The Democratic Socialist Republic of Sri Lanka

FY2018 Ex-post Evaluation Report of Japanese ODA Loan

"Eastern Province Water Supply Development Project"

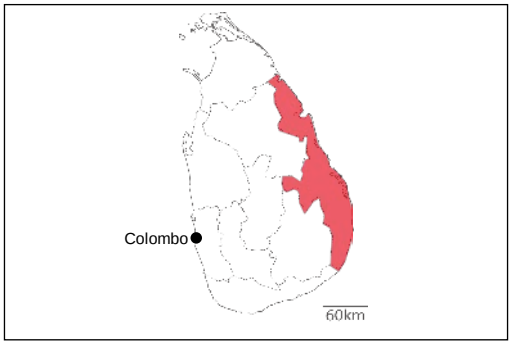
External Evaluator: Hajime Sonoda, Global Group 21 Japan, Inc.

0. Summary

The Eastern Province Water Supply Development Project (hereinafter referred to as "the Project") was implemented in the Eastern Province of the Democratic Socialist Republic of Sri Lanka (hereinafter referred to as "Sri Lanka") with the aim of achieving a safe drinking water supply by constructing and expanding water supply facilities, thereby contributing to improving living standard and reducing poverty in the target areas. At the time of the appraisal and ex-post evaluation, the Project is highly consistent with the policies and development needs of Sri Lanka. The Project is also compatible with the ODA policies of Japan at the time of the appraisal. As such, the relevance of the Project is high. The actual project cost was within the plan, however, since the actual project period was significantly longer than planned, the efficiency of the Project is fair. The volume of water distributed, the number of new domestic connections to water supply service, daily water supply duration, and water quality were roughly as planned. The degree of satisfaction of beneficiaries for the Project is high, with impacts being achieved in terms of reduced cost of water (time and labor), increased convenience in their daily lives, improved hygiene, increased opportunities for productive activities, and increased revenue. Therefore, the effectiveness and impacts of the Project are high. There are no problems in the organizational or financial aspects of operation and maintenance of the Project. Although there are problems in the technical aspect of municipal governments and community organizations and in the operation of some facilities, their adverse effect on the Project as a whole is limited. As such, the sustainability of the Project in general is high.

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

1. Project Description



Project Location (Eastern Province)

Mahaoya Purification Plant (newly constructed)

1.1 Background

In Sri Lanka, mainly in the northern and eastern part of the country, civil conflict lasting more than 25 years caused heavy human and material damage. Moreover, Eastern Province (Ampara District, Batticaloa District, and Trincomalee District), which is the target area of the Project, was affected by the tsunami which occurred in December 2004, causing enormous damage in Eastern Province：about 14,000 fatalities and the complete destruction of approximately 20,000 houses. The Government of Sri Lanka's *10 Year Development Framework (2006-2016)* stressed the importance of the "water and sanitation" sector, in particular indicating the need for a safe water supply in the areas affected by the tsunami and civil conflict. In 2008, Eastern Province, home to approximately 1.46 million people, suffered a serious water shortage, with the coverage of the water supply system being approximately 27% and water only being supplied for approximately 18 hours per day in Ampara District, three hours per day in Batticaloa District, and six hours per day in Trincomalee District. Under these circumstances, a loan agreement for the Project was signed in March 2010.

1.2 Project Outline

The objective of the Project is to supply safe drinking water by constructing and expanding water supply facilities in Eastern Province of Sri Lanka, thereby contributing to improving living standard and reducing poverty in the target area.

Loan Amount Approved / Disbursed Amount	4,904 million yen/4,847 million yen	
Loan Agreement Signing Date	March 2010	
Terms and Conditions	Interest Rate	Main component: 0.65%, Consultant component: 0.01%
	Repayment Period (Grace Period)	Main and consultant components 40 years (10 years)
	Conditions for Procurement	Untied
Borrower / Executing Agencies	The Government of Sri Lanka/Ministry of Finance and Planning (overall project coordination), National Water Supply and Drainage Board (NWSDB) (Ampara District Water Supply Component), Eastern Province Government (Rural Water Supply Component)	
Project Completion	April 2017	
Main Contractors (Over 100 million yen)	(No contracts over 100 million yen)	
Main Consultants	Infotecs Ideas Pvt. Ltd. (Sri Lanka)/Ceywater Consultants Pvt. Ltd. (Sri Lanka)/Integrated Development Consultants (Sri Lanka)	
Related Study	None	
Related Project	Eastern Coastal Towns of Ampara District, Phase III (ECTAD) (Australian Government)	

2. Outline of the Evaluation Study

2.1 External Evaluator

Hajime Sonoda (Global Group 21 Japan, Inc.)

2.2 Duration of Evaluation Study

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

Duration of the Study: September 2018 - August 2019

Duration of the Field Study: 11th November to 21 December, 2018,
17th to 27th February, 2019

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

3.1 Relevance (Rating: ③[2])

3.1.1 Consistency with the Development Plan of Sri Lanka

At the time of the appraisal (2009), the Government of Sri Lanka's *10 Year Development Framework (2006-2016)* cited reducing poverty and correcting economic differences among regions as important policy issues and deemed Northern Province and Eastern Province to be priority regions from the perspective of economic revival and promoting peace. The plan also indicated the need for a safe water supply in areas affected by the tsunami and civil conflict. The Project also conformed to the priority sector in the plan. With an aim of ensuring access to a safe water supply by all citizens, the Government of Sri Lanka planned to provide safe water to 85% of the national population by 2015 and to 100% of the population by 2025. In the subsequent national development plan *Mahinda Chintana*[3], the country aims to achieve access to safe water for 100% of citizens by 2020 and piped-water coverage rate of 60%.

At the time of the ex-post evaluation, the economic development plan *Vision 2025* announced by the government of Sri Lanka in 2017 put forth the promotion of public-private partnerships (PPP) for public services including water supply, and a response to chronic kidney disease, for which water is thought to be a cause. *The Strategic Plan 2016-2020 of the National Water Supply and Drainage Board* (hereinafter referred to as "NWSDB") endeavors to provide its citizens with high-quality sustainable water and sanitation services, and to promote supply of safe drinking water and sanitation services to rural areas and areas not yet served by the water supply, while aiming to achieve a coverage rate of water supply under the control of NWSDB of 49.1% by 2020. Additionally, infrastructure development is given as one of five priority sectors in Eastern Province's *Medium-Term Development Plan 2017-2020*, and in the four-year period from 2017 to 2020 it aims to construct 15 rural water supply systems and supply safe water to 100% of the

[1] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory
[2] ③: "High", ②: "Fair", ①: "Low"
[3] Mahinda Chintana, Vision for a New Sri Lanka (2010), Ministry of Finance and Planning

population.

Thus, at the time of both the appraisal and the ex-post evaluation, the Project is highly consistent with the development policies of Sri Lanka.

3.1.2 Consistency with the Development Needs of Sri Lanka

As discussed in “1.1 Background”, due to severe water shortages, coverage rate of the water supply system in Eastern Province was only 27% as of 2008, and the construction of water supply facilities both in urban areas and villages was an issue that needed to be addressed urgently. In Ampara District, the construction of water supply facilities was proceeding with the aid of the Australian Government, but due to a lack of funds, there was little progress in the construction of transmission/distribution facilities from the purification plant that had been constructed, making it impossible to well utilize the water from the purification plant. There was therefore a need to effectively utilize existing facilities, expand the service area and boost the supply capacity by expanding transmission/distribution facilities.

According to Eastern Province, the supply rate of safe water in Eastern Province in 2015 was improved to 75%. The coverage of the piped-water supply system in Ampara District reached 81% in October, 2018. Thus, in Eastern Province and Ampara District, the supply rate of safe water, including piped-water supply, increased, but as discussed in “Effectiveness and Impacts”, the installations of the Project are playing an important role in the supply of safe water in all target areas.

As such, the Project is highly consistent with the development needs at the time of both the appraisal and ex-post evaluation.

3.1.3 Consistency with Japan’s ODA Policy

The Japanese government’s revision of *the Official Development Assistance (ODA) Charter* in September 2003 placed priority on “Peace-Building”, while *the Country Assistance Program for Sri Lanka* (April 2004) cited assistance to consolidate peace and facilitate reconstruction. The plan includes, as priority sectors, the construction of economic infrastructure and community infrastructure including water supply as a part of measures to reduce poverty. The Project supports reconstruction from the internal conflict and the tsunami and promotes the provision of community infrastructure, and is therefore consistent with the abovementioned aid policy.

Therefore, the Project is highly consistent with Japan's aid policy.

As a result of the above, the project has been highly relevant to the country’s development plan and development needs, as well as Japan’s ODA policy. Therefore its relevance is high.

3.2 Efficiency (Rating: ②)

3.2.1 Project Outputs

The Project consists of two components: the "Ampara District Water Supply Component" implemented by the NWSDB targeting mainly urban areas, and the "Rural Water Supply Component" implemented by the Eastern Province Government targeting mainly rural areas. The planned and actual outputs of the Project are shown in Table 1. Ampara District Water Supply Component has a large weighting in the Project, accounting for more than 80% of project costs (planned amount).

Table 1 Planned and Actual Outputs

	Planned	Actual
＜Ampara District Water Supply Component＞		
Transmission main		
Construction of transmission main (Konduwattuwana to Kalmunai)	28 km	25 km
Construction of pumping facilities	1 location	As planned
Construction of distribution reservoir	2 locations	1 location
Purification facilities		
Expansion of existing purification plant	1 location	As planned
Construction of new purification plant	1 location	As planned
Transmission/distribution facilities		
Target areas	8 areas	10 areas
Construction of distribution reservoir	4 locations	6 locations
Construction of transmission/distribution pipes	549 km	828 km
Construction of pumping facilities/pumps	9 locations	11 locations
Power generation facilities	(not planned)	4 locations
Offices and other buildings	(not planned)	4 locations
Operation and maintenance equipment	(not planned)	3 vehicles, 3 asphalt cutters, etc.
Consulting services	Water treatment technology, detailed design assistance, etc.	As planned
<Rural Water Supply Component＞		
Number of rural water supply systems constructed	28 systems (preliminary candidates)	24 systems
Consulting services	Baseline study, feasibility study, detailed design, support for tender, work supervision, training, etc.	As planned

Sources: Documents provided by JICA, Ministry of Finance and Planning, NWSDB and Eastern Province Government

(1) Ampara District Water Supply Component

All of the facilities constructed in the Project are expansions of the existing water supply system of the NWSDB. The planned transmission main and the transmission/distribution facilities in eight areas (including expansion and construction of purification plants in two areas) were all implemented. Of these, the transmission facilities utilize water from the existing Konduwattuwana Purification Plant (refer to "Effectiveness"). According to the NWSDB, plans for these facilities were changed for the following reasons. All of the changes were made in an

appropriate manner according to the circumstances at the time of implementation.

- Since verification of deterioration of existing facilities through the detailed design revealed that some of the existing facilities (mainly transmission/distribution facilities) could or could not be utilized, some of the planned facilities were excluded from the Project, or facilities not included in the original plan were added.
- There were requests from adjoining areas to install water supply facilities, so the water distribution network (laying of transmission/distribution pipes) was extended and distribution reservoirs were added. Meanwhile, one distribution reservoir which had been planned was implemented using other donor funds, and was therefore excluded.
- To ensure smooth operation and maintenance of facilities, power-generation facilities, offices and other buildings, and operation and maintenance equipment were added.

Due to competition, project costs were dramatically compressed, and the outstanding amount of the ODA Loans was used to add pumping/distribution facilities in two areas. Both of these areas were suffering severe water shortages, so the addition was relevant.

(2) Rural Water Supply Component

At the time of the appraisal, 31 villages were put forward as candidates for the construction of rural water supply systems[4], and the plan was to make the final decision after the commencement of the Project on the villages in which the facilities would be constructed. After the commencement of the Project, the consulting service performed a water source survey of the candidate villages, and six villages were removed from the list, taking into account duplication with other projects and the fact that a suitable water source could not be obtained. Meanwhile, at the request of the Eastern Province Government, two villages with high degree of necessity were added, and ultimately 24 rural water supply systems were constructed in 27 villages[5].

Of the 24 rural water supply systems, five systems distribute water received as treated water from the NWSDB's existing water systems. Of the remaining 19 systems, two systems use reservoirs constructed by the Irrigation Department as water sources, while the remaining 17 systems use groundwater as water sources. Of these, at eight systems (two systems which use reservoirs as water sources and six systems which use groundwater as water source), purification facilities were constructed according to the quality of the water source. Water chlorination is performed in all systems. For water distribution, distribution reservoirs (distribution towers) or variable-speed pumps which can automatically regulate water pressure are used.

[4] The target areas of the Rural Water Supply Component are, for the sake of convenience, referred to as “villages” in the ex-post evaluation, but some of these are towns or residential urban areas.
[5] Some rural water supply systems serve more than one village.


(Left) Added pumping facility（Irakkamam: Ampara District Water Supply Component）
(Right) Distribution reservoir（Pottuvil: Ampara District Water Supply Component）


(Left) Treatment facility (Mathurankerni: Rural Water Supply Component)
(Right) Distribution reservoir (Alankulam: Rural Water Supply Component)

3.2.2 Project Inputs

3.2.2.1 Project Cost

The total project cost was planned as 6,054 million yen, of which ODA loans were to account for 4,904 million yen. Actual costs were 5,473 million yen (90% of the planned figure), of which ODA Loans were 4,847 million yen (99%) (Table 2).

Planned construction costs for the Ampara District Water Supply Component were 3,971 million yen (2,993 million yen + contingency and amount corresponding to rise in prices), while actual construction costs were 3,879 million yen, within the range of the plan at the time of the appraisal. According to the NWSDB, this was mainly because price competition in the bidding process brought about a drastic reduction in construction costs. Taking into account that there were additional outputs including the increase in the number of target areas, the efficiency of project costs is adequately high.[6]

[6] Adding the planned amount (at the time of request for addition) of 742 million yen for construction costs in the two additional areas to the planned amount of 3,971 million yen for construction costs (including contingency and price

Table 2 Planned and Actual Project Costs

(unit: million yen)

	Planned (At time of Appraisal)			Actual								
				Ampara District Water Supply Component			Rural Water Supply Component			Entire Project		
	Total	ODA Loan	Other Party	Total	ODA Loan	Other Party	Total	ODA Loan	Other Party	Total	Yen Loan	Other Party
Construction (procurement and public work)												
Ampara District Water Supply Component	2,993	2,993	0	3,879	3,871	8	-	-	-	3,879	3,871	8
Rural Water Supply Component	420	400	20	-	-	-	745	720	25	745	720	25
Price escalation	700	696	4	-	-	-	-	-	-	-	-	-
Contingency	411	409	2	-	-	-	-	-	-	-	-	-
Consulting service	314	314	0	78	78	0	102	102	0	180	180	0
Land acquisition	0	0	0	0	0	0	0	0	0	0	0	0
General administration	242	0	242	427	0	427	63	0	63	490	0	490
VAT/customs duties	881	0	881	0	0	0	103	0	103	103	0	103
Interest/other charges	94	94	0	44	44	0	31	31	0	78	78	0
Total	**6,054**	**4,904**	**1,150**	**4,429**	**3,994**	**435**	**1,044**	**853**	**191**	**5,473**	**4,847**	**626**

Source: material provided by JICA, Ministry of Finance and Planning, NWSDB and Eastern Province Government
Note: The VAT and customs duties of the Ampara District Water Supply Component are included in general administrative expenses.

Planned construction costs of the Rural Water Supply Component were 553 million yen (420 million yen + contingency and amount corresponding to rise in prices), while actual costs were 745 million yen, 135% of planned costs.[7] Taking into account that the target villages were reduced from 28 provisional candidate villages to 24 villages, the efficiency of the project cost is fair/low.[8] According to the Ministry of Finance and Planning, the aim was to provide 30 small contracts to enable local companies to be awarded them, with a view to promoting the recovery of the local economy affected by internal conflict, but in practice only some contracts were awarded to local companies. Overall, the number of bids was limited, resulting in re-tender in some cases, and the lack of price competition may be considered to have had an impact on the

escalation) at the time of the appraisal, the total amount is 4,713 million yen. The actual amount of 3,879 million yen corresponds to 82% of this total, indicating that the efficiency of project cost is quite high.

[7] Sri Lanka's rural water supply policy requires a beneficiary burden (in cash or labor) corresponding to 10% of construction costs. Taking into account that the Project targets areas were affected by civil conflict and it is difficult to expect beneficiaries to pay a high amount, the burden was set with 5% as a guideline, and contributions were requested in the form of labor to pipe laying work for distribution mains. According to the consultants for the Project, a large number of residents are poor or accustomed to receiving support without participation on the part of beneficiaries after the civil conflict and the tsunami, and there were a considerable number of villages which required time to gain the understanding of residents in this regard. That being said, the overall contribution is estimated to be approximately 5.5%. The amounts contributed by residents are not included in the planned and actual project costs.

[8] Construction costs at the time of planning were rough estimates before target villages were determined, making direct comparison with actual amounts difficult.

efficiency of the project cost.

As described above, the efficiency of the project cost was deemed high for the Ampara District Water Supply Component and fair/low for the Rural Water Supply Component. On a project cost basis (planned/actual), the former accounted for more than 80% of the total cost, and the project cost for the entire project was within plan (90%), so the efficiency of the project cost of the entire project is deemed to be high.

3.2.2.2 Project Period

The plan was to implement the Project over 46 months from the loan agreement in March 2010 to completion in December 2013 (start of service of the facilities). After the conclusion of the loan agreement in March 2010, the Ampara District Water Supply Component actually started service in April 2017, and all facilities of the Rural Water Supply Component had started service in February 2015. The actual project period for the Ampara District Water Supply Component was 86 months (187% of the plan) and the Rural Water Supply Component was 60 months (130% of the plan), and the delay in the former resulted in the final disbursement being extended for one year from 23 July, 2015. Taking into account that the percentage accounted for the former was high, the efficiency of the project period for the entire project is low. According to the NWSDB, the main reasons for the delay in completion of the Ampara District Water Supply Component were as follows.

- For two of the contracts, a plurality of bidders had objections to the bid evaluation results. While the examiner from the Procurement Arbitration Board found there to be no problems with the bid evaluation results, 18 months to two years was required to complete procurement.

- Due to delays in procuring materials, the start of work to lay transmission mains was delayed. Moreover, after laying the transmission mains, a large number of water leakages from the transmission mains connectors were found, requiring work to be carried out again.

- With regard to the pipe laying work, time was needed to obtain approval to remove bedrock by blasting. In addition, some sections of the roads, of which side had been a planned location to lay the pipes, were paved before the pipes were laid. and therefore time was required to move the laying positions of the pipes to the outside of paved area.

- After the commencement of public works, cost savings were able to be made due to differences in assumed soil quality and by making structural changes to aqueducts and the like. Therefore, additional works to expand the water supply network were made in response to requests from residents within the range of the contract amount. The design

and implementation of these works caused the construction period to be extended.

- In one area, the owner of a distribution reservoir site was living overseas, so time was required to acquire the land with the agreement of the owner.

In the Rural Water Supply Component, the facilities commenced operation in order as completed, but the final completion was delayed by a year and two months from the plan. According to the Ministry of Finance and Planning, the main reasons for the delay were as follows.

- Due to the floods of 2010 and 2011, time was required to implement the feasibility studies.
- There were few bids from local companies, and it took time to reach procurement due to re-tendering.
- There were 10 villages where understanding concerning the contribution of beneficiaries (see footnote 7 in page 8) was difficult to obtain, which meant time was required for completion of construction work.

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

At the time of the appraisal, the Economic Internal Rate of Return (EIRR) of the Ampara District Water Supply Component was expected to be 6.1%, based on the following assumptions. While, the Financial Internal Rate of Return (FIRR) was not calculated, based on the facts that the Project targeted areas were impacted by civil conflict and water tariff was to be set taking into account the income levels of the poorest segment of the population.

- Cost: project costs, operation and maintenance costs
- Benefit: the total amount that people who are newly connected are willing to pay, reduction in expenses related to pharmaceuticals to treat water-borne diseases
- Project life: 30 years

In the ex-post evaluation, the EIRR was recalculated on the basis of the same assumptions as 4.1%, which was lower than that expected at the time of the appraisal. The main reasons for this were that as the target areas included a large number of rural areas on the outskirts of cities (refer to “Impacts”), the ratio of commercial and institutional users (commerce and industry, schools, hospitals, government institutions, etc.) who may be expected to benefit more was lower than assumed at the time of the appraisal.[9]

[9] At the time of the appraisal, approximately 16% of the total number of connections was expected to be institutional users, but based on the results of on-site visits, it was recalculated to 10%

In the light of the above, although the project cost was within the plan, the project period exceeded the plan. Therefore, the efficiency of the Project is fair.

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

3.3.1 Effectiveness

The Project was implemented with an objective to provide safe drinking water in Eastern Province. The achievement rate of this objective is analyzed below for the Ampara District Water Supply Component and the Rural Water Supply Component, respectively.

Table 3 Planned and Actual Operation and Effect Indicators
(Ampara District Water Supply Component: target areas for construction of transmission and distribution facilities)

Indicator	Baseline: 8 districts (2009)	Target: 8 districts (2015)	Actual: 8 districts (2018)	Actual: 10 districts (2018)
Volume of water distributed (m^3/day)	20,086	27,000	28,400	29,200
Number of connections	30,539	41,000	46,785	48,900
(Increase in number of connections)	-	10,461	16,246	18,361
Population supplied with water (people)	153,045	209,000	233,925	244,500
Minimum water supply duration (hours/day)	4	24	22.4 (average)	22.2 (average)

Source: Baseline and target values were from the material provided by JICA, and actual values were from interviews with NWSDB officers in charge for each water supply system.
Note: At the time of the appraisal, targets were set for 2015, two years after the Project's completion. The actual times of completion for the target areas ranged from November 2015 to April, 2017.

(1) Ampara District Water Supply Component

< Effects of Transmission and Distribution Facilities (10 districts)>

At the time of the appraisal, planned figures were established for the volume of water distributed, the number of connections/population supplied with water, and minimum daily water supply duration for the eight target areas for the construction of transmission and distribution mains. Concrete targets were not established for the two areas added after commencement of the Project. In the ex-post evaluation, in addition to comparison of actual figures with these target indicators (Table 3), information was also gathered concerning water quality which acts as an indicator for “safe water”.

① Volume of water distributed: the total volume of water distributed in the eight areas in 2018 (28,400 m^3/day) corresponds to 145% of the baseline for 2009 and 105% of the target value

[10] Sub-rating for Effectiveness is to be put with consideration of Impacts.

for 2015, meaning that the degree of achievement of plans for the volume of water distributed is high. Adding the two areas which were added, the volume of water supplied is even greater.

② Number of connections/population supplied with water: The total number of connections (46,785) in the eight areas in 2018 corresponds to 153% of the reference value for 2009, and 114% of the planned value for 2015. The increase in the number of connections after the Project (16,246) reached 155% of the planned figure. The actual population supplied with water in 2018 is estimated as 233,925, assuming five people per domestic connection, which corresponds to 112% of the planned figure for 2015. Thus, the achievement rate of the number of connections/population supplied with water is high. Including the two areas which were added, the number of connections/population supplied with water are even greater.

③ Water supply duration: Before the Project, 24-hour water supply was only taking place in one of the eight target areas, but at the time of the ex-post evaluation, 24-hour water supply has been achieved in seven target areas. In the one other target area (Pottuvil), the production of the water source (well) reduced, causing the volume of water that could be distributed to decrease far below the demand, and 24-hour water supply is not being achieved.[11] The average water supply duration of the eight areas is 22.4 hours/day (93% of planned figure), meaning that the achievement rate of water supply duration is high. In one of the added two areas (Koneshapuram) the distribution reservoir (outside the scope of the Project) has yet to be completed, so water distribution is taking place through a direct pump feed, and water supply duration is 18 hours. In another district (Panama), the plan was to distribute water from the same existing purification plant as Pottuvil, but for the reason outlined above, there was a water shortage, and as of January 2018, water distribution has yet to commence (water supply duration is zero).[12] As a consequence, the average daily water supply duration for the 10 districts was 22.2 hours.

④ Water Quality: The NWSDB performs regular water quality inspections in each water supply system by taking samples of water at purification plants, distribution reservoirs and tap water. All inspection samples taken in 2018 from the water supply systems of the nine areas included in the Project (excluding the Panama area in which water supply has not started) satisfied Sri Lanka's water quality standards. Thus, the achievement rate of water quality is high.[13]

[11] Pottuvil has a purification plant (existing) which uses groundwater as a water source, but due to a reduction in production volume from the well, 24-hour water supply is only being achieved in some areas of the city's center, with average water supply duration being approximately 4 hours. The NWSDB has dug an additional well in a bid to increase the volume of water distributed, but adequate supply of water has yet to be secured.

[12] The plan was for the existing water purification plant which was distributing water to Pottuvil, to also distribute water to Panama, but the water production volume of the well, which was the water source, was depleted to the extent that it was unable to cope with the demand of Pottuvil, so water distribution to Panama has not started. The NWSDB is drilling a new well in Panama and water supply using the distribution mains constructed in the Project is expected to start in the course of 2019.

[13] According to the “Report on Preparatory Survey of Water Sector in Democratic Socialist Republic of Sri Lanka”

< Effects of Transmission Main >

Aside from the 10 areas mentioned above, transmission mains were constructed from the existing Konduwattuwana Purification Plant to two reservoirs, supplying water to a wide area. The Konduwattuwana Purification Plant has a purifying capacity of 7.2m^3/day, but before the Project, only half of the purifying capacity was being used due to the restrictions in terms of transmission facilities. The Project enabled the transmission of an additional 16,000 to 20,000 m^3/day, achieving great progress in the utilization of the Konduwattuwana Purification Plant. In the areas to which water was distributed through these transmission mains, before the Project, transmission took place circumventing the transmission mains to other areas, so the volume of water supplied was restricted, and water supply duration was 12 hours per day. While, after the Project, 24-hour water supply was achieved. Making estimates from the transmission volume achieved, the total number of connections supplied from these transmission mains and for which 24-hour water supply was achieved is considered to be approximately 30,000, and the population supplied with water 150,000 people. Konduwattuwana Purification Plant and transmission mains are being operated as planned, and an adequate project effect has been achieved.

According to interviews with local residents (which will be mentioned later), the level of satisfaction of local residents of areas in which 24-hour water supply was achieved as a result of this project (including areas in which water is distributed from the Konduwattuwana Purification Plant by the transmission mains) is extremely high[14]. In two areas, Pottuvil and Panama, however, there were dissatisfactions and hopes for the achievement of 24-hour water supply.

Summing up, the effectiveness of the Ampara District Water Supply Component is high.

(2) Rural Water Supply Component

In the Rural Water Supply Component, feasibility studies were conducted for each of the 24 villages ultimately selected. Water supply systems were designed to achieve the water supply volume and the number of connections according to the demand in each village, basically with the target of water quality suitable for drinking, supply duration of 24 hours per day or a minimum of 12 hours per day during water shortages.[15] In the ex-post evaluation, with the number of connections, water supply duration and water quality of each system as indicators, the results

(JICA, 2017), in Eastern Province as a whole, including Ampara District, compliance with water standards was 99.7% in 2015.

[14] Together with the abovementioned seven areas in which 24-hour water supply was achieved, the Project is estimated to have achieved 24-hour water supply for approximately 70,000-80,000 household connections (a population of 350,000 to 400,000 people).

[15] The operation and effect indicators for the Rural Water Supply Component were to be set after commencement of the Project. In the ex-post evaluation, the target value for the number of connections was confirmed by a monitoring report issued in September 2011. The water quality target was in compliance with water quality standards stipulated by the Government of Sri Lanka. Regarding water supply duration, the planned standards proposed by the consultant for the Project approved by the executing agency were confirmed in the consultant's completion report (March 2014)

were brought together for the 23 systems aside from the single system equipped only with a hand-operated pump.[16]

① Number of connections: approximately 8,600 households are receiving water supply for the first time from the 23 systems. This figure represents 81% of the approximately 10, 650 households planned for in the feasibility study. The reasons why the planned figure was not achieved are outlined below. In two systems, drinking water is supplied to the surrounding villages by municipal water wagons, and the actual number of beneficiary households is even greater. Therefore, the achievement rate of the number of connections is high.

- In many villages, there are households which use individual wells and therefore avoid connecting to the water supply.
- Some residents avoid using the water supply due to inadequate water pressure and water quality (two systems).
- Water supply was stopped before the time of the ex-post evaluation (two systems).
- There are a large number of residents who cannot pay connection fees for economic reasons (one system).

② Water supply duration: 11 systems (approximately 2,500 households) are achieving 24-hour water supply throughout the year. Four systems (approximately 2,200 households) are achieving 24-hour water supply aside from the dry season in which groundwater is depleted, and two systems (approximately 1,500 households) have not achieved 24-hour water supply for other reasons but have achieved an average 12-hour water supply. The abovementioned 17 systems (approximately 6,200 households, approximately 60% of the target 10,650 households) have achieved at least 12-hour water supply which was the minimum target in the feasibility study. Apart from the abovementioned systems, one system had no problems in terms of water supply volume and quality but was supplying water for around 6-7 hours per day, one system had an inadequate water volume and was supplying water for around 10 hours per day, two systems had a water quality which was not suitable for drinking and limited the water supply duration, and two systems stopped supplying water. Thus, the target achievement rate for water supply duration is fair.

③ Water quality: The water quality of 14 systems out of the 23 (approximately 4,800 households, slightly less than 50% of the target 10,300 households) generally satisfy Sri Lanka's standards throughout the year, and water quality suitable for drinking is being supplied. In three systems,

[16] It is difficult to gain an accurate picture of water distribution volume of each system since there are systems for which it is impossible to obtain records using a water meter. Therefore, water distribution volume was not included in the quantitative analysis.

there is no problem in the wet season, but turbidity, color, iron and manganese levels increase in the dry season, causing a deterioration in water quality. Meanwhile, in four systems, deterioration in the quality of the water source (groundwater) and problems in the operation of purification facilities (discussed in detail in "Sustainability") made it impossible to ensure water quality suitable for drinking.[17] According to health authorities of Eastern Province, in 2017 there were cases of E.coli being detected in three systems operated by the NWSDB (one was water purification plant + distribution, two were expansion of the water distribution network alone)[18]. As a consequence, the target achievement rate for water quality is fair.

According to the interviews with local residents (to be mentioned later), the degree of satisfaction was extremely high among residents of areas in which 24-hour water supply was achieved as a result of the Project. Even in villages in which, depending on the season, water supply duration was shortened or water quality deteriorated, many users were satisfied with the fact that they were able to connect to the water supply system. In the two villages where water supply stopped, however, there were many strong calls for the water supply to be restarted. Summing up the above, the effectiveness of the Rural Water Supply Component is fair.

In the Rural Water Supply Component, on the other hand, the following issues can be indicated.

- Water source restrictions: Of the 23 systems, 16 systems use groundwater (wells) as a water source.[19] According to the consultants for the Project, the target villages of the Project are villages which have been left behind due to the difficulty of obtaining appropriate water sources. Surveys have been carried out repeatedly to find groundwater sources that can be used with sustainability, but in practice, drawing groundwater takes time and causes the depletion of and/or deterioration in water quality of the groundwater, which in turn results in a stoppage of water supply and restricts the water supply duration and growth in the number of domestic connections.

- Operation and maintenance of purification facilities: in eight of 24 systems, water treatment other than water chlorination is being implemented, but in five of these, appropriate operation and maintenance is not being carried out, and water supply duration and volume is limited (refer to "Sustainability"). In the consulting service of the Project, training of trainers with regard to operation and maintenance was carried out for technical officers of Eastern Province and municipal governments in a bid to transmit knowledge to municipal

[17] In the other two facilities, water supply per se has stopped.
[18] There are no cases of E.Coli being detected in facilities operated by community organizations or municipal governments. In facilities operated by community organizations and municipal government, twice yearly samples are sent to the NWSDB for water quality testing. In addition to this testing, the Eastern Province health authorities perform general bacteria and residual chlorine inspections irregularly, during diarrhoea outbreaks, for example.
[19] Apart from that, two facilities used irrigation ponds, five facilities used NWSDB purification plants (surface water) as water sources.

government personnel and community organizations who actually perform operation and maintenance. The following observations were made by the Ministry of Finance and Planning and the consultants: the consultants were busy with work such as tender support and supervision, preventing them from having adequate time for training; municipal government technical officers were extremely busy, so participation rates were not high; the technical and training capacity of participants in training of trainers was not high; changes in personnel after the completion of training meant that personnel actually performing operation and maintenance did not have adequate knowledge. The consulting service did not include follow-up after facilities started operation.

3.3.2 Impacts

3.3.2.1 Intended Impacts

On the basis of the number of households with connections in each of the target areas and target villages of the Project, the number of beneficiary households of the Project was approximately 48,000 households in the Ampara District Water Supply Component (23,000 households with new connections, 25,000 households with existing connections), and when combined with the approximately 9,000 households (only households with new connections) of the Rural Water Supply Component it is expected to give a total of approximately 57,000 households. Some of the target areas of the Ampara District Water Supply Component were rural areas in the vicinity of towns, so the majority of the abovementioned number of beneficiary households were rural areas.

Table 4 Number of Beneficiary Households of the Project

(unit: thousand households)

	Households with new connections		Households with existing connections	
	Urban areas	Rural areas	Urban areas	Rural areas
Ampara District Water Supply Component	10	13	18	7
Rural Water Supply Component	3	6	0	0
Total	13	19	18	7

Source: Prepared by evaluator based on data provided by executing agency

As the impacts of the Project, improved living environment and sanitation of local residents, improved health, improved standard of living, increased opportunities for productive activities due to a reduction in the time spent drawing water, and increased revenues were expected. According to interviews with the beneficiaries[20], residents mainly use tap water for drinking and

[20] In order to form a clear view of the manifestation of the impact, in this ex-post evaluation, interviews were performed on commercial facilities, schools and medical facilities and residents who acquired new connections. Interviews of general residents were carried out on 172 people (92 males, 80 females) in 11 target areas in the Ampara Water Supply Component, and 126 people (78 males, 48 females) in 12 target areas of the Rural Water Supply Component. Interviews were also carried out for schools (in three locations), medical facilities (in five locations) and restaurants (in three

cooking, but in rural areas residents also use water from nearby wells for hygiene purposes such as washing hands, faces, bathing, toilets and cleaning in order to save on water bills. If there is not a nearby well, or if there is a nearby well which has dried up in the dry season, tap water is used for all of these applications. In many households, water usage for hygiene purposes or for family vegetable gardens has increased, which has led to an increase in total water consumption (total volume of water including water from the water supply and other water). In rural areas, some responses indicated that this figure increased by a maximum of 300 to 400%. Demonstrated examples of impacts of such water use are given below.

- Reduction in time spent for fetching water: Before the Project, local residents were using well water and surface water such as water from rivers and canals, but in some cases this entailed walking a distance of 2-3km to water place.[21] Fetching water is primarily the role of females and children. Since the amount of water that they can carry at one time is limited, this involved walking the distance two to three times in some cases. Generally, residents would go to draw water and wash their faces in the morning, and after farm work was completed, they would bathe in the water place. For doing laundry, residents sometimes had to queue and wait at the water place. Apart from cases in which the volume of water was insufficient and wells had to be used, the Project brought about a dramatic reduction in such time spent drawing water.

- Increase in productive activities: Some of the time saved by a reduction in the time spent drawing water is being used in productive activities such as farm work, side jobs at home, and family vegetable gardens.

- Increase in convenience pertaining to water: In cases where 24-hour water supply was achieved, water could be used immediately when necessary, which increased the convenience of residents' daily lives and efficiency of household chores.

- Improvement in school arrival times: Before the Project, children were often going to the water place to fetch water by themselves, and to get ready before going to school, which often caused students to be late. Some teachers reported that previously nearly half the class had always arrived late. After the Project, families of these students were able to obtain water at home, and there were many reports that children were now able to arrive at school on time.

- Increase in hygiene activities: It was reported that in many villages, with the availability of tap water, the frequency of hand washing, toothbrushing and bathing increased. It was

locations).

[21] According to the baseline survey for the Rural Water Supply Component, the average daily time taken for drawing water in target households for this component was 50 minutes, and took up to 3 to 4 hours per day in some cases.

reported that previously people were bathing in canals with the cows, but now they are able to bathe in clean water, wash their children clean, do their cleaning and laundry using tap water, and use flush toilets.

- Reduction in water-borne diseases: In almost all target villages, residents indicated the opinion that there was a reduction in diarrhea and skin diseases after the Project. There were concrete reports such as: the disappearance of skin diseases, which were previously a constant occurrence; diarrhea, which was widespread among children and adults, was now only sometimes experienced by children; and people no longer having to go to the hospital for treatment of diarrhea. These reports indicate a reduction in water-borne diseases in some villages. Doctors from medical institutions in the target areas reported that the number of cases of diarrhea and skin diseases was halved over a five-year period, that there was a reduction in diarrhea and dengue fever, and that hepatitis A had disappeared since the epidemic five years ago.[22]

- Utilization of family vegetable gardens: In the majority of villages, there were reports that residents were able to continue with their family vegetable gardens even in the dry season, as an advantage of water supply system. Generally speaking, a variety of fruits, vegetables and spices are cultivated on farm sites in the target areas. The majority of these are consumed by the farmers themselves, but some are sold, contributing to a reduction in the cost of buying vegetables and spices and an increase in the revenue from the sale of agricultural produce. There was evidence of tap water being used to open new nurseries for trees and fruit trees, generating income, and a considerable number of residents are simply happy to see the increase in plants and flowers in their gardens and appreciate the greening of their surroundings.

- Impacts on educational facilities: In primary schools which provide school meals thanks to a government program, it is no longer necessary to fetch water from wells, and water quality was improved. Before the Project, students had to take water in a small plastic bottle from home each day, but after the Project this was no longer necessary. There was also an increase in children washing their hands at school. It became possible to flush toilets with water, increasing hygiene, which was particularly welcomed by the (parents of) female students.

- Impacts on medical facilities: At clinics and hospitals in the target areas, tap water is used

[22] According to Eastern Province health authorities, the incidence of diarrhea has dropped dramatically in the target areas compared to 10 years ago, but it was impossible to obtain disease data which would have enabled the proof of a concrete causal relationship with the Project. Eastern Province health authorities implement health education for residents through several hundred public health officers and midwives and are working to educate residents about water usage and hygiene activities.

for drinking, cooking and cleaning. In some higher-order medical institutions, tap water is also used to sterilize medical instruments. There were reports that the Project eliminated water shortages in the dry season and improved water quality, which were problems prior to the Project when well water was used.

- Impacts on religious facilities: At mosques in Muslim areas people worship 5 times each day, and worshippers must wash their hands and mouths before worship. Tap water is used for these purposes. Worshippers welcomed the fact that they were able to use adequate amounts of water even in the dry season.


(Left) Family vegetable garden (Kalmunai, standing in the center is a water meter)
(Right) Residential water supply facility (Muthur West)

3.3.2.2 Other Positive and Negative Impacts

(1) Environmental and Social Impacts

While the Project did not require an environmental impact assessment based on the Sri Lanka's laws [23], the implementing agencies performed environmental monitoring on noise, vibration, dust and other aspects during construction, as well as on water quality and noise during operation of the facilities. In interviews with implementing agencies, on-site visits and interviews with local residents, there was no evidence of a significant impact on the environment caused by the implementation and operation of the Project.

In the Ampara District Water Supply Component of the Project, a site (one location) for the construction of a purification plant was acquired without any problems. Aside from that, there was a case where it took time to obtain the agreement of land owner for the acquisition of a site for the construction of distribution reservoir (refer to "Efficiency"), but no particularly major problems were encountered. In the Rural Water Supply Component there was a need for new land for treatment facilities and distribution towers, but land for these needs was acquired without

[23] According to the NWSDB, in Sri Lanka's water supply sector, environmental impact assessments are required only in cases where purification plants of a given size or larger are constructed (new facilities).

problems due to donations from beneficiary local residents. The Project did not cause a displacement of local residents.

(2) Other Impacts

In community organizations of villages that generated revenues from the operation of the water supply (refer to “Sustainability”), those funds are used for a variety of community activities, including microfinance, scholarships (tuition subsidies) and free English classes. This is considered to contribute indirectly to the poverty alleviation in target villages.

In the light of the above, the effectiveness of the Ampara District Water Supply Component is high, and the effectiveness of the Rural Water Supply Component is fair. Taking into account that, on a project cost basis, the weighting of the former accounts for more than 80% of the total (refer to “Efficiency”), the overall effectiveness of the Project combining both components is deemed to be high. Both components had a high degree of satisfaction among beneficiaries, and the intended impacts of the Project were achieved. These included: reduced water fetching costs (time and labor), increased convenience in their daily lives, improved hygiene, increased opportunity for productive activities, and increased revenues. Thus, the Project has achieved its objectives. Therefore, the effectiveness and impacts of the Project are high.

3.4 Sustainability (Rating: ③)

3.4.1 Institutional/Organizational Aspects of Operation and Maintenance

All of the water supply systems of the Ampara District Water Supply Component and some (seven systems) of the Rural Water Supply Component are operated and maintained by the NWSDB. The remaining rural water supply systems (17 systems) are operated and maintained by local governments (Pradeshiya Sabha) or community organizations in each village. As demonstrated below, there are no particular problems observed in the institutional/organizational aspects of operation and maintenance.

(1) NWSDB

The NWSDB is a public corporation responsible for urban water supply services under the auspices of the Ministry of City Planning, Water Supply and Higher Education and performs the design, construction, operation, maintenance and collection of water charges for water supply facilities throughout the country. Although responsible for water supply mainly in urban areas, the NWSDB also provides technical support to local governments and community organizations in rural areas as necessary. In Eastern Province, the NWSDB has five operation and maintenance offices, and under a manager, each office has electrical/mechanical engineers, a rural water supply system engineer, as well as several officers in charge of the operation and maintenance of water

supply systems[24]. Regular inspections, maintenance and repairs of electro-mechanical equipment are performed by electrical/mechanical engineers from each operation and maintenance office on a traveling basis. Water quality inspections are carried out in inspection laboratories at each operation and maintenance office.

According to interviews with officers-in-charge, in some water supply systems, there is a shortage of laborers to carry out regular inspections and maintenance of valves, repair leaks, and perform new connection work. According to NWSDB headquarters, however, the appropriate numbers of laborers are assigned according to the scale of each water supply system, and the problem lies more with the management by the officer in charge or the attitude towards work among some laborers[25]. At any rate, there were no dissatisfactions expressed by residents concerning the response of the NWSDB with respect to water leakages and the like, and water supply duration, water quality, non-revenue water rate (to be mentioned later) are maintained at appropriate levels, so it is difficult to consider that a lack of laborers has a significant impact on the level of water supply service.

(2) Local Governments and Community Organizations

Of the rural water supply systems, in nine villages the systems are operated by local governments and in eight villages by community organizations. The local governments have taken on the responsibility for water supply in areas in which the water supply is not operated by the NWSDB, and operate rural water supply systems and water wagons. In five of the nine villages in which water supply is operated by local governments, initially water supply was being operated by community organizations, but it became difficult for community organizations to operate the water supply mainly due to technical reasons, so operation was transferred to local governments.

When a water supply is operated by local governments, under the supervision of technical officers of the local governments, meter reading, collection of water charges, pump operation and maintenance of the distribution network are carried out by the development officers dispatched to each village and village residents employed by the local governments. In cases in which the water supply is operated by community organizations, a chairman, vice-chairman, treasurer, and secretary are appointed, and pump operators, cleaning and security personnel, and maintenance

[24] Each officer in charge is responsible for one to three water supply systems according to the size of each system. Staff including civil engineers, electrical/mechanical engineers, inventory managers, meter-readers, pipe workers, laborers, pump operators, clerical staff and drivers are assigned under each officer in charge accoring to the scale of the water suppy system and the existence of a treatment plant. Vehicles are available, but heavy machinery such as excavators is only deployed from operation and maintenance offices.

[25] According to explanation provided by NWSDB Headquarters, in Sri Lanka's government institutions and public corporations, employment of workers through personal connections is generally widespread, and it is quite often the case that the gender or credentials of laborers do not correspond to the nature of their work. As a consequence, females who are employed as laborers take up clerical work, and workers with superior credentials may dislike doing labor on-site, resulting in a drop in the number of laborers on site.

personnel for the distribution network are employed. Among the community organizations involved in the operation of the Project, some already existed prior to the Project, and some were newly established for the purposes of the Project. Community organizations can request technical and financial assistance from their local governments as necessary, but in the target villages of the Project, the local governments are also subject to technical and financial constraints, and there were no examples observed in which community organizations were actively supported.

3.4.2 Technical Aspects of Operation and Maintenance

As shown below, the NWSDB has adequate technical capacity, but the technical capacity of local governments and community organizations is limited, and there is a need for technical support for external bodies such as the NWSDB in some cases.

(1) NWSDB

The NWSDB has been operating urban water supply systems over the entirety of Sri Lanka for more than 50 years. The organization employs more than 10,000 personnel, including close to 1,000 engineers and is operating and maintaining more than 300 water supply systems across the country without any problems. The NWSDB is therefore considered to have adequate experience and technical know-how concerning the operation and maintenance of water supply systems. NWSDB has a Manpower Development and Training Division and Regional Support Center, and structures have been put in place to perform planning, implementation and evaluation of training, with approximately 8,300 people participating in training in the form of 214 internal training courses across the entire NWSDB in 2015. The operation and maintenance of facilities provided through the Project does not require a particularly high level of technical know-how. Thus, the NWSDB has adequate numbers of technical personnel and has established a training framework.

(2) Local Governments and Community Organizations

In the Project, training of trainers was carried out through the consulting service, mainly targeting technical officers of local governments, in a bid to strengthen the operation and maintenance capacity of local governments and community organizations, but as already discussed in “Effectiveness”, adequate technical capacity has yet to be established for purification facilities. On the other hand, wells, pumping facilities, water supply towers, distribution main networks and the like are generally being operated and maintained appropriately. There were cases of a technical officer of one local government having specialist knowledge in the field of electrical machinery replacing pumps that had broken down and repairing control devices, but since there is only one technical officer in each city and technical officers have various areas of expertise, it is not necessarily the case that they are equipped with the specialist expertise necessary for the Project. With regard to technical problems, local governments and community

organizations often request advice from the NWSDB, and the NWSDB provides advice in response free of charge. However, if the solution to a problem requires funds, the NWSDB is unable to provide such funds.

3.4.3 Financial Aspects of Operation and Maintenance

As described below, no major problems have been observed in the financial aspect of the operation and maintenance of the Project.

(1) NWSDB

The financial performance of the NWSDB is shown in Table 5. Water charge revenues (sales) are increasing year on year. In 2015, a slight operating loss was recorded, but in 2016, a profit was recorded once more. The operating margin for 2017 was 3%, and current ratio is quite high at 414%, with the debt ratio only 15%. In light of the above, the finances of the NWSDB overall are considered to be sound and stable.

Table 5 Financial Performance of the NWSDB

(unit: million Rs)

		2014	2015	2016	2017
Revenue	a	18,710	20,252	23,585	23,860
Cost of sales	b	-11,326	-12,315	-13,486	-14,196
Gross profit	c=a+b	7,384	7,938	10,099	9664
Other operating revenues	d	1,390	1,074	1,478	1,724
Administrative expenses	e	-5,985	-8,506	-9,139	-9,935
Other operating expenses	f	-334	-540	-681	-714
Operating profit	g=c+d+e+f	2,455	-34	1,757	739
Financial income	h	213	1,187	1,236	1,157
Financial cost	i	-1,243	-3	-3	-13
Profit before tax	j=g+h+i	1,425	1,149	2,990	1,883
Income taxation	k	-53	-54	-63	-66
Profit for the year	l=j+k	1,372	1,095	2,927	1,817
	Operating margin	13%	0%	7%	3%
	Current ratio	177%	448%	597%	414%
	Debt ratio	23%	14%	15%	24%

Source: documents provided by the NWSDB

In 2016, 46% of the cost of sales were personnel expenses, and 9% were administrative and maintenance expenses. Since 2014, the ratio of personnel expenses has been increasing somewhat, but the ratio of administrative and maintenance expenses has remained more or less unchanged over the past three years. According to the NWSDB's Finance Department, there are no problems in the financial aspect of the operation and maintenance of water supply systems, but there is a lack of funds for new capital investment, with the NWSDB depending largely on external funding

such as support from donors. According to officers in charge of the water supply systems included in the Project, aside from a lack of laborers in some areas and limited vehicle expenses, there was no evidence of budgetary restrictions such as restrictions on operation and maintenance.

The revision of water charges is carried out at the request of the NWSDB and approved by the government. Since the last revision in 2012, revisions (price rises) requested by the NWSDB were not approved due to political decisions and water charges have remained unchanged.[26]

(2) Local Governments and Community Organizations

When rural water supply systems are operated by local governments and community organizations, water charges are set independently. Generally speaking, water charges are lower than those charged by the NWSDB, but in 10 of the 17 villages, income from water charges is adequate to cover operation and maintenance expenses, and there are no pressing financial problems. Some community organizations generate significant income from water supply systems, which is used in social welfare projects, with some organizations having accumulated reserves of over 1 million Rs (equivalent to approximately 700,000 yen). For another example, revenues from a plurality of village water supply systems including the Project account for two-thirds of the budgets of local governments, making them an important source of funds. In addition, each village has established regulations such as late fees and suspension of service in the event that users are unable to pay water charges, and there were no villages in which payment of water charges was a problem.

On the other hand, three villages were operating their water supply at a loss: two villages in which water quality deteriorated, prompting a reduction in water charges; and one village in which expenses are incurred in purification treatment (electricity expenses and operating personnel expenses, etc.). From the village in which the purification treatment is incurring expenses, drinking water is distributed free of charge to surrounding villages by water wagons of the local government. Both of the villages are administrated by local governments, and the necessary expenses are covered by the local government budget, so there are no constraints as to operation and maintenance.

3.4.4 Status of Operation and Maintenance

(1) Water Supply Systems Operated and Maintained by the NWSDB

According to interviews with officers responsible for the water supply system of the NWSDB and on-site visits, the majority of facilities of the Project operated by the NWSDB (all systems of the Ampara District Water Supply Component and six of 24 systems of the Rural Water Supply Component) are being operated and maintained appropriately, and the function of system is being

[26] In the most recent water charge revision proposal by the NWSDB, an average increase of approximately 40% was proposed.

maintained appropriately. The non-revenue water rate of each water supply system falls with the range of 8-17%, which is adequately low[27], and the water distribution network may also be considered to be being maintained appropriately. On the other hand, in three areas, Pottuvil, Panama and Pulmudai, major problems in operation and maintenance were observed, and in Dehiyathakandiya minor problems were observed.

- In Pottuvil and Panama (Ampara District Water Supply Component: 3,794 households as of December 2018), an adequate volume of untreated water has not been obtained, leading to water supply restrictions (refer to "Effectiveness"). The NWSDB plans to dig a new well in Panama and start water supply in the course of 2019. However, for a permanent solution brought about by a stable water source, it is necessary to await the completion of the reservoir project planned by the Irrigation Department, and it is expected to take 3-4 years for its realization.

- At the Pulmudai purification plant (Rural Water Supply Component: 1,252 households as of December 2018) the turbidity of well water near the river increased and the filtration pond became clogged, resulting in a deterioration in water quality. The NWSDB dug a new well in 2018, but this alone was inadequate to respond to demand in the dry season, so the plan is to take in river water and add water supply facilities according to the water quality of river water.

- At the water intake facility from the river at Dehiyathakandiya (Ampara District Water Supply Component), the pump was damaged by sand and was replaced. Over the course of 2019, permanent countermeasures to prevent the inflow of sand are to be implemented within the NWSDB's budget.

(2) Water Supply Facilities Operated and Maintained by Local Governments and Community Organizations

The facilities of the Project operated by local governments and community organizations (18 of 24 systems of the Rural Water Supply Component), no major problems were observed in terms of operation, aside from the six systems below. Major problems were not observed in the operation and maintenance of pumping facilities, water supply towers and water distribution networks. Preventive maintenance of pumps is generally being carried out properly, and repairs are being carried out as necessary. Cleaning and disinfection of water supply towers is being carried out regularly.

- 40th Village (315 households): The treatment facility is not being operated continuously

[27] The national average rate of non-revenue water is 27% (2015), and the average for Ampara District is 18% (September 2018). The meter take-up rate is 100%, with all users paying volume-based water charges.

due to lack of knowledge, and an adequate quantity of water cannot be supplied, so the purification facility is not being used. Only water chlorination is carried out, and the water quality is not suitable for drinking.

- Thihalaweddi (357 households): Backwash of filter media is carried out more often than necessary, and as a result, water is only supplied once every two days.
- Mallihathivu (75 households) and Kannekipuram (365 households): Groundwater quality deteriorated (iron and manganese problem) after starting operation, making the water unsuitable for drinking.
- Karadiyanaru (450 households): Groundwater quality deteriorated after starting operation, and inability to treat the groundwater resulted in stopping operation.
- Aligambay (300 households): A groundwater well, which was the water source, dried up, and operation was stopped.

As a consequence, no problems have been observed in the organizational or financial aspects of the operation and maintenance of the Project, but there are problems in the operation of some facilities in terms of the technical aspect of operation and maintenance by some local governments and community organizations. However, facilities which are subject to operation and maintenance by the local governments and community organizations make up part of the Rural Water Supply Component, and their relative importance in the Project is low. Moreover, the number of beneficiaries of water supply systems with major operational problems (a total of approximately 7,000 households) is limited to around one tenth of the households benefiting from the Project (approximately 57,000 households).

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 Project was implemented in the Eastern Province of Sri Lanka with the aim of achieving a safe drinking water supply by constructing and expanding water supply facilities, thereby contributing to improving living standard and reducing poverty in the target areas. At the time of the appraisal and ex-post evaluation, the Project is highly consistent with the policies and development needs of Sri Lanka. The Project is also compatible with the ODA policies of Japan at the time of the appraisal. As such, the relevance of the Project is high. The actual project cost

was within the plan, however, since the actual project period was significantly longer than planned, the efficiency of the Project is fair. The volume of water distributed, the number of new domestic connections to water supply service, daily water supply duration, and water quality were roughly as planned. The degree of satisfaction of beneficiaries for the Project is high, with impacts being achieved in terms of reduced cost of water (time and labour), increased convenience in their daily lives, improved hygiene, increased opportunities for productive activities, and increased revenue. Therefore, the effectiveness and impacts of the Project are high. There are no problems in the organizational or financial aspects of operation and maintenance of the Project. Although there are problems in the technical aspect of municipal governments and community organizations and in the operation of some facilities, their adverse effect on the Project as a whole is limited. As such, the sustainability of the Project in general is high.

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

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

(1) NWSDB needs to take the necessary measures for the following areas.

- ✧ Urgently start water supply using the newly dug well in Panama as a water source. Work to establish an additional water source at Pottuvil by digging wells. In addition, prepare for the construction of a purification plant and transmission facilities to coincide with the start of a new reservoir project of the Irrigation Department, and link this to the permanent resolution of water source problems in both areas (Ampara District Water Supply Component).
- ✧ Utilize the newly dug well at Pulmudai and construct a river water intake and an additional purification facility, thereby improving water quality and water distribution quantity (Rural Water Supply Component).
- ✧ Construct a facility to remove sand from the water intake at Dehiyathakandiya to prevent pump damage (Ampara District Water Supply Component).

(2) With regard to villages with major problems in the operation and maintenance of water supply systems of the Project (40th Village, Thihalaweddi, Mallihathivu, Kannekipuram, Karadiyanaru, Aligambay), t the Eastern Province Government as well as local governments and community organizations to whom the water supply systems were transferred; with the technical support of the NWSDB, need to carry out the training for the operation and maintenance, to analyze the needs and possibility of alternative water sources including transmission by NWSDB and those of the repairs to purification facilities and distribution

facilities, and then to implement these measures securing financing.

4.2.2 Recommendations to JICA

JICA should examine possible support towards the achievement of the aforementioned recommendations, while also bearing in mind the utilization of the Rural Infrastructure Development Project in Emerging Regions currently being implemented as an ODA Loan project in Eastern Province.

4.3 Lessons Learned

Operation and Maintenance of Rural Water Supply Systems

If the local government and community organizations which have taken on the control of water supply systems in rural areas lack adequate experience or technical capacity, there is a need to perform adequate training before facilities start operation. Moreover, in order to ensure that operation and maintenance is carried out properly while gaining experience and that problems which occur after the systems start operation can be handled appropriately, it is preferable that follow-up be provided for a given period after facilities start operation. This follow-up should continue for at least a year to enable personnel to experience both the wet and dry seasons. The development of a support framework by an organization with appropriate technical know-how would also be a means of enabling permanent technical support.

In the Rural Water Supply Component of the Project, in some of the water supply systems with treatment facilities, training before transfer of facilities to local governments and community organizations was inadequate, and operation and maintenance is not being carried out properly. In some systems which use groundwater as a water source, it was confirmed that the quality and production volume of untreated water changed after the facilities started operating, and it became impossible to supply water appropriately.

END

Comparison of the Original and Actual Scope of the Project

Item	Plan	Actual
① Outputs*		
<Ampara District Water Supply Component>		
Transmission main		
Construction of transmission main (Konduwattuwana to Kalmunai)	28 km	25 km
Construction of pumping facilities	1 location	As planned
Construction of distribution reservoir	2 locations	1 location
Purification facilities		
Expansion of existing purification plant	1 location	As planned
Construction of new purification plant	1 location	As planned
Transmission/distribution facilities		
Target areas	8 areas	10 areas
Construction of distribution reservoir	4 locations	6 locations
Construction of transmission/distribution pipes	549 km	828 km
Construction of pumping facilities/pumps	9 locations	11 locations
Power generation facilities	(not planned)	4 locations
Offices and other buildings	(not planned)	4 locations
Operation and maintenance equipment	(not planned)	3 vehicles, 3 asphalt cutters, etc.
Consulting services	Water treatment technology, detailed design assistance, etc.	As planned
<Rural Water Supply Component>		
Number of rural water supply systems constructed	28 systems (preliminary candidates)	24 systems
Consulting services	Baseline study, feasibility study, detailed design, support for tender, work supervision, training, etc.	As planned
② Project Period	March 2010 - December 2013 (46 months)	March 2010 - <Ampara Dist. Comp.> April 2017 (86 months) <Rural Water Comp.> December 2014 (60 months)
③ Project Cost*		
ODA Loan fund	4,904 million yen	4,847 million yen
Sri Lankan fund	1,150 million yen	626 million yen
Total	6,054 million yen	5,473 million yen
Exchange rate	1 US$ =90.3yen = 115Rs (December 2009))	1 US$ =99.0yen = 130Rs (Average 2010-2017)
④ Final Disbursement	July 2016	