municipal Administration (DMA) within the Tamil Nadu government budget. However, in a survey conducted with TNUDF and the ten target municipalities in the ex-post evaluation, there was no recognition of any training regarding the enhancement of financial capacity, including the collection of water bills, or for operation and maintenance capacity specific to this project. On the other hand, according to DMA, their technical wing provides regular training to municipalities, and another independent organization, the Tamil Nadu Institute of Urban Study<sup>8</sup>, also conducts training for municipalities. The institute provides appropriate training in various fields such as engineering, sanitation, finance, urban planning, etc. and refresher training in response to requests from municipalities. Normally, municipal engineers are in charge of a wide range of infrastructure projects including water supply, sewerage, and roads, which are implemented by the municipality, and the technical training provided by the institute includes the area of water supply.

It is thought that the coordination with DMA related to the training planned at the time of appraisal and the monitoring of training would normally be conducted mainly by the executing agency, TNUDF, and the quality assurance consultants who support it, and that JICA should have confirmed the implementation status of the above training through its project monitoring system. However, since the quality assurance consultant who was initially planned to be hired under the project budget was eventually hired under the World Bank project budget, JICA was not in a position to directly supervise the quality assurance consultant. As a result, implementation of a systematic training program, as well as its monitoring, may have been difficult.

TWADB provided technical guidance and support for the operation and maintenance of the facilities through on-the-job training to the four municipalities (Palani, Coonoor, Idappadi, Devakottai) that implemented the sub-projects outsourced to TWADB, during the one-year warranty period from the completion of the facilities to their handover to the municipalities. As described in “3.4.2 Technical Aspect of Operation and Maintenance” later, no technical problems in the operation and maintenance of the target municipalities were observed during the ex-post evaluation.

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<sup>8</sup> Tamil Nadu Institute of Urban Study (TNIUS) is an organization that was established in 1981 to improve the management capacity of municipalities by providing training to municipality officials, research and consulting services.

Based on the above, it is observed that throughout the project period, DMA, Tamil Nadu Institute of Urban Study, and TWADB provided training, guidance, and advice on improving the financial and facility operation and maintenance capacities of municipalities, and no technical problems in the operation and maintenance of the target municipalities were observed. Therefore, it seems there was a certain effect on the capacity development of the targeted municipalities.

### 3.3.2 Impacts

#### 3.3.2.1 Intended Impacts

##### (1) Improvement of living conditions in and the environment of municipalities

In order to understand the impact of this project, an interview survey (qualitative survey)<sup>9</sup> was conducted with 50 beneficiary households that receive a direct water supply from the water supply facilities developed and improved by this project. The results of the survey are as follows.

The main uses of the water were for drinking (94%), cooking (92%), showering and bathing (86%), and toilets (78%). Comparing the results before and after the implementation of the project, there was no significant change in the way that water was used.

As for the change in the labor of fetching water, 96% of the respondents answered that there was no change as most of the respondents had already been receiving a water supply at their respective houses (house connection services) before the project was implemented. However, one resident, who was not one of the households interviewed in this study, said that before the project, the water collection point had been located several kilometres away from their house, and it required a lot of time and energy to collect water. However, after the implementation of the project, they were able to use a communal water tap near their house, which freed them from the labor of collecting water.

Regarding the change in sanitation, 96% of the respondents indicated that there was no change. In terms of the prevalence of waterborne diseases, 92% of the respondents answered that there was no change.

On the other hand, 64% of the respondents answered that “the convenience of their daily life improved” due to the increase in water supply volume after the project was implemented, while 36% answered that there was “no change”. Regarding the impact on the natural environment after the implementation of the project, 86% of the respondents answered “not at all” and 14%

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<sup>9</sup> In the selection of municipalities for the survey, five municipalities were selected from those where site surveys were feasible, Tiruchirappalli, Idappadi, Devakottai, Thoothukudi, and Dindigul, based on geographical conditions and other factors. In each municipality, the sample (ten households per municipality) was selected by significant sampling, taking into account gender ratio, age group, income, and other factors.

answered “not much”, indicating that the increased water supply did not have any negative impact on the environment such as bringing bad odors or pest infestation.

A survey was also conducted on the degree of satisfaction with the water supply service after project implementation. Regarding water quality, 98% of the respondents answered “no problem” (the remaining 2% answered “do not know”). Regarding the water supply volume, 98% of the respondents answered “no problem”; regarding the water pressure, 92% of the respondents answered “no problem”; and regarding water outages, 98% of the respondents answered “no problem”. Regarding water supply time, 78% of the respondents answered that there was “no problem”, while 12% of the respondents replied that there were “some constraints/limitations”. In terms of water charges, 90% of respondents answered that there was “no problem”, while 6% of respondents answered that they were expensive and 4% answered that they were “expensive to some extent”. The households that felt that the water rates were high had used public wells in their neighbourhoods, but after the implementation of this project, they started receiving a water supply to their individual households. The water rates for individual households were higher than the previous water rates. As for the evaluation of the water supply service as a whole, 92% of the respondents were “very satisfied” and 8% were “satisfied to some extent”, indicating a high degree of satisfaction.

To summarize the results of the above survey, improvements in the living environment of municipalities thanks to the project, through the expanded volume of daily water supply to each household, and the convenience of storing water in household water storage tanks, was recognized. It was also found that there were generally no problems with the water supply service after the project was implemented in terms of water quality, water pressure, water outages, water supply time, and water charges. There were, however, some comments that the two-hour water supply time per day was insufficient.

### 3.3.2.2 Other Positive and Negative Impacts

#### (1) Impacts on the Natural Environment

In *the Japan Bank for International Cooperation (JBIC) Guidelines for Confirmation of Environmental and Social Considerations* (2002), this project was classified as Category FI as it satisfied all of the following conditions: that “JICA’s funding of projects is provided to a financial intermediary or executing agency; the financial intermediary or executing agency substantially undertakes the selection and appraisal of sub-projects under the projects, only after JICA’s approval of the funding, so that the sub-projects cannot be specified prior to JICA’s approval for the funding (or prior to JICA’s appraisal of the project); and those sub-projects are expected to have potential impacts on the environment and society”. The environmental and social considerations were included in the DPR for each sub-project, and no critical negative environmental impacts were envisaged at the time of planning. For this project, World Bank

project funds were used to hire an environmental management consultant who worked with TNUDF to review the reports submitted to each municipality by contractors, to conduct quarterly site surveys, and to monitor the environmental impacts during implementation. According to the target municipalities, no negative impact on the natural environment was confirmed during project implementation. Also, there has been no negative impact on the natural environment related to the project since project completion, and no grievances have been voiced by local residents.

## (2) Resettlement and Land Acquisition

The environmental and social considerations were included in the DPR for each sub-project, and resettlement of residents was not expected at the time of planning, nor did it occur. Although land was acquired for the construction of water towers and distribution reservoirs, most of the land was publicly owned. In cases where private land was acquired, compensation was provided in accordance with the prescribed procedures of Indian domestic law. There were no grievances and disputes associated with the land acquisition.

Summarizing the above, looking at the operational effect indicators for the water supply sub-projects set for each of the nine target municipalities, it is considered that the target values at the time of project completion had largely been achieved. Even though there were some indicators yet to be achieved, all have been achieved at the time of the ex-post evaluation in 2021. Regarding improvement of the financial and facility operation and maintenance capacity of municipalities, DMA and the Tamil Nadu Institute of Urban Study have conducted regular trainings for municipality officials. In addition, the four municipalities that implemented the sub-projects commissioned to TWADB received technical guidance and support from TWADB, which is expected to have had a certain effect in improving their capabilities for financial and facility operation and maintenance. The qualitative survey results from 50 beneficiary households of this project showed no change in the labor of drawing water. In the sanitary environment, or in the incidence of waterborne diseases after the project, as most of the survey targets were households that had been supplied with water before the implementation of the project. However, the increase in water quantity was perceived as an improvement in the convenience of daily life. There were generally no problems with water quality, water supply volume, water supply time, or water charges, and the overall evaluation of the water supply service was very high. There was no negative impact on the natural environment due to this project, and the majority of land acquisition was of land that was publicly owned, so no resettlement occurred.

This project has mostly achieved its objectives. Therefore, the effectiveness and impacts of the project are high.

### 3.4 Sustainability (Rating: ③)

#### 3.4.1 Institutional/Organizational Aspect of Operation and Maintenance

[Municipalities]

Since completion, each municipality has been responsible for the operation and maintenance of its own water supply facilities. Many municipalities outsource the day-to-day operation and maintenance of facilities to private contractors (private service providers). Each municipality has a technical department, where there is a chief engineer who supervises the outsourced operation and maintenance. CMWSSB is in charge of the operation and maintenance of the water supply facilities in Madhavaram. No problems were found in the operation and maintenance systems and structures of the municipalities.

[Others]

TNUDF was established in 1996 as the first state development fund in India. It was funded by joint capital investment of the public and private sectors, and is responsible for promoting urban infrastructure development, including water supply and sewerage, in Tamil Nadu. While the majority of TNUDF's funding comes from foreign donors, new projects are selected every year, and although the disbursement amount decreased in FY2019/20 due to the impact of COVID-19, the total project cost and the amount of disbursement of newly selected projects have both increased compared to FY2009/10, and this continues to play an important role in the urban infrastructure development of municipalities in Tamil Nadu<sup>10</sup>. Since 2016, TNUDF has introduced an ex-post evaluation system for completed projects to review the financial status and technical level and capabilities of municipalities, and to evaluate the operation and maintenance status of municipalities. TNUDF expects to carry out an ex-post evaluation once a year for each project and will continue to do so for 15 years after completion. For the water supply sub-project of Idappadi, which is a target of this project, the ex-post evaluation has already been conducted and technical advice has been provided to Idappadi based on the evaluation results. The ex-post evaluation of other sub-projects has been temporarily suspended due to COVID-19.

DMA is an organization under the Department of Municipal Administration and Water Supply (DMAWS) which administers and guides municipalities in the state except for the Greater Chennai Corporation. The nine target municipalities for this project, excluding Madhavaram, are basically under the control of DMA, and DMA regularly monitors and evaluates the water supply operations of each municipality, including the amount of water supplied. If there are any

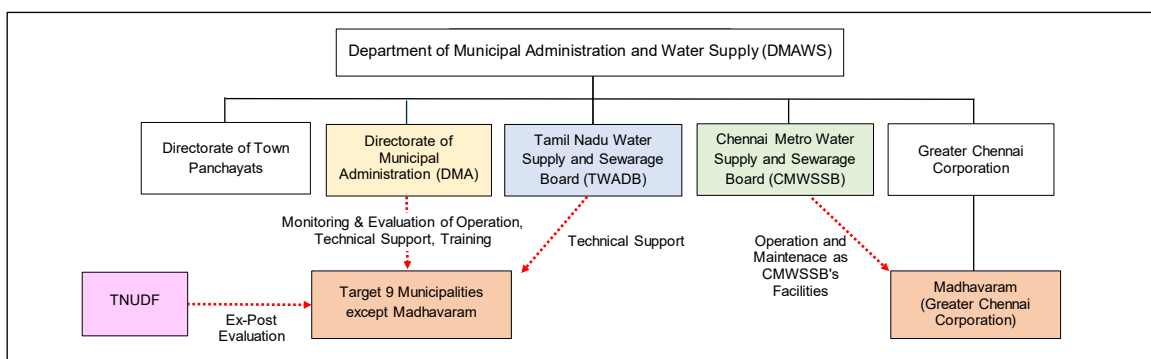
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<sup>10</sup> In FY2009/10, TNUDF approved 16 local urban infrastructure projects (including water supply and sewerage as well as road maintenance, etc.) with a total project cost of Rs. 2,730 million and a disbursement amount of Rs. 1,514 million. In the last three years, there were 11 approvals (total project cost Rs. 5,414 million) with a disbursement amount of Rs. 4,417 million in FY2017/18, 13 approvals (total project cost Rs. 29,285 million) with a disbursement amount of Rs. 3,767 million in FY2018/19, and 6 approvals (total project cost Rs. 38,376 million) with a disbursement amount of Rs. 2,137 million in FY2019/20. (Source: TNUDF Annual Report).

problems, TWADB will be dispatched to the site of the municipality at the request of DMA to provide technical support.

TWADB is the public corporation responsible for the development of water supply and sewerage facilities in the state of Tamil Nadu, excluding the Greater Chennai Corporation, and has 80 divisional offices in 36 districts in the state (allocated 2-3 divisional offices per district). If a problem occurs with a water supply facility, the municipality will consult with the nearest TWADB divisional office, and TWADB will provide technical support free of charge. TWADB also belongs to DMAWS.

The support system for the operation and maintenance of the project described above is shown in Figure 3.



Source: Prepared by the evaluator referring to DMA web site (<https://www.tn.gov.in/maws/hod.htm>).

Figure 3: Project Operation and Maintenance Support System

### 3.4.2 Technical Aspect of Operation and Maintenance

#### [Municipalities]

The engineers of each municipality mainly supervise the operation and maintenance of the facilities conducted by the outsourced private companies/contractors. Although the engineers of each municipality are mainly civil engineers, the water supply facilities use conventional technology, and their technical level is sufficient. Some of the private companies/contractors to which the project is outsourced are large-scale contractors, while others are small and medium-sized contractors mainly doing business locally. However, in general, the private contractors have an adequate level of technical capability, and no problems have been observed in the operation and maintenance of the project facilities. While some municipalities use maintenance plans and manuals to carry out maintenance, some municipalities do not archive and share manuals at site level, but respond individually using the experience and knowledge of private contractors. CMWSSB, which is in charge of the operation and maintenance of the water supply facilities in Madhavaram, has not faced any technical problems.



[Others]

As mentioned above, TNUDF conducts ex-post evaluations and provides technical advice to municipalities based on evaluation results. In addition, each municipality can receive technical assistance from TWADB as needed. DMA and the Tamil Nadu Institute of Urban Study provide regular training to municipal officials, which includes training on water supply maintenance.

### 3.4.3 Financial Aspect of Operation and Maintenance

According to the questionnaire survey and interviews with the nine target municipalities for which the sub-projects have already been completed, sufficient measures have been taken by each municipality for the operation and maintenance budget, and no financial problems were found. The operation and maintenance budgets of the six target municipalities who responded to the questionnaires are shown in table below. The CMWSSB, which oversees the operation and maintenance of water supply facilities in Madhavaram, does not have any particular problems in terms of the operation and maintenance budget. In Tamil Nadu, water meters have not been installed, except for some facilities and industries, so water rates are fixed. With the increase in the volume and duration of supply, a future shift to metered rates is being considered.

Table 7: Operation and Maintenance Budgets of Target Municipalities

Unit: 1,000 Rupee

Municipality	2019		2020		2021	
	Plan	Actual	Plan	Actual	Plan	Actual
Tiruchirappalli	45,000	56,388	110,000	104,790	130,000	44,324
Coonoor	120	150	135	164	150	185
Idappadi	216	216	216	216	216	216
Devakottai	5,000	4,740	5,000	4,793	5,000	4,812
Mettupalayam	34,894	33,232	42,531	40,506	44,356	42,244
Udumalpet	34,894	33,232	42,531	40,506	44,356	42,244

Source: Response to the questionnaires from target municipalities.

Note: Three municipalities (Palani, Thoothukudi, Dindigul) out of nine municipalities did not provide operation and maintenance budget data.

### 3.4.4 Status of Operation and Maintenance

Through site surveys in five municipalities (Tiruchirappalli, Idappadi, Devakottai, Thoothukudi, Dindigul) and telephone interviews with four municipalities (Palani, Coonoor, Mettupalayam, Udumalpet), it was confirmed that the water supply facilities of the project are generally maintained in good condition and no problems were found.

No major problems have been observed in the institutional/organizational, technical, financial aspects and current status of the operation and maintenance system. Therefore, the sustainability of the project effects is high.

## **4. Conclusion, Lessons Learned and Recommendations**

### **4.1 Conclusion**

The objective of this project was to provide a safe water supply and sewerage facilities for small and medium sized municipalities in Tamil Nadu in southern India, where the population is growing, by providing long-term funds through the Tamil Nadu Urban Development Fund (TNUDF), thereby contributing to the economic development of small and medium sized municipalities as well as to the improvement of the living conditions of residents.

The project was highly relevant and fully consistent with the development plan and development needs of India at the time of appraisal and of the ex-post evaluation, and with Japan's ODA policy at the time of the appraisal. Although the project cost was within the plan, the project period exceeded the plan, and therefore the efficiency of the project is fair. The reasons for the delay in the project period were due to delays in the start of each sub-project caused by the re-selection of the target sub-projects, the delay in land acquisition, the time required to obtain the necessary permits for laying water pipes, the delay in contractor selection due to unsuccessful bidding, and the delay in construction progress due to deterioration of the contractor's financial base. The operation and effect indicators for the nine completed target sub-projects were generally achieved. It seems that a certain level of project effect was realized in the improvement of the financial and facility operation and maintenance capacity of the target municipalities. Through a qualitative survey of 50 beneficiary households of the project, it was recognized that the increase in water quantity following the implementation of the project had led to an improvement in the convenience of daily life. There were generally no problems with water quality, water supply volume, water supply time, or water charges, and the overall evaluation of the water supply service was very high. No negative impact on the natural environment was observed, most of the land acquired was public land, and there was no resettlement of residents. Therefore, the effectiveness and impact of this project are high. No problems were observed in terms of the institutional/organizational, technical, financial aspects and current status of the operation and maintenance system. Therefore, the sustainability of the project is also high.

In light of the above, the project is evaluated to be highly satisfactory.

### **4.2 Recommendations**

#### **4.2.1 Recommendations to the target municipalities**

In some municipalities, the operation and maintenance manuals of the facilities (usually prepared by the suppliers of materials and equipment) are not properly archived in the municipality, or shared with the outsourced private contractors. Therefore, each municipality needs to improve the management and the archive system of these manuals.

Among the municipalities targeted by the project, Tiruchirappalli regularly conducts water quality inspections at water supply facilities, while in the other municipalities, water quality

inspections are conducted only when problems, such as tap water pollution, occur. In order to ensure the safety of tap water, it is recommended that each municipality consider (1) conducting daily inspections for TDS (total dissolved solids) and residual chlorine levels at water intake facilities, water purification facilities, and water storage facilities, and conducting tests for all water quality standard items once a month; (2) establishing a system for conducting the above water quality tests; and (3) submitting water samples once every six months to the TWADB Water Quality Inspection Laboratory or the National Accreditation Board for Testing and Calibration Laboratories (NABL) accredited laboratory and obtain a third-party analysis report in order to make a comparison of water quality with age.

#### 4.2.2 Recommendations to JICA

During the implementation of the project, the JICA India Office dispatched a monitoring mission at least once a year, and consultations with the executing agency (TNUDF) were conducted on a regular basis. However, since the end of the loan period in March 2016, communication with the executing agency has become less frequent, and is mainly via email. The Madhavaram water supply sub-project, which is currently under implementation, is scheduled to be completed in November 2021 and will start operation in March 2022 after commissioning. JICA is expected to monitor the progress of the project by closely communicating with the executing agency by e-mail, telephone, etc. until the sub-project is completed and operational.

### 4.3 Lessons Learned

#### (1) Establishment of a Project Monitoring System including Confirmation of Technical Support and Training

At the time of the appraisal, it was planned that training on maintenance, financial improvement and toll collection improvement would be provided to the engineers and operators of project facilities in the municipalities targeted for sub-projects through DMA. However, through the surveys with TNUDF and the target municipalities, it was confirmed that the situation of the above training, including whether or not implementation had taken place, was unclear, making it difficult to confirm the actual achievements of the improvement of the capacity of municipality staff based on the plan and to verify the effectiveness of the training.

It is considered that monitoring of the above training programs should have been conducted mainly by TNUDF and the quality assurance consultants who support the work of TNUDF. However, since the quality assurance consultant who was initially planned to be hired with the project budget was eventually hired with the World Bank's project budget, JICA was not in a position to directly supervise the quality assurance consultant. As a result, there may be difficulties in the implementation of a systematic training program as well as its monitoring.

In order to ensure and enhance the sustainability of the targeted sub-projects, a project management consultant who is responsible for overall project management should be employed under the project budget, and the above project management consultant should be assigned to assist TNUDF in overall management of project progress including the supporting and monitoring the implementation of training programs for municipality staff. Alternatively, it would be desirable to include support for the implementation of training programs for municipality staff as one of the mandates of the Project Coordination and Monitoring Committee.

A mechanism for an adequate project monitoring system, including the implementation of training programs for municipality staff, should have been established through such measures as mentioned above.

#### (2) Necessity of Reviewing Operation and Effect Indicators Due to Changes in Target Sub-projects

In this project, the operation and effect indicators for the water supply and sewerage sub-projects were set on the basis of the candidate projects shortlisted by the Indian side at the time of the appraisal. If any changes occurred after the sub-projects were confirmed, the indicators were to be reviewed again. However, JICA and TNUDF did not review the operation and effect indicators during project implementation and did not agree on the revised operation and effect indicators. In order to avoid such a situation, it would have been better if the DPR, one of the eligibility requirements when selecting each sub-project, had included operation and effect indicators including baseline values (at the time of planning) and target values (at the time of project completion), and if JICA and TNUDF had confirmed the DPR, including the validity of the operation and effect indicators, when considering whether or not to select the sub-project.

End

### Comparison of the Original and Actual Scope of the Project

Item	Plan	Actual
1. Project Outputs Construction of water supply facilities in ten municipalities		
<b>(1) Tiruchirappalli</b> - Chlorination facility - Water intake facility - Pumping facility - Transmission pipes - Distribution pipes - Service reservoir - House service connection	- 1 No. - 3 Nos. - 12 Nos - 82.3 km - 558.2 km - 37 Nos - 30,258	- Same as plan - Same as plan - Same as plan - 80.4 km - 366.6 km - Same as plan - Same as plan
<b>(2) Palani</b> - Water purification plant - Chlorination facility - Water intake facility - Pumping facility - Transmission pipes - Distribution pipes - Service reservoir	- Capacity 16,000 m <sup>3</sup> /day (Repair of the existing plant) - 1 No. - 1 No. - 1 No - 13.9 km - 74.0 km - 7 Nos	- Capacity 16,500 m <sup>3</sup> /day (Repair of the existing plant) - Same as plan - Same as plan - Same as plan - Same as plan - Same as plan - Same as plan
<b>(3) Coonoor</b> - Water purification plant - Water intake facility - Pumping facility - Transmission pipes - Service reservoirs - New feeder main - Internal water distribution system - House service connection	- Capacity 5,800 m <sup>3</sup> /day (Replacement of existing plant) - 1 No. - 2 No. - 10.0 km - 5 No. - 14.6 km - New: 22.5 km Replacement: 14.2 km - 2,870	- Same as planned - Same as planned - 1 No. - 9.5 km - Same as planned - 17.48 km - 31.3 km (including replacement) - 1,880
<b>(4) Idappadi</b> - Water purification plant - Water intake facility - Pumping facility - Transmission pipes - Distribution pipes - Feeder main - Service reservoir - House service connection	- Capacity 5,600 m <sup>3</sup> /day - 1 No. - 1 No. - 11.0 km - 25.63 km - 18.10 km - 3 Nos. - 2,352	- Capacity 6,800 m <sup>3</sup> /day - Same as planned - Same as planned - 9.7 km - 105.0 km - Same as planned - 4 Nos. - 1,120
<b>(5) Devakottai</b> - Water intake facility - Pumping facility - Transmission pipes - Distribution pipes - House service connection	- 1 No. - 1 No. - 10.3 km - 35.6 km - 2,100	- Same as planned - Same as planned - Same as planned - Same as planned - 3,256

Item	Plan	Actual
<b>(6) Thoothukudi</b> - Water purification plant - Water intake facility - Pumping facility - Transmission pipes - Distribution pipes - Service reservoir	- Capacity 84,000 m <sup>3</sup> /day - 1 No. - 4 Nos - 35.9 km - 526 km - 22 Nos.	- Capacity: 97,000 m <sup>3</sup> /day - Same as planned - Same as planned - Same as planned - Same as planned - Same as planned
<b>(7) Dindigul</b> - Water purification plant - Pumping facility - Transmission pipes - Distribution pipes - Replacement of feeder main - Service reservoir - House service connection	- Capacity 16,800 m <sup>3</sup> /day - 4 Nos. - 19.9 km - 227.6 km - 5.2 km - 4 Nos. - 30,000	- Same as planned - Same as planned - 21.8 km - 235.8 km - 6.7 km - Same as planned - 27,300
<b>(8) Mettupalayam</b> - Transmission pipes - Distribution pipes - Service reservoir - House service connection	- 2.4 km - 27.6 km - 1 No. - 2,870	- Same as planned - 25.3 km - Same as planned - 1,880
<b>(9) Udumalpet</b> - Distribution pipes - Service reservoir - Disinfection system provision - House service connection	- 66.8 km - 1 No - 9 Nos. - 6,934	- 70.2 km - Same as planned - Same as planned - 6,645
<b>(10) Madhavaram</b> - Transmission pipes - Distribution pipes - Service reservoir - House service connection	- 4.3 km - 168.4 km - 7 Nos. - 29,730	- 3.5 km - 155.6 km - 6 Nos. - 14,156
2. Project Period	March 2008 – June 2013 (64 months)	March 2008- November 2021 (165 months)
3. Project Cost		
Amount Paid in Foreign Currency	308 million yen	N.A.
Amount Paid in Local Currency	9,516 million yen (3,339 million rupee)	N.A.
Total	9,824 million yen	10,507 million yen
ODA Loan Portion	8,551 million yen	6,818 million yen
Exchange Rate	1 rupee = 2.58 yen (As of July 2007)	1 rupee = 1.66 yen (Average between 2009-2021)
4. Final Disbursement	March 2016	