India

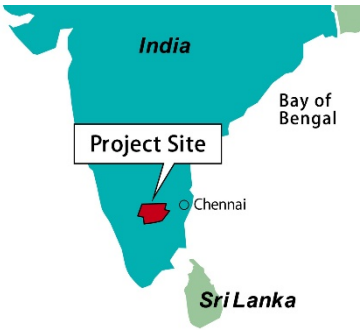
FY2018 Ex-Post Evaluation of Japanese ODA Loan
"Hogenakkal Water Supply and Fluorosis Mitigation Project (L/A No. ID-P195)" and
"Hogenakkal Water Supply and Fluorosis Mitigation Project Phase II (L/A No. ID-P204)"
External Evaluator: Eriko Yamashita, Value Frontier, Co., Ltd.

0. Summary

The objective of the "Hogenakkal Water Supply and Fluorosis Mitigation Project" and "Hogenakkal Water Supply and Fluorosis Mitigation Project Phase II" (hereinafter referred as "the Project") is to provide safe and reliable water supply services to meet the increasing water demand in the Dharmapuri and Krishnagiri districts in the southern State of Tamil Nadu, India by constructing water supply facilities sourced from the River Cauvery and providing fluoride mitigation support, thereby improving living conditions of the residents in the concerned areas. The Project is consistent with India's national development and sector policies that uphold securing safe water to all, development needs of the two districts that were suffering from chronic water shortage and were dependent on fluoride-contaminated groundwater, and Japanese ODA policies. Therefore, its relevancy is high. While the Project cost was within the planned cost, the Project period was much longer than planned, due to the delayed authorization for water connection in two areas and the delayed implementation of the fluorosis mitigation component. Therefore, efficiency of the Project is fair. The target effect indicators, including the served population and water supply amount, were all met, and the water quality meets the national standard for drinking water. Accordingly providing a reliable safe water supply has been achieved by the Project. The residents' living conditions in the two districts have improved, as drinking water became available inside their living habitations and the labour for water fetching was reduced, thus, allowing for the utilization of saved time and energy in other activities. In addition, with the availability of the safe drinking water provided by the Project the residents in future generations are expected to reduce the fluorosis prevalence among them. Therefore, effectiveness and impacts are high. The facilities constructed by the Project are operated and maintained appropriately, and there are no major issues in institutional/organisational, technical, or financial aspects. Thus, sustainability of the Project is high.

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

1. Project Description



Project Location Map

(Photo) Hogenakkal Water Treatment Plant

1.1 Background

The Dharmapuri and Krishnagiri districts in Tamil Nadu State, with a total of 2.98 million people (2006) of which 1.1 million were living under the poverty line, were facing the increased water demand that came with its population increase. The two districts were suffering from recurring water shortages, due to little annual precipitation and the absence of any dependable and portable water supply, without surface water source nearby. Accordingly, the residents depended too heavily on groundwater for their drinking water sources, therefore, leading to its depletion. Furthermore, the groundwater in the two districts was contaminated with high levels of fluoride content, resulting in wide prevalence of dental, skeletal, and non-skeletal fluorosis among the residents.

Meanwhile, ownership of local level water supply schemes had been transferred to local bodies, as a result of the Constitutional reform in 1992, and a community-based approach for water supply operation and management was being experimented.

1.2 Project Outline

The objective of this Project is to provide safe and reliable water supply services for the Dharmapuri and Krishnagiri districts, in the State of Tamil Nadu, by constructing water supply facilities, sourced from the River Cauvery, and providing fluoride mitigation support, thereby improving living conditions of the residents in the concerned areas.

<ODA Loan Project>

Loan Approved Amount/ Disbursed Amount	Phase 1: (L/A No. ID-P195) 22,387 million yen / 16,885 million yen Phase 2:(L/A No. ID-P204) 17,095 million yen / 7,304 million yen
Exchange of Notes Date/ Loan Agreement Signing Date	Phase 1: (L/A No. ID-P195) March 10, 2008/ March 10, 2008

	Phase 2: (L/A No. ID-P204) March 27, 2009/ March 31, 2009	
Terms and Conditions	Interest Rate	- 1.20% for Construction of Water Supply Facilities, Fluorosis Mitigation and Capacity Building activities; - 0.01% for Consulting Service
	Repayment Period	30 years
	(Grace Period)	(10 years)
	Conditions for Procurement	General untied
Borrower / Executing Agency	President of India / Tamil Nadu Water Supply and Drainage Board (TWAD)	
Project Completion	July 2017	
Target Area	Dharmapuri district and Krishnagiri district in Tamil Nadu State, India	
Main Contractor(s) (Over 1 billion yen)	IVRCL-CADAGUA Hogenakkal Water Treatment Company Limited, Hyderabad (India &Spain),PRATIBHA INDUSTRIES LTD. (India)/SMC INFRASTRUCTURE PRIVATE LTD (India)/NCC LTD. (India)/M/S ELECTROSTEEL CASTINGS LIMITED (India)、M/S IVRCL INFRASTRUCTURES AND PROJECTS LTD. (India)、LARSEN & TOUBRO LTD. (India)	
Main Consultant(s) (Over 100 million yen)	Metcalf & Eddy Ltd. (Hong Kong)/SHAH TECHNICAL CONSULTANTS PVT. LTD. (India)/Nippon Koei, Ltd. (Japan)	
Related Studies (Feasibility Studies, etc.)	JBIC Special Assistance for Project Formation (SAPROF) for Hogenakkal Water Supply Project in the Republic of India (2007)	
Related Projects	[ODA Loan - financed Technical Cooperation]: Counterpart Training Course in Japan; Hogenakkal Water Supply and Fluorosis Mitigation Project (2012) [ODA Loan] Tamil Nadu Biodiversity Conservation and Greening Project (February, 2011)	

2. Outline of the Evaluation Study

2.1 External Evaluator

Eriko Yamashita, Value Frontier Co., Ltd.

2.2 Duration of Evaluation Study

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

Duration of the Study: November 2018 – October 2019

Duration of the Field Study: February 10, 2019 – March 2, 2019 & May 11, 2019 – May 18, 2019

2.3 Constraints during the Evaluation Study

The planned figures for the total outputs and cost for the construction of water supply facilities were revised based on the "Detailed Design" conducted after the initiation of Phase 1. However, documents regarding this change were not available for this evaluation; therefore, the evaluator was unable to conduct an analysis on the background and details of the changes applied in the revision.

Additionally, financial statements of the Executing Agency, for the fiscal years after 2016, were not yet published and available at the time of this ex-post evaluation. Therefore, the evaluator alternatively conducted an analysis on the financial status of operation and maintenance of this Project in section 3.4.3, "Financial Aspects of Operation and Maintenance."

3. Results of the Evaluation (Overall Rating: A[1])

3.1 Relevance (Rating: ③[2])

3.1.1 Consistency with the Development Plan of India

As a national development policy at the time of appraisal in 2008, the *Eleventh Five Year Plan (2007-2012)* upheld that clean drinking water be available for all by 2009, as one of the twenty-seven national targets. Efforts for rural areas are considered especially indispensable, for full coverage of the rural drinking water supply to be achieved by March 2009. In addition, for the first time in the *Five Year Plans,* establishing institutional frameworks for fluorosis mitigation was discussed to enhance disease reduction efforts, and, consequently, the *National Programme for Prevention and Control of Fluorosis* (NPPCF) was launched in 2008-2009.

As sector policy, the *National Water Policy – 2002* affirmed that drinking water provision should be "a primary consideration" in water resource development, and that sufficient and safe drinking water should be provided to the entire population. The Presidential Minimum Common Programme, published by the presidential administration that started in May 2004, also stated policies to expand public investment in water supply facilities, drinking water provision for the entire population, including both urban and rural areas, and expansion of drinking water sources, as the highest priority issues.

At the time of ex-post evaluation, a national development policy, the *Three Year Action Agenda (2017-2019)* holds its vision for assuring water security through the sustainable management of

[1] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

[2] ③: High, ②: Fair, ①: Low

available water resources for economic prosperity and environmental stability of India. It states in the health chapter that uninterrupted water supply should be provided in rural areas and piped water supply should be promoted for households in urban areas. In addition, it states the importance of assuring that fluoride-affected patients should be treated and that water resources are free of contamination. The *National Water Policy – 2012* states that access to safe drinking water continues to be a problem in many areas. It stresses that safe drinking water should be considered pre-emptive needs of people with high prioritization.

NPPCF continued under the *Twelfth Five Year Plan (2012-2017)*. At the time of ex-evaluation, continued actions were taken by medical authorities at the level of State and District.

3.1.2 Consistency with the Development Needs of India

At the time of appraisal in India, improvement in the indication of the population with access to safe water[3] had fallen behind the increasing demand for water, concurring with increasing population and economic development, and the population was facing problems in terms of water volume, quality, and related services. The development gap between urban areas and rural areas was large, and the percentage of people with access to safe water was 95% in urban areas and 79% in rural areas, in 2000. Additionally, as a result of excessive dependence on groundwater as a water source, the groundwater level was lowered and harmful substances were found. Patients with fluorosis, infected by the fluoride found in the groundwater, totaled over 60 million people in India, of which the majority was from rural areas.

In Tamil Nadu State, 968 habitations, out of the total 81,787, were neither covered nor partially covered with water supply, as of April 2006; of those, 711 of such habitations belonged to the Project area. The annual precipitation in the Project area is less than the average of the nation and the State, and residents depended on their water sources from groundwater, while two thirds of the habitations were suffering with chronic water shortage. A total of 30-60% of the water sources were detected as contaminated with fluoride; especially, in the Dharmapuri district, 9.0mg/L of fluoride was identified, which was far beyond the WHO drinking water standard of 1.5mg/L.

At the time of ex-post evaluation, the percentage of people with access to safe water in India is 73.8% (2018) in rural areas, and needs for improved access to safe water remains high. In Tamil Nadu State, among the total 100,014 habitations, 4,411 are still "partially covered with water supply[4]." The Project area continues with rainfall shortages and high fluoride contamination levels of its groundwater, at the time of ex-post evaluation, similarly as the time of the appraisal. Therefore, there is still a great need for a reliable supply of safe water that meets the national standard for drinking water.

[3] The percentage of people with access to water more than 40L per day
[4] Habitation with access to water, but less than 40L per day per person

3.1.3 Consistency with Japan's ODA Policy

At the time of appraisal, the *ODA Charter (2003)* emphasized the need for assistance in the water and sanitation sectors, under a priority issue of "Poverty reduction." Under a separate priority issue of "Addressing global issues," it also upheld addressing environmental problems and infectious diseases through the ODA. The *Medium-Term Policy on ODA (2005)*, as an approach for "Poverty reduction," upheld its policies to enhance basic social services, including an active support for assuring safe water supply. In the *JBIC Overseas Economic Cooperation Strategy (2005)*, it aimed to enhance poverty reduction through sustainable growth, and the prioritized assistance areas included economic infrastructure development, rural development that would benefit the poor classes of population and addressing environmental issues. Furthermore, the *Country Assistance Plan for India (2006)* listed "improvement of the poverty and environmental issues" as a prioritized area, in which assistance for water supply and sanitation was considered as an important effort to address environmental management issues.

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

3.2 Efficiency (Rating: ②) [5]

3.2.1 Project Outputs

a) Construction of Water Supply Facilities

	【Plan】			【Actual】		
Facility	Total (Appraisal at Phase 2)	ODA Loan Coverage		Total	ODA Loan Coverage	
		Phase 1	Phase 2		Phase 1	Phase 2
Water Treatment Plant	160 Million Liters per Day			159.92 Million Liters per Day		
Transmission Mains	401 km	293 km	108 km	288.29km	221.12km	67.17km
Feeder Mains in Urban areas	22 km	22 km	0 km	112.46km	105.19km	7.27km
Booster Stations	6	2	4	6	2	4
Master Balancing Reservoirs on Transmission Mains	27	2*	2	16	13	3
Over-Head Tanks*	1,063	1,709*	133	530	481	49
Internal Networks*	8,875km	8,020km*	2,644km	9,996km	6,835km	3,161km
Public Fountains*	1,507	4,624*	225	638	587	51
Electricity Feeder Main				16 Electricity Feeder Mains		
Provision of SCADA (Supervisory Control And Data Acquisition)				As planned		

*As a result of the "Detailed Design" review, conducted after Phase 1's initiation, some numbers for the total outputs were revised by the time of the Phase 2 appraisal. However, the detailed information regarding changes applied for Phase 1's output numbers, or its background, were not available. Therefore, the numbers listed in the Phase 1 column were the original numbers planned at the time of Phase 1's appraisal.
Source：Documents provided by JICA and TWAD

[5] This Project was originally planned to be a single ODA loan project for the fiscal year 2008, but the Hosur area in the Krishnagiri district was removed from the Phase 1 project scope on its phase separation to be covered in Phase 2, due to the annual ceiling for the total Japanese ODA loan amount for India. Therefore, baseline values, as well as target values for Phase 1, were established, excluding the Hosur area. However, the Phase 2 appraisal established comprehensive values for both baseline and targets, covering the entire Project area (covering both phase 1 and Phase 2). Considering this background, this ex-post evaluation analyzed and made evaluation judgement based on the indicator values established at the Phase 2 appraisal (2009).

The output reduction of over-head tanks (OHT) and public fountains (PF) against the plan is due to a policy change as a result of the "Detailed Design[6]," that utilizes existing facilities in some towns and villages instead of constructing new facilities, based on re-analysis of the planned water supply amount by the Project and the capacity of the existing facilities. This policy change did not influence the achievement of the Project objective to construct necessary water supply facilities to provide sufficient amount of water to all the habitations and populations of the Project area. Changes in the total length of transmission mains and distribution networks were due to layout changes, in accordance with the "Detailed Design" and the site conditions, which were necessary and appropriate changes to achieve the Project objective.

b) Project Activities

i) Fluorosis Mitigation Component

Activities under the Fluorosis Mitigation (FM) component were implemented through the following approaches: 1) Medical Approach, 2) School Approach, and 3) Community Approach. All approaches were in an effort to improve FM knowledge of medical officers, teachers, and residents, in the Project area, for the purpose of enhancing fluorosis mitigation by enabling fluorosis diagnosis, providing the appropriate medical treatment, and promoting fluorosis prevention.

Activities	Plan	Actual
Baseline Survey: Family Health Survey on fluorosis	Survey on 596,023 households	Survey on 667,224 households
Training for doctors and teachers	554 doctors and 3,000 teachers	841 doctors and 3,785 teachers
Information, Education, and Communication (IEC) activities (including diet counselling)	Mass Media Audio Visual Media Print Media Folk Media/Street Play Group Counselling Essay Contest/Debate Event	Audio Visual Media Print Media Folk Media/Street Play Group Counselling Essay Contest/Debate Event
Training on fluorosis diagnosis through fluoride blood testing	Training on fluorosis diagnosis for 4 technical experts in laboratories for 10 days: testing fluoride in human bodies (urine, blood) and drinking water	As planned
	Monitoring	Impact assessment with the selected population group to monitor fluoride urine analysis

[6] In areas where the existing groundwater sources are confirmed to be safe, some local bodies deliver water services with the water combined, from the Project and the groundwater in OHT. However, the combining ratio of the two water sources was strictly defined at the time of planning with meticulous calculation, and it was confirmed that the water quality of the combined water has met the Indian Standard for Drinking Water.

Others	Hiring fluorosis specialists	Hired a consulting team; fluorosis specialists elaborated the detailed implementation plan; it was approved.
	Procurement of equipment and supplies for diagnosis and trainings	- C-arm (Mobile) Image Intensifier (1 unit) - Automated Analyzer (3 units) - Dental Chairs (17 units)

Source：Documents provided by JICA and TWAD

For the FM component, all the planned activities were implemented. The detailed implementation plan was prepared by the hired fluorosis specialist consulting team, under the supervision of the Project FM committee. During the implementation process, some activity details were revised, based on the actual conditions of the Project area, and some activities were conducted for more beneficiaries than planned, resulting in some increased outputs.

ii) Capacity Building Component

Another component of the Project activities was capacity building for local bodies that assume responsibility for operation and maintenance (O&M) of the water supply facilities constructed at the local level (referring OHT, and the below internal distribution networks and the PFs). At appraisal, it was planned to consist of: (i) Training programme for local bodies for O&M and financial sustainability, (ii) Expansion of training facilities, (iii) Elaboration of village plans for equitable water management, and (iv) Monitoring and Evaluation. However, the activities of (i), (ii), (iii), and (iv) were not implemented, and a situation analysis was first conducted, instead, based on which a detailed implementation plan for capacity building, that is, the originally planned (i) – (iv) activities, was elaborated. Influenced by a delay in elaborating the implementation plan and a delayed institutionalization process of local bodies, which was due to a political confusion of the State during the Project period, JICA and TWAD agreed to exclude the activities of (i), (ii), (iii), and (iv) from the Project scope. The necessary budget for its implementation was allocated by TWAD in July 2018, but it has not yet implemented at the time of ex-post evaluation report.

3.2.2 Project Inputs

3.2.2.1 Project Cost

The planned Project cost was 48,024 million yen (ODA loan amount: 39,482 million yen), and the actual cost was 33,243 million yen[7] (ODA loan amount: 24,190 million yen), which

[7] In accordance with JICA's Ex-post Evaluation Reference, the yen amount was calculated based on the annual average of IFS exchange rate during the Project period from the Project cost paid in Indian Rupees. On the other hand, TWAD has recorded the Project cost in yen amount as 31, 209 million yen, based on the actual exchange rate of the moment of its disbursement every time the related payment was made.

represents 69.2% of the plan; thus, the actual Project cost was within the planned cost. The main reason the actual cost was far below that of the plan was because the exchange rate between Indian Rupees and Japanese Yen turned out to be preferred during the Project implementation period[8]. Actually, in Indian Rupees, the total planned cost was 19,288 million Rupees, while the actual cost was 18,561 million Rupees; thus, the actual cost corresponded to 96.2% of the planned cost. While the actual cost in Indian Rupees was slightly less than the planned cost, the actual cost in Japanese Yen was significantly below the planned cost in its term.

3.2.2.2 Project Period

The Project period was planned for 65 months, from March 2008 (signing of the Loan Agreement) to July 2013 (completion of the consulting service[9]), but the actual Project period resulted in 113 months, from March 2008 (signing of the Loan Agreement) to July 2017, and was significantly longer than planned (173.8% of the plan). Despite over 90% of the water supply facilities' construction was completed within the planned period, the start of construction and connection work was delayed in two areas (a reserved forest area and an area where highway expansion work was initiated during the implementation period) due to delayed authorization from the related other government agencies. The implementation process of the FM component and Capacity Building component was also delayed. Thus, the actual period turned out to be significantly longer than planned.

Regarding whether or not Inputs (cost and period) were appropriate for the Output achievement, TWAD answered in the questionnaire response that they were appropriate, as the planned outputs were achieved within the planned inputs, with the exception of delayed construction in the two areas, caused by the factors that TWAD could not control (delayed authorization by other government agencies). The output reduction of new OHTs and PFs were appropriate changes, made on a policy-change decision, to utilize the existing facilities, and the reduced cost of these changes represents only 0.7% of the total Project cost, which is considered to have had minimum influence in the inputs. Therefore, it is fair to say that the Project inputs were appropriate for achieving the Project outputs.

3.2.3 Results of Calculations for Internal Rates of Return (Reference only)

Due to the nature of the Project, only Economic Internal Rates of Return (EIRR) were

[8] The exchange rate referred at the planning time of Project cost was 2.49 yen against 1 Indian Rupee, while the IFS rate at the Project completion, July 2017, was 1.74 yen against 1 Indian Rupee.

[9] Although the definition of the Project completion at the Phase 1 appraisal was the completion of the construction, it was agreed at the Phase 2 appraisal that the definition would be changed to the completion of the consulting service. Because in this ex-post evaluation the Project indicators were analyzed against the indicators established at the Phase 2 appraisal, likewise the Project completion definition at the Phase 2 appraisal was adopted, that is "the completion of consulting service."

calculated at the time of appraisal.

For the ex-post evaluation, the EIRR was recalculated and compared with the EIRR for Phase 2 that covers the entire Project. The EIRR increased, due to a higher increase in population than expected, resulting in increased water supply amount and, accordingly, the increased benefits, while the actual costs in Indian Rupees were almost the same as the planned cost.

	Appraisal at Phase 2 (2008)	Ex-post Evaluation
EIRR	9.05% (Project Life: 25 years)	10.16% (Project Life: 25 years)
i) Cost	i) Capital Cost (excluding tax), and Operation and Maintenance Cost	
ii) Benefit	ii) Reduction in the number of hours for drawing water, Increase in the number of workable hours, and Decrease in healthcare related expenditure, etc.	(the same as left)

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

3.3 Effectiveness and Impacts[10] (Rating: ③)[11]

3.3.1 Effectiveness

3.3.1.1 Quantitative Effects (Operation and Effect Indicators)

【Operation Indicators】

Operation Indicator	Target (Not established)	Actual 2017 Completion Year	Actual 2018 1 Year After Completion
Raw water intake (MLD*/ sec)	—	1,198	1,325
Maximum amount of average daily production (m^3/day)	—	134,987	135,225
Average amount of daily supply (m^3/day)	—	103,161	135,225
Rate of facility utilization (%)**	—	64	71
Average water feed pressure (m)	—	Not Available	Not Available

*MLD: Million Liters per Day
**Rate of facility utilization was calculated as (Average amount of daily supply) ÷ (Facility Capacity) × 100
Source: documents provided by TWAD

Although operation indicators were not established for the Project at the time of appraisal , this ex-post evaluation analysed performance indicators as supplemental operation indicators, in order to confirm the Project's achievement against its objective to provide "reliable water supply services." As a result, it was confirmed that most of the relevant operation indicators showed appropriate values in accordance with the operation plan, and no major issues were

[10] Sub-rating for Effectiveness is to be put with consideration of Impacts.
[11] As described in the footnote # 5, the evaluation was conducted with the indicators established at the Phase 2 appraisal in 2009.

found. Regarding the average water feed pressure, water supply operation from the treatment plant to OHT, including water pressure, has been monitored and registered in accordance with the operation plan, and no major issues were found. However, the junction points from feeder mains to internal network are under the responsibilities of local bodies, in which water feed pressure is not monitored or registered by local bodies. Therefore, it was not possible to analyse and evaluate the average water feed pressure.

【Effect Indicators】

The appraisal documents state that the ex-post evaluation be conducted with indicators registered "2 years after the Project completion." However, the year in which this ex-post evaluation was conducted corresponds to "1 year after the Project completion." Therefore, the following evaluation judgements were made, as such, based on the registered indicators in 2018, which is "1 year after the Project completion."

Effect Indicator		Baseline 2007	Target 2015 2 years after completion	Actual 2017 Completion year	Actual 2018 1 year after completion
Population served (thousand)		910	3,238	3,342	3,376
Total available amount of water supply (㎥/day)		40,875	152,799	144,185	160,075
Water availability amount (liters per capital and per day)					
	Municipality	37	90	90	90
	Town Panchayat	29	70	70	70
	Habitation	10	40	40	40
(Additional indicators) Quality of treated water	Fluoride (mg/L)	Not available	Not defined	0.1	0.1
	Iron (mg/L)	Not available	Not defined	Not detected	Not detected
	E. Coli (numbers)	Not available	Not defined	Not detected	Not detected
	Turbidity (NTU)	Not available	Not defined	0.50	0.35
	Manganese (mg/L)	Not available	Not defined	Not detected	Not detected

Source: Documents provided by JICA and TWAD.
Note: In Indian statistics, the population served is calculated as a sum of the population living in the water served areas. The total amount of water supply is decided based on the population statistics, multiplying the number of populations served by the minimum water availability amount needed in accordance with the corresponding area category.

The actual indicator values regarding the population served and the total available amount of water supply, shown at 1 year after the Project completion, are already beyond the target values set for 2 years after the Project completion, reflecting the actual increase of the population. In the appraisal documents, an indicator for water supply hours was originally set with a target value of "4 hours," which was actually intended to be a design parameter for capacity of the facilities, in consideration of an average water supply hours ensured at OHT, and the related facilities were constructed as planned. It should be noted that the water supply

service hours at the user level vary depending on operation rules of each local body. The water quality is inspected and recorded every hour at the water treatment plant. The fluoride records a level of 0.1mg/L or below, while the Indian Standard for Drinking Water requires 1 - 1.5mg/L. Iron, E. Coli, manganese were not detected. Turbidity is less than 0.35- 0.5NTU[12], far below the national standard that is 5- 10NTU.

3.3.1.2 Qualitative Effects (Other Effects)

(None)

3.3.2 Impacts

3.3.2.1 Intended Impacts

【Quantitative Impact】

At the time of appraisal, 2 intended quantitative impacts were defined: a) Decreased rate of non-skeletal fluorosis-affected patients, and b) Decreased rate of dental fluorosis-affected 'Students' in the Project area.

a) Decreased rate of non-skeletal fluorosis-affected patients

The baseline survey, covering all of the population in the Project area, was conducted as follows. The hired NGOs conducted door-to-door surveys, which concluded a non-skeletal fluorosis rate in the Project area as 7.2% in 2012. The survey following the Project completion has not yet been conducted, and the corresponding data, namely the rate of non-skeletal fluorosis-affected patients at the time of ex-post evaluation, is not available. During the field study, the evaluator tried to confirm this impact achievement through interviews with medical officers in the Project area. However, most non-skeletal fluorosis-affected patients do not visit medical facilities, and fluorosis diagnosis is not possible without conducting fluoride testing in such facilities; therefore, medical officers were not able to indicate the tendency rate (increase/decrease) of patients affected by non-skeletal fluorosis at the time of ex-post evaluation.

b) Decreased rate of dental fluorosis-affected "Students" in the Project area

The baseline survey to determine the rate of dental fluorosis-affected students was conducted in 2012 by the trained teachers by the Project, which revealed a rate of 42.0% in public schools and 33.1% in private schools. Subjects surveyed were students between the ages of 6 and 11. In order to confirm if the rate has decreased, a survey, consisting of students of the same ages who are provided safe drinking water by the Project during their childhood, should be conducted 6 to 8 years after the Project completion, as it should take at least this long for a new patient to

[12] Nephelometric Turbidity Unit

contract dental fluorosis. The MOU, signed in November 2008, indicates that the impact assessment should be conducted 8 years following the Project's completion by the related government institution. At the time of ex-post evaluation, the assessment has not been conducted and, thus, impact is not yet possible to confirm this impact.

【Qualitative Impact】

a) Improvement of living conditions

The interview results with the District governments, local bodies, and residents in the Project area, at the time of this ex-post evaluation, confirmed the following findings. First, residents in rural areas without a water source used to go to other villages to fetch water; however, since the Project, they no longer need to do so and are able to collect drinking water inside their own village. Secondly, a number of interviewed residents expressed that the saved time for water collection goes toward other activities, and scheduling day-activities is now possible, as water is supplied at scheduled hours, which allows them to use their time and energy effectively and efficiently. On the other hand, the interview results indicate that some local bodies have irregular water supply hours or issues of unequal water distribution: As operation of water supply facilities under OHT is the responsibility of each local body, the actual water supply service conditions vary. Power supply conditions also influence the stability of the water supply service in some local bodies. Thus, the water supply services at the user-end vary depending on local bodies.

b) Improvement of health conditions

It is expected that future cases of fluorosis-affected patients will decrease, considering that residents who had depended on the water source, which was contaminated with fluoride, now drink safe water supplied through the distribution network constructed by the Project, for which the water quality is confirmed. The interviewed skeletal-fluorosis patients during the field study expressed that they feel less pain after they started drinking the water supplied by the Project. According to a study report,[13] provided by JICA, the number of residents who go to primary healthcare centres to request medicines for general water-borne diseases has decreased[14].

Under the FM component of the Project, fluoride-level monitoring in urine analysis of the selected residents was conducted as an "impact assessment" to confirm the impact of water supply. Among the residents initially identified with various non-skeletal fluorosis symptoms, 25,325 were diagnosed as non-skeletal fluorosis patients and preliminarily selected as the target monitoring group. Then, their urine sample was analysed twice, with a 5-month interval, after

[13] Project Study Report "*Establishment of Gender mainstreaming structure*" attachment 2-7 *"Site visit report of Hogenakkal Water Supply and Fluorosis Mitigation Project (Phases 1 and 2) in India*" (July 2016), M&Y Consultants., Co. Ltd. and Koei Research Institute

[14] According to the Project Study report, conditions such as diarrhea, fever, and dysentery are decreased.

conveying the diagnosis to the patients, in order to confirm if there is any variation in the fluoride level in their urine sample. The result shows that the number of patients with more than 1mg/L in their urine decreased by 18%, compared to the first analysis conducted at the time the diagnosis was conveyed. However, water supply by the Project had been initiated two years before the time the diagnoses was conveyed; therefore, the fluoride-level decrease cannot be exclusively attributed as the impact of the Project's water supply. Additionally, the level of fluoride in urine is determined, not only by the level of fluoride intake through drinking water, but by many factors, such as a consistent and balanced diet, degree of advanced fluorosis, and patients' age, among others. Considering this presupposition, a discussion between the evaluator and DHFW medical officers in Tamil Nadu suggests another possible interpretation. The discussion led to consideration that the decrease in fluoride-levels among the patients diagnosed with non-skeletal fluorosis can also be partially attributed to their increased concerns about fluorosis after receiving their diagnosis, which may have induced their further behavioural change in the consideration of safe drinking water[15].

c) Increased awareness and knowledge of fluorosis among doctors, teachers, and residents in the Project area

Increased awareness and knowledge of fluorosis among doctors and teachers was confirmed through field survey interviews. The related manuals and materials generated by the Project were continuously used at public facilities, including medical outlets and schools in the Project area, and knowledge of fluorosis also increased among students. On the other hand, the impact from Information, Education, and Communication (IEC) activities for residents, at the community level, was considered limited. Based on the interview results, the assumed reasons include: i) residents did not clearly understand the IEC activities, ii) fluorosis is a low priority for residents, as most cases do not influence their daily life, and iii) one-time activities by the Project were not enough to ensure sustained awareness and knowledge for the residents.

Regarding water safety, in areas where groundwater availability is sufficient, interview results revealed that the value of water safety provided by the Project was widely recognized, and the residents use groundwater and the water supplied by the Project for different purposes. In areas which had chronically severe water shortages before the Project, on the other hand, all interviewed residents expressed their satisfaction purely with larger water availability and realizable water supply by the Project, rather than the ensured water safety. Among residents living with economically limited conditions, knowledge on water safety was hardly confirmed, but they widely recognized the difference in water taste, as the water supplied by the Project is "not salty and delicious."

[15] By learning that groundwater was a major factor for fluorosis, the residents started ensuring the use of piped water to be for drinking and cooking and minding sources of drinking water constantly.

Left： Women collecting water at a PF.
Right： In this local body, PFs were constructed in front of each house.

3.3.2.2 Other Positive and Negative Impacts

a) Impacts on Gender

In many households in the Project area, water collection is a job for women. The Project benefitted women by allowing them to collect a necessary amount of water for daily life in proximate distance from their house and inside their own village, therefore, enabling them to save time collecting water and spend more relaxed time in early morning and evening, during which they were released from water duties. Some interviewed women expressed that they have more time to farm and can sometimes participate in paid-job activities as day worker; therefore, it can be assumed that they may have increased income. Although it was presumed, at the time of appraisal, that more than 30 % of the capacity building training participants should be women in order to promote women's role in water supply operations and maintenance, the capacity building trainings had not yet been initiated at the time of ex-post evaluation, so it was not possible to confirm the gender impact, in this regard.

b) Impacts on the Natural Environment

Although the Environment Impact Assessment is not required for the construction of water supply facilities in India, TWAD obtained the "No Objection Certificate" for the Project, from the Tamil Nadu Pollution Board, before the implementation. TWAD also confirmed that there was no temperature increase around the water treatment plant after it went into operation. In addition, noise and air monitoring were conducted during construction. The evaluator confirmed the monitoring results for this ex-post evaluation and found no major issues[16].

The treated water by the small-scale wastewater treatment facility,[17] constructed by the Project,

[16] The values between 71.2- 74.3 dB were registered for noise monitoring during the construction period, which was under the daytime exposure limit of 75dB. Ambiental air monitoring was conducted against six parameters of SO2, NO2, Suspended Particulates Matter, Respiratory Suspended Particulate Matter, CO, and Hydrocarbon, and the five parameters which have the guideline requirement, recorded substantially low values within the respective requirement.

[17] Simple sewage treatment system with anaerobic treatment technology called Fluidized Bio-Bed Reactor. The O&M is conducted by TWAD, but the O&M fee was collected from the connected households and commercial housings by the local body that makes a payment to TWAD. The shortage of the O&M income against the O&M cost

is 100% recycled, being used for watering plants and cleaning in the neighbouring area. The sludge generated in the water treatment plant is sun-dried and disposed of by the landfill in the assigned area on the premises and has not generated odour. TWAD explained that farmers can request and obtain the sludge, free of charge; however, it has not been offered to any farmer, as no farmers have shown interest at the time of ex-post evaluation.

c) Resettlement and Land Acquisition

At the time of appraisal, an acquisition of 20.83ha of public and private land was planned for the Project. However, during the "Detailed Design" phase, the decision was made to utilize some existing facilities. Hence, the actual land area for acquisition was reduced to 14.34ha. Most of the acquired land was previously a vacant plot of the land on the premises of public facilities and public schools or vacant land under the property of temples; thus, no resettlement was involved. The necessary land was acquired in accordance with the Land Acquisition Act of 1894, and smooth negotiations were accomplished through appropriate government institutions, such as District governments, the Hindu Religious Charitable and Endowment Department, and Public Works Department, etc. depending on the property owners. As of ex-post evaluation, there have been no issues.

To summarize, the water supply facilities have been operated as planned, and there have been no issues with operation indicators. All effect indicators, regarding the population served, total available amount of water supply, water availability amount per person per day, and water quality of the treated water, have achieved the target values. Therefore, it can be concluded that the Project achieved its purpose to provide a reliable supply of safe water, that meets the Indian Standard for Drinking Water, across the entire Project area. Despite not being able to measure the actual values for the decreased rate of non-skeletal fluorosis-affected patients or the decreased rate of dental fluorosis-affected students in the Project area, the safe and reliable water supply by the Project has improved residents' living conditions: People in areas that previously suffered from chronic water shortages now use the saved energy and time collecting water for other activities. Additionally, because of the availability of safe drinking water, future generations are expected to have a reduced rate of fluorosis prevalence, and the health conditions of the residents are expected to improve, accordingly.

Thus, the Project has generated the expected effects and impacts Therefore, this Project has largely achieved its objectives and effectiveness and impacts of the Project are high.

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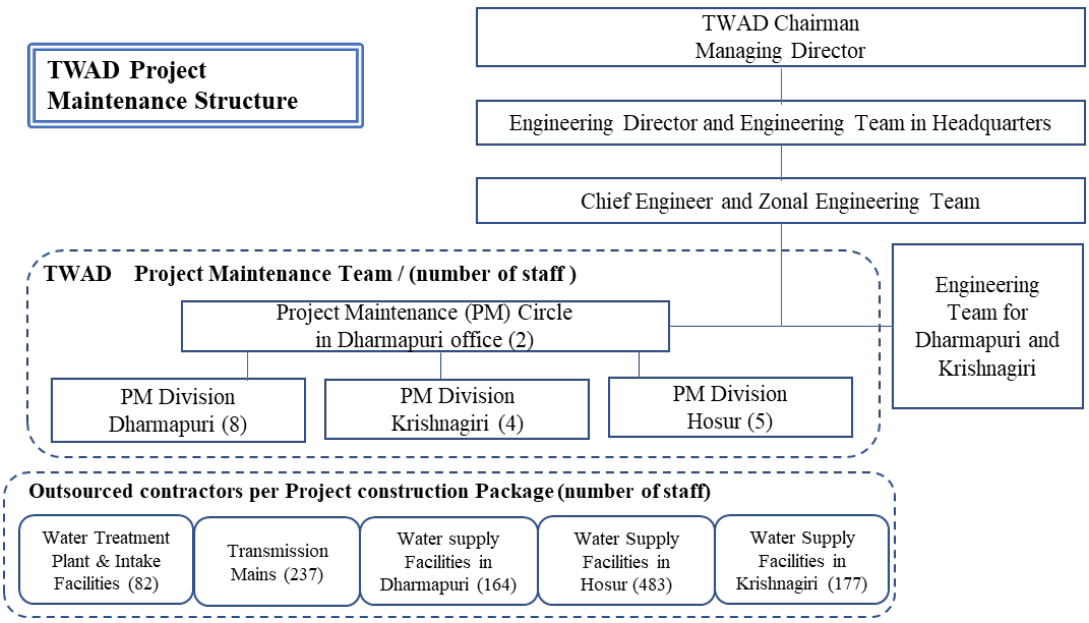
was covered by the State subsidies.

【Colum 1 ：Contributions to SDGs】

	【Contributions to Goals 3 and 6 of the Sustainable Development Goals (SDGs)】 Goal 3: Ensure healthy lives and promote well-being for all at all ages Goal 6: Ensure availability and sustainable management of water and sanitation for all
Target 6.1 under SDG Goal 6 is to "achieve universal and equitable access to safe and affordable drinking water for all" by 2030, and Target 6.4 is to "substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity" by 2030. The objective of this Project is to provide safe and reliable water supply services, sourcing from river water, for all residents in the Project area with severe chronic water shortages and groundwater fluoride contamination, through the bilateral cooperation between Japan and India. This Project has helped achieve the aforementioned targets. In addition, decreasing fluorosis prevalence among the residents in the concerned area is another expected impact of this Project. This goal should be accomplished through increasing access to safe and reliable water supply and the fluorosis mitigation component activities. Accordingly, it is also expected to contribute to the achievement of the SDG Target 3.9 to "substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination" by 2030.	

3.4 Sustainability (Rating: ③)

3.4.1 Institutional / Organizational Aspects of Operation and Maintenance



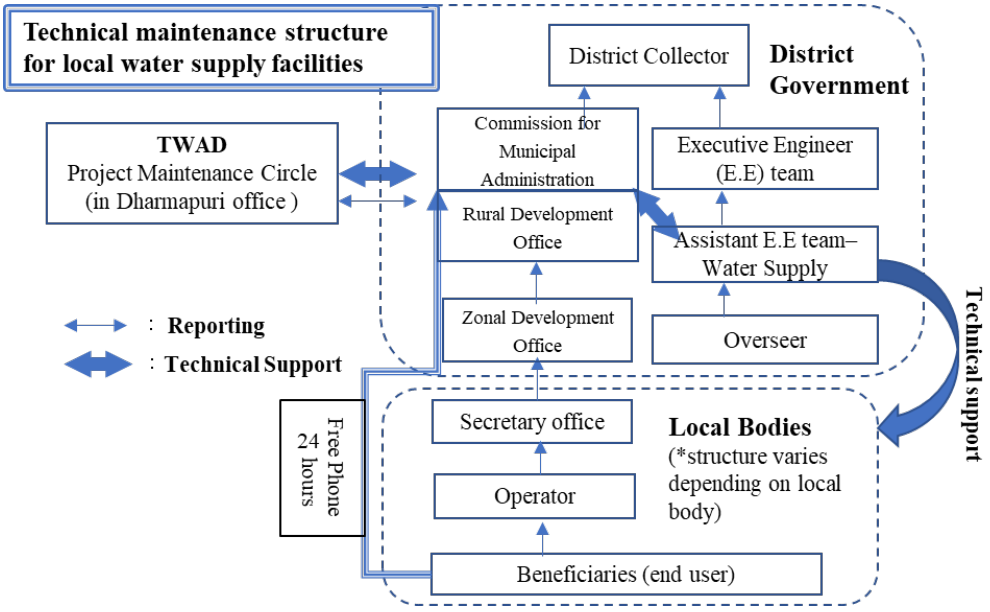
Source：Made by the evaluator

TWAD is mandated to plan and implement water supply and sanitation schemes, corresponding to the time of appraisal, as well as to conduct operations and maintenance (hereinafter referred as "O&M") of combined facilities (facilities that benefit more than one local body) in Tamil Nadu State, except for the Chennai metropolitan area. As of January 2019, TWAD has 3,162 administration staff and 765 engineers. The total number of available posts has been decreasing over the past decade, along with its financial reform. However, having started outsourcing of daily O&M activities, the reduction in posts has not influenced their actual O&M. As for this Project's O&M, water supply facilities from the intake facilities up to OHTs are operated and maintained by TWAD, as planned. The number of TWAD engineers in charge of the Project's O&M is 19, and, under their supervision, 1,143 outsourced contractors[18] appropriately conduct daily O&M.

The District governments and local bodies bear the responsibility of O&M for the water supply facilities under OHTs. The two District governments have close communication and daily coordination with TWAD, supervising maintenance conducted by local bodies in the respective districts. Each local body manages the water supply facilities of its designated area and assigns a minimum of one to three operators in rural areas. When any technical issue is found, the local body firstly tries to solve the issue on its own. When the issue is beyond its technical capacity, the local body reports to the District government, and District engineers are dispatched to analyse the situation and handle straightforward repairs. When the District engineers determine that advanced technical support is necessary, they contact the regional office of TWAD to request technical support from TWAD engineers. While the operation for the local level water supply facilities is handled by the District government and local bodies, as previously mentioned, appropriate institutional framework has been established to conduct necessary maintenance, in consideration of the water supply importance in residents' daily lives.

In addition to the above institutional O&M framework, the District governments in the Project area initiated a new organizational initiative in 2015, in which the Project beneficiaries can contact and report any issue concerning water supply directly to District government through a free 24-hour phone line. When District government receives a report or request from beneficiaries through this line, the District government is committed to solving the issue within 24 hours of receiving the call. The number of phone calls, issues, provided responses, and response time are fully recorded and regularly reported to the District Collector. When the beneficiaries are not satisfied with the O&M or responses of the technical support conducted by their own local body, they use this initiative as an alternative to resorting to the direct reporting to the District government.

[18] Different contractors are hired depending on type of facilities and region.



Source：Made by the evaluator

Therefore, sustainability for the institutional/organization aspect of operation and maintenance is high.

3.4.2 Technical Aspects of Operation and Maintenance

In total, 15 TWAD engineers received trainings conducted by the Project. At the time of ex-post evaluation, 6 of those engineers continue to be responsible for O&M of the Project facilities, providing technical support to the District engineers and outsourced technical staff, as necessary. Moreover, all TWAD engineers receive regular trainings in accordance with their institutional responsibility and professional background. Manuals on the Project's O&M are properly maintained, and the copies are distributed to the relevant divisions and staff in charge, by print and digitally.

At the district level, Commission of Municipal Administration and Department of Rural Development provide technical support regarding the Project maintenance for local bodies, i.e. municipalities and panchayats, in rural areas, respectively. All District engineers participate in regular training courses every year, and the related technical manuals are appropriately maintained and distributed to them. For the local bodies, capacity building on village plan elaboration and operation for equal water distribution is set to be initiated by TWAD between July 2019 and February 2020.

Therefore, there are no major issues found in the technical aspect of operation and maintenance.

3.4.3 Financial Aspects of Operation and Maintenance

TWAD collects water charges, corresponding to the amount of water supplied to the two

Districts, to partially recover the O&M costs. The District governments pay monthly water charges to TWAD using the water user charges that local bodies collect from the beneficiaries, to which the residential tax income and national funds are added to meet the required water charge amount. Although TWAD and District governments cannot fully recover the required O&M cost through this water charge system, there is a mechanism to recover the financial gap of O&M by various funds and subsidies, granted by the national and state governments in light of the national water policies that uphold that drinking water provision is considered one of the most fundamental rights of the population. In Tamil Nadu, a State order provides the guidelines for rural water supply charges, free for PFs and costing 30 Rupees[19] per month for a connected household, in principle. In urban areas, local bodies collect between 40 to 100 Rupees per month from the connected households. It was confirmed that there are a few local bodies with a house connection coverage high enough to cover the necessary O&M cost, through sufficient water user charge income.

The institutional financial statements of TWAD, after FY2016, were not yet published at the time of ex-post evaluation, and the financial figures of the last three years were not available. Therefore, the evaluation on the financial aspect was conducted based on the financial O&M data of this Project only, which is shown in the following table[20].

（Unit：Million Rupees）

	FY*2013	FY2014	FY2015	FY2016	FY2017
Income	127	230	271	295	283
Expenditure	302	540	754	828	775
Profit & Loss	**- 175**	**- 310**	**- 483**	**- 534**	**- 492**
State subsidy	0	0	455	524	524
Total deficit accumulated[21]	**- 175**	**- 485**	**- 513**	**- 523**	**- 491**

Source: Data provided by TWAD
*FY: Fiscal Years

Although the majority of water supply facilities constructed by the Project initiated its operation in December 2013, requests for the State subsidy to recover the O&M deficit were not submitted until FY2015. Since FY2015, the State subsidy has been provided to gradually recover the O&M deficit accumulated over the years. The State subsidies, provided between fiscal years 2015 and 2017, totalled 1,502 million Rupees and covered most of the deficit accumulated between fiscal years 2013 and FY2016. At the time of ex-post evaluation, the 492 million Rupees that correspond to the deficit of FY2017 were in a State subsidy request process and set to be provided within the next fiscal year, 2018, accordingly.

Thus, despite the systematic shortfall of the O&M income against the expenditure of this Project,

[19] The IFS rate at the time of February 2019 is approximately 1.55 yen against 1 Indian Rupee.
[20] The figures shown in the table are rounded off; therefore, some numerical sums do not necessarily match vertically or horizontally.
[21] The total deficit accumulated was calculated as the deduction of the provided subsidies from the accumulated deficit until the corresponding fiscal year.

the gap is to be recovered structurally by the State through subsidy; therefore, there are no major issues, in regard to financial sustainability, to conduct O&M of the Project.

3.4.4 Status of Operation and Maintenance

TWAD monitors water quality hourly at the water treatment plant. Monitoring of water quality at OHTs are entrusted to local bodies, whereas TWAD delivers water quality monitoring kits to local bodies upon their request for free. With support of the SCADA[22] installed by the project, 24-hour monitoring of operation from the water treatment plant to OHTs has been conducted, and no major problems have occurred since the operation started. Necessary preventive measures are taken, as part of daily O&M activities, and necessary spare parts are stored on site. Necessary O&M are also conducted for the facilities under OHTs, which are under the operation of local bodies. Equipment purchased for the FM component are utilized and maintained appropriately inside the located medical facilities.

However, the status of water supply facilities operations under OHT vary depending on capacity of the corresponding local bodies. Based on the interview results during the field survey and the views of TWAD, the reasons for different capacity levels among local bodies are considered to stem from: a) different levels of commitment by local body authorities, b) assorted vocational levels of residents, including operators, and c) various experiences of operating other water supply facilities in the past. Each local body establishes its optimum operation policies for equal water distribution, in accordance with its own environment and conditions, but it seems that residents in some local bodies do not receive the full amount corresponding to the necessary minimum quantity per person per day. Since the independence of a local body's water supply operation is guaranteed by the Constitutions and the national rural water policies, neither this Project nor TWAD can indemnify operational policies or framework of local bodies; therefore, this evaluation cannot make judgements on operational conditions of facilities located at the local level.

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

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

The objective of the Project is to provide safe and reliable water supply services to meet the increasing water demand in the Dharmapuri and Krishnagiri districts in the southern State of Tamil Nadu, India by constructing water supply facilities sourced from the River Cauvery and

[22] Supervisory Control And Data Acquisition

providing fluoride mitigation support, thereby improving living conditions of the residents in the concerned areas. The Project is consistent with India's national development and sector policies that uphold securing safe water to all, development needs of the two districts that were suffering from chronic water shortage and were dependent on fluoride-contaminated groundwater, and Japanese ODA policies. Therefore, its relevancy is high. While the Project cost was within the planned cost, the Project period was much longer than planned, due to the delayed authorization for water connection in two areas and the delayed implementation of the fluorosis mitigation component. Therefore, efficiency of the Project is fair. The target effect indicators, including the served population and water supply amount, were all met, and the water quality meets the national standard for drinking water. Accordingly providing a reliable safe water supply has been achieved by the Project. The residents' living conditions in the two districts have improved, as drinking water became available inside their living habitations and the labour for water fetching was reduced, thus, allowing for the utilization of saved time and energy in other activities. In addition, with the availability of the safe drinking water provided by the Project the residents in future generations are expected to reduce the fluorosis prevalence among them. Therefore, effectiveness and impacts are high. The facilities constructed by the Project are operated and maintained appropriately, and there are no major issues in institutional/ organisational, technical, or financial aspects. Thus, sustainability of the Project is high.

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

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

Achievement of the Project impact, which is defined as the improvement of living and health conditions of residents, should be expected by that the residents drink safe water supplied by the Project. However, if an appropriate amount of water is not equally distributed among the residents at the local level, those with insufficient water could possibly continue relying on the fluoride-contaminated groundwater to fill in the gaps of water shortage, which could limit achievement level of the Project's impact. At the time of ex-post evaluation, cases of unequal water distribution were found in a few communities where some residents were not seemingly receiving the appropriate amount necessary per day per person. This is due to the operational vulnerability, despite TWAD ensuring a reliable, appropriate amount of water supply to all local bodies. As it is critically important to ensure equal water distribution capacity of the local bodies, establishment of constant budget allocation and an institutional support structure within TWAD, would be highly recommended for the implementation of continuous and regular capacity building for local bodies in enhancing equal distribution. A fixed rate and constant budget allocation every year to the capacity building activities as a part of the annual Project maintenance cost estimate, specifically for local bodies in the Project area, for example, could

be considered: TWAD officials consider that 0.5 – 1% of the annual Project maintenance budget investment in the corresponding capacity building is feasible.

4.2.2 Recommendations to JICA

Although the capacity building component for local bodies was removed from the Project scope, and JICA agreed with TWAD that it should be implemented with TWAD funds, JICA should enhance the capacity building implementation through its regular communication with TWAD.

Regarding the confirmation of impact of the FM component, JICA and TWAD had stated in their agreed document that impact assessment should be conducted by the relevant institution in Tamil Nadu, 8 years after the Project completion. JICA is expected to enhance the impact assessment implementation through its regular communication with TWAD.

4.3 Lessons Learned

House connection instalment by the Project

Considering Tamil Nadu State orders ensure no water charges for PF users, it is ideal to enhance house connection in regard to the financial sustainability of the Project. The monthly water user charges for the connected household is kept low, and most local bodies are able to collect the user charges without any major problems: It is noteworthy that a rural local body, which realized 100% house connection of all the households, is fully recovering O&M cost by way of the collected water fee, without depending on subsidies. On the other hand, house connection could be also a cause of unequal water access, generating a disadvantage for some economically-limited households that cannot afford the house connection fee; the connection fee are approximately 6,000 Rupees in urban areas and 1,000 - 2,000 Rupees in rural areas[23]. This is the alleged reason for some local bodies not allowing house connections for any household within their community. Whereas house connection of all households in the entire local body should potentially contribute to the realization of equal water distribution, and ensuring the Project's sustainability, house connection fees are an obstacle for promoting house connection in the Project area. Recognizing this situation, contemplating house connections for the entire project area, as an integral part of the project, should be considered for future similar projects.

The contribution of the fluorosis mitigation component in water supply project

For the first time in India, this project conducted the fluorosis mitigation component as an official and integral part of the water supply project. Fluorosis should be mitigated by providing

[23] The decision-making on operation policies for water supply service, including the user fee, resides with each local body; therefore, the house connection fee differs among local bodies.

residents with safe drinking water, through the Project's constructed water supply facilities. Nevertheless, the fluorosis mitigation component contributed to improving the knowledge of doctors and school teachers in the Project area, resulting in their improved capacity to identify and diagnose the fluorosis-affected patients. It is also expected that the fluorosis mitigation component contribute to the next generation of children having a better understanding on fluorosis through school education, increasing the likelihood to seek medical diagnosis for fluorosis. On the other hand, beneficiaries who were previously exposed to a risk to contract fluorosis or who have already contracted to fluorosis, with increased knowledge on fluorosis, are expected to have more opportunities to receive appropriate medical treatment than before. Additionally, the result of the impact assessment, conducted with urine analysis monitoring of the selected group during the Project, can imply that increased awareness or improved knowledge in residents can further enhance the level of impact achievement in their living and health conditions. Therefore, there is a significant value of having included the specific fluorosis mitigation component in the Project.

Consideration of vulnerability of local bodies: Separation of operational structure and technical maintenance supporting structure for local bodies

Vulnerability of local bodies, that assume O&M responsibility for the water supply facilities under OHT, was commonly recognized from the time of appraisal but remains an 'external factor' for the Project, as operational independence for local bodies is guaranteed by India's relevant national policies. In the face of such circumstances, this Project was successful in constantly grasping the local level technical maintenance conditions through engineers' close collaboration between TWAD and the District government on daily basis. Besides the fact that beneficiaries can report to their local bodies when an issue arises, the District government has established the reporting structure in which beneficiaries can also request technical support directly to the District government, by free phone and 24-hours a day. This has allowed TWAD and the District government to provide direct technical maintenance support to local level facilities that are under local bodies' responsibility, and minimized the Project's maintenance risks, regardless of the operational policies of local bodies. This can be referred to as a model for planning other similar projects in other states facing similar risks caused by vulnerabilities of local communities, in consideration of sustainability. The establishment of this structure within this Project can also be attributed to the high-level political commitment expressed by the State Chief Secretary for this Project, at the planning stage, and the Change Management Group (CMG) reform (see the Column 2 below), which was in process prior to the Project launch.

【Column 2：Change Management Group of TWAD】

While the focus of water supply policies was shifting toward its sustainable delivery, in the face of an acute water crisis, an institutional initiative for TWAD engineers, called Change Management Group (CMG), was implemented between 2002 and 2011. CMG reoriented the attitudes and perspectives of TWAD engineers to ensure that "the roles of TWAD engineers, as social engineers, are not only to provide technical service, but to realize life improvement of people through better access to water." Under this perspective, a series of workshops and pilot projects were implemented for TWAD managers, engineers, and communities, to enhance the attitudinal reform that re-examined the nature of relations between TWAD engineers and the community residents, as users, to be equal "Public-Public Partners." The initiative aimed to transform TWAD to be a "people focused, community responsive, and publicly accountable organization." As a process and impact of CMG, a declaration was adopted to enhance making choices with an emphasis on sustainability, from technical, financial, and social aspects, for any TWAD schemes. Plans for new rural water supply schemes are prepared and implemented through discussions with community. Furthermore, TWAD engineers have begun to engage with communities that had not previously benefitted from past water supply schemes; they also began mobilizing appropriate and sustainable strategies in consideration of different needs by various types of water users, including women and scheduled castes, resulting in the great enhancement of a "safe water supply for all." Simultaneously, attitudinal change of TWAD engineers, toward community members and villagers, induced water service users to take ownership of their water supply schemes, therefore, contributed to promoting rural water governance.

The CMG, as a success model, was analysed and referred to as a case study on water governance by many international donors, including World Bank and UNICEF, as well as development institutions. It was also referred to in a number of water sector reform cases. To disseminate the CMG model, Centre of Excellence for Change has been established in Chennai, the capital of Tamil Nadu; being referred, not only by other States of India, but also by countries around the world, including Africa, the dissemination of its experience in the water sector is continuously promoted.

(end)

Comparison of the Original and Actual Scope of the Project

Item	Plan[24]	Actual
1. Project Outputs	**i) Water Supply Facilities** Water Treatment Plant Transmission Mains: 401 km Feeder Mains in Urban areas: 22 km Booster Stations: 6 Master Balancing Reservoirs on Transmission Mains: 27 Overhead Tanks: 1,063 Internal Networks: 8,875km Public Fountains: 1,507 **ii) Project Activities** **a) Fluorosis Mitigation:** Baseline Survey; Training for doctors and teachers; Information, Education, and Communication (IEC) activities; Training of fluorosis diagnosis through fluoride testing in blood **b) Capacity Building:** O&M trainings for local bodies	**i) Water Supply Facilities** Water Treatment Plant As planned Transmission Mains: 288km Feeder Mains in Urban areas: 112km Booster Stations: 6 Master Balancing Reservoirs on Transmission Mains: 16 Overhead Tanks: 530 Internal Networks: 9,996km Public Fountains: 638 **ii) Project Activities** **a) Fluorosis Mitigation:** As planned **b) Capacity Building:** Removed from the Project scope
2. Project Period	March 2008 – July 2013 (65 months)	March 2008 – July 2017 (113 months)
3. Project Cost		
Amount Paid in Foreign Currency	2,251 million yen	833 million yen
Amount Paid in Local Currency	45,773 million yen (18,383 million Indian rupee)	32,410 million yen[25] (18,106 million Indian rupee)
Total	48,024 million yen	33,243 million yen
ODA Loan Portion	39,482 million yen	24,190 million yen
Exchange Rate	1 Indian Rupee = 2.49 yen (As of November 2008)	1 Indian Rupee = 1.79 yen (Average between 2008 and 2017)[26]
4.Final Disbursement	July 2017	

[24] Figures reviewed at the time of the Phase 2 appraisal for the Project (covering Phases 1 and 2)
[25] The yen amount paid in local currency is calculated with the annual average IFS rate during the project period, in accordance with JICA Ex-post Evaluation Reference. Therefore, as described in footnote #7, the figures differ from the registered amount by TWAD, which applied the actual exchange rate of each disbursement moment.
[26] The average for Indian Rupee against yen was calculated based on IFS rates of Indian Rupee and Japanese yen against USD, respectively, and rounded off to two decimal places.