Ex-Post Project Evaluation 2015 Package II-6

(Thailand, Turkey, India, Sri Lanka)

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Thailand

FY2015 Ex-Post Evaluation of Japanese ODA Loan Project

"Seventh Bangkok Water Supply Improvement Project (I)"

"Seventh Bangkok Water Supply Improvement Project (II)"[1]

External Evaluator: Keisuke Nishikawa, Japan Economic Research Institute Inc.

0. Summary

In this project, water treatment plants and transmission tunnels were developed to establish a well-balanced water supply system and respond to the growing demand for water from both sides of Chao Phraya River in the metropolitan Bangkok area. This project was consistent with the development plans and needs of Thailand at the time of appraisal and ex-post evaluation, as well as the priority areas of Japan's ODA policy at the time of appraisal. Therefore, the relevance of this project is high. With regard to project implementation, although some of the project components were changed, the changes were appropriate for generating project effects, and the project cost was within the plan. However, the efficiency was fair as the project period substantially exceeded the plan due to the effects of policy changes, etc. With respect to project effectiveness, the targets for the majority of quantitative indicators were achieved and the qualitative effects were also sufficiently achieved. As for the impact of the project, it was confirmed that this project contributed to the reduction of groundwater pumping and created a convenience for the residents in their lives. Therefore, the effectiveness and impact of this project are high. Regarding sustainability, there were no issues in terms of all institutional, technical and financial aspects, and operation and maintenance status. Therefore, project effects generated in this project are considered sustainable.

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

[1] In this report, the "Seventh Bangkok Water Supply Improvement Project (I)" is referred to as "Phase I" and the "Seventh Bangkok Water Supply Improvement Project (II)" as "Phase II".

1. Project Description

Project Location

Maha Sawat Water Treatment Plant Expanded in this Project

1.1 Background

Concurrent with the population growth in the metropolitan Bangkok area, the maximum demand volume of water had been expected to grow from 4.26 million m^3/day in 1999 to 5.42 million m^3/day in 2007. In those days, the water supply system in the metropolitan Bangkok area was dependent on the treatment capacity of the Bang Khen Water Treatment Plant located on the eastern side of Chao Phraya River. The water treated and produced at the plant was supplied to the plant through existing transmission tunnels and distribution pipes, but the transmission tunnels had water leakages due to their technical designs and dilapidation, undermining the transmission capacity of the water produced. Meanwhile, the western side of the river was receiving its supply of water from the eastern side and was expecting to see a growth in population, requiring a response to the foreseeable increase in water demand associated with such growth. Moreover, in the Bangkok Metropolitan Area, as ground subsidence was significant in areas where ground water was excessively extracted, the government was trying to reduce the extraction of ground water by converting to the use of surface water.

Therefore, it was necessary to establish a well-balanced network of water treatment, transmission and distribution throughout the entire metropolitan Bangkok area as a response to the increase in demand for supplied water, which came about by converting away from the use of ground water as a measure for supplying it to an increased population

and the ground subsidence issue. The Metropolitan Waterworks Authority (hereinafter referred to as 'MWA') was implementing this initiative as the 'Seventh Bangkok Water Supply Improvement Project' which this project was intended to support.

1.2 Project Outline

The objective of this project was to establish a well-balanced water supply system and respond to the increasing demand for water by strengthening treatment and transmission capacities in the Bangkok Metropolitan Area, thereby contributing to the improvement of public health and the living environment.

<ODA Loan Project>

Loan Approved Amount/ Disbursed Amount	(Phase I) 12,608 million yen / 5,752 million yen (Phase II) 9,601 million yen / 6,641 million yen	
Exchange of Notes Date/ Loan Agreement Signing Date	(Phase I) September 1999 / September 1999 (Phase II) September 2000 / September 2000	
Terms and Conditions (Both for Phase I and Phase II)	Interest Rate	Construction: 1.70% Consulting Services: 0.75%
	Repayment Period (Grace Period)	Construction: 25 years (7 years) Consulting Services: 40 years (10 years)
	Conditions for Procurement:	Construction: General Untied Consulting Services: Bilateral Tied
Borrower / Executing Agency	Metropolitan Waterworks Authority / Metropolitan Waterworks Authority	
Final Disbursement Date	(Phase I) January 2006 / (Phase II) April 2013	
Main Contractor (Over 1 billion yen)	(Phase I) Civil works: Sino-Thai Engineering and Construction Public Co., Ltd. (Thailand), OTV SA (France) / Summit Grade Limited Partnership (Thailand) (Phase II) Civil works: Italian-Thai Development Public Company Limited (Thailand) Supply of Materials and Equipment: Joint Venture TPS (Thailand)	

Main Consultant (Over 100 million yen)	(Phase I) Nihon Suido Consultants Co., Ltd. (Japan) / TEAM Consulting Engineering and Management Co., Ltd. (Thailand)
Feasibility Studies, etc.	Re-revised Master Plan for Water Supply and Distribution of Metropolitan Bangkok (1990), Safege Consulting Engineers (France) / Thai DCI Co. (Thailand)
Related Projects	[Technical Cooperation] The National Waterworks Technology Training Institute Project (1985 – 1991) The National Waterworks Technology Training Institute Project (II) (1994 – 1999) Technical Assistance Related to "Eighth Bangkok Water Supply Improvement Project" (2010 – 2013) [ODA Loan Project] Bangkok Water Supply Improvement Project (Stage I Phase II) (June 1979) Bangkok Water Supply Improvement Project (II-I) (September 1984) Bangkok Water Supply Improvement Project (Stage 2 – Phase 1 – A2) (October 1985) Bangkok Water Supply Improvement Project (Tunnel Rehabilitation) (November 1988) Bangkok Water Supply Improvement Project (Stage 2 – Phase 1 – B) (November 1988) The Fourth Bangkok Water Supply Improvement Project (Phase I) (September 1991) Fourth Bangkok Water Supply Project (II) and Fifth Project (January 1993) Networks System Improvement Project (September 1993) Sixth Bangkok Water Supply Improvement Project (September 1994) Eighth Bangkok Water Supply Improvement Project (December 2009)

	[Grant Aid] Construction of National Waterworks Technology Training Institute (1985 – 1986) [Other International / Aid Organizations] World Bank: Bangkok Water Supply Improvement Project (Stage I Phase I) (1974) Asian Development Bank: Three projects during the period of Bangkok Water Supply Improvement Project (Stage I Phase II) and (Stage II Phase I) (1974 – 1984)

2. Outline of the Evaluation Study

2.1 External Evaluator

Keisuke Nishikawa, Japan Economic Research Institute Inc.

2.2 Duration of Evaluation Study

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

Duration of the Study: August 2015 – October 2016

Duration of the Field Study: December 15 – 29, 2015, and March 9 – 16, 2016

3. Results of the Evaluation (Overall Rating: A[2])

3.1 Relevance (Rating: ③[3])

3.1.1 Relevance to the Development Plan of Thailand

The national development plan at the time of appraisal of this project was the "Eighth National Economic and Social Development Plan (1997 – 2001)", with 'Human-centered Development' as its basic concept. In the plan, seven development strategies were listed including a strategy to achieve human development by strengthening economic competitiveness and to improve the quality of life. In this plan, five basic principles for the water supply sector in the Bangkok Metropolitan Area, such as 'to promote water resource management based on economy, efficiency, priority and fairness, were set. Also in the 'Re-revised Master Plan for Water Supply and Distribution of Metropolitan Bangkok (Re-revised Master Plan) prepared in 1990, a plan to extend the total length of transmission pipes to 126.6km by 2015 and the distribution network to 34,700km by 2017 was outlined. Concerning the ground subsidence issue, there was a plan to supply water by establishing a tunnel network as a substitute for the extraction of ground water.

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

[3] ③: High, ②: Fair, ①: Low

In the "Eleventh National Economic and Social Development Plan" (2012 – 2016), a national development plan at the time of ex-post evaluation, six priorities were listed including a strategy for restructuring the economy toward quality growth and sustainability. In the strategy, the aim of water sector development was to strengthen water supply capacities in both urban and rural areas in terms of both quality and quantity. The Re-revised Master Plan was also operative at the time of ex-post evaluation.

As stated above, the goals of national plans to try to improve water supply remained the same, at both the time of appraisal in the "Eighth National Economic and Social Development Plan" and the ex-post evaluation in the "Eleventh National Economic and Social Development Plan". The overall plan of the water supply sector had remained unchanged from the time of appraisal till ex-post evaluation, with the expansion of water supply networks consistently emphasized. Therefore, this project, which strengthened water production and transmission capacities including the cessation of ground subsidence in the Bangkok Metropolitan Area, can be said to have been consistent with the development plans at the time of appraisal and ex-post evaluation.

3.1.2 Relevance to the Development Needs of Thailand

At the time of appraisal of this project, it was necessary for the water supply in the Bangkok Metropolitan Area to have a well-balanced network of water treatment, transmission and distribution throughout the entire metropolitan Bangkok area to respond to challenges such as water leakages in the existing water treatment system, increases in demand from the western side of Chao Phraya River, and increases in demand for water supply caused by the shift from the use of ground water to surface water[4].

During the ex-post evaluation, questions were asked to MWA regarding these challenges, and it was confirmed that the establishment of a well-balanced network of water treatment, transmission and distribution in both the eastern and western areas of Chao Phraya River in the Bangkok Metropolitan Area not only responded to the growth in demand from the western area but was also important from a viewpoint of crisis management in that water could be supplied from east to west or vice versa when a crisis occurred. Having additional water production capacities was also necessary to implement regular maintenance works, and having an established network was considered essential for the achievement of a stable water supply. Therefore, this project,

[4] According to the documents provided by JICA, the population of the Bangkok Metropolitan Area was expected to increase from 7.56 million in 1998 to 10.23 million in 2010. Accordingly, the maximum water demand per day was also expected to increase from 4.69 million m^3/day in 1998 to 6.12 million m^3/day in 2010.

which enhanced the water production capacity in the western area of Chao Phraya River and developed a transmission tunnel between the eastern and western areas, responded to the development needs at the time of appraisal and ex-post evaluation.

The water demand, supply capacity and number of connections in the Bangkok Metropolitan Area are shown in the table below.

Table 1: Water Demand, Supply Capacity and Number of Connections in the Bangkok Metropolitan Area

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Volume of water demand (million m^3/year)	1,173	1,224	1,251	1,250	1,282	1,282	1,317	1,361	1,377	1,406
of which in the eastern area	792	832	851	846	865	866	893	923	930	949
of which in the western area	381	392	400	404	417	416	424	438	447	457
Water supply capacity (million m^3/day)	5.52	5.52	5.52	5.52	5.52	5.52	5.52	5.92	5.92	5.92
Number of connections (in thousands)	1,743	1,804	1,860	1,920	1,965	2,018	2,060	2,114	2,171	2,227
of which in the eastern area	1,016	1,051	1,081	1,115	1,138	1,167	1,191	1,218	1,252	1,282
of which in the western area	727	754	779	805	827	850	870	895	920	945
Population in the Bangkok Metropolitan Area (in millions)	-	11.22	11.28	11.33	11.39	11.41	11.46	11.53	11.60	11.67

Source: Data provided by the Executing Agency

As shown in Table 1, from 2006 to 2015, the 'volume of water demand' increased by 20%[5] and the number of connections by 28%, indicating a more rapid increase than the population growth. In particular, the number of connections in the western area increased by 30%, surpassing the rate of increase in the eastern area. As this project enhanced the supply capacity, it can be deemed a project capable of responding to this kind of demand increase. Accordingly, the importance of developing water supply networks in the western part of the Bangkok Metropolitan Area was high both at the time of appraisal and ex-post evaluation.

3.1.3 Relevance to Japan's ODA Policy

In the "Medium-Term Strategy for Overseas Economic Cooperation Operations"

[5] The water demand decreased by 300,000m^3 from 2008 to 2009, and according to the Executing Agency, this was due to the economic slowdown influenced by continuous occurrences of global financial crises after September 2008.

prepared by JICA in 1999, three priority areas were listed, including 'poverty reduction and assistance for economic and social development'. Also JICA's "Country Assistance Strategy for Thailand" prepared in 2000, specified the water supply sector as a priority area for assistance. Moreover, Japan's "Country Assistance Policy for Thailand', formulated in March 2000, prioritized economic infrastructure development.

In this way, social infrastructure development and social development implemented in this project can be said to have been consistent with these policies as the development of a water supply system was meant to support sustainable economic growth through the development of economic and social infrastructure and industries, as well as promote equitable distribution of the outcomes of economic growth through poverty reduction measures and social development. The water supply sector was also set as a priority area for assistance in the Country Assistance Policy and the Country Assistance Strategy from the viewpoint of economic infrastructure development, demonstrating a high consistency as a whole with Japan's ODA policy at the time of appraisal.

As shown above, it was confirmed that this project had been consistent with Thailand's development plans and needs at the time of appraisal and ex-post evaluation, and also with Japan's ODA policy at the time of appraisal. Therefore, the relevance of this project is judged to be high.

3.2 Efficiency (Rating:②)

3.2.1 Project Outputs

Throughout the Phase I and II of this project, the Maha Sawat Water Treatment Plant in the western area of the river and the Bang Khen Water Treatment Plant in the eastern area were expanded; transmission tunnels were constructed and rehabilitated; and trunk mains pipes, were installed. Table two summarizes the original and actual project scope.

Table 2: Original and Actual Scope of this Project

Scope	Original	Actual
[Phase I]		
Expansion of Maha Sawat Water Treatment Plant	Expansion of treatment capacity by additional 400,000m^3 per day. Procurement and installation of electrical substation. Procurement and installation of pump equipment at: - Tha Chin Raw Water Pumping Station (1 unit) - Maha Sawat Raw Water Pumping Station (3 unit) - Maha Sawat Transmission Pumping Station (1 unit) - Petch Kasem Distribution Pumping Station (1 unit)	No installation of pump equipment at Tha Chin Raw Water Pump Station. Other components were implemented as planned.
Construction of transmission tunnel	From Nakhon Indra Project Road to Tha Phra Pumping Station: Approximately 3km-long and 2,500mm in diameter	Implemented as planned
Expansion of Bang Khen Water Treatment Plant	Expansion of treatment capacity by additional 400,000m^3 per day. Expansion of Raw Water Pumping Station at Sam Lae. Expansion of Bang Khen Transmission Pumping Station. Procurement and installation of pump equipment at: - Sam Lae Raw Water Pumping Station (1 unit) - Bang Khen Raw Water Pumping Station (1 unit) - Bang Khen Raw Water Pumping Station (3 unit)	Implemented as planned
Civil Works for Unaccounted-for-Water	Civil works for Unaccounted-for-Water Pilot Project implemented under consulting services	Implemented as planned
Consulting Services	Detailed designing, bidding assistance, construction supervision, environmental monitoring, etc. for the expansion of water treatment plants, installation of transmission tunnel, and so on. Surveys, project planning, bidding assistance, construction supervision, environmental monitoring, etc. for the Unaccounted-for-Water Pilot Project	Implemented as planned

[Phase II]		
Rehabilitation of Existing Transmission Tunnel	Steel-lining works for the rehabilitation of three damaged sections (13.6km in total) of the transmission tunnel from the Bang Khen Water Treatment Plant	Rehabilitation of 0.18km-section from Lumpini Valve Chamber to Lumpini added. Other components were implemented as planned.
Installation of Trunk Mains Pipes	New installation and replacement of trunk mains pipes (161km in total: 106km for new installation and 55km for replacement)	Implemented as planned
Consulting Services	Bidding assistance and construction supervision for the rehabilitation of transmission tunnels and advice on environmental conservation measures	Implemented as planned

Sources: Information provided by JICA, and interviews with the Executing Agency

The reason not to install pump equipment at Tha Chin Raw Water Pump Station during Phase I was that it became clear in the technical survey conducted by MWA that water transmission from the pumping station, located upstream, to the Maha Sawat Water Treatment Plant, located downstream, would be possible without raising the pressure head by using a pump. Therefore, a pump to transmit water from Tha Chin Raw Water Pumping Station to Maha Sawat Water Treatment Plant was judged to be unnecessary for some time, and in fact, the water volume transmitted to Maha Sawat Water Treatment Plant had been sufficient. With regard to the additional rehabilitation of the 0.18km-section of the transmission tunnel between the Lumpini Valve Chamber and Lumpini during Phase II, the reason to include the section for rehabilitation work was that the section was found to have water leakages during the detailed designing stage.

Both Phase I and II underwent changes during the detailed designing stage such as the cancellation of pump equipment installation at the raw water pumping station and the additional rehabilitation of the transmission tunnel, which were changes that would not negatively affect the project effects. Therefore, it can be judged that there were no problems regarding these changes. Other outputs were confirmed to have been implemented when project sites other than the transmission tunnels buried underground were visited.

Bang Khen Water Treatment Plant
(section expanded in this project)

Pump installed in this project
(Phet Kasem Distribution Pumping Station)

3.2.2 Project Inputs

3.2.2.1 Project Cost

Phase I of this project was planned at a cost of 17,254 million yen, including the ODA loan amount of 12,608 million yen, and Phase II at 15,253 million yen, including the ODA loan amount of 9,601 million yen. Table 3 compares the original and actual amounts for each phase.

Table 3: Comparison of Original and Actual Project Cost (by overall cost and loan amount)

(Unit: million yen)

	Original		Actual	
	Overall cost	of which the loan amount	Overall cost	of which the loan amount
Phase I	17,254	12,608	9,126	5,752
Phase II	15,253	9,601	12,041	6,641
Total	32,507	22,209	21,167	12,393

Source: Data provided by JICA and the Executing Agency

Although the project cost planned at the time of appraisal was based on the preparatory study, the cost was reduced[6] during the detailed designing stage, as there were cases of competitive bidding among contractors for each contract package after that and the actual quantity of construction works turned out to be less than the

[6] For example, cancellation of pump installation at Tha Chin Raw Water Pumping Station reduced the project cost by 458 million yen. Also, regarding the addition of the transmission tunnel rehabilitation in the Lumpini area, the cost of the contract package including other work sections was in fact 2,203 million yen, less than the planned amount of 2,981 million yen, though the package had a variation order.

quantity initially expected; all of which led to the reduction of the overall cost[7].

As a result of detailed design and bidding, the installation of pump equipment at the raw water pumping station was cancelled and the transmission tunnels were additionally rehabilitated. The actual overall project cost combining Phase I and II was 21,167 million yen which was 35% lower than the planned amount.

3.2.2.2 Project Period

The period of this project was expected to be 78 months from September 1999 to February 2006, with Phase I continuing 61 months, from September 1999 to September 2004, and Phase II proceeding 66 months, from September 2000 to February 2006. Table 4 summarizes the original and actual project period.

Table 4: Comparison of Original and Actual Project Period

	Original	Actual	Changes
Phase I	September 1999 – September 2004 (61 months)	September 1999 – September 2007 (85 months)	139%
Phase II	September 2000 – February 2006 (66 months)	September 2000 – March 2014 (163 months)	247%
Total	September 1999 – February 2006 (78 months)	September 1999 – March 2014 (175 months)	224%

Source: Information provided by JICA and the Executing Agency

As shown in the table above, both Phase I and II exceeded the planned periods. The primary reasons are described below.

[Phase I]

- In December 2003, a polder dyke within the premises of Bang Khen Water Treatment Plant, which was outside the scope of this project, collapsed causing sludge to flow into the construction area. Consequently, it took 18 months for the recovery work to conclude causing delays of related work associated with recovery work, and led to an overall delay of 24 months.

[Phase II]

- During the project implementation, the Government of Thailand banned the

[7] As stated later, the project period exceeded the plan as a polder dyke at Bang Khen Water Treatment Plant collapsed and sludge flowed into the construction area within the transmission pumping station. While the cost increased due to recovery work, it is not included in the cost of this project as the inflow of sludge into the transmission pumping station was caused due to the collapse of the facility (dyke) that was outside the project's scope.

excavating of wells in the southeastern area of the Bangkok Metropolitan Area causing a substantial increase in demand for water in that area. In this project, some parts of the water supply system were planned to be cut off due to the rehabilitation work on transmission tunnels, but some concerns arose over the transmission capacity to the southeastern area and the stability of the water supply system during that period. As a consequence, a new transmission tunnel funded by MWA was planned for construction before the transmission tunnel of this project was to be rehabilitated. It took four years to complete this new plan.

- The International Competitive Bidding System was adopted in this project, but a significant delay occurred upon its procedure.
- Due to the occurrence of large-scale flooding in and around Bangkok in 2012, a company of one of the contract packages incurred various influences, such as having to undertake preventative work so that flood water would not flow into the construction site, difficulties in securing construction materials and manpower, and a closure of roads leading to the construction site. As it was expected that the initial contract completion date would not be met, the contract period was extended by 210 days as a measure to support that company (Cabinet resolution in March and May 2012).
- A delay in the construction of Maha Sawat Water Treatment Plant in the "Eighth Bangkok Water Supply Improvement Project" (commenced in 2010) required an adjustment to postpone the commencement of rehabilitation work on the transmission tunnel (Route 2) for this project.

As stated above, various factors were related to the delay of the project. As the large-scale flooding in and around Bangkok during Phase II, which caused such widespread effects, was said to be one that would occur only once every few decades, the extended period of 210 days was subtracted from the calculation of the project period.

Therefore, with Phase I and II combined, it can be judged that the actual period was 168 months (with the dates September 1999 – March 2014 equaling 175 months and minus 7 months), compared to the planned period of September 1999 – February 2006 (78 months). The actual project period was significantly longer than planned as it became 215% that of the original plan.

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

Financial Internal Rate of Return (FIRR)

It was expected at the time of appraisal that the FIRR of Phase I would be 16.2% and the overall FIRR including the 'Seventh Bangkok Water Supply Improvement Project', supported by Japan, be 10.6%. On the other hand, the FIRR for Phase II had not been calculated at the time of appraisal. Therefore, the overall FIRR of the 'Seventh Bangkok Water Supply Improvement Project' was recalculated in this ex-post evaluation study. In the same way as the calculation at the time of appraisal, the benefits were considered revenues from water rates, meter installation, and equipment (installation of water taps), and the costs were considered construction costs, water treatment costs, meter reading/fees collection costs, maintenance costs, and interest rates. The project life was set for 30 years.

The recalculation of the FIRR for the overall 'Seventh Bangkok Water Supply Improvement Project' in the ex-post evaluation showed a result of 9.31%, which was higher than the weighted average cost of capital, of 7.82%. The main reason for the rate being lower than the plan was that water rates and new connection fees had not been raised. However, it was considered the appropriate investment as it was higher than the weighted average cost of capital.

Regarding the output in this project, while there were some changes such as the cancellation of pump equipment at Tha Chin Raw Water Pumping Station and the extension of a transmission tunnel by 0.18km, they were considered adequate as these were not changes that damaged the generating of project effects, as stated above. The actual overall project cost as a result was within the plan, at 65% of the planned project cost. On the other hand, the project period significantly exceeded the plan 215% resulting from the inflow of sludge caused by the collapse of the adjacent polder dyke and the suspension of the transmission tunnel construction associated with the ban on the excavating of wells.

In 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[8] (Rating:③)

3.3.1 Quantitative Effects (Operation and Effect Indicators)

In this project, no indicators to measure project effects were set at the time of appraisal of Phase I, but the operation and effect indicators, shown in the table below, were set at the time of appraisal of Phase II, one year later. Therefore, actual figures of these indicators were checked and their achievement levels were evaluated in the ex-post evaluation study.

[8] Sub-rating for Effectiveness is to be put with consideration of Impact.

Table 5: Operation and Effect Indicators of this Project

			Baseline	Target	Actual	Actual	Actual
			1999	2007	2013	2014	2015
			Appraisal Year	1 Year After Completion	1 Year Before Completion	Completion Year	1 Year After Completion
Operation Indicator	Average Water Production (million m^3/day)		3.88	4.93	4.94	4.92	5.03
	Unaccounted-for-Water Rate (%)		39.4	30.0	24.6	23.4	22.1
	Leakage Rate (%)		32.0	26.0	No data		
	The following indicators for Petch Kasem Distribution Station						
	1. Water Supply Volume (million m^3/day)		0.26	0.38	0.27	0.34	0.35
	2. Water Pressure (m)		23.0	42.0	18.9	22.3	26.2
	3. Size of area without any or without sufficient water supply (km^2)		20.0	10.0	No data		
Effect Indicator	Water Supply Coverage (%)	Population-based	64.0	67.0	99.0	99.3	99.5
		Area-based	37.3	45.6	80.0	81.3	No data

Source: Data provided by JICA and the Executing Agency

As the figures set as targets for 2007 at the time of appraisal were the ones to be achieved one year after project completion, comparisons were made with the figures of 2015 which were accounted for one year after the actual completion of this project. It was confirmed that the Average Water Production, Unaccounted-for-Water Rate, Water Supply Coverage (population- and area-based) were above the targets. The water leakage rates are not recorded at MWA as they were captured in the Unaccounted-for-Water Rates. As the Unaccounted-for-Water Rate was 22.1%, the actual leakage rate was thought to be less than that rate.

While the water supply volume and water pressure from Petch Kasem Distribution Station were lower than the planned figures, real-time and sufficient distribution including supply from other distribution stations to the supply area were achieved in response to the demand. As the optimal water supply in the entire water supply network was made possible, no supply shortage occurred in reality, and the surplus supply capacity at Petch Kasem Distribution Station was to be used for increases in demand for water in the future. Regarding the supply area, it was presumed that water was distributed to almost all residential areas as the population-based water coverage rate in

the Bangkok Metropolitan Area, covered by MWA, was 99.5% (2015).

In addition to the indicators expected at the time of appraisal, maximum water supply volume and water production capacities were realized, which is shown below.

Table 6: Water Production and Supply in the Bangkok Metropolitan Area

Indicator	2011	2012	2013	2014 (Completion Year)	2015 (1 Year After Completion)
Maximum Water Supply Volume (million m^3/day)	5.17	5.31	5.43	5.42	5.42
Water Production Capacity (million m^3/day)	5.52	5.52	5.92	5.92	5.92

Source: Data provided by JICA and the Executing Agency

The water production capacity increased by 400,000m^3/day at Bang Khen and Maha Sawat Water Treatment Plant through implementing this project, and it became 3.6 million m^3/day at Bang Khen Water Treatment Plant and 1.2 million m^3/day at Maha Sawat Water Treatment Plant. Together with other smaller water treatment plants, water production capacity in the Bangkok Metropolitan Area had become 5.52 million m^3/day since 2006 and had stably catered to demand for water from the late 2000s till the early 2010s.

In this ex-post evaluation study, opinions of residents regarding the stability of water supply and water quality, etc. were obtained in a beneficiary survey[9]. 95% of the residents responded that water supply was ‘very stable’ or ‘stable’, and 81% responded that the stability ‘improved a lot’ or ‘improved’ compared to the situation before the completion of the project. 12% responded that there was no change before and after the project as it had already been stable for them. Regarding the water quality, 97% responded that it was ‘good’ or ‘acceptable’, and 96% responded that the water pressure was ‘good’ or ‘acceptable’. In this way, it was observed in the beneficiary survey that water users evaluated the improvements highly in terms of water supply stability, water quality and water pressure.

As stated above, quantitative effects were broadly generated as many of the indicators in this project achieved the targets set at the time of appraisal ahead of schedule as a whole.

[9] Three districts in the Bangkok Metropolitan Area (40 each, 120 effective responses) were extracted based on judgment sampling. In each district, interview surveys with residents (75%), shops (23%) and factories (2%) were conducted in three groups.

3.3.2 Qualitative Effects (Other Effects)

At the time of appraisal of this project, it was expected that two qualitative effects, 'establishment of a well-balanced water supply system on the eastern and western sides of Chao Phraya River' and 'presentation of effective measures for Unaccounted-for-Water', would be generated through implementing the project.

With regard to the first effect, i.e., the establishment of well-balanced water supply system on the eastern and western sides, as Maha Sawat Water Treatment Plant came to have a supply capacity of 1.2 million m^3/day with the expansion of 400,000m^3/day through implementing this project, the demand on the western side of Chao Phraya River was met. It can be said that water supply was optimized as the water supplied from the eastern side was minimized.

As to the second effect of the presentation, i.e., effective measures for Unaccounted-for-Water, a pilot project was implemented in Tungmahamek, Sathorn District as part of the consulting services. In the pilot project, construction of a valve chamber, repair of damage causing water leakage, and replacement of water pipes were conducted and a non-revenue-water management including proactive leakage management, rapid repair, water pressure management, and infrastructure management with the use of an information management system was implemented. According to the Executing Agency, this experience led to an overall improvement in the capacities of those concerned with non-revenue-water management. After receiving support and training for this project, and support from the waterworks bureaus of Japanese local governments through technical cooperation projects and technical assistance related to ODA loan project, they implemented non-revenue-water management independently, which was considered to have led to a substantial improvement in the Unaccounted-for-Water rates, shown in Table 5. After that, MWA formulated the "Water Leakage Management Master Plan" in 2012 and had been making efforts in the field of water management, which were in line with standards set by the International Water Association[10]. Therefore, it can be judged that the 'presentation of effective measures for Unaccounted-for-Water', expected at the time of appraisal of this project, was implemented.

3.4 Impacts

3.4.1 Intended Impacts

At the time of appraisal, the following impacts through project implementation were

[10] A not-for-profit international organization established in 1999 to supply stable and safe water and contribute to public health in the world through efficient management of water and improvement of water treatment techniques. Approximately 130 countries are the members.

expected.

- New installation of water trunk, i.e., pipes, and a water supply system in areas where ground water was used would contribute to the easing of ground subsidence.
- Prevention of water leakage from the transmission tunnel would stop the erosion of underground soil and prevent secondary accidents such as damage to roads.

There were some areas in the Bangkok Metropolitan Area where ground subsidence had become a problem, and its cause was thought to be excessive pumping of ground water. During the implementation of this project, the excavating of new wells was banned and levies on ground water pumping were imposed. While the ground subsidence issue was under the jurisdiction of the Ministry of Natural Resources and Environment, not MWA, MWA contributed to the resolution of this issue through developing water supply networks. Also, efforts had been made on the prevention of leakages by rehabilitating transmission tunnels in this project and others, and it was assumed that the actual erosion of underground soil and disasters such as road sagging could be prevented.

According to MWA, no reports were received from residents saying that ground subsidence cases had occurred due to water supply or that road sagging cases had occurred due to water leakage of transmission tunnels. In the beneficiary survey, 78% of residents responded that ground subsidence had not occurred. The remaining 22% replied that ground subsidence had continued. Common comments on the ground subsidence issues were that though they were occurring in some areas, they were improving compared to the past. The factors considered were that ground water pumping was not totally abolished and that influences of past pumping were still seen in some areas. However, it is inferred that this project made a certain level of contribution to the reduction of ground water pumping.

Regarding ‘changes in lifestyle’ in the beneficiary survey and excepting the impacts mentioned above, there were opinions that residents’ lifestyles had become more convenient with the improvements in water supply and increase in number of coin-operated launderettes, implying that this project also contributed to the enhancement of convenience.

3.4.2 Other Impacts

3.4.2.1 Impacts on the Natural Environment

During the planning stage, it was expected that the implementation of this project would improve the hygiene of the residential environment by enabling residents to access safe water and improving their living environment.

Impacts to the natural environment were checked through MWA in the ex-post evaluation and no negative impacts to environment had been seen during nor after the project implementation. In the beneficiary survey, a majority, comprising 98% of residents, responded that there were no particular problems while 2% replied that a type of sandy dust was generated during the water pipe installation works. As for water-borne diseases such as cholera and diarrhea, caused by unsafe water, all of the respondents replied that there were no such cases.

It was reported by MWA that no asbestos-cement pipelines were used during the implementation of this project, and no negative environmental effects were expected in this regard.

Based on the above, it was considered that there were no problems as a whole, as it became clear from the information provided by MWA and the beneficiary survey that no water-borne diseases had developed and no negative effects on the natural environment had been observed in particular, either during or after the project.

3.4.2.2 Land Acquisition and Resettlement

In regard to land acquisition and resettlement in this project, it was expected that

- Phase I: The land outlined for the project had been acquired and there would be no resident resettlement.
- Phase II: No land was going to be acquired for tunnel rehabilitation or installation of trunk mains, and there would be no resident resettlement.

According to MWA, the land for the water treatment plant (approximately 1km^2) was purchased from a private owner and this land was used in this project. There were no issues as the land had already been purchased from the private owner for the future expansion even before this project was planned. It was reported that no resident resettlement occurred in this project, and a visit to the project site in the ex-post evaluation study implies that there was no resident resettlement.

Therefore, it can be judged that there were no problems on the process of land acquisition and resettlement.

With regard to the operation and effect indicators used to measure the effectiveness of this project, no data for some of the indicators could be found. However, with other

indicators considered, it can be judged that the targets were achieved for all indicators except those at Petch Kasem Distribution Station. For Petch Kasem Distribution Station, while the indicators of the distribution station itself had not been achieved, it was not a problem as a stable supply had been realized under the integrated management including the supply at other distribution stations. The qualitative effects were also sufficiently achieved.

Regarding the impact, it was seen that the project had contributed to the reduction of ground water pumping and the residents' lifestyles had become more convenient. No issues were found in terms of environmental and socials aspects.

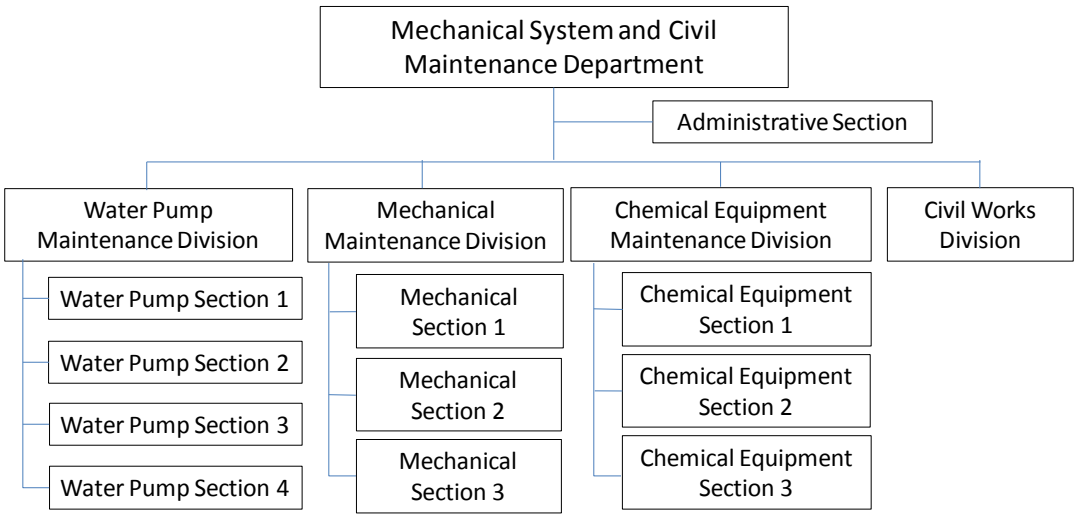
In light of the above, this project has largely achieved its objectives. Therefore, the effectiveness and impact of the project are high.

3.5 Sustainability (Rating:③)

3.5.1 Institutional Aspects of Operation and Maintenance

The executing agency of this project was MWA, under the Ministry of Interior, consisting of 9 bureaus including the Governor's Office, Administration, Finance, Planning and Development, Engineering and Construction, Water Production and Transmission, Eastern Services, Western Services and Information Technology. The number of staff was 4,137 (as of December 2015). The number had decreased by more than 2,000 staff members since the time of appraisal of this project, and this was because MWA had already started reducing the number of staff to achieve efficient management before that time. According to MWA, new employment was limited to 25% of the total retirement, and it was concluded through analysis that the authority could be downsized to a level where the ratio of staff to customers would be 1:400. At the time of ex-post evaluation, the number of staff was reduced to that ratio. However, judging from the operation and maintenance status, the needed number of technicians seemed to have been sufficiently employed.

Operation and maintenance of this project was undertaken by each department and section of Bang Khen and Maha Sawat Water Treatment Plants, etc. under the management of Deputy Governor, who was in charge of production and transmission. The Mechanical System and Civil Maintenance Department was in charge of maintenance of facilities and equipment. The department consisted of 4 divisions, the Water Pump Maintenance Division, the Mechanical Maintenance Division, the Chemical Equipment Maintenance Division etc., with 101 staff members.



Source: Information provided by the Executing Agency

Figure 1: Organization Chart of Mechanical System and Civil Maintenance Department

Regarding the structure of operation and maintenance, MWA had a clear demarcation of roles by division and it was felt from the actual operation and maintenance status that it had the structure to conduct sufficient operation and maintenance.

At the time of appraisal of this project, there was the possibility that at a time of a series of privatizations of state-owned enterprises in Thailand, MWA would also be privatized; but it was not carried out with the change of government after all. It was confirmed that privatization was not being planned at the time of ex-post evaluation.

3.5.2 Technical Aspects of Operation and Maintenance

MWA expressed their view that it had sufficient capacities and technical skills within their authority to operate the water supply business and maintain facilities and equipment. In fact, there were no facilities left unrepaired, and as described earlier, the beneficiary survey showed that 95% of the respondents answered that water was supplied stably, indicating sufficient technical skills for operation and maintenance. While repairs and overhauls of pumps, motors, clarifying and filtering facilities were outsourced to the private sector, there were no issues observed in terms of optimal and efficient maintenance. According to MWA, manuals on operation and maintenance were prepared and provided for each contract package of this project and were utilized for maintenance work.

With respect to capacity development of maintenance technicians, internal training programs such as training on maintenance of pumping equipment as well as a vibration analysis training conducted by an external organization were provided to develop capacities of technicians. Japan also provided assistance for capacity development of

technicians between the 1980s and 1990s and then again in the early 2010s, in addition to the support by 'Bangkok Water Supply Improvement Project', implemented several times.

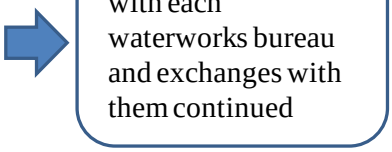
Column: Long-term Cooperation by Japanese Local Governments for Capacity Development of MWA's Technicians

The National Waterworks Technology Training Institute was constructed through the Grant Aid Project: 'Construction of National Waterworks Technology Training Institute' in 1986, and Technical Cooperation: 'The National Waterworks Technology Training Institute Project' (1985 – 1991 and 1994 – 1999) and Technical Assistance related to 'Eighth Bangkok Water Supply Improvement Project' (2010 – 2013) (hereinafter referred to as 'Related Technical Assistance') were implemented with the cooperation of technicians from Japanese water supply corporations from the Tokyo Metropolitan Government, Nagoya City, Osaka Prefecture, Sapporo City, Yokohama City, Saitama Prefecture, etc. During and after that period, MWA hosted JICA's Third Country Training Programs[11] in areas such as water supply technologies and water supply business management, and had become a hub in the Asian region to disseminate water supply technologies which Thailand had learned.

In the Technical Cooperation project being implemented before the commencement of this project, the conducting of training, research and development activities were done in water resource management, advanced technologies of water purification, non-revenue-water volume management, etc., and the technicians came to acquire technical skills for responding to increases in water demand and realizing stable water supply. However, when the 'Eighth Bangkok Water Supply Improvement Project', a successor of this project, was planned for implementation, it was found that leakage management, distribution management, pipeline designing, water purification, etc. needed to be supported further, and Tokyo Metropolitan Government, Nagoya City and Osaka Prefecture cooperated in the Related Technical Assistance.

[11] A scheme in which a certain developing country (i.e. a country that received technical assistance from Japan in the past) hosts technicians from other developing countries with support from donor countries or organizations for the purpose of transfer or sharing of development experiences, knowledge and technology

Technical Assistance Related to "Eighth Bangkok Water Supply Improvement Project"	
Tokyo	Non-Revenue-Water Management
Nagoya	Water Distribution Management
Osaka Prefecture	Water Supply –Transmission Management / Risk Management



MWA improved their technical skills in the above fields through the Related Technical Assistance and was making efforts to further lower the non-revenue-water rates by reducing water leakage. After the completion of Related Technical Assistance, a Memorandum of Understanding was signed with each waterworks bureau to continue future exchanges.

MWA had continued a cooperative relationship with JICA and become an important partner for JICA, as it continued to host JICA's Third Country Trainees from many parts of the world, particularly from ASEAN countries, and had been cooperating with the Thai-Japanese Association School in Bangkok on their field trips since 2004. MWA received the International Cooperation Appreciation Award from JICA in 2011.

3.5.3 Financial Aspects of Operation and Maintenance

In the ex-post evaluation study, MWA's overall revenue and expenditure and the maintenance budget of recent years were obtained. The income statement is from MWA's financial statements shown below.

Table 7: MWA's Statement of Income

(Unit: million Baht)

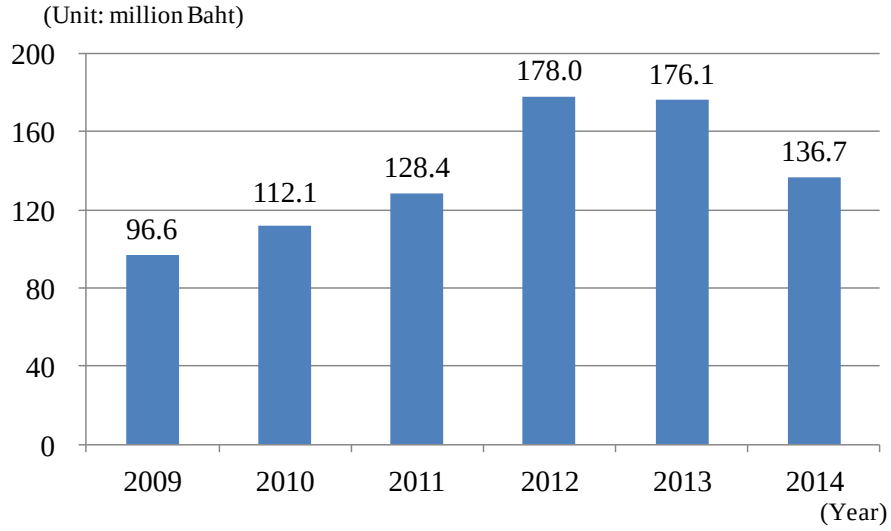
	2009	2010	2011	2012	2013	2014
[Operating revenues]						
Water sales	14,873	15,302	15,287	15,562	16,257	16,403
Water meter fees	783	805	824	844	865	888
Tap water connection fees	472	471	455	371	425	455
Work contract revenues	389	471	561	614	742	786
Other operating revenues	147	137	236	214	579	661
Total operating revenues	16,665	17,186	17,363	17,605	18,867	19,194
[Operating expenses]						
Raw materials and consumables used	1,995	1,947	2,040	2,364	2,555	2,545
Employee benefit expenses	3,289	3,463	3,420	3,188	3,249	3,269
Depreciation and amortization expenses	4,880	4,573	4,427	4,665	4,411	4,674
Other operating expenses	1,169	1,310	1,580	1,702	2,028	2,094
Total operating expenses	11,333	11,293	11,467	11,919	12,243	12,582
Operating profit	5,331	5,892	5,895	5,686	6,624	6,613
[Other revenues and expenses]	-188	159	-26	271	703	329
[Finance costs]	-641	-410	-222	-165	-83	-65
Profit for the year	4,502	5,641	5,647	5,792	7,244	6,877

Source: Data provided by the Executing Agency

Note: Individual figures and total figures may not necessarily correspond due to rounding.

It was confirmed from the income statement that revenues, particularly through water sales, were increasing, leading to sufficient net profit as the demand for water had been increasing. The financial statements including the balance sheet and the cash flow statement had no problems and were in a sound financial status.

Expenditures for maintenance of water supply facilities and equipment are as shown in Figure 2. While the expenditure decreased in 2014 from its increasing trend from till the previous year, MWA commented that necessary repairs and inspections were conducted without problems and a sufficient amount of maintenance budget was allocated.



Source: Data provided by the Executing Agency

Figure 2: Repair and Maintenance Expenses of Facilities and Equipment

The water tariff could be freely determined by MWA after the amendment of the 1992 Metropolitan Waterworks Authority Act, but it had not been raised since December 1999. For households, it was 8.50 Baht per $1m^3$ up to the first $30m^3$, above which point the water tariff per single unit gradually goes up. According to MWA, as the financial status had been sound, with increases in water sales, there was no immediate need to raise the tariff.

Based on the above, there were no particular concerns on the financial aspect, and there were no issues as a whole.

3.5.4 Current Status of Operation and Maintenance

Inspections during the ex-post evaluation of the water treatment plants and distribution station developed in this project found that all of the facilities were working in good condition. While the tunnels could not be checked visually, as they were all buried underground, all of them were used in all sections without any problems, according to MWA. At MWA, two types of maintenance plans, a preventive one and a predictive one, were formulated and used, with the former being used as a setting for the frequency of inspections; The items to be checked weekly, monthly, quarterly, biannually, yearly, every 36 and 60 months were specified. The latter plan was to analyze the status on a regular basis. According to MWA, these maintenance plans were adequately exercised with the conducting of regular inspections. MWA also regularly carried out large-scale repairs of water treatment plants and pumps and it was confirmed during the ex-post evaluation that older equipment outside the scope of this project was

being repaired.

Regarding the procurement of spare parts, a longer time was taken for non-versatile or infrequently-used parts. However, there seemed to be no problems in general as no parts went unreplaced.

During the site survey of the ex-post evaluation, no concerns were found regarding operation and maintenance.

In light of the above, no major problems have been observed in the institutional, technical and financial aspects of the operation and maintenance system. Therefore, the sustainability of the project effects is high.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

In this project, water treatment plants and transmission tunnels were developed to establish a well-balanced water supply system and respond to the growing demand for water from both sides of Chao Phraya River in the metropolitan Bangkok area. This project was consistent with the development plans and needs of Thailand at the time of appraisal and ex-post evaluation, as well as the priority areas of Japan's ODA policy at the time of appraisal. Therefore, the relevance of this project is high. With regard to project implementation, although some of the project components were changed, the changes were appropriate for generating project effects, and the project cost was within the plan. However, the efficiency was fair as the project period substantially exceeded the plan due to the effects of policy changes, etc. With respect to project effectiveness, the targets for the majority of quantitative indicators were achieved and the qualitative effects were also sufficiently achieved. As for the impact of the project, it was confirmed that this project contributed to the reduction of groundwater pumping and created a convenience for the residents in their lives. Therefore, the effectiveness and impact of this project are high. Regarding sustainability, there were no issues in terms of all institutional, technical and financial aspects, and operation and maintenance status. Therefore, project effects generated in this project are considered sustainable.

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

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

Some time has passed since the facilities and equipment were developed in this project and it is assumed that major repair work will be necessary in the future. It is expected that good management, based on the maintenance plan, will be continued as

seen till now, so that the water supply will continue to be stable.

4.2.2 Recommendations to JICA

None

4.3 Lessons Learned

Improvement of Project Effects by Capacity Development through Long-term Technical Assistance

Not only the support for water supply network development through ODA loan projects but also the capacity development of staff members has been provided to MWA since the 1980s through the construction of National Waterworks Technology Training Institute and the provision of technical cooperation. As a result of such assistance, a reduction of Unaccounted-for-Water Rates through capacity development of technicians, who work on non-revenue-water management and, distribution management, and a stable supply of water through proper maintenance of water supply facilities have been achieved, while the facilities developed in this project have been effectively utilized. With long-term technical cooperation, the effects of facility development projects such as those seen in this project have been magnified. Therefore, when implementing a similar project, it is considered effective that the implementation capacity of the executing agency be adequately examined and capacity building assistance be provided separately or in conjunction.

(End)

Comparison of the Original and Actual Scope of the Project

Item	Plan	Actual
1. Project Outputs (Phase I)		
Expansion of Maha Sawat Water Treatment Plant	Expansion of treatment capacity by additional 400,000m^3 per day Procurement and installation of electrical substation Procurement and installation of pump equipment at: - Tha Chin Raw Water Pumping Station (1 unit) - Maha Sawat Raw Water Pumping Station (3 units) - Maha Sawat Transmission Pumping Station (1 unit) - Petch Kasem Distribution Pumping Station (1 unit)	No installation of pump equipment at Tha Chin Raw Water Pump Station Other components were implemented as planned.
Construction of transmission tunnel	From Nakhon Indra Project Road to Tha Phra Pumping Station: Approximately 3km-long and 2,500mm in diameter	Implemented as planned
Expansion of Bang Khen Water Treatment Plant	Expansion of treatment capacity by additional 400,000m^3 per day Expansion of Raw Water Pumping Station at Sam Lae Expansion of Bang Khen Transmission Pumping Station Procurement and installation of pump equipment at: - Sam Lae Raw Water Pumping Station (1 unit) - Bang Khen Raw Water Pumping Station (1 unit) - Bang Khen Raw Water Pumping Station (3 units)	Implemented as planned
Civil works for Unaccounted-for-Water	Civil works for Unaccounted-for-Water Pilot Project implemented under the consulting services	Implemented as planned

Consulting services	Detailed designing, bidding assistance, construction supervision, environmental monitoring, etc. for the expansion of water treatment plants, installation of transmission tunnel, and so on Surveys, project planning, bidding assistance, construction supervision, environmental monitoring, etc. for the Unaccounted-for-Water Pilot Project	Implemented as planned
(Phase II) Rehabilitation of existing transmission tunnel	Steel-lining works for the rehabilitation of three damaged sections (13.6km in total) of the transmission tunnel from the Bang Khen Water Treatment Plant	Rehabilitation of 0.18km-section from Lumpini Valve Chamber to Lumpini added Other components were implemented as planned.
Installation of trunk mains pipes	New installation and replacement of trunk mains pipes (161km in total: 106km for new installation and 55km for replacement)	Implemented as planned
Consulting services	Bidding assistance and construction supervision for the rehabilitation of transmission tunnels and advice on environmental conservation measures	Implemented as planned
2. Project Period	(Phase I) September 1999 – September 2004 (61 months) (Phase II) September 2000 – February 2006 (66 months)	(Phase I) September 1999 – September 2007 (85 months) (Phase II) September 2000 – March 2014 (163 months)
3. Project Cost (Phase I) Amount Paid in Foreign Currency Amount Paid in Local Currency Total Japanese ODA Loan Portion Exchange Rate	 10,959 million yen 6,295 million yen (1,961 million baht) 17,254 million yen 12,608 million yen 1 baht = 3.21 yen (as of April 1999)	 5,752 million yen 3,373 million yen (1,143 million baht) 9,126 million yen 5,752 million yen 1 baht = 2.95 yen (Average between September 1999 and September 2007)

(Phase II)		
Amount Paid in Foreign Currency	9,601 million yen	2,892 million yen
Amount Paid in Local Currency	5,652 million yen (1,976 million baht)	9,149 million yen (2,854 million baht)
Total	15,253 million yen	12,041 million yen
Japanese ODA Loan Portion	9,601 million yen	6,641 million yen
Exchange Rate	1 baht = 2.86 yen (as of April 2000)	1 baht = 3.20 yen (Average between September 2000 and March 2014)

Republic of Turkey

FY2015 Ex-Post Evaluation of Japanese ODA Loan Project

"Istanbul Water Supply Project/Istanbul Water Supply Project (Phase II)"

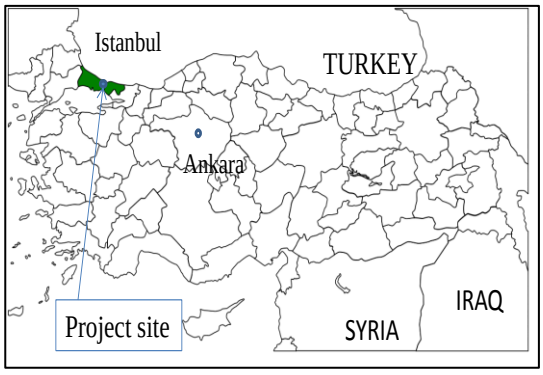
External Evaluator: Toshiyuki Katagiri, Japan Economic Research Institute Inc.

0. Summary

In this project, in order to provide a stable water supply to the residents of Istanbul, whose population had been increasing rapidly, the Melen intake weir was constructed to withdraw water from the Melen river, whose water source was in a mountainous region along the coast of the Black Sea 170 km east of Istanbul. In addition, a pipeline was constructed to the existing Kagithane Water Distribution Station and a treatment plant was also constructed. This project was consistent with the Turkish development plan and development needs, as well as with Japan's ODA policy, therefore the relevance of this project is high. With regard to the effectiveness of the project, the amount of water produced increased as well as the number of population to be served, and the percentage of population served became 100%, so the intended targets were achieved. In addition, an improvement in public hygiene was observed. As a whole, effectiveness and impact of the project are judged to be high. From the viewpoint of project implementation, the efficiency of the project is low because the project costs exceeded the plan due to inflation, and the project period significantly exceeded the plan due to a shortage in the budget, which was caused by the tight-financing policy of the Turkish government and the bankruptcy of a contractor influenced by the financial crisis triggered by Lehman's collapse. With respect to operation and maintenance (O&M), no major problems had been observed in the institutional, technical and financial aspects. Therefore sustainability of the project effects is judged to be high.

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

1. Project Description



Project Location

Melen Pumping Station

1.1 Background

At the time of project appraisal in 1993, Istanbul was the most populous city in Turkey, with about 7.6 million residents accounting for 12.4% of the total population of Turkey. The population of Istanbul had increased drastically through rapid urbanization and an inflow of migrants from rural areas (annual average rate of population increase was 4.6% from 1970 to 1990), while a delay in infrastructure improvement had been designated. Regarding waterworks, there were no big rivers in Istanbul nor its environs, and drinking water for the residents had been dependent upon supply from surrounding areas since long ago. As the development of water resource had not met the rapid water demand, residents suffered from a chronic shortage of water. The drought, which had continued for two years since 1989, caused the level of water in all reservoirs to go down to around 20% of the full storage level in autumn of 1990. The Istanbul Water and Sewerage Administration (ISKI) had to cut water supply from the usual 1.72 million m^3/day to 0.80million m^3/day. Since then, the shortage, in terms of the absolute total amount of water intake, as well as the conditions related to weather, had not changed at the time of project appraisal.

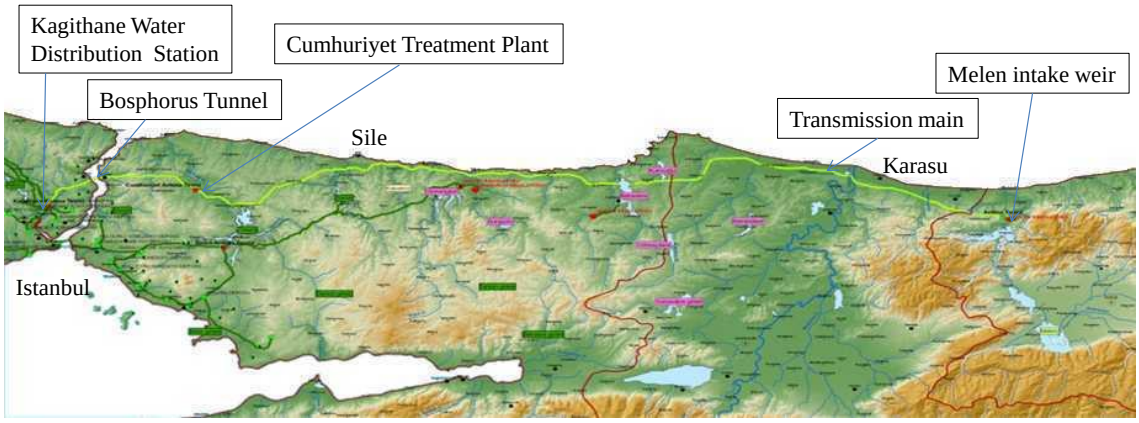


Figure 1 General view of the project

1.2 Project Outline

The objective of the project was to ensure a stable water supply and improve the water supply rate by developing the Melen intake weir and constructing a pipeline, treatment plant, Bosphorus Tunnel as well as other facilities, thereby contributing to the improvement of public hygiene for the residents in Istanbul.

<ODA Loan Project>

Loan Approved Amount/Disbursed Amount	(Phase I[1]) 52,473 million yen/51,573 million yen (Phase II) 42,310 million yen/42,259 million yen	
Exchange of Notes Date/Loan Agreement Sighing Date	(Phase I) June,1993/November,1993 (Phase II) May,1996/September,1996	
Terms and Conditions	(Phase I) Interest Rate 3.0% Repayment Period 25 years (Grace Period 7 years) Conditions for Procurement General Untied	(Phase II) Interest Rate 2.50% Repayment Period 25 years (Grace Period 7 years) Conditions for Procurement General Untied
Borrower/Executing Agency	The Government of the Republic of Turkey/General Directorate of State Hydraulic Work (DSI)	
Final Disbursement Date	(Phase I) May,2011 (Phase II) May,2012	
Main Contractor[2][3] (Over 1 billion yen)	Contract Package (CP)1: Hitachi (Japan)/Yüksel İnşaat A.Ş. (Turkey) (JV) CP2: Alsim Alarko Sanayi Tesisleri Ve Ticaret A.Ş. (Turkey)/Jsc Rosneftegazstroy (Russia) (JV) CP3: Ack İnşaat Sanayi. Tesisleri.Ve Ticaret A.Ş. (Turkey)/ Guriş İnşaat Ve Mühendislik A.Ş. (Turkey) (JV) CP3B: İMA Mühendislik İnşaat Ve Ticaret Ltd. Şti. (Turkey) CP4: Palet İnşaat Ve Ticaret A Ş.. (Turkey)/ Yertaş İnşaat Turizm Sanayi Ve Maden Ticaret Ltd. Şti. (Turkey) (JV) CP5: Otv Sa (France)/Emit Spa (Italy) /Marubeni(Japan)/ Limak İnşaat ve Ticaret Sanayi A.Ş. (Turkey) (JV) CP6: Alke İnşaat Sanayi Ticaret A.Ş. (Turkey)/ Ataç İnşaat Ve Sanayi A.Ş. (Turkey) (JV) CP7: Alke İnşaat Sanayi Ticaret A.Ş (Turkey)/ STFA İnşaat A.Ş.	

[1] In this report, "Istanbul Water Supply Project" is mentioned as "Phase I" and "Istanbul Water Supply Project (Phase II)" is mentioned as "Phase II".

[2] Phase I includes CP1, 2, 3, 3B, 4, 8, 11 and Phase II includes CP1, 5, 6, 7, 9, 10.

[3] CP3A is not subject to the Japanese ODA Loan. The Turkish side implemented CP3A on its own budget.

	(Turkey)/Ojsc Mosmetrostroy (Russia) (JV) CP8: Noksel Çelik Boru Sanayi A.Ş. (Turkey) CP9: Ümran Çelik Boru Sanayi A.Ş. (Turkey) CP10: Erciyas Çelik Boru Sanayi A.Ş. (Turkey) CP11: Areva Energietechnik GMBH (Germany)/ Mapa İnşaat Ve Ticaret A.Ş. (Turkey) (JV)
Main Consultant[4]	April,1996-August,2008: Nippon Koei (Japan) / Su-Yapı Mühendislik ve Müşavirlik A.Ş. (Turkey)/ Temelsu Uluslararası Mühendislik Hizmetleri A.Ş. (Turkey)/Gibb Ltd. (U.K)/Motto Macdonald Ltd. (U.K) (JV) January,2011-August,2012: IC Consulenten Ziviltechniker Gesmbh (Austria) / Coyne Ve Bellier Mühendislik Ve Müşavirlik Ltd. Şti.. (Turkey)/ Fugro-Sial Yerbilimleri Müşavirlik Ve Mühendislik Ltd. Şti.. (Turkey) (JV)
Feasibility Studies, etc.	"Greater Melen Project Feasibility Study" DSI, January,1991-October,1991
Related Project	[Technical cooperation project] Dispatched experts for "Greater Istanbul Water Supply Project" and "The Bosphorus Rail Tube Crossing Project", safety management system and construction supervision system, March,2009-July,2009

2. Outline of the evaluation Study

2.1 External Evaluator

Toshiyuki Katagiri (Japan Economic Research Institute Inc.)

2.2 Duration of Evaluation Study

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

Duration of the Study: August, 2015 - October, 2016

Duration of the Field Study: January 3 - January 12, 2016, April 25 - May 30, 2016

2.3 Constraints during the Evaluation Study

Since October 2015, frequent terrorism has occurred in Turkey including Ankara and Istanbul. Under the circumstance, it was decided to conduct the second field study by

[4] As the first consultant contract expired during project implementation because of the lengthening of the project, the following consultant contract was concluded.

local consultants under the supervision of an external evaluator.

The water supply area of this project covered the whole of Istanbul, i.e., ISKI's service area, and the amount of water capacity in Istanbul increased through this project by 268 million m^3, which is 42 % of the amount increased for the total water capacity in Istanbul (639 million $m^{3)}$.[5] The project contribution was nearly half of the total increase, and the effect of this project was seen throughout the entire Istanbul area, but it was impossible to separate the water supply area and measure effects for just this project. Therefore, as the quantitative effects of effectiveness of this project, the indicators for the whole area of Istanbul were adopted.

3. Results of the Evaluation (Overall Rating: B[6])

3.1 Relevance (Rating:③[7])

3.1.1 Relevance to the Development Plan of Turkey

At the time of project appraisal, in Turkey's development plan "The Fifth Development Plan (1985-1989)" and "The Sixth Development Plan (1990-1994)", the water and sewerage/sanitation sector was an important field and the weight of this sector in terms of total public investment of "The Fifth Development Plan (1985-1989)" was over 10%.

At the time of ex-post evaluation, in "The Tenth Development Plan (2014-2018)" which was issued in 2013, the water and sewerage sector was continuously mentioned as one of the important fields for public investment, occupying 12.8% of the total amount of public investment during the plan's period. In the plan, "the need for treatment of drinking water has increased" is described, which indicates the importance of maintenance and expansion of waterworks.

3.1.2 Relevance to the Development Needs of Turkey

At the time of project appraisal, a continuous increase in population of urban areas in Turkey made water facilities an immediate necessity due to additional water demand. In Istanbul, the most populous city in Turkey, stable water supply was an especially urgent issue because the concentration of population had been growing.

The condition of waterworks in Istanbul had suffered a chronic shortage of water because the development of a water resource was not produced to meet the drastic increase in demand for water due to lack of big rivers in the area.

There had been no change to the condition of the waterworks influenced by weather,

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[5] The amount of the water capacity in Istanbul increased from 654 million m^3at the time of the project appraisal to 1,293 million m^3at the time of the ex-post evaluation.

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

[7] ③: High, ②: Fair, ①: Low

and from a viewpoint of risks from natural disasters such as drought, the stable supply of water remained a high priority.

Melen river system targeted in this project had the following advantages; 1) There were no problems of water quality in view of the land usage in the upper watershed, 2) Stable water flow including meltwater from snow during spring was expected, 3) The river had a broad catchment basin and high potential for increasing water volume (in the future it could enable intake of 1,077 million m^3/year by constructing a dam). From a viewpoint of future water resource development in Istanbul, there was no big development planned other than Melen river system. This project was the first stage of the Melen System[8] which was expected to entail a role to be the largest water supply facility in Istanbul designated for meeting future water demand.

At the time of ex-post evaluation, Istanbul had population of 14.16 million (in 2014) as the most populous city, and it occupied 18.5% of the total population of Turkey. The population of Istanbul had increased through rapid urbanization and an inflow of migrants from rural areas (from 7.47 million in 1990 to 14.16 million in 2014). So, the need for a stable water supply was continuously strong especially on the western side of Istanbul (the European side) where residents were concentrated.

Therefore, the implementation of this project met the needs of stably supplying good-quality water to an increasing population in Istanbul at the time of both project appraisal and ex-post evaluation.

3.1.3 Relevance to Japan's ODA Policy

Although no country assistance policy or plan for Turkey had been made at the time of project appraisal, the "Implementation Status of Japan's Official Development Assistance" in 1995 stated that "the stability of the Middle and Near East Area is extremely important not only for Japan but also for world security and prosperity. Japan's ODA is implemented on the basis of this. "

In addition, the Government of Japan and the Government of the Republic of Turkey carried out an economic cooperation policy meeting in September 1998, confirming the role of Japan's ODA to emphasize on the following fields: environment (improvement of the urban environment and countermeasures for marine pollution), human resource development for the improvement of economic and social development, promotion of

[8] Because of the drought in Istanbul in 1989-1990, "Greater Melen Project Feasibility Study" was conducted by DSI in 1991 to solve future water supply problems. The whole plan of this FS is called the Melen System. In the plan of Melen System after completion of this project, by constructing the dam at the Melen River and adding a big water intake and transmission facilities, the water demand until 2035 is to be covered. This project is planned to take the consistency with the whole plan of the Melen System.

principle industries such as agriculture and fishery in order to reduce the disparity in economic power among regions, the improvement of basic human needs such as medical treatment for health, and South-South Cooperation. Therefore this project is thought to be consistent with Japan's ODA policy from the viewpoint of the improvement of the urban environment.

In light of the above, this project has been highly relevant to the Turkish development plan and development needs, as well as to Japan's ODA policy; therefore, its relevance is high.

3.2 Efficiency (Rating:①)

3.2.1 Project Outputs

As they are shown in Table 1, in this project, the intake weir, pumping station, treatment plant, energy supply and other facilities, as well as the pipeline and Bosphorus Tunnel were constructed.

The differences between the plan and the actual works were the integration of contract packages through the D/D process, changes of specifications, and a change of scope in the former CP[9]4 for the construction of Alacali Dam to the construction of the pipeline and water channel (see Table 1). The main reasons for these changes were 1) adopting proper / efficient routes and construction methods under the D/D process and 2) avoiding the increase of compensation for land and adopting measures to achieve a shortened construction period after cancelation of the construction of Alacali Dam. After D/D, there were no changes to the specifications and the outputs remained as planned.

[9] The former CP was from CP1 to CP 13 (in the first version, there was no CP 11). Phase I included the former CP1, 2, 3, 4, 8, 12 and consulting service. Phase II included the former CP5, 6, 7, 9, 10 and 13.

Table 1 Outputs of the Project

	Plan		Actual	
Phase I	CP	Contents	CP	Contents
	1	Melen intake weir (Amount of Water Intake 8.5 m^3/second)	1	Melen intake weir (Amount of Water Intake 8.5 m^3/second) Melen pumping station (4,500KW×6 units)
	2	Melen pumping station (4,500KW×6 units)	2	Pipeline installation between Melen and Kinchili (Total 69.2km)
	3	Pipeline installation between Melen and Cumhuriyet (Total 135.3km)	3A[10]	Pipeline installation between Kinchili and Agva (Total 35.3km)
			3B	Pipeline installation between Agva and Sile, and between Hamidiye and Cumhuriyet (Total 36.6km)
	4	Construction of Alacali Dam (Rockfill dam, height :63m)	4	Pipeline installation between Sile and Hamidiye and construction of water channel (Total 17.2km)
	8	Pipe production and supply, 50% of CP3	8	Pipe production and supply, 50% of CP3 (71.2km)
	12	Energy supply (154KV 2 circuit distribution lines)	11	Energy supply (154KV 2 circuit distribution lines)
	Consulting service	Tendering support, Detailed design, Construction management etc.	Consulting service	Tendering support, Detailed design, Construction management etc.
Phase II	CP	Contents	CP	Contents
	13	Cumhuriyet pumping station (1,450KW×5 units)	1	Cumhuriyet pumping station (2,500KW×6 units)
	5	Cumhuriyet treatment plant (Purification capability 700,000 m^3/day)	5	Cumhuriyet treatment plant (Purification capability 720,000 m^3/day)
	6	Pipeline installation between Cumhuriyet and Kagithane (28.4km)	6	Pipeline installation between Cumhuriyet and Kagithane (Total 20.4km)
	7	Bosphorus Tunnel (Total 3.0km)	7	Bosphorus Tunnel (Total 5.5km)
	9	Pipe production and supply, 50% of CP3	9	Pipe production and supply, 50% of CP3 (69.5km)
	10	Pipe production and supply of CP6	10	Pipe production and supply of CP6 (14.6km)

Source: Provided by JICA and the Executing Agency

[10] CP3A is not subject to Japanese ODA Loan.

3.2.2 Project Inputs

3.2.2.1 Project Cost

Regarding project cost, the actual project cost was 127,722 million yen and the planned cost was 126,377 million yen, revealing that the actual cost exceeded the planned one (101% in comparison). In the process of D/D, although more proper and efficient installation routes and measures were adopted to reduce costs, and the depreciation of the Turkish Lira (TL) made the cost in yen to decrease, high inflation in Turkey made labor costs and materials costs increase during the delay of the project. As a result of these issues, the actual project cost was somewhat higher than the planned cost (see Tables 3 and 4).

Table 2 Project Cost

Unit : million yen

	Plan		Actual	
	Total	Japanese ODA loan	Total	Japanese ODA loan
Phase I	69,964	52,473	69,217	51,573
Phase II	56,413	42,310	58,505	42,259
Total	126,377	94,783	127,722	93,832

Source: Provided by JICA and the Executing Agency

Table 3 Foreign Exchange Rate per US1$

Year	1997	2000	2005	2010
YEN	120.99	107.77	110.22	87.78
TL*	0.15	0.63	1.34	1.50

Source: IMF “International Financial Statistics; Yearbook”

Note*: New TL base after denomination in 2005

Table 4 Consumer Price Index in Turkey

Year	1997	2000	2005	2010
Index	21.2	100	341.6	518.3

Source: IMF “International Financial Statistics; Yearbook”

Note: Index is 100 in 2000

3.2.2.2 Project Period

The planned project period was 98 months (from November 1993, Loan Agreement signing date, to December 2001) in comparison with the actual one of 256 months (from November 1993, Loan Agreement signing date, to March 2015), resulting in the actual one substantially exceeding the plan (261% by comparison). Regarding project period, the main reason for the delay in the project period was that, as the construction for each contract are mutually related, the delay in one contract instigated delay for others. As for individual causes, the project consultant indicated the following causes;

1) the delay of consultant selection by introducing prequalification (P/Q), 2) the delay caused by a contract based on a low bidding price, making it difficult for the contractor to absorb the price inflation in Turkey and delayed construction, 3) the shortfall of budget due to the tight financing policy of the government of Turkey, 4) a cancellation of the construction of Alacali Dam and change of scope, 5) the bankruptcy of a contractor triggered by the Lehman collapse, resulting in cancelation of the contract, a process of re-tendering and change of the contractor.

3.2.3 Results of Calculations of Internal Rate of Return (Reference only)

As the Financial Internal Rate of Return (FIRR) was only calculated at the time of project appraisal in both Phase I and Phase II, it was re-calculated as closely as possible with the pre-conditions set in Phase II at the time of ex-post evaluation. The reason to compare only with the FIRR from the appraisal of Phase II was that because comparison was made against the calculation reflecting the newer budget and data (water charge and unaccounted-for water rate). The FIRR at the time of the ex-post evaluation was 8.58%, and profitability was acknowledged. Although the water charge in 2016 was twice as much as that at the time of project appraisal in Phase II, O&M costs at the time of ex-post evaluation were increased three times as much as those at the time of project appraisal in Phase II, resulting in a decrease of the FIRR.

Table 5 Precondition of Calculation of FIRR at the Time of Both Project Appraisal in Phase II and Ex-Post Evaluation

	At the time of project appraisal in Phase II	At the time of ex-post evaluation
FIRR	9.27%	8.58%
Cost	Construction costs, renewal costs, O&M costs	Construction costs, renewal costs, O&M costs
Benefit	Water charge	Water charge
Project Life	35 years	35 years
Precondition	Water charge was fixed at US1$/$m^3$ in 2002 at the start of operation.	・O&M costs were calculated based on the increase rate of consumer prices. ・Benefit was calculated from the tariff table of ISKI in January 2016((US2.04$/$m^3$)

Source: Provided by JICA

In light of the above, the project cost exceeded the plan and the project period significantly exceeded the plan. Therefore, efficiency of the project is low.

3.3 Effectiveness[11](Rating:③)

3.3.1 Quantitative Effects (Operation and Effect Indicators)

Although the operation and effect indicators had not yet been introduced at the time of appraisal of this project, substitute targets were set from various documents at the time of ex-post evaluation. As items for quantitative effects, operation indicators were the following; 1) population served in Istanbul, 2) the amount of water supply, 3) the amount of water supply capacity, 4) rate of facility utilization, 5) unaccounted-for water rate, 6) leakage rate. The effect indicators were the following; 7) percentage of population served, and 8) water supply per capita. Realizing a stable water supply through the achievement of these indicators was thought to be the project effects. Table 6 indicates the results of the effects.

[11] Sub rating for Effectiveness is to be put with consideration of Impact

Table 6 Operation and Effect Indicators

	Indicators	Baseline	Target	Actual
		1990	2004	2015
		Baseline Year	2 years after Completion	Completion Year
Operation Indicators	Population Served in Istanbul (million people)	5.97	11.13	14.16*
	Amount of Water Supply (million m^3/year)	397	867	965
	Amount of Water Supply Capacity (million m^3/year)	654	1,232	1,293
	Rate of Facility Utilization (%) ** (Cumhuriyet treatment plant only)	57	-	60 (61)
	Unaccounted-for Water Rate (%) ***	40	32	27
	Leakage Rate (%) ***	40	32	24
Effect Indicators	Percentage of Population Served (%)	80	100	100
	Water Supply per capita(ℓ/day)	182	227	187

Source: Provided by JICA and the Executing Agency

Note*: Istanbul population in 2014

Note**: Average water supply in Istanbul /day ÷ Total Purification capability /day

As a reference for the effectiveness of the rate of facility utilization of Cumhuriyet treatment plant, which was a facility constructed through this project, it is measured for the completion year, as shown. Because this project is old, the operation indicators were not set at the time of project appraisal.

Note***: As the figures for unaccounted-for water rate and leakage rate were the same at the baseline and target years, the forecast is suspected to have been falsely estimated because of shortage of data, therefore, the credibility of the data is not enough.

Upon evaluation of operation indicators and effect indicators, though there was a difference between the target and actual date of completion because of the drastic delay in the project, the comparison was conducted between the target year and completion year as operation was stabilized in the completion year.

Regarding operation indicators, population served in Istanbul, amount of water supply and amount of water supply capacity, it was confirmed that all of them drastically exceeded their targets. And improvements in rates of facility utilization, unaccounted-for-water and leakage were recognized.

Regarding effective indicators, the percentage of population served was 100%, which was the same as the target. Though the absolute amount of water supply per capita was

under the target because of the drastic increase in population served in Istanbul, a calculation under the condition of population served in the target year (in 2004) would be 237 ℓ per day. As this is over the target amount (227ℓ per day), it could be said that the effect appeared sufficient against the target.

Furthermore, from the viewpoint of the demand and supply gap (see Table7), while there was an increase in population in Istanbul in terms of percentage of population served and water supply per capita, the result revealed an increase in amount of water supply capacity by the completion of this project, so it is judged that the supply balances the demand at the time of ex-post evaluation. According to the Executing Agency, the forecasted demand through 2035 will be covered mostly by the completion of the Melen System in its entirety.

The Melen System is divided into four stages and this project was the first stage (the amount of water supply capacity increased 268 million m^3/year). After the completion of the Melen System in its entirety, the supply of water will be increased to 1,077million m^3/year. As for the second stage, the Melen Dam is presently being constructed adjacent to the Melen intake weir by DSI and the pipeline is being constructed by ISKI. The Melen Dam is planned for completion in May, 2017. No major projects are being planned in the future in Istanbul, except for water resource development of the Melen River.

Furthermore this was a pioneering project at the first stage of the Melen System which was to essentially supply stable water to Istanbul into the future, and the effects of this project at the first stage were large.

As stated above, all of the indicators, except for water supply per capita were above the target; therefore the quantitative effects were mostly achieved.

Table 7 Demand-Supply Gap (Trial Calculation)

year	1990 (Actual)	2015 (Actual)	2035 (Estimation)
Amount of Water Supply Capacity (million m^3/year) (a)	654	1,293	2,102
Amount of water demand(million m^3/year) (b)	662	1,270	2,090
Demand-Supply Gap (a)-(b)	▲8	23	12

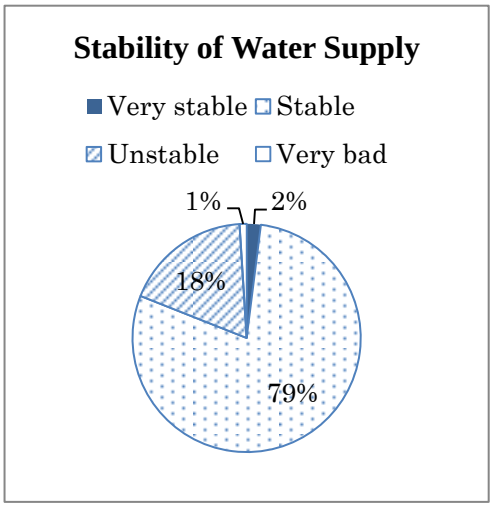
Source: Provided by JICA and the Executing Agency

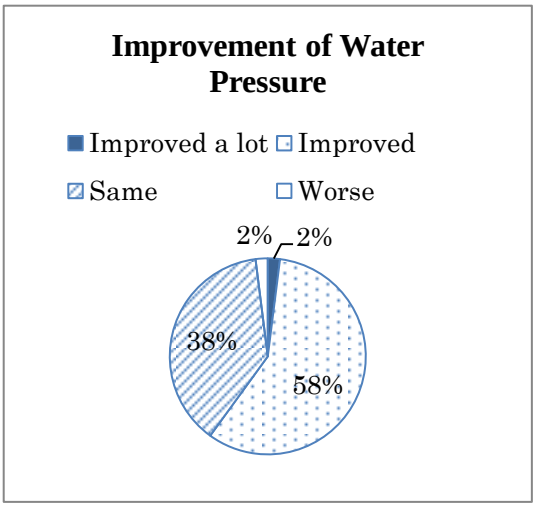
3.3.2 Qualitative Effects

The “Stability of water supply” as a qualitative effect, which means stable water

supply without suspension or lowering of water pressure, is interviewed in the beneficiary survey[12] and from its results one can conclude that the implementation of this project contributes to the stability of water supply.

From the beneficiary survey, 81% of interviewees responded that the water supply was "very stable" or "stable" (see Figure2), and as for the changes after this project, 61% of interviewees responded that there had been changes after the project. Furthermore, 93% of those who responded that there were changes claimed that the stability of the water supply had "improved a lot" or "improved". From these results it was confirmed that stability of water supply had improved through this project and it was stated that the project effect had been achieved.





Source: Beneficiary survey

Figure 2 Stability of Water Supply

Figure 3 Improvement of Water Pressure

Regarding water pressure, 60% of interviewees responded that it had "improved a lot" or "improved", whereas 38% responded that it remained the "same" (see Figure 3), and regarding the condition of water pressure, the total responses of "very good/excellent", "good", or "acceptable" comprised 91% of those interviewed. It was thought that even if there had been no change in the degree of improvement, the condition of water pressure is assumed to have been higher than the average level before the project.

[12] 100 interviewees by nonrandom selection of residents and shop owners (93 residents and 7 shop owners) who lived on the European side of Istanbul (4 areas: Fulya, Osmanbey, Kagithane, Besiktas) where water had been supplied by the Melen System were separately interviewed (25 interviewees from each area). The interviewees, i.e., residents and shop owners who lived there more than 20 years, were selected to ascertain the differences from before and after the project. The ratio of men to women was 60 to 40. The ages of interviewees were above 40 because they had lived there more than 20 years beyond adulthood. Examples of questions include the stability of water supply before and after the project implementation, the improvement and difference of water pressure, and the improvement of public hygiene.

3.4 Impacts

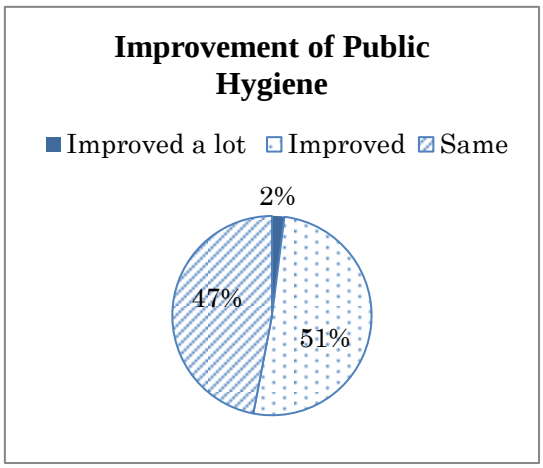
3.4.1 Intended Impacts

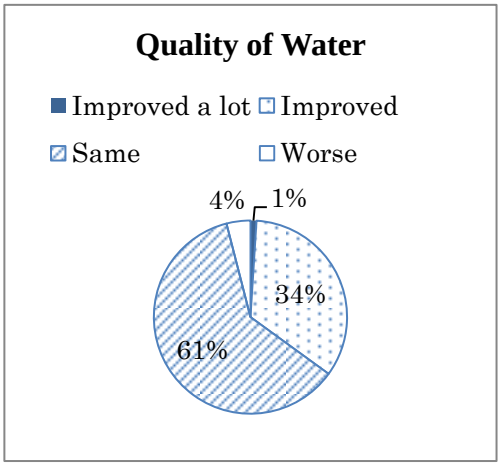
At the time of project appraisal, the intended effect of "improvement of public hygiene" was expected to be the impact of this project, so, the beneficiary survey was conducted to confirm the situation.

Regarding the improvement of hygiene, 53% of interviewees responded that hygiene conditions at home and in the community had "improved a lot" or "improved" whereas the rest of the respondents answered "same" (see Figure 4), and regarding the decrease of infections from waterborne diseases, 52% of interviewees responded that they had "decreased", 37% responded "don't know", and 11% responded that they had "not decreased".

Regarding the supply of safe water, 35% of interviewees responded that the quality of water had "improved a lot" or "improved" whereas 61% responded "same" (see Figure 5), and regarding the condition of the quality of water, the total responses of "very good/excellent", "good", or "acceptable" comprised 89% of those interviewed.

From these results it was thought that the improvement of public hygiene had been achieved and the improvement of water quality had also progressed.





Source: Beneficiary survey

Figure 4 Improvement of Public Hygiene

Figure 5 Quality of Water

Inferring a judgement of "hygienic status" for supplied water based on water conditions at the time of ex-post evaluation, the quality of Istanbul's water was within the standards set forth by Turkey and the Europe Community, and had no problems.

Table 8 The Condition of Water Quality in Istanbul

Parameter	Turkish Standard Value (TS 266) and the Europe Community's Standard Value	Kagithane Water Distribution Station	Cumhuriyet Treatment Plant
Turbidity	1.0	0.2	0.17
Total Trihalomethanes (μg/ℓ)	100	38.4	64.3
Aluminum (mg/ℓ)	0.200	0.123	0.045
Nickel (mg/ℓ)	0.02	0.001	0.004
Copper (mg/ℓ)	2.0	0.001	0.002
Iron (mg/ℓ)	0.2	＜0.005	0.059
pH	6.5-9.5	7.13	7.02

Source: Istanbul Water Quality Report (June 2015)

Cumhuriyet Water Treatment Plant

3.4.2 Other Impacts

3.4.2.1 Impacts on the Natural Environment

Although sediment outflow was suspected at the time of project appraisal and partial landslides occurred during the construction period, the project was completed without hindrance by making adjustment to the inclination of pipelines and using the foundation piles. As a countermeasure for underground water when burying pipes in the ground, a well-point method, which drained underground water by using vacuum pumping, was adopted and managed efficiently. According to DSI, there were no negative impacts to the natural environment neither during nor after construction. Also, no negative impacts to the natural environment were found during the site visit at the time of ex-post evaluation.

3.4.2.2 Land Acquisition and Resettlement

The resettlement of 517 residents and land acquisition for the construction of Alacali Dam were supposed at the time of project appraisal; however, the construction of the dam was canceled because of 1) the sudden rise of price in both the area surrounding the dam construction site and new lands resulted in difficulties for resettlement although fundamental agreements on the resettlement with the residents had already been arranged through public hearing and 2) the claim on the rights of clay-mining traders made it difficult to use the planned dam construction site due to the revised mining law. As a consequence of these results, although some sections of the grassland were acquired, there was no land acquisition accompanied by resettlement. Neither was there a resettlement without land acquisition. These were reconfirmed during the visit to all project sites at the time of ex-post evaluation.

3.4.2.3 Decrease of the Burden of Drawing Water for Women

At the time of project appraisal, communal wells, where women often drew water, were used depending on areas, including Istanbul, and water wagons came to some areas because of unstable water supply. Therefore the effect of decrease of burden for women drawing water was confirmed in the beneficiary survey. For the decrease of burden after the project, 53% of interviewees responded “yes”, 28% of them responded “don’t know” and 19% of them responded “no”. Considering the beneficiary survey, it was judged that there had been a positive impact on decreasing the burden for women drawing water.

Regarding the impacts of the project, the improvement of public hygiene and the supply of safe water were confirmed in the beneficiary survey. There were no negative impacts on the natural environment and there was no land acquisition accompanied by resettlement. The decrease of the burden for women drawing water was also achieved.

In light of the above, this project has largely achieved its objectives. Therefore effectiveness and impacts of the project are high.

3.5 Sustainability (Rating:③)

3.5.1 Institutional Aspects of Operation and Maintenance

DSI, the Executing Agency of this project, was established in 1954 as a government agency under the Ministry of Forestry and Hydraulic Works in order to develop and manage water resources and implement construction. ISKI was established in 1981 as a municipal agency of Istanbul in order to operate and maintain water and sewerage services in Istanbul. After completion of this project, facilities and equipment such as

the pumping station, the treatment plant and pipeline were transferred from DSI to ISKI, and ISKI has been in charge of O&M.

The O&M section of ISKI is divided into three departments, the Water Treatment Department, Water Distribution Department and Electric and Electronics Maintenance Department. The staff of each is 43, 20 and 51 respectively, totaling 114.

The roles of Water Treatment Department are to operate and maintain the treatment plan. Water Treatment Department is undertaking disinfection; maintenance of machines; repair and supplying parts for machines and equipment; maintenance of the water cleaning system.

The Water Distribution Department, which has a branch on both the Asian side and European side of Istanbul, takes charge of the maintenance and repair of the pipeline.

The Electric and Electronics Maintenance Department takes charge of the maintenance and repair of power transmission, machinery, and electric equipment.

Table 9 The Organization of Water Treatment Department, Water Distribution Department and Electric and Electronics Maintenance Department

As of December, 2015

Department	Breakdown of Engineers	Number of Persons
Water Treatment	Environmental engineer	2
	Electric and electronics engineer	2
	Mechanical engineer	1
	Machine technician	1
	Electrical technician	1
	Mechanical expert	10
	Electrical expert	8
	Electrical master	2
	Chlorine master	5
	Operator	11
	Subtotal	43
Water Distribution	Civil engineer	2
	Mechanical engineer	2
	Mechanical technician	2
	Electrical technician	2
	Management master	2
	Business worker	6
	Operator	4
	Subtotal	20
Electric and Electronics Maintenance	Engineer	3
	Technician	3
	Expert	14
	Qualified staff	31
	Subtotal	51
	Total	114

Source: Provided by the Executing Agency
Note: Breakdown of engineers is classified by the Executing Agency.

It was learned in the interview with ISKI that maintenance is performed through proper staff organization, so it could be concluded that staff organization for facility operations is suitable.

Control Room in the Treatment Plant

Sile Control Center

3.5.2 Technical Aspects of Operation and Maintenance

ISKI had already been operating and maintaining many treatment plants and pipelines, and had enough experience of operation, repair and maintenance for civil engineering facilities and electric facilities.

Through the interviews from ISKI and DSI, it was revealed that there were no technical problems with O&M among the technical staff members. They operated facilities by using manuals and were trained through OJT.

A categorized table of engineers for the Water Treatment Department, Water Distribution Department and Electric and Electronics Maintenance Department are shown in table 9, and each expert is arranged to each department according to its technical level. During the site visit at the treatment plant, several staff members were performing operational management properly through the use of the computer system, and the situation of it was confirmed to be stable.

Therefore, the standard skill level is judged to be good.

3.5.3 Financial Aspects of Operation and Maintenance

To evaluate the financial aspect, the revenues and expenditures of ISKI were analyzed.

The water tariff of ISKI (monthly by household) changes per every ten cubic meters of water used (0-10m^3: 3.90TL/m^3, 11-20m^3: 5.80TL/m^3, more than 21m^3: 8.30TL/m^3); thus, for example if an individual household used 22m^3 of water the tariff will become 113.6 TL[13]excluding VAT (equivalent to about 5,055 Japanese yen[14]) in January 2016.

The water tariff is applied for every year by ISKI to the Istanbul City Congress, the entity which imposes the tariff. Furthermore, it is adjusted every month to be consistent with the inflation rate reported by the State Statistics. The tariff recommended by ISKI

[13] 10 m^3x3.90+10 m^3x5.80+2 m^3x8.30=113.6TL

[14] 1TL=44.5Yen (average rate of 2015), Source: IMF ”International Financial Statistics; Yearbook”

to the congress was calculated with consideration for total costs, including maintenance costs, investment and an appropriate annual profit. Therefore stable revenue has been maintained every year.

The total revenues were 4.4 billion TL (196 billion yen) in 2015, an increase of 4.7% compared to the revenue of the previous year.

On the other hand, the contents of expenditures were capital investment and ordinary expenditures which met the revenue. Though the increase of loans granted temporarily created a balance deficit in 2015, there was no anxiety about cash-flow because the amount of current assets was ten times as much as the deficit.

After analysis of three years of balance sheets from 2013 to 2015, stable financial conditions were confirmed (in 2015 capital adequacy ratio was 84%, current ratio was 700% and fixed assets ratio was 78%), and it was thought that there would be no problems for future O&M (see Table 11).

Table 10 Revenues and Expenditures of ISKI

Unit : Million TL

Contents		2014	2015
Revenues	Operating income	3,802	3,930
	Other income	415	487
	Total	4,217	4,417
Expenditures	Personnel and Social Security	534	579
	Purchase of Goods and Services	771	878
	Capital Expenditures	1,884	1,848
	Loans Granted	400	800
	Other expenditures	455	609
	Total	4,044	4,714
Balance		173	-297

Source: Provided by the Executing Agency

Table 11 The Balance Sheet of ISKI

Unit: Million TL, %

	End of December,2013		End of December,2014		End of December,2015	
	Amount	Ratio	Amount	Ratio	Amount	Ratio
Current Assets	2,087	19.8	2,457	23.0	2,891	21.9
Fixed Assets	8,441	70.2	8,203	77.0	10,320	78.1
Total Assets	10,528	100.0	10,660	100.0	13,211	100.0
Current Liabilities	282	2.7	286	2.7	413	3.1
Fixed Liabilities	1,563	14.8	1,673	15.7	1,749	13.2
Net Assets	8,683	82.5	8,701	81.6	11,049	83.7
Total Liabilities and Net Assets	10,528	100.0	10,660	100.0	13,211	100.0

Source: Provided by the Executing Agency

A total of the annual budget for the Water Treatment Department, Water Distribution Department and Electric and Electronics Maintenance Department is described in Table 12. The amount is 71 million TL (about 3.2 billion Yen) for 2015. There is no problem with the amount, judging from ISKI's budget, and from a financial aspect, it can be inferred that O&M is stable.

Table 12 The Budget for Three Departments

Department	Amount of money (TL)*	Amount of money (Million Yen)**
Water Treatment	26,000,000	1,157.0
Water Distribution	1,400,000	62.3
Electric and Electronics Maintenance	44,000,000	1,958.0
Total	71,400,000	3,177.3

Source: Provided by the Executing Agency

Note*: Including labor costs

Note**: Converted rate 1 TL=44.50 Yen

3.5.4 Current Status of Operation and Maintenance

At the time of ex-post evaluation, current situations and issues of the facilities constructed through this project were checked through interviews and site visits, to confirm if the facilities are properly maintained. Regarding the condition of operational management, the facilities constructed through this project were being run well during the site visits from the Melen intake weir to Kagithane Water Distribution Station.

According to the interview with ISKI, the provision and improvement of the water distribution system such as the replacement of deteriorated water pipes had been conducted continuously and the actual unaccounted-for water rate and leakage rate had been improved. On top of that, it was said that a maintenance plan had been formulated and implemented. At the time of the site visit, it was confirmed that a constant provision of stable water, devoid of troubles, was realized. Regarding maintenance, it was performed referring to each manual daily, monthly and yearly, while action for needs of temporary repair was suitably taken.

The management of chemicals used at the treatment plant was confirmed to have been implemented properly according to the external evaluator's warehouse visit.

From the information provided through interviews and site visits, it was judged that proper O&M for the facilities of this project were implemented.

Based on the above, no major problems have been observed in the institutional, technical and financial aspects of the operation and maintenance systems. Therefore sustainability of the project effects is high.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

In this project, in order to provide a stable water supply to the residents of Istanbul, whose population had been increasing rapidly, the Melen intake weir was constructed to withdraw water from the Melen river, whose water source was in a mountainous region along the coast of the Black Sea 170 km east of Istanbul. In addition, a pipeline was constructed to the existing Kagithane Water Distribution Station and a treatment plant was also constructed. This project was consistent with the Turkish development plan and development needs, as well as with Japan's ODA policy, therefore the relevance of this project is high. With regard to the effectiveness of the project, the amount of water produced increased as well as the number of population to be served, and the percentage of population served became 100%, so the intended targets were achieved. In addition, an improvement in public hygiene was observed. As a whole, effectiveness and impact of the project are judged to be high. From the viewpoint of project implementation, the efficiency of the project is low because the project costs exceeded the plan due to inflation, and the project period significantly exceeded the plan due to a shortage in the budget, which was caused by the tight-financing policy of the Turkish government and the bankruptcy of a contractor influenced by the financial crisis triggered by Lehman's collapse. With respect to O&M, no major problems had been observed in the institutional, technical and financial aspects. Therefore sustainability of the project effects is judged to be high.

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

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

Presently at the second stage of the Melen project, Melen Dam, which is adjacent to the Melen intake weir, and the second pipeline parallel to the previously installed one are under construction. It is important to advance the construction effectively and efficiently by utilizing the experience such as the construction method used for countermeasures against groundwater during excavation of ground as was learned during the construction phase of laying pipes during the first stage of the project.

4.2.2 Recommendations to JICA

None

4.3 Lessons Learned

"Considerations for information sharing and feedback for cases in which information from the executing agency and the implementing agency are different"

In this project, the executing agency was DSI and the implementing agency was ISKI, the entity to which water supply facilities were transferred from DSI; and, the information/data sharing and feedback systems for implementation management of this project between DSI, as a national agency, and ISKI, as a regional agency, were not conducted sufficiently because these two agencies were different organizations. Therefore the issues faced by ISKI in the O&M stage could not be made use of in the planning and construction of the facilities by DSI. If the sharing of information among related agencies were available, it would be useful for increasing learning opportunities and knowledge sharing for effective and efficient operation and management. Moreover, it could be expected that grasping and sharing the project's condition, could be beneficial for future policy-making, facilities construction and O&M. Actually, DSI and its competent authority, the Ministry of Forestry and Hydraulic Works, are aware of these issues, and are trying to solve them.

Therefore when JICA plans a similar project, it should confirm or try to support the creation of a system premised on the sharing of information and feedback between the competent authority and among related agencies when implementing a project.

The realization of jointly conducting monitoring and feedback of the progress, issues and effects of a project being implemented by related agencies, describing them thoroughly in progress reports, and evaluating them properly is thought to contribute to the improvement of human resource development and the capacity building in the policy-making and O&M of each agency.

Comparison of the Original and Actual Scope of the Project

Item	Plan	Actual
1.Project Outputs		
Melen Intake Weir	Amount of Water Intake 8.5 m^3/second	As planned
Melen Pumping Station	4,500KW×6 units	As planned
Pipeline installation between Melen and Cumhuriyet	135.3km	158.3km
Cumhuriyet pumping station	1,450KW×5 units	2,500KW×6 units
Cumhuriyet treatment plant	Purification capability 700,000 m^3/day	Purification capability 720,000 m^3/day
Pipeline installation between Cumhuriyet and Kagithane	28.4km	20.4km
Bosphorus Tunnel	Total 3.0km	Total 5.5km
Energy supply	154KV 2 circuit distribution lines	As planned
Pipe production and supply	Pipeline between Melen and Cumhuriyet, and Pipeline between Cumhuriyet and Kagithane	As planned
Construction of Alacali Dam	Rockfill dam, height :63m	Canceled
Consulting Service	Tendering support, Detailed design, Construction management etc.	As planned

2.Project Period	November 1993- December 2001 (98 months)	November 1993- March 2015 (256 months)
3.Project Cost[15] Amount Paid in Foreign Currency	72,939million yen	93,832million yen
Amount Paid in Local Currency[16]	53,438million yen (Phase I: 1,664,874 m TL Phase II : 10,268,114m TL)	33,890million yen (526.7million TL)
Total	126,377million yen	127,722million yen
Japanese ODA Loan Portion[17]	94,783million yen	93,832million yen
Exchange Rate[18]		1TL ＝145.58yen (Average between January, 1997 and December, 2015[19])
Phase I	1US$ ＝126.35yen＝ 6875.1 TL (As of September 1992)	
Phase II	1US$ ＝106.30yen＝ 47,786.9 TL (As of February 1996)	

[15] Actual amount paid in foreign currency was calculated annually.
[16] The plan was before denomination and the currency was former TL
[17] The plan of the amount of Japanese ODA loan included local currency portion.
[18] The exchange rate of the plan is before denomination and the former TL. The exchange rate of the actual is used and calculated by annual average rate from 1997 to 2015, reflecting denomination for the whole period. Source: IMF ”International Financial Statistics; Yearbook”
[19] According to the Executing Agency materials, the payment of the project cost was paid from 1997 to 2015.

India

FY2015 Ex-Post Evaluation of Japanese ODA Loan

"Yamuna Action Plan Project (II) "

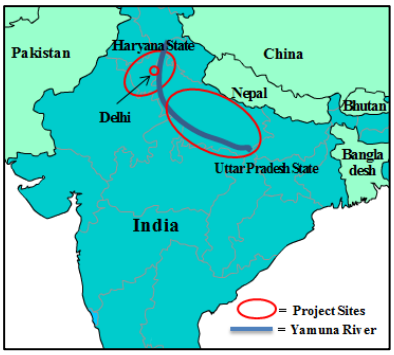
External Evaluator: Hisae Takahashi, Ernst & Young Sustainability Co., Ltd.

0. Summary

This project was conducted to increase the sewerage capacity by developing sewerage facilities and also aimed to promote water quality conservation and raise understanding of improving the living environment in the Yamuna River basin at Delhi, Uttar Pradesh (UP) State and Haryana State of India, through awareness and Public Relation (PR) activities to the local residents as well as strengthening the institutional capacity of executing agencies. It is consistent with the national development policy, which has highlighted water quality improvement of major rivers as a critical issue of the environment sector, and also with the Japanese policy of assistance to India. Development needs are also high considering the polluted condition of the Yamuna River and the hygiene situation of the river basin. Hence, the relevance of this project is high. The efficiency of the project is low, as the project cost slightly exceeded the plan due to the increased output and price escalation and the project period significantly exceeded the plan since more time was required to acquire land and obtain construction approval. Thanks to the project, effects such as an increase in the amount of wastewater treated and the improvement of effluent water quality were confirmed and the percentage of population served was also on target in the project areas. Since the Yamuna River basin covered a broad area, the effects on water conservation in terms of the whole Yamuna River through this project alone were limited. Compared with the situation before the project, however, a larger amount of wastewater treated with better water quality was discharged into Yamuna River, meaning that the project contributed to water conservation of the river to a certain extent. Therefore, the effectiveness and impact of the project is high. Operation and Maintenance (O&M) of sewerage systems developed under this project shows that they are in good condition and no major problems were observed in terms of institutional and technical aspects of O&M. The O&M cost required for the facilities has also been secured, thus the sustainability of the project effect is high.

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

1. Project Description



Project Locations


Sewerage Treatment Plant (Okhla)

1.1 Background

Yamuna River originates from the Yamunotri Glacier of Uttarakhand State in India, running through Delhi to the Ganges River in UP State. It is a tributary of the Ganges River and has a total length of about 1,400 km and a total catchment area of about 34,600 km. Many rivers, including Yamuna River, are used for bathing as sacred rivers and also provide drinking water, etc., making them intimate parts of resident's daily lives. However, more sewerage was being discharged into rivers than could be naturally purified due to the soaring population that accompanied rapid urbanization and industrialization. Consequently, the contaminated rivers caused health and sanitation problems for river basin residents. With this in mind, the Indian Government launched the "Yamuna Action Plan[1]" with the intention of reducing the pollution load on the Yamuna River. To support YAP, the "Yamuna Action Plan Project (I) (YAP (I))", developing the sewerage facilities, was implemented with the support of Japan International Cooperation Agency (JICA) and an ODA Loan to target 15 cities in the three states of Delhi, UP and Haryana, situated in the Yamuna River basin.

However, amid rapid industrialization, urbanization and population growth, at the time of appraisal of this project, the total volume of untreated wastewater released into the Yamuna River was about 3,600 million liters per day (MLD) in Delhi and about 147 MLD in Agra of UP State, which comprised 84% of the total 4,456 MLD pollution load generated in the 15 cities along the river[2]. Thus, YAP (II) was planned to maintain sewerage systems in Delhi and Agra as the most critical segment to reduce the pollution load in the Yamuna River. Moreover, as well as developing sewerage systems, this project included extending activities such as an awareness program to raise people's understanding of the importance of water quality preservation and living environment and capacity building among the implementing agencies of each state, which helps improve the project effectiveness.

[1] This is one of the projects shown in the "National River Conservation Plan" as explained hereinafter. This plan indicates "YAP" as a second national-level river purification plan behind "Ganga Rejuvenation Project" for the Ganges River.

[2] Source: Documents provided by JICA

1.2 Project Outline

The objective of this project was to improve the sewerage capacity to handle the water pollution of Yamuna River and raise residents' awareness to understand the importance of water quality preservation and improve the life environment by developing sewerage facilities, as well as conducting non-sewerage works, including public health activities and reforming the institutional capacity of the implementing agencies in each state, thereby helping to improve the hygienic environment and health condition of riverside residents.

Loan Approved Amount/ Disbursed Amount	JPY 13,333million / JPY 8,328 million
Exchange of Notes Date/ Loan Agreement Signing Date	March, 2003 / March, 2003
Terms and Conditions	Interest Rate 0.75% Repayment Period 40 years (Grace Period) (10 year) Conditions for Procurement: General Untied
Borrower / Executing Agency	President of India / National Mission for Clean Ganga (NMCG)
Final Disbursement Date	July, 2012
Main Contractor (Over 1 billion yen)	・Patel Engineering Limited. (India) / Michigan Engineering Pvt. Ltd. (India) (JV), Angerlehner (Austria) / Michel Bau Gmbh (Germany) (JV), Degremont SA (France) / Degremont Ltd. (India) (JV), Shriram Epc Ltd. (India) / KMG Pipe Rehabilitation Emirates Llc. (United Arab Emirates) (JV), VA Tech Wabag Gmbh (Austria) / VA Tech Wabag Ltd. (India) (JV)
Main Consultant (Over 100 million yen)	・RV Anderson Associates Ltd. (Canada) / Tce Consulting Engineers Limited (India) / Development Consulting Ltd. (India) / Price Waterhouse Coopers Pvt. Ltd. (India) / Tokyo Engineering Consultants, Co., Ltd. (Japan) (JV), CH2M Hill Construction Pvt. Ltd. (India), MDP Consultant Private Limited (India)
Feasibility Studies, etc.	Feasibility Study related to YAP (II)
Related Projects	・(Technical Cooperation) Integrated Pollution Abatement and River Basin Management Project for Ganga Basin(March, 2003) ・(ODA Loan) YAP (I) (December, 1992), YAP (III) (February, 2011) ・(Government of India) Ganga Action Pan (1985～) ・(World Bank) Delhi Water Supply and Sewerage Project (2005)

2. Outline of the Evaluation Study

2.1 External Evaluator

Hisae Takahashi, Ernst & Young Sustainability Co., Ltd.

2.2 Duration of Evaluation Study

This ex-post evaluation was conducted with the following schedule:

Duration of the Study: August, 2015 – September, 2016

Duration of the Field Study: December 2 – December 19, 2015, February 28 – March 12, 2016

2.3 Constraints during the Evaluation Study

This project implemented support for awareness and PR activities for the local residents as well as enhancing the institutional capability of Project Implementing Agency (PIA) in each state. No indicators for these activities were established to confirm the effects, and it was difficult to analyze the extent to which the capability of PIAs and activities for residents were improved. And it was also difficult to assess them since awareness activities were conducted within only a limited area alongside the vast Yamuna River and many years had passed by the time of the ex-post evaluation. Accordingly, the effectiveness and impact were evaluated by weighting the effects generated from constructing the sewerage facility, comprising 88% of total funding. Awareness and PR activities and capacity building of PIA in each state were also analyzed by determining how these activities contributed to a smooth implementation and generated the effect and impact of this project.

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

3.1 Relevance (Rating: ③[4])

3.1.1 Relevance to the Development Plan of India

The development policy of India at the time of appraisal, "the 10th Five-Year Development Plan" (2002 – 2007), targeted 8% GDP growth per year to attain 13 numerical targets. One of the targets, "purification of major polluted rivers", was intended to improve the quality of major rivers by 2007. Furthermore, YAP, the basis for this project, was placed as the core program of each Five-Year Plan from the 8th through the 10th Five-Year Plan. The development policy at the time of ex-post evaluation, "the 12th Five-Year Plan"(2012-2017), emphasized "accelerated and sustainable inclusive growth" and specified environmental conservation needs for sustainable growth. In particular, an appropriate drainage plan was required, underlining the need to maintain a sewerage facility along the Yamuna River due to the

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

[4] ③: High, ② Fair, ① Low

severely polluted condition of the Yamuna River tributary to the Ganges River[5].

Moreover, the national sector plan in the water area, "the National Water Policy" (2002) and its updated policy (2012), indicated the need to improve the quantity and quality of the water supply and hygienic environment by developing water sources and constructing water supply and sewerage facilities[6]. Furthermore, this project was also included, as a core project in the nationwide river water quality conservation program, "the National River Conservation Plan", targeting 29 rivers along with 151 cities of those basins in India[7]. This project aimed to help improve the water quality of the river by developing sewerage facilities in the city along Yamuna River and conducting various activities to improve residents' awareness of the need to preserve water quality. Therefore consistency with the sector policy is confirmed.

3.1.2 Relevance to the Development Needs of India

Many rivers in India are used for bathing as a sacred and intimate part of residents' daily lives. However, water pollution caused by coliform at the time of appraisal worsened considerably compared to the average from 1979 to 1985 (see Table 1). In particular, the water quality of Yamuna River worsened more than those of other rivers, which meant immediate maintenance of the sewerage facilities was required. Subsequently, the biochemical oxygen demand (BOD)[8] of Yamuna River remained high, despite some other major rivers showing improved values (see Table 2).

Table 1 Amount of Bacillus Colonies of the Major Rivers

River	Amount of Bacillus Colonies (MPN Note/100ml)	
	1979 - 1985	1999
Yamuna	440,000	19,000,000
Ganges	600,000	7,300,000
Subarnarekha	15,000	13,000
Bramhani	1,000	11,000

Source: Documents provided by JICA
Note: MPN stands for most probable numbers.

Table 2 Amount of BOD of the Major Rivers

River	BOD(mg/l)3	
	2002	2010
Yamuna	7.0	7.2
Ganges	2.5	3.1
Subarnarekha	2.0	1.4
Bramhani	2.7	1.8

Source: Central Pollution Control Board, "Annual Report 2011-2012"

The Yamuna River basin extends through three states, Delhi, UP and Haryana and its water quality worsened particularly in Delhi and Agra (See Table 3). At the time of ex-post evaluation, while the capacity of sewerage treatment facilities, alongside the Ganges River and including its tributary was about 35% of discharged sewerage, 65% of domestic and factory

[5] Source: Questionnaire responses from the NMCG and website of the Planning Commission, Government of India (http://planningcommission.nic.in/plans/planrel/fiveyr/12th/pdf/12fyp_vol1.pdf)
[6] Source: Questionnaire responses from the executing agency and website of Ministry of Water Resources (http://wrmin.nic.in/forms/list.aspx?lid=1190)
[7] Source: Documents provided by JICA
[8] This is also called biochemical oxygen consumption, one of the most common water quality indicators, showing the amount of oxygen needed by microorganisms for oxidative breakdown of the organic materials in water. Generally speaking, the higher the BOD value, the worse quality of the water.

sewerage was drained directly into rivers, which is a source of pollution[9]. Disposal of human waste and dumping into rivers also polluted the Yamuna River. Accordingly, the needs to develop sewerage facilities in Delhi and Agra and boost awareness and PR activities for residents to improve water quality are both high.

Table 3 Amount of BOD of Yamuna River Basin

Monitoring points	BOD(mg/l)[3]		
	1996	2002	2011
Hathnikund /Tajewala (Haryana, near the entrance)	1.2	1.0	0.8
Sonipat (Haryana)	3.0	2.0	2.5
Nizamuddin Bridge (Delhi)	25.0	34.0	21.3
Mathura Upper Stream (UP)	4.0	15.0	8.7
Agra Down Stream (UP)	9.0	20.0	9.5
Juthika / Auraiya (UP, near the exit)	5.0	9.0	2.0

Source: Documents provided by JICA and Delhi Water Board

3.1.3 Relevance to Japan's ODA Policy

JICA "Medium-Term Strategy for Overseas Economic Cooperation Operation" at the time of appraisal emphasized "poverty alleviation through development of agriculture and rural areas" and "improvement of severely deteriorated facilities for environment and hygiene condition in major cities" as priority areas of support for India. Also JICA Country-specific Programs set assistance priority in "environment conservation concentrating on securing quality water resources[10]. Japan's Country Assistance Program for India, which was being formulated at the time, showed a focus on improving the sewerage facility in urban areas to reduce environment deterioration caused by economic growth[11]. This project was to help improve the water quality of Yamuna River, which is a major water source for watershed cities and is relevant to Japan's assistance policy which emphasized improvement of the environment and the hygienic environment in major cities.

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

3.2 Efficiency (Rating: ①)

3.2.1 Project Outputs

This project implemented the development of sewerage facilities, non-sewerage works (support for smooth implementation and sustaining the effects of the project) and consulting services. Table 4 shows the planned and actual outputs.

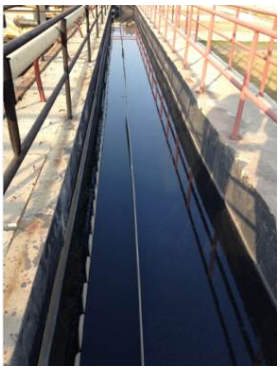
[9] Source: Questionnaire responses from NMCG
[10] Source: Documents provided by JICA
[11] Source: "Official Development Assistance (ODA) 2004, Japan's ODA data by Country", Ministry of Foreign Affairs of Japan

Table 4　Planned and Actual Outputs (Sewerage Component)

	Item	Area	Unit	Planned	Actual
Delhi	Sewerage treatment plant (Construction) (rehabilitation)	 Okhla Keshopur	m^3/day	135,000 54,000	As planned
	Sewer line (rehabilitation / replacement) (renewal) (new)	 Ring Road Bela Road Wazirabad	m	10,900 6,293 14,700	As planned 6,929 13,954
Agra	Sewerage treatment plant (construction)	Northern Area	m^3/day	10,000	14,000
	Sewer line (construction)		m	34,000	36,770
	Pumping station (construction)		m^3/day	10,000	14,000
	Rising main		m	6,100	5,370
	Sewerage treatment plant (construction)	Western Area	m^3/day	28,000	40,000
	Sewer line (construction)		m	39,200	34,960
	Pumping station (construction)		m^3/day	28,000	40,000
	Rising main		m	6,600	9,500

Source: Documents provided by JICA, NMCG, Delhi Water Board and Agra Water Board

The output for the sewerage component in Delhi was almost as planned, while the actual sewerage treatment plant (STP) capacities in the both Northern and Western areas of Agra were about 40% higher than planned. The main reason for the disparity was the miscalculation of capacity, due to citing the wrong standard year during the design stage, hence the capacity of STPs were increased based on the executing agency's proposal after commencing the project[12]. The outputs of the sewer line, pumping station and rising main were also modified based on the situation on the ground and changed capacities of STPs, accordingly. Each change was made based on a detailed survey and the situation on the ground, with changes deemed necessary to generate effect and was reasonable.



Sewerage Treatment Plant (Western area)

Sewerage Treatment Plant (Keshopur)

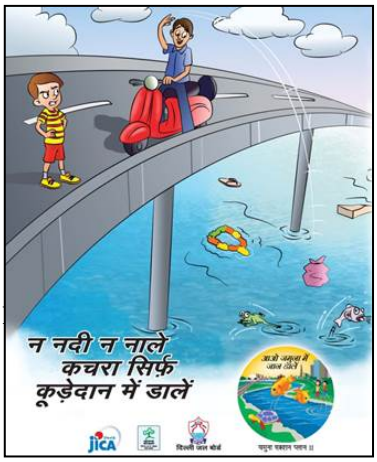
[12] The treatment capacity of STP is generally designed based on the time of completion as the standard year. In this project, 2002 data was mistaken as the standard year instead of the 2007 data. This mistake was recognized in 2003 and necessitated changes in treatment capacity along with the population forecast (11% difference between 2002 and 2007).

Each detailed activity of non-sewerage components was planned after the project started and the activities were conducted based on this plan. The main outputs are 1) Public Participation and Awareness activities (PPA) and PR activities to promote an understanding of the importance for improving the living environment of residents, 2) Capacity building activities for each state of PIA, 3) Improvement of the water quality management system of the National River Conservation Directorate (NRCD), 4) Feasibility Study (F/S) report preparation for the next phase. 5) Research related to preparing a guideline to redevelop the slums area was outside the scope because the intended riverside slums had already been forcibly relocated due to flooding when the project started.

Table 5 Planned and Actual Outputs (Non-sewerage Component, Consulting Services)

Item	Planned	Actual
1) PPA and PR activities	Workshops, short plays, seminars, meetings, etc.	Development of teaching material for public awareness (riverside residents, schoolchildren and media), school hygienic education with developed material, PR activities inducing workshops, short plays, meetings, rallies. Setting up a water and wastewater corner at the National Sciences Museum
2) Institutional capacity building of PIA	Enhancing technical capability and facility operation ability, improving the financial structure	Developing and implementing action plans (trainings for civil engineering work and maintenance) of a total of 15 local authorities)
3) Capacity building of NRCD	Improvement of the water quality management system and financial and information system	Introduction of a water quality management system (placement of server and hardware, instalment of software, training for water quality data management)
4) F/S report preparation for the next phase	Preparation of a detailed plan YAP (III)	Preparation of F/S for the next phase, Formulation and implementation of the Pilot projects (construction of laundry area, refurbishment of crematory)
5) Research related to formulating a guideline to redevelop slums	Research to prepare guideline	Not implemented at this project
Consulting services	Bidding documents review, bidding assistance, construction supervision, research assistance, preparation assistance of materials such as detailed F/S, staff training, etc.	As planned

Source: Documents provided by JICA, NMCG, NRCD, each PIA and interviews.



Poster Prepared for
the Awareness Activities

Water Preservation and
Hygienic Education at School

3.2.2 Project Inputs

3.2.2.1 Project Cost

The planned project cost was set at 15,808 million yen (13,333 million yen from Japanese ODA loan) and the actual project cost totaled 17,120 million yen (8,323 million yen from Japanese ODA loan), 108% of the original plan, which was higher than planned. This increased cost was due to the increased construction cost from changes of output for STPs in Agra[13] as well as the affect from inflation. Besides, the substantially lower Japanese ODA loan disbursement than what was planned was due to the sharp rise in the yen when the civil works began. Despite the fact that there was an unused balance in the Japanese ODA loan[14], the Government of India only allowed disbursements up to the amount approved for the project cost in rupee, including the Japanese ODA loan portion. Therefore, the remaining balance was not utilized.

3.2.2.2 Project Period

The planned project period[15] at the time of appraisal was 63 months in total (January 2003 – March 2008) and the actual period was 127 months (March 2003 – September 2013), significantly longer than planned (202% of the planned period). The major factors behind this delay were longer duration for land acquisition and necessary approvals for construction from each related authorities. Table 6 shows the detailed factors behind the delay.

[13] The increased amount by extending capacities of STPs in Agra was covered by the Indian side.
[14] For instance, the exchange rate at the time of appraisal was 2.45 Japanese Yen (JPY) to the Indian rupee and the average rate during the project was 2.19 JPY to the Indian rupee. During the full-scale engineering work in 2010, 2011 and 2012, the exchange rates were 1.92 JPY, 1.71 JPY and 1.50 JPY, respectively (quoted from the IMF rate).
[15] The project term is defined from the time of Loan Agreement (L/A) signing to the time of completion of the facility construction.

Table 6 Major Sites Delayed and Factors behind the Delay

Situation of delay	Major factors
The delay in starting construction of the STP (Okhla)	Approval had to be obtained for the start of construction at the planned site from the Municipality Corporation of Delhi (MCD) and related authorities. However, insufficient information sharing for this project meant a delay in obtaining approval. Moreover, an unexpected rocky area on site also delayed the work.
The delay in starting rehabilitation work for the STP (Keshopur)	When rehabilitating the existing facility, the inflow to the existing facility has to be connected to the other facility before the work can start. This connection process took longer, delaying the start.
The delay in constructing the sewer line (Bela Road)	The laying location of the sewer line was near the Kashmir Gate metro station, surrounded by historical buildings. Accordingly, it took time to obtain approval from the Delhi Metro Rail Corporation (DMRC) and the Archaeological Survey of India (ASI).
The delay in constructing the sewer line (Wazirabad)	The planned construction site was located in a crowded area in Delhi, so the construction method was changed to the Micro Tunneling Method, which allows sewers to be constructed, even in confined spaces. This change required more time to obtain approval from the MCD. Unexpected ground water from subterranean formation also delayed construction.
The delay in constructing the sewer line (Ring Road)	The construction was planned near Delhi castle (Red Fort), a tourist site, which meant obtaining approval from the ASI took longer. It was also difficult to continue the construction as planned in the area crowded with tourists, which delayed the work.
The delay in constructing the sewer line (Western area)	The construction site was surrounded by a national road and two stations. Accordingly, it took time to obtain approvals from the National Highways Authority of India (NHAI) and Indian Railways.
The delay in constructing the pumping station (Northern and Western areas)	Part of the construction site was owned by farmers and owners who opposed the project in the early stage, which meant time was required to acquire the land. There was no resettlement in this case.
The delay in constructing the STP (Northern and Western areas)	It took time to secure the construction site. Moreover, the construction did not proceed as planned due to unexpected thickness of the sand layer.

Source: Interviews with Delhi Water Board and Agra Water Board

Approval is always required from each of the related authorities when planning to construct sewerage facilities near stations, national roads or historical buildings in the city. However, the duration required to obtain such approval depends on the authorities or other circumstances and is beyond the control of the executing agencies, which meant delays at many project sites. In this project, proper information sharing, preparations of a proper plan in a timely manner and coordination with related authorities[16] for implementation were not sufficiently promoted before and at the start of the project[17], which was considered to trigger a critical situation.

[16] For this project, the authorities indicate the MCD, DMRC, ASI, NHAI, Indian Railways and Police, etc.
[17] Source: Interview with the civil works department at the Delhi Water Board

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

Financial Internal Rate of Return (FIRR) was recalculated based on the assumption[18] at the time of appraisal. FIRR was estimated as 3.5% against the preliminary calculation of 9.6%. The differences were due to the seven and a half years delay in the project period and water charges being raised less than the level assumed at the time of appraisal, resulting in a lower benefit.

While the project cost slightly exceeded the plan, the project period significantly exceeded the plan. Therefore, efficiency of the project is low.

3.3 Effectiveness[19] (Rating: ③)

3.3.1 Quantitative Effects (Operation Indicators)

3.3.1.1 Amount of Wastewater Treated at the STP

Table 7 shows the amount of wastewater treated at STPs developed under this project. Except for the Western area, approximately 80% of the targeted volume was achieved in the Okhla, Keshopur and Northern areas. Although the target amount of each facility was set at the design capacity of the STPs, this does not necessarily mean that the STP capacity will meet 100% of the targeted amount within the few years after project completion, because connection to sewers or weather affects the amount of sewerage inflow to the STPs. Given this factor, the wastewater treated amount of STPs in all sites except the Western area mostly met targeted values. Accordingly, the effectiveness of this project was confirmed.

Table 7 Amount of Wastewater Treated of Targeted Plants

(Unit: m^3/day)

	Baseline 2002/03 Baseline Year	Target 2010/11 2 Years After Completion	Actual 2012/13 Completion Year	Actual 2013/14 1 Year After Completion	Actual 2014/15 2 Year After Completion	Achievement Status (%)
Okhla (Extension)	682,000	773,000[Note1]	545,640	577,469	613,845	79%
Keshopur (Rehabilitation)	327,000	327,000	218.256	250,085	309,196	95%
Northern area (Construction)	—	10,000 (14,000)[Note2]	12,250	12,250	12,250	88%
Western area (Construction)	—	28,000 (40,000)[Note 2]	4,590	6,700	11,870	30%

Source: Documents provided by JICA and each STP

Note 1: The target amount shows the total capacity of existing STP and that of constructed STP in Okhla. Considering the fact that the dilapidated old STP constructed in 1937 with a capacity of 136,400m^3/day was demolished in Okhla, Delhi Water Board recognizes that the total capacity of STPs in Ohkla can be calculated as 636,600m^3/day, meaning 96% of the target value was achieved.

Note 2: Data in parentheses of the lower line shows the capacity after changing output. Achievement status indicates the rate of actual capacity value after changing output.

[18] Cost: Initial investment cost, O&M cost, Benefit: Revenue from sewerage charges, Project life: 30 years after the project completion

[19] Sub-rating for Effectiveness is to be put with consideration of Impact.

The reasons why the achievement status showed 30% of the targeted value in the Western area were that the construction works were delayed due to an undistributed budget for sewer line connections until March 2016[20] and that the connection works were underway, even at the time of ex-post evaluation, under the original plan to be fully operated by 2022. Furthermore, most residents in this area were poor compared to those of Agra in the North and not very interested in connecting to sewer lines, which also affected the progress[21]. The amount of wastewater treated of this area comprised only 3% of the total in this project, and besides, the total amount of wastewater treated of the STPs developed in this project reached 82% of the target. Accordingly, it can be judged that the amount of wastewater treated in the targeted STPs met the targeted value of the project.

3.3.1.2 Population Treated

The population treated in each area where the project constructed STPs is shown in Table 8. Targets were achieved in the Okhla, Keshopur and Northern area[22], while that at the Western area was 38% of the planned value, since the sewer connection works remains ongoing as explained above. However, the actual population treated by the project as a whole (population treated by STPs which were developed under the project) achieved 99% of the target value.

Table 8 Population Treated

(Unit: thousands people)

	Baseline	Target	Actual		
	2002/03	2010/11	2012/13	2013/14	2014/15
	Baseline Year	2 Years After Completion	Completion Year	1 Year After Completion	2 Year After Completion
Okhla (extension)	3,000	3,400	3,400	3,400	3,400
Keshopur (rehabilitation)	2,500	2,500	2,500	2,500	2,500
Northern area (construction)	-	55	N.A	N.A	97
Western area (construction)	-	152	N.A	N.A	57
Total[Note1]	5,500	6,107	-	-	6,054

Source: Documents provided by JICA and each STP

Note1: Total number of population treated; covered by all STPs developed under this project.

3.3.1.3 Improvement of Effluent Quality

BOD (effluent) concentration and BOD reduction rate largely achieved the target level at all STPs as shown in Table 9. Moreover, all satisfied the standard level set by each State Pollution Control Board (below 30mg/l for BOD), which meant improved effluent water

[20] Civil works restarted from March 2016 and an improvement in the situation is expected.

[21] Connecting to the sewers and each house requires 5,000 Indian rupees as the initial cost, which is a large sum and a big burden for poor households.

[22] The target value of the population treated remained unchanged though the capacity of STPs in the northern and western areas increased as explained in footnote 12. Because the changes in the STP capacity were made due to errors in setting the baseline year, this did not affect the prediction of the population as explained.

quality discharged from developed STPs was confirmed. The reduction rate has been decreasing in the STP of the western area because part of the inlet (inflow parts) was damaged, and maintenance works were implemented from June to December 2015[23]. Thus the rate decrease was temporary.

Table 9 BOD Concentration of STPs

		Baseline	Target	Actual		
		2002/03	2010/11	2012/13	2013/14	2014/15
		Baseline Year	2 Years After Completion	Completion Year	1 Year After Completion	2 Year After Completion
Okhla	Inflow (mg/l)	196.0	200.0	182.8	177.5	175.3
	Outflow(mg/l)	22.7	10.0	5.0	8.0	9.3
	Reduction Rate (%)	88.4	95.0	97.3	95.5	94.9
Keshopur	Inflow (mg/l)	250.0	250.0	209.0	210.0	175.0
	Outflow(mg/l)	44.0	10.0	19.0	5.0	6.0
	Reduction Rate (%)	82.4	96.0	90.9	97.6	96.6
Northern area	Inflow (mg/l)		225.0	205.0	207.0	204.0
	Outflow(mg/l)	-	30.0	29.8	29.1	28.8
	Reduction Rate (%)		87.0	85.5	85.9	85.9
Western area	Inflow (mg/l)		225.0	87.5	87.5	95.0
	Outflow(mg/l)	-	30.0	11.5	16.8	29.7
	Reduction Rate (%)		87.0	86.9	80.8	68.7

Source: Documents provided by JICA and each STP

3.3.2 Quantitative Effects (Effect Indicators)

3.3.2.1 Percentage of Population Served

The Percentage of Population Served achieved the target value at all sites (See Table 10). Those at the Okhla, Keshopur and Northern area are very high thanks to the contribution of this project by expanding the capacity of wastewater treated through developing sewerage facilities. While that in the western area was 30%, which is relatively low, it achieved the target value, meaning the planned effect of the whole project was confirmed.

Table 10 Percentage of Population Served

(Unit: %)

	Baseline	Target	Actual		
	2002/03	2010/11	2012/13	2013/14	2014/15
	Baseline Year	2 Years After Completion	Completion Year	1 Year After Completion	2 Year After Completion
Okhla	80	90	90	90	90
Keshopur	25	25	100	100	100
Northern area	-	21	88	88	95
Western area	-	22	11	17	30

Source: Documents provided by JICA and each STP

Note: Percentage of population served is defined as (population treated)/(target population treated) x100.

[23] Source: Interview with Agra Water Board

3.3.2.2 Reduction Rate of the Pollution Loading Amount[24]

Table 11 shows the pollution loading amount before the project and the planned and actual reduction rates in the pollution loading amount. The reduction rate in the pollution loading amount was 44%, which exceeded the target rate of 28% in Agra, while necessary data was not available from the Delhi Water Board. The pollution loading amount itself worsened after the project, but the effluent water quality improved and the treated wastewater amount also increased by constructing sewerage treatment facilities, as explained in "3.3.1.3 Improvement of Effluent Quality". Accordingly, the implementation of this project is also considered to have helped reduce the pollution loading amount.

Table 11 Reduction Rate of Pollution Loading Amount

(Unit: kg/day)

	Baseline	Target			Actual		
	2002/03	2012/13			2014/15		
	Baseline year	Completion year			2 years after completion		
	—	Without project	With project	**Reduction rate**	Without project	With project	**Reduction rate**
Delhi	208,915	365,297	188,528	**48%**	N.A	N.A	**N.A**
Agra	14,068	22,667	16,164	**28%**	81,000	45,000	**44%**

Source: Documents provided by JICA and Agra Water Board

Note: Pollution Loading Amount shows the amount (kg) of BOD per day and is calculated as water quality (concentration of pollution) × water volume (discharged flow). This evaluation compared the situation with/without the project using actual and predicted degrees of pollution loading, as calculated and estimated by the Agra Water Board.

3.3.3 Qualitative Effects (Other Effects)

3.3.3.1 Promoting the Understanding of the People through Awareness and PR Activities

Table 12 shows the result of the beneficiary survey[25] conducted during the ex-post evaluation. It was confirmed that 93% of the respondents changed their understanding on minimizing open defecation through awareness and PR activities of the project. Before this project, community toilets were constructed with the support of YAP (I) and activities to promote awareness of usage and O&M of community toilets were conducted. Continued activities to convey these priorities, even in this project, can be said to have impacted and changed the people's understanding.

[24] Total amount of substances polluting the river water

[25] A beneficiary survey was conducted as follows. Method: Structured interview, Number of valid responses: 100 in total, target beneficiaries: residents of Delhi (25 in Ohkla, 25 in Keshopur) and Agra (8 in Moti Kunj, 8 in New Rajamandi Colony, 10 in Tota ka Teela, 8 in Jagpura, 8 in Lohamandi, 8 in Sonth ki Mandi) nearby the Yamuna River basin (50 from each), Sex: 72% for male and 28% for female, ages: 18－30 (12%), 31－40 (30%), 41－50 (26%), 51－60 (14%), over 60 (18%).

Table 12 Improvement of Local People's Understanding on Living Environment

	Greatly improved	Improved	No change	Worse	Much worse
Minimizing open defecation	40%	53%	6%	1%	0%
Reducing the disposals into water bodies	0%	3%	95%	1%	1%
Reducing the wasteful usage of water	0%	25%	74%	0%	0%
Keeping good hygiene condition	1%	27%	71%	0%	1%

Source: Result of beneficiary survey

On the other hand, 95% of them explained no change in understanding for "reducing the disposal into water bodies." Regarding "keeping good hygiene condition" and "reducing the wasteful usage of water," less than 30% answered as "improved" and 70% cited "no change." As for these results, it can be explained that awareness and PR activities were conducted in 2009, so the people did not clearly remember those activities at the time of ex-post evaluation unlike toilets, which are actually still visible in the area. Also one project could cover only a limited number of beneficiaries within the huge area of Yamuna River basin. Moreover, various awareness activities have been conducted in this area after project completion, making it difficult for the people to discern activities between this project and others.

It is generally considered that the effects of awareness activities, such as changes of awareness, must be confirmed before and right after the project. Afterwards, they become second nature and will then be reflected in actual actions by implementing continued activities. Accordingly, also in YAP (III), which will be conducted, reviewing the changes before and right after the project and continued awareness and PR activities based on the result of the reviews is expected to sustain the effects from YAP (I) and YAP (II).

3.3.3.2 Improvement in the Institutional Capacity of each PIA

In this project, support to prepare and implement action plans to construct sewer lines was provided to 15 local authorities of UP and Haryana States with the aim of improving the O&M capacity for sewerage facilities. When confirming changes in institutional capacity to PIA, thanks to the support, "smooth implementation of project activities" as well as "improved O&M for sewerage facilities" were confirmed.

The project assisted bidding for a smooth project implementation. In particular, since some PIAs lacked sufficient experience to work with NGOs, the support through this project can be said to have contributed toward smooth implementation. Moreover, it was also mentioned that conducting training in the O&M of sewerage facilities has contributed toward O&M activities of facilities developed under YAP (I) and YAP (II) after commissioning the facilities. Considering the fact that actual O&M conditions of the facilities are good as mentioned in "3.5.4 Current Status of O&M", it can be said that the knowledge and

experience acquired in the trainings have been utilized. F/S for the following phase of the project (YAP(III)) was conducted and a draft project plan was prepared as part of the non-sewerage component (to improve the foundation of project activities). However, the commencement of YAP (III) is delayed[26], hence there is concern that the F/S plan would not be in line with the actual situation over time.

3.3.3.3 Strengthening the Institutional Capacity of NRCD

NRCD is an institution which controls and supervises the water preservation of rivers in India. This project supported efforts to improve the water quality management system. For example, a server was set and the necessary hardware and software for data processing was installed so that NRCD could receive monitoring information on water quality by data. Training on data management methods for the NRCD staff was also conducted. Following this support, a foundation for sending water quality monitoring data from each state to NRCD by data was developed, although it was submitted by paper before implementing the project. Due to this change, the data is submitted from states on a monthly basis, as opposed to quarterly as before. Furthermore issues such as delays in submitting reports, which were frequently seen before the project, have since improved[27].

3.4 Impacts

3.4.1 Intended Impacts

3.4.1.1 Water Preservation of Yamuna River

The “Water preservation of Yamuna River” was expected as an impact of the project. However, despite a significant contribution toward generating this impact, expecting this impact to come from the support of a single project is unrealistic, since the Yamuna River basin covers a huge area and various other factors also affect water quality. Conversely, if the effluent water quality and volume from the developed STPs of this project to Yamuna River improved and increased, it can be said that “the project helped preserve water.” As described in Table 13, both effluent water quality and volume from target STPs improved and met the requirement of the State Pollution Control Board. Accordingly, it can be judged that the larger volume of effluent and better water quality contributed toward the water conservation of Yamuna River.

[26] The executing agency of YAP (III) was shifted from NRCD to NMCG in line with the change of government in 2014. This required changes including the approval process and coordination with the project which NMCG was conducting apart from YAP (III) at the time and delayed in YAP (III). After the field survey of this evaluation survey, however, a bidding of a part of project was announced.

[27] Interviews with the staff of NRCD

Table 13 Water Quality and Quantity Discharged into Yamuna River from STPs

	Effluent water quality (BOD mg/l) Before project → After project	Amount of wastewater treated
Okhla	22.7 → 9.3	Increased by extending the existed plant
Keshopur	44.0 → 6.0	No change as rehabilitation of existed plant
Northern area	No data due to new construction→ 28.8	Increased by constructing new plants
Western area	No data due to new construction → 29.7	Increased by constructing new plants

Source: As STPs in the Northern and Western area were newly constructed, the data before the project implementation was not existed.

3.4.1.2 Improved Hygiene Environment and Health Condition

In the beneficiary survey, 24% of the respondents replied that the hygiene environment had "improved", 44% cited "no change" and 22% responded that it had "worsened." Many explained the reasons for the improvement as cleaner condition are kept since the number of over flow of untreated wastewater from drainage is becoming less. This happened because wastewater was formerly discharged directly to drainages but now flows into developed STPs. For the same reason, 37% of responses stated that the odor had improved. For health issues, 32% of them cited improvement, particularly on diarrhea and stomach issues. As such, the improvement was not drastic and there is a limitation on water preservation in Yamuna River, which covered a broad area by one project as explained above. 32% of respondents answered that the hygiene environment had "worsened or largely worsened" in the survey, but considering the population growth in Delhi and Agra and economic development in India, this project is thought to have helped prevent worsening of the situation to a certain extent, since 68% of respondents answered that hygiene conditions had "improved or not changed."

Table 14 Improvement of Hygiene Environment

	Largely improved	Improved	No change	Worsen	Largely worsen
Hygiene environment	2%	22%	44%	22%	10%
Odor	4%	33%	33%	23%	7%
Health condition	1%	31%	40%	22%	6%

Source: Beneficiary survey result

3.4.2 Other Impacts

3.4.2.1 Impacts on the Natural Environment

Interviews with each water board and residents and a site survey confirmed that no complaints such as noises and odors had arisen from implementing this project. Sludge generated from STPs was appropriately treated and the quality of discharged water from STPs also met the water quality standard, thus no negative impact on the natural environment was confirmed.

3.4.2.2 Land Acquisition and Resettlement

71 hectare of land to construct STPs and a pumping station in Agra were acquired through this project. The land was acquired in line with regulations set by the state government. However, it took longer than expected, which was one of the factors delaying the project period. Similar issues related to land acquisition occur frequently in this country and avoiding those issues can be considered very difficult[28]. No resettlement took place for implementing the project[29].

3.4.2.3 Effect of Improving the Quality of Irrigation Water

According to the beneficiary survey, 57% of respondents engaged in farming answered that agricultural activities had improved when treated water was used as irrigation water. Before the project, the water which the farmers used for irrigation were the water from rivers and drainage where untreated water were discharged. Even when interviewing farmers of nearby STPs developed in this project, at the time of ex-post evaluation, many explained that using treated water with better quality for irrigation increased the yield. Accordingly, it can be said that developing STPs in this project contributed to agricultural activities nearby the STPs to a certain extent.

This project has largely achieved its objectives. Therefore effectiveness and impact of the project are high.

3.5 Sustainability (Rating: ③)

3.5.1 Institutional Aspects of Operation and Maintenance (O&M)

The executing agency of this project was shifted from NRCD to NMCG in line with the change of government administration in 2014 (after project completion). However, this shift did not affect the O&M structure, since O&M activities for sewerage facilities were managed by the Delhi and Agra Water Boards. The total number of staff in the Delhi Water Board is 19,152, where 7,435 of whom are technical staff and 3,500 are engaged in O&M; while the total staff at the Agra Water Board is 202 people, where 125 of whom are technical staffs and 157 of whom are engaged in O&M works at the time of ex-post evaluation. Sufficient staff are assigned considering the fact that both water boards outsourced O&M of the facilities to private contractors and are giving actual positive O&M condition in the field. The responsibilities for each role; daily O&M works by private contractors, supervisory work by staff of the Water Boards, are also clear. Accordingly, no problems have been seen in the O&M structure.

[28] Interview with Agra Water Board
[29] Interview with each PIA

Awareness and PR activities have also been continued, primarily by each Water Board and the public health department of each state, which has helped prevent issues from arising.

3.5.2 Technical Aspects of Operation and Maintenance

The Delhi and Agra Water Board are institutions which have overseen O&M for water supply and sewerage facilities, thus they have sufficient knowledge and experience for O&M of sewerage facilities. They are also familiar with water quality control at STPs and have worked on preventive maintenance. Furthermore, management of contact with contractors and monitoring of O&M activities done by contractors have been made without any issues. During the site survey, it was confirmed that manuals for O&M provided to each facility through this project were properly kept and utilized at the time of ex-post evaluation. O&M for each project facility was assigned to contractors, which constructed the facility, for three years after the operation started. Following that contract period, contractors are selected through a bidding process and conclude contracts every three years. Eligible contractors who have passed the pre-qualification are only allowed to participate in bidding, which means contractors have sufficient technical skills for daily O&M activities.

In addition, each PIA utilizes experience gained from the component of institutional capacity building in the project for daily O&M sewer activities and so on. The information system for monitoring water quality introduced under this project was also operated and maintained without issues by NRCD staff.

3.5.3 Financial Aspects of Operation and Maintenance

According to the staff of the Delhi and Agra Water Boards, the O&M budget for sewerage facilities has been properly secured. The balance of current transactions in the Delhi Water Board shows a surplus for the past few years, as indicated on Table 15, so no serious financial issues are likely[30]. Regarding the Agra Water Board, the required budget for O&M is allocated each year by the Water Board of UP State and no budget issues have arisen.

Table 15 Delhi Water Board's Income and Expenditure

(Unit: million Indian Rupees (INR))

	2012/13	2013/14	2014/15
Income	**21,553**	**20,045**	**19,098**
Water charges	13,379	13,221	14,359
Other income	8,174	6,824	4,739
Expenditure	**16,721**	**19,405**	**18,912**
Establishment	10,286	11,028	11,680
Power	4,492	4,913	5,400
Repair and maintenance	1,566	3,187	1,517

[30] Although the Delhi Water Board is basically an autonomous entity, part of the project cost for investing in facilities is allocated as subsidies from central government or municipal government.

Raw water	302	173	219
Taxes	75	104	97

Source: Documents provided by financial department of Delhi Water Board

Table 16 O&M Cost of the Agra Water Board

(Unit: million INR)

	2012/13	2013/14	2014/15
O&M Cost	145	167	180

Source: Documents provided by Agra Water Board

3.5.4 Current Status of Operation and Maintenance

It was confirmed that the facilities developed under this project were in good condition at the time of ex-post evaluation through interviews with the Delhi Water Board, Agra Water Board and private contractors and through site surveys. Although the utilization rate of the Western area was low, it was within the plan as explained and connections from sewers to STPs will increase hereafter.

Maintenance works at each facility are conducted for set items based on the daily and regular maintenance system. It was also confirmed that each facility has kept records on preventive maintenance sheets and formats to complete information on parts which are problematic. Spare parts of facilities and equipment are all available within the country and no problems were confirmed since the installation up to the time of ex-post evaluation. Furthermore, since the actual O&M condition is good, no issues were confirmed concerning the current O&M status.

No major problems have been observed in the institutional, technical and financial aspects of the O&M system. Therefore sustainability of the project effects is high.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

This project was conducted to increase the sewerage capacity by developing sewerage facilities and also aimed to promote water quality conservation and raise understanding of improving the living environment in the Yamuna River basin at Delhi, UP State and Haryana State of India, through awareness and PR activities to the local residents as well as strengthening the institutional capacity of executing agencies. It is consistent with the national development policy, which has highlighted water quality improvement of major rivers as a critical issue of the environment sector, and also with the Japanese policy of assistance to India. Development needs are also high considering the polluted condition of the Yamuna River and the hygiene situation of the river basin. Hence, the relevance of this project is high. The efficiency of the project is low, as the project cost slightly exceeded the plan due to the

increased output and price escalation and the project period significantly exceeded the plan since more time was required to acquire land and obtain construction approval. Thanks to the project, effects such as an increase in the amount of wastewater treated and the improvement of effluent water quality were confirmed and the percentage of population served was also on target in the project areas. Since the Yamuna River basin covered a broad area, the effects on water conservation in terms of the whole Yamuna River through this project alone were limited. Compared with the situation before the project, however, a larger amount of wastewater treated with better water quality was discharged into Yamuna River, meaning that the project contributed to water conservation of the river to a certain extent. Therefore, the effectiveness and impact of the project is high. O&M of sewerage systems developed under this project shows that they are in good condition and no major problems were observed in terms of institutional and technical aspects of O&M. The O&M cost required for the facilities has also been secured, thus the sustainability of the project effect is high.

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

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency and JICA

- This project prepared detailed F/S for YAP (III), the project following YAP (II). L/A for YAP (III) was signed in 2011, but activities have not fully commenced since then and the progress is delayed, though bidding was announced for a part of the project. Accordingly, there is a concern that the contents of the F/S would not match the real condition and not be utilized if things continued to be unchanged. The executing agency and JICA need to work on resolving problems which have disturbed the start of the activities and provide support to commence YAP (III).
- While the effectiveness and impact of YAP(I) and YAP(II) were high, continued actions, including developing sewerage facilities, awareness and PR activities would be required for further water preservation of the broad Yamuna River basin.

4.3 Lessons Learned

- <u>Setting up a place for sharing information with related authorities</u>

The period of this project was much longer than planned (202% of the plan). One of the major reasons, as explained, was the longer time required to obtain approval to construct sewerage facilities from the related institution. Although such issues occurred frequently in the projects for sewerage sectors, insufficient information sharing and coordination before and on commencement of construction could be considered to compound the situation considerably. For similar projects, the executing agency must share information thoroughly with related agencies (for example, the DMR, AIS, National Highway Authority of India, Railway Agency,

each municipalities, polices etc., in case of this project) at the time of project commencement to avoid similar problems. There are possibilities that project plans at the time of the planning stage could change according to the progress of construction works. Therefore, as well as sharing information with related institutions, it would be also effective to avoid delays in projects by planning and implementing modified plans, stating by whom it will be conducted and the orders of actions.

・To include a monitoring system by reviewing effects of awareness and PR activities to promote the sustainability of the project effect

This project conducted awareness and PR activities to promote changes in people's understanding of water preservation and the hygiene environment. The effect of these activities should be reviewed both before and right after the project and then continue activities based on the reviewed result, which will help sustain the effect of the activities. In future, for projects including activities such as awareness-raising and PR (for example in the case of YAP (III) which is a project following this one), a monitoring system to understand the situation before and right after the project should be included for reviewing the effect of activities at the time of project completion and then continuing activities to promote the sustainability of the effects.

Comparison of the Original and Actual Scope of the Project

Item	Plan	Actual
1. Project Outputs		
1) Sewerage component		
Delhi: STP (Construction)	135,000m^3/day (Okhla)	As planned
(Rehabilitation)	54,000m^3/day (Keshopur)	As planned
Sewer line (Rehabilitation/replacement)	10,900km (Ring Road)	As planned
(Renewal)	6,293m (Bela Road)	6,929m
(New)	14,700m (Wazirabad)	13,954m
Agra: STP (Construction)	10,000m^3/day (Northern area)	14,000m^3/day
Sewer line (Construction)	34,000m	36,770m
Pumping station (Construction)	10,000m^3/day	14,000m^3/day
Raising main	6,100m	5,370m
STP (Construction)	28,000 m^3/day(Western area)	40,000 m^3/day
Sewer line (Construction)	39,200m	34,960m
Pumping station (Construction)	28,000 m^3/day	40,000 m^3/day
Raising main	6,600m	9,500m
2) Non-sewerage component		
① PPA and PR activities	Workshops, short plays, seminars, meetings, etc.	Development of teaching material for public awareness, hygienic education, awareness for water quality preservation, PR, Setting up a water corner at the National Science Museum
② Capacity building of PIA	Enhancing technical capability and facility operation ability and improving financial structure	Developing and implementing action plans
③ Capacity building of NRCD	Improving the water quality management system and financial and information system	Introducing a water quality management system
④ F/S report preparation for the following phase	Preparation of a detailed plan YAP (III)	Preparation of F/S for the next phase pilot project
⑤ Research related to formulating a guideline to redevelop slums	Research to prepare guideline	Not implemented at this project
3) Consulting services	Bidding documents review, bidding assistance, construction supervision, research assistance, preparation assistance of materials such as detailed F/S. staff trainings, etc.	As planned
2.Project Period	January 2003 – March 2008 (63 months)	March 2003 – September 2013 (127 months)
3.Project Cost		
Amount Paid in Foreign Currency	1,861million yen	Unknown
Amount Paid in Local currency	13,948million yen (5,693 million INR)	Unknown
Total	15,808million yen	17,120million yen
Japanese ODA Loan Portion	13,333million yen	8,328million yen
Exchange Rate	1INR = 2.45 yen (As of September 2002)	1INR = 2.23 yen (Average between March, 2003 and September, 2013)

India

FY2015 Ex-Post Evaluation of Japanese ODA Loan

"Bangalore Water Supply and Sewerage Project"

External Evaluator: Hisae Takahashi, Ernst &Young Sustainability Co., Ltd.

0. Summary

This project was conducted with the purpose of increasing the water supply and sewerage treatment in Bangalore city by constructing water supply and sewerage systems. Its relevance is high, since the project purpose is consistent with the national development policy of India and State Water Policy of Karnataka, both of which aimed to increase the water supply and improve hygiene conditions and development needs of Bangalore city amid rapid development, as well as Japan's ODA policy. Because this was the first large-scale donor supported public project for the executing agency, the bidding process was delayed and since longer was required to secure the sites and gain approval from the related authorities, the project period largely exceeded the plan. The project cost also exceeded the plan due to price escalation and the increased cost of acquiring land, hence the project efficiency was low. Because of this project, the coverage rates of water supply and sewage treatment[1] rose as well as the volume of water supply and wastewater treated. The overall quality of the treated water at sewerage treatment plants (STPs) has also met the requirement set by the State Pollution Control Board. Living and hygiene conditions have also improved, while IT and automobile companies set up new business in the area where the water supply and sewerage systems were developed, meaning that this project also helped improve the conditions for the industrial foundation in the city, thus its effectiveness and impact were high. The sustainability of the project effect is also high as no serious issues were confirmed in terms of structural, technical and financial aspects of the Operation and Maintenance (O&M), while the facilities developed under this project have also been properly operated and maintained.

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

[1] The rates indicate the area served by water supply and sewerage treatment against the project area covered. The project area, old Bangalore city, was 245km^2 until 2006. However, it expanded to 575 km^2 in 2007 by intergrating new areas. Refer to the note of table 1 for the detail.

1. Project Description

Project Locations

Water Transmission Line to Bangalore City

1.1 Background

Bangalore, the capital of Karnataka State in India, is known as the "Silicon Valley of Asia" amid continued soaring growth, centering on the key industry of software. As the population of the city was 4.1 million people in 1991, expected to rise to 7 million in 2000, the development inside the old city area was expanded outside it as well[2]. The city also started to increase the water supply by taking in supplies from Cauvery River, located 100 km away, for geographic reasons such as the city location at 840 – 940 m above sea level and its distance from a stable water source[3]. However, the total water supply was insufficient to cover the population increase and a further increase in water supply was demanded. The sewerage system also proved inadequate in the growing suburbs and part of the old city. In fact, at the time of appraisal, the volume of wastewater in the old city alone exceeded the capacity of the three STPs located in the city. This not only hampered efforts to improve the living environment in the old city but further exacerbated it, amid the increased sewage and development of the suburb.

Under those circumstances, the project scope included expanding the existing Cauvery water supply system to alleviate severe water shortage and also expanding as well as building STPs to deal with the expecting sewage increase from further water usage[4].

1.2 Project Outline

The objective of this project is to respond to the increased demand for water supply and sewerage system in Bangalore city by constructing a water supply and sewerage system, thus helping to improve the quality of life and industry growth.

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[2] Source: Document provided by JICA

[3] In Bangalore, "Cauvery Water Supply Scheme (CWSS)" was implemented for water intake from Cauvery River over three stages (stage 1 completed in 1974, stage 2 in 1982 and stage 3 in 1994, respectively). This project will be phase 1 in stage 4.

[4] At the time of appraisal, the demand forecast showed large demand/supply gaps in the water supply and difficulties in meeting all the demand required even after the completion of this project. Therefore, the plan envisaged that phase 2 of this project would be implemented to meet the remaining demands.

<ODA Loan Project>

Loan Approved Amount/ Disbursed Amount	28,452 million yen / 23,047 million yen	
Exchange of Notes Date/ Loan Agreement Signing Date	January, 1996 / January, 1996	
Terms and Conditions	Interest Rate	2.1%
	Repayment Period	30 year
	(Grace Period)	(10 year)
	Conditions for Procurement:	General Untied (other than consulting services), Partial Untied (consulting services)
Borrower / Executing Agency	President of India / Bangalore Water Supply and Sewerage Board (BWSSB)	
Final Disbursement Date	January, 2005	
Main Contractor (Over 1 billion yen)	Steel Authority of India (India), Degremont (France), Dodsal Private Ltd. (India), Petron Civil Engineering Ltd. (India)/Electro Steel Casting Ltd. (India)(JV), Bharat Heavy Electricals Ltd. (India), Nila Bauart Engineering Limited Badoda (India), Larsen & Toubro Ltd. (India) /Ksb Pumps Ltd. (India)(JV), V A Tech Wabag Ltd. (India), Larsen & Toubro Ltd. (India) /Thames Water Asia Pte. Ltd. (Singapore) (JV)	
Main Consultant (Over 100 million yen)	TCE Consulting Engineers Limited (India) / Pacific Consultants International (Japan) / Mott Macdonald Ltd. (Singapore) (JV)	
Feasibility Studies, etc.	"Feasibility report" (1995) (Tata Consulting Engineers Limited)	
Related Projects	・(Bangalore City) "Cauvery Water Supply Scheme" (Stage I : 1974,Stage II: 1982, Stage III: 1994) ・(Yen Loan) "Bangalore Water Supply and Sewerage Project" (II-1)(March, 2005), (II-2)(March, 2006)	

2. Outline of the Evaluation Study

2.1 External Evaluator

Hisae TAKAHASHI, Ernst & Young Sustainability Co., Ltd.

2.2 Duration of Evaluation Study

Duration of the Study: August, 2015-October, 2016

Duration of the Field Study: November 21-December 2, 2015, February 22-February 26, 2016

2.3 Constraints during the Evaluation Study

Although an ex-post evaluation is normally conducted within three years of the project completion, the evaluation for this project was scheduled after the completion of the subsequent project (Bangalore Water Supply and Sewerage Project (II) (Phase 2)), scheduled for completion in 2013 and intended to cover both projects. However, since Phase 2 had not been completed by the end of 2015, the ex-post evaluation of this project was conducted separately before completion of Phase 2. Consequently, a decade elapsed after the project was completed, which hindered efforts to collect project documents and apprehend changes between before and after conducting the project from beneficiary interviews and also led to unclear and inconsistent responses on the part of beneficiaries. Accordingly, this information was treated as a reference.

3. Results of the Evaluation (Overall Rating: B[5])

3.1 Relevance (Rating: ③[6])

3.1.1 Relevance to the Development Plan of India

At the time of appraisal, "The 8th Five Year Development Plan (1992 – 1997)", a development policy, showed its objective to improve water supply and sewerage systems. In concrete terms, the objectives included to increase the penetration rate in the city and the water supply volume of individual taps and measures to prevent leakage or theft of the water supply and install hygienic latrines with sewerage, to reuse discharge from STPs in urban cities and increase the number of sewerage users in the city[7]. "The 12th Five Year Development Plan (2012 – 2017)[8]", the development policy at the time of the ex-post evaluation, focuses on health, education, drinking water and sanitation and providing critical infrastructure in rural and urban areas for inclusive and sustainable development. The Plan particularly emphasizes the "provision of drinking water and public hygiene" to access safe drinking water and hygienic facilities with improved health in mind.

The sector plan in India, "National Water Policy (2002) (2012: revised 2002 version)[9]", raised urgent issues such as the development and management of water resources, equal and fair water distribution, improvement of safe drinking water and hygienic environment, management of water quality and quantity through sewerage facilities and the non-revenue water plan. In addition, the "State Water Policy of Karnataka 2002"[10] set the target of increasing the water supply volume and equal water distribution. Furthermore, the Ministry of

[5] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory
[6] ③: High, ② Fair, ① Low
[7] Source: Document provided by JICA
[8] Source: Web site of Planning Commission Government of India (http://planningcommission.nic.in/plans/planrel/fiveyr/12th/pdf/12fyp_vol1.pdf)
[9] Source: Web site of Ministry of Water Resources (http://wrmin.nic.in/forms/list.aspx?lid=1190)
[10] Source: Web site of Government of Karnataka (http://waterresources.kar.nic.in/state_water_policy-2002.htm)

Urban Development shows 18 standards in the water supply and sanitation category as "service level benchmarks[11]", as well as emphasizing the improved quantity and quality of the water supply and sewerage system.

As stated above, the development policy in India consistently targets an increased water supply and improved hygiene environment by developing water supply and sewerage systems. Accordingly, the project has been relevant to the development plan for India.

3.1.2 Relevance to the Development Needs of India

Bangalore city has been struggling to keep pace with the rapid development in the water supply system and was only able to supply 100 liters (L) per capita per day of water at the time of appraisal (1995), far below the required volume of 150 – 200 L for this size of city. Moreover, the demand/supply gap for the total water supply was 306 million L per day (MLD) at the time of appraisal (1995) and was expected to expand to 460 MLD in 2000. The sewerage system capacity of 376 MLD was also far below the required capacity of 544 MLD, which underlined the urgent need to develop water supply and sewerage systems[12].Although this project helped increase both the water supply and sewerage capacity of Bangalore city by the time of the ex-post evaluation, the population of the city also increased from four million at the time of appraisal to 9.5 million in 2014 and is expected to climb further[13]. The covered area of Bangalore city has also expanded to 2.3 times. As shown in Table 1, a major demand/supply gap remains for both water supply and sewerage capacity. Accordingly, the need to expand both the water supply and sewerage system are still high.

[11] Source: Web site of Ministry of Urban Development（http://moud.gov.in/）
[12] Source: Document provided by JICA
[13] According to the executing agency, the executing agency has submitted a proposal to JICA for Phase 3 following Phase 2 since a further increase in demand is anticipated with the increasing polulation in the city. In addition, executing agency explained that pipes from water source to the city need to be constructed every decade to ensure the water volume provided keeps pace with the population growth.

Table 1 Summary of Capacity of Water Supply and Sewerage System in Bangalore City

	At the time of appraisal (1995)	At the time of the ex-post evaluation (2015)
Population (Million)	4.0	9.5[14]
Area of Bangalore city (km^2)	245	575
Water supply volume per capita (L per day)	100	132
Total water supply volume (MLD)	567	1,430
Demand supply gap (MLD)	306	740
Capacity of STPs (MLD)	376	721
Demand supply gap (MLD)	168	423

Source: Documents provided by executing agency

Note: The area of Bangalore city expanded since eight Urban Local Bodies (ULBs) were integrated in 2007. At the time of ex-post evaluation, the area of the city expanded to 800km^2 as 110 villages were later added. Meanwhile, population data is available only for the old Bangalore city area (Bangalore city area at the time of appraisal) and eight ULBs, and BWSSB's official service area was this area at the time of the ex-post evaluation. Thus, data at the time of the ex-post evaluation in table 1 shows the information for the old city area and eight ULBs (city area : 575km^2).

3.1.3 Relevance to Japan's ODA Policy

At the time of appraisal, Japan's ODA assistance policy toward India (1995) emphasized "Improvement of economic infrastructure", "Poverty reduction" and "Environmental preservation"[15]. The policy focused on the provision of safe drinking water as part of "Poverty reduction" and stressed efforts to improve the water quality and water supply in "Environmental preservation". As the project developed water supply and sewerage systems, its consistency with the policy is confirmed.

The project has been fully relevant to India's development and sector plans, which targeted an expansion of the water supply and sewerage capacity, state water policy of the Government of Karnataka, development needs of the rapidly expanding Bangalore and Japan's ODA policy. Therefore its relevance is high.

3.2 Efficiency (Rating: ①)

3.2.1 Project Outputs

The following Table shows the project outputs (planned and actual), any changes and reasons. While the water supply system (Table 2) was basically implemented as planned, the sewerage system (Table 3) differed considerably from the plans, due to the changes in scope based on the result at the time of detailed design. This is because the extent of the sewerage

[14] Population shows the data in 2014.
[15] Source: Document provided by JICA

capacity was subject to review at the time of detailed design[16] as was set out in the appraisal stage.

Table 2 Major Plan and Actual Outputs (Water Supply)

Item	Plan (at the time of appraisal: 1995)	Actual (2005)
1. Intake Structure	1 structure (From water source to Netkal Balance Reservoir（NRR）) Intake tower	As planned (Concrete wall height of channel between intake facility and transmission facility modified)
2. Raw water gravity Main.	1 main (Pipe Steel 2,000mm dia, Length: 9.7 km) NRR ～ T.K. Halli Water Treatment Plant	As planned (Size of Pipe steel was modified to 1,900 mm dia)
3. Water treatment plant (WTP)	1 plant (Capacity: approx. 270 MLD)	As planned
4. Clear water reservoirs (CWR) Pumping plant	Three T. K. Halli:approx. 13.5 million L Harohalli:approx. 11.25 million L Tataguni: approx. 11.25 million L Approx. 1,250KW x 8 each	As planned (the capacity was modified) T. K. Halli: approx. 24 million L Harohalli: approx. 12 million L Tataguni: approx. 12 million L 1,100KW, 1,200KW, 1,300KWx3
5. Treated water transmission	- Pipe Steel 1,950mm dia Length 75 km - Water Pressure Reduction System (WPRS)	- Pipe Steel: Almost as planned (modified to 1,950mm, 1,600mm, 1,200mm dia, length 94km) - WPRS: as planned
6. Water transmission and distribution -Ground level reservoirs (GLR) -Pumping stations -Distribution pipe -Procurement equipment	 - Seven GLR (217 million L in total) Overhead tanks: 5 - 2 stations - 124.5 km Main pipe: 74.5 km Sub pipe: Newly extended: approx. 50km Rehabilitation: approx.10km -Seepage detection, flowmeter	 -Seven GLR (147million L in total) Overhead tanks: Canceled - As planned - 147.0 km Main pipe: 70 km Sub pipe: New: 77km Rehabilitation: Canceled -As planned
7. Others		Non-revenue water control and water distribution system rehabilitation (pilot project)

Source: Documents provided by JICA and Questionnaire responses to executing agency

[16] Source: Document provided by JICA

Table 3 Main Plan and Actual Outputs (Sewerage System)

Item		Plan		Actual (2005)
		Appraisal (1995)	Detailed design survey[Note] (1998)	
1. Sewerage System				
Expansion	K&C Valley	55 MLD	55 MLD	55MLD
	Hebbal Valley	30 MLD	Out of this project scope	Out of this project scope
	Subtotal (Expansion)	**85 MLD**	**55 MLD**	**55 MLD**
New Construction	Geddalahalli	56 MLD	50MLD (Raja Canal)	40 MLD
	Medohalli	49 MLD	20 MLD (KP Puram)	20 MLD
	Bodanhalli	74 MLD	30 MLD (Kadabesinahalli)	50MLD
	Mailasandra	97 MLD	75MLD	75 MLD
	Teggalapariya	49 MLD	20 MLD (Nagasandra)	20 MLD
			20 MLD (Jakkur)	10 MLD
	K&C Valley	-	30 MLD	30MLD
	Subtotal (New onstruction)	**325 MLD**	**245 MLD**	**245 MLD**
Total (Extension & New construction)		**410 MLD**	**300 MLD**	**300 MLD**
2. Pumping Station		11points		8 points
3.Trunk Sewer		Reinforced concrete pipe: Approx. 150 km Cast iron pipe: Approx. 9 km		55 km 16 km
4. Others		Machinery & appliances, Machinery & appliances for laboratory, Cleaning equipment for sewer maintenance		As planned

Source: Documents provided by JICA and responses of Questionnaire to executing agency

Note: STPs in parentheses indicate the location of STP as newly determined at the time of the detailed design stage.

Table 4 Major Plan and Actual Outputs (Others, Consulting Services)

	Plan (at the time of appraisal: 1995)	Actual (2005)
Others	Construction of dormitories and management building, Communication equipment, rehabilitating the service road	As planned
Consulting Services	Contents: Detailed design, Documentation for bidding, Support of bidding, Construction supervision, Trainings for staffs, preparation of reports Total 964MM	As planned 2,281MM

Source: Documents provided by JICA and Questionnaire for ex-post evaluation for JICA-financed project

Changes in output and reasons

(Water supply system)

The output of the water supply systems was basically as planned. As shown in Table 5, some changes were made in the height of the concrete wall of channel between intake and transmission facility, pipe sizes, reservoir capacity, and number of pumps. There were cancelations of constructing an elevated tank, etc., to suit the current situation. None of these changes affected any functions of the intake structure, raw water transmission or water supply and were thus justified as reasonable.

Table 5 Reasons for Changes in Scope of Water Supply System

Item	Reasons for changes
Intake structure	Taking the water level and banks into consideration, the height of the concrete wall of the channel between the intake and transmission facility was changed to protect against overflow.
Raw water gravity Main	The size of the pipes was changed, with cost, safety and effectiveness in mind.
Reservoirs	Detailed survey into the site location and needs exposed the requirement for higher capacity than originally planned and the capacity of the T.K. Halli reservoir in particular was expanded.
Water distribution facility	Based on the water supply volume and capacity in Bangalore city, the total size of GLR was downscaled and adjusted to ensure consistent and equal distribution of water within each area. In addition, the length of the distribution pipes was also changed for newly adopted detours due to the difficulties in using planned distribution routes. Constructing a reservoir at high altitude also eliminated the need to install an elevated tank, hence installation of tanks were canceled.
Others	With the surplus of this project, pilot survey[17] was added (August, 2002) and conducted for non-revenue water in the latter half of the project as one of the key issues to be tackled in Bangalore city. The results of this survey are utilized as a component of non-revenue water during Phase 2.

Source: Questionnaire and interview to executing agency.

(Sewerage system)

The capacities for STPs were re-examined at the time of the detailed design as planned. The sewerage facilities, including the pump station, had to be relocated elsewhere due to the difficulties in securing the original site given the land issues, such as the cooperation provided by those living there. The new site was determined with adequate consideration of the site condition and the capacity of each facility to secure necessary capacities.

[17] This component included research into measures for leakage and non-accounted water (installment of a water meter and introduction of a water payment system, etc.) and rehabilitation of distribution systems.

Accordingly, with no effects impacting on the project result, the changes made were deemed reasonable. Major changes and reasons for them are shown in Table 6.

Table 6 Reasons of Scope Changes for Sewerage System

<table>
<tr><th>Item</th><th>Reasons of changes</th></tr>
<tr><td rowspan="3">Sewerage Facilities</td><td>Habbal Valley STP had to take immediate action to deal with severe water pollution. Conversely, progress of this project was delayed, so the expansion works were performed with State Government funding.</td></tr>
<tr><td>The facility was newly constructed in addition to expanding the existing facility in K&C Valley to correspond to the deficiencies on the existing system.</td></tr>
<tr><td>The STP capacity was to be “re-determined based on population and development predictions as of 2001 during the detailed design survey.” Based on the detailed design survey, the planned capacity was modified and the STP construction sites had to be newly prepared because many planned construction sites had already been encroached by residents due to the delay in commencing the project. Consequently, the amount of wastewater and appropriate location were examined and modified as follows:
<table>
<tr><th>Original</th><th>Modified</th><th>Reasons for changes</th></tr>
<tr><td>Geddalahalli</td><td>Raja Canal</td><td rowspan="3">Construction sites were relocated as the planned sites could not be acquired.</td></tr>
<tr><td>Medohalli</td><td>K R Puram</td></tr>
<tr><td>Bodanhalli</td><td>Kadabesinahalli</td></tr>
<tr><td colspan="2">Mailasandra
Decrease capacity of STP</td><td>As the project was delayed, STP (Vashahabaty) was constructed 0.5km away from the Mailasandra STP with the support of the State government. Accordingly, the capacity of Mailasandra was decreased.</td></tr>
<tr><td>Tegglapariya</td><td>Nagasandra</td><td>Construction sites were changed as the planned sites could not be acquired.</td></tr>
<tr><td></td><td>Jakkur</td><td>In line with the site relocations and STP capacity changes, Jakkur STP was newly constructed to accommodate the total treatment capacity.</td></tr>
</table>
</td></tr>
<tr><td>Pumping Station</td><td>Along with the STP site relocation, the number of pumping stations also has to be changed. Based on the detailed survey for appropriate capacity and location, the location was adequately changed as planned.</td></tr>
<tr><td>Trunk Sewer</td><td>After the project commenced, 95km of sewer was conducted and completed by the Indian side, which resulted in changing the total length of 55km among the planned 150km of trunk sewers under this project. The length of steel pipes was changed from the planned 9km to 16km.</td></tr>
</table>

Source: Questionnaires and interview with executing agency

Water Treatment Facility (T.K. Halli)

STP (Nagasandra)

3.2.2 Project Inputs

3.2.2.1 Project Cost

The planned total project cost was 33,474 million yen (28,452 million yen from Japanese ODA loan) while the actual cost was 36,253 million yen (23,047 million yen from Japanese ODA loan), meaning the total project was higher than planned (108% of the original plan)[18]. The major reasons for the budget excess were the increase in equipment cost along with price escalation, increased construction cost along with the delay in the project period (see 3.2.2.2 project period), the increased cost of land acquisition along with changes of scope for STPs and the higher-than-expected bid price.

3.2.2.2 Project Period

The scheduled project period[19] was 72 months, January 1996 through December 2001 and the actual period was 113 months, January 1996 through May 2005, longer than planned (157% of the planned period). The major factors behind this delay were the "bidding process" and "land acquisition" as explained as follows:

1) The delay in bidding

This project was the first large public project supported by donors for the executing agency. Under such circumstances, more time was required, particularly for preparing the bidding documents, resulting in a two-year delay from the planned period. This

[18] In this project, the extension of Hebbal Valley STP and construction of 63% of the trunk sewer were outside the project scope. Because some classifications of project items differed at the time of appraisal and project completion in the collected documents during the ex-post evaluation, a comparison of the project cost following consideration of the changes could not be simply made. Accordingly, the classifications were reorganized under such restrictions with the potential range and it emerged that the actual cost for STPs was 266%, while that for trunk sewers was 52% of the planned cost. The largely exceeded cost for STPs was explained as changes in the K&C Valley STP of new construction in addition to extension, delays in relocating the construction site and price escalation, but no further analysis was possible, since the cost of STPs was not collected. Conversely, the total trunk sewer length declined and the pipe size also decreased after due consideration of safety and efficiency, which means the modification can be considered appropriate.

[19] The project period is defined from the time of Loan Agreement (project commencement) to completion of construction works (project completion).

delayed the initial construction and caused many STPs to relocate.

2) Issues on land expropriation

As described above, along with the delay in starting construction, residents encroached the planned site locations of transmission water pipes from T.K. Halli CWR to Harohalli CWR and STPs. The completion of the works was delayed for a year as longer time was required for solving the issues.

In addition, it also required time to obtain construction approval from the Bangalore Development Authority to lay the sewer line, and some problems emerged, including a land dispute on the part of Mailasandra STP and difficulties in implementing ground surveys, while issues affecting the pumping supply process[20] and coordination of effluent standard changes by the Karnataka State pollution control board further delayed the project. Furthermore, relocating water and sewerage facility sites usually involves changes to the sewer line, which takes more time than the other facilities, since the design as well as the routes have to be changed, also taking vertical intervals into consideration[21].

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

Financial Internal Rate of Return (FIRR) was recalculated based on the assumption[22] at the time of appraisal. FIRR was calculated as 5.46% from the preliminary calculation of 7.29% at the time of appraisal. The differences were due to the extended project period and water charges which were lower than assumed at the time of appraisal, which resulted in a lower benefit.

In the light of the above, both the project cost and project period significantly exceeded the plan. Therefore, efficiency of the project is low.

3.3 Effectiveness[23] (Rating: ③)

3.3.1 Quantitative Effects (Operation and Effect Indicators)

(1) Water supply: coverage rate of water supply, amount of water supplied

Table 7 shows the coverage rate of water supply and amount of water supply in the

[20] This project used a latest model of main pump made by Japan and a motor made in India to install the pumping systems. This means a motor had to be sent from India to Japan first and tested there, which caused a year or so of delay. According to the executing agency, both the main pumping and motors were procured in India to avoid similar delay issues for Phase 2.

[21] For example, the design for the sewerage line needs to have a proper slope (pitch) to send sewerage to STP for smooth flowing.

[22] Cost: Initial investment cost, maintenance cost, Benefit: Revenue from water supply, Project life: 30 years after the project completion

[23] Sub-rating for Effectiveness is to be put with consideration of Impact.

project area. Though the project aimed to increase the population served with water at the time of appraisal, the relevant data could not be confirmed from the executing agency. Therefore, this evaluation confirmed the coverage rate of water supply as an alternative indicator and also set a target water supply amount based on capacities of both existing and newly built water treatment facilities in this project and analyzed the effectiveness.

Thanks to the project, the coverage rate of water supply in the project area increased to 100% at the time of project completion from 70% at the time of appraisal. The rate decreased to 70% for a certain period since eight ULBs were added to Bangalore city in 2007 (see note on table 1), yet it increased back to 95% at the time of ex-post evaluation with also the contribution of Phase 2. Meanwhile, capacity of water supply at the year of project completion was originally expected as becoming 950 MLD by expanding the water supply facility from Cauvery River and constructing a water treatment plant capable of handling 270MLD[24]. It ultimately achieved 890 MLD, 94% of original target value as the supply capacity sourced from Arkavati River, a different source from this project, has been decreasing since 2005 due to changes in weather conditions or precipitation[25]. Subsequently, water supply facilities were completed at Phase 2 and the water supply amount in the city increased to 1,430 MLD at the time of the ex-post evaluation. The facility utilization has also been maintained at 100% since the project completion. Accordingly, it can be said that the project effectiveness of developing water supply facilities contributed to improve the coverage rate of water supply and the water supply amount in the Bangalore city.

[24] Amount of water supply, 270 MLD, comprises 30% of the total water supply in Bangalore city at the time of project completion and 20% at the time of ex-post evaluation.

[25] This project water supply system has Cauvery River as a water basin. However, the water supply decreased from 150 MLD to 50 MLD in the water supply system which has Arkavati river as a water basin due to changes in the rainfall amount and natural conditions.

Table 7 Coverage Rate of Water Supply and Amount of Water Supply in Bangalore City

	Baseline	Target	Actual				
	1995	2001	2005	2011	2012	2013	2014
	Baseline Year	2 Years After Completion	Completion Year	6 Years After Completion	7 Years After Completion	8 Years After Completion	9 Years After Completion
Coverage rate of water supply (%)[Note1]	70	N.A	100[Note2]	70	85	90	95
Amount of Water Supply (MLD)	680	950	890	930	950	1,230[Note3]	1,430
Facility Utilization (%)	100	N.A.	100	100	100	100	100
Unaccounted Water Rate (%) [Note4]	30	N.A.	35	38	45	45	40
Leakage Rate (%)[Note4]	20	N.A.	25	28	35	35	30

Source: Prepared based on documents provided by JICA and executing agency

Note 1: The project area for 1995-2005 was old Bangalore City, 245km^2. The area was later expanded, and at the point of 2011, it was 575 km^2.

Note 2: Data of 2006 which was available in executing agency.

Note 3: Water supply increased in 2013 with implementing Phase 2.

Note 4: Although the baseline and target value for the rate of unaccounted water and leakages were not set as markers to determine the effectiveness of this project, the information was obtained as a reference to understand the situation of Bangalore city[26].

(2) Sewerage: coverage rate of sewerage treatement, amount of treated wastewater, effluent quality

Table 8 shows the coverage rate of sewerage treatment, amount of treated wastewater and effluent quality[27] of the project area. The appraisal of this project was before the ex-ante evaluation scheme was introduced. Thus, no target of operation indicator for the sewerage facility was set at the time of appraisal. Accordingly, in this evaluation, the target value was set and the achievement level analyzed based on the capacity of the STPs, planned sewerage quantity at the time of appraisal and the quality level defined by the State Pollution Control Board.

The coverage rate of sewerage treatment improved to 70% at the time of project completion from 60% at the time of appraisal. As stated above, the rate decreased to 60% in 2011 due to the expansion of Banagalore city. However, it increased to 80% at the time of ex-post evaluation alongside the extension of sewer connections to the STPs and improvements in the rate of STP utilization (utilization rate of STPs shown in Table 9). The coverage rate would be far lower, if the project had not constructed new STPs. Therefore,

[26] There is significant leakage from dilapidated distribution pipes, unlike the pipes installed in this project and the rates of leakage and water unaccounted for at the time of the ex-post evaluation worsened from figures at the time of appraisal. Given the purpose of this project, the unaccounted water issue was only measured in the pilot project (survey) within a limited area, so conducting this project had no impact on the unaccounted water rate. However, a survey with added scope was included in the component for unaccounted water during Phase 2, which led to the full-scale implementation of countermeasures against unaccounted water and is expected to have an effect in the future.

[27] Effluent water quality shows that of the targeted STPs extended and constructed for this project.

this project can be said to have contributed to increase in the coverage rate of sewerage treatment. The amount of treated wastewater at the time of project completion was 23% of the planned amount estimated at the time of appraisal. The planned amount of sewerage was estimated by 80% of the water supply amount and the sewerage facility of this project was designed and developed based on that number. In fact, a certain period of time was generally required until the sewerage facility went into full operation, by gradually connecting to the sewer lines following construction of the sewerage facility[28]. The STPs constructed in this project are also expected to go into full operation by 2020, development of sewer lines by this project is limited and the amount of treated sewerage at the time of the ex-post evaluation was significantly increased to 75% of the planned amount. Accordingly, the effectiveness of increasing sewerage treatment as planned under this project was confirmed.

Table 8 Coevrage Rate of Sewerage Treatment, Amount of Treated Wastewater, Effluent Quality of Bangalore City

	Baseline	Target	Actual				
	1995	2001	2005	2011	2012	2013	2014
	Baseline Year	2 Years After Completion	Completion Year	6 Years After Completion	7 Years After Completion	8 Years After Completion	9 Years After Completion
Coverage rate of sewerage treatment (%)	60	N.A	70 Note1	60	65	75	80
Amount of Treated Wastewater (MLD)	150	796 Note2	180	319	479	525	600
BOD Concentration Note3 Outflow (mg/ℓ)	60 Note4	20	11.8	11.7	11.7	12.1	11.5
SS Concentration Note3 Outflow (mg/ℓ)	150 Note4	30	13.4	14.1	15.0	15.1	14.1

Source: Documents provided by JICA and executing agency
Note 1: Data as of 2006 which was available in executing agency.
Note 2: In the documents prepared at the time of appraisal, the planned amount of wastewater treated was calculated as 80% of the water supply.
Note 3: Data is the average of STP constructed under this project.
Note 4: Data for BOD and SS concentrations as of the baseline were for K&C Valley alone.

Biochemical Oxygen Demand (BOD)[29] and Suspended Solids (SS)[30] concentrations of treated wastewater at STPs constructed under this project meet the standards (target) set by the Karnataka State Pollution Control Board. Both the BOD and SS effluent concentrations

[28] Based on the interviews with the executing agency.
[29] It is also called "biological oxygen needed" and is one of the key indicators of water quality. It is the amount of dissolved oxygen needed (i.e. demanded) by aerobic biological organisms to break down organic material present in a given water sample at a certain temperature over a specific period. Generally, the larger the BOD, the worse the water quality.
[30] It is a collective terms for small solid particles (less than 2mm) which remain in suspension in water as a colloid.

of K&C Valley improved significantly compared with that before the project[31], hence the improvement in water quality was also confirmed.

Table 9 Utilization Rate of STPs

(Unit: %)

	2011	2012	2013	2014	2015
K&C Valley	104.1	86.2	98.3	92.3	96.5
Kadabesinahalli	55.4	52.7	58.0	68.5	64.8
Mailasandra	45.4	49.8	57.3	61.0	78.3
Nagasandra	37.4	33.7	42.0	48.9	64.4
Jakkur	40.6	39.4	58.7	73.1	86.9
K R Puram	26.4	37.3	76.8	104.2	107.9
Raja Canal	44.8	46.5	88.2	90.86	65.3[Note]

Source：Documents provide by executing agency

Note: In late 2015, part of the sewer line connected to Raja Canal STP was affected by work to widen the road, which decreased 10MLD of capacity and the operation rate of Raja Canal STP in 2015. This situation will be resolved after December 2016, when the road construction will be completed.

3.3.2 Qualitative Effects (Other Effect)

A beneficiary survey[32] and interviews with residents living next to water and sewerage systems were conducted to complement the quantitative effect of the project during the site survey. The surveys were summarized as follows[33]:

When confirming the water supply volume, around 60% of respondents cited that the water supply volume increased. However, an average increase of 26 liters per family was confirmed after project completion when the actual volume of water supply was queried (See Table 10). Duration for water supply[34] per time also slightly improved (See Figure 1) and 70% of respondents answered that the adequacy of frequency and timing for the water supply was reliable or fair (See Table 11). Meanwhile, only 28% answered that the water quality had improved compared to before the project implementation (See Table 12). As water is normally supplied once every two days, water is stored in the tank installed at houses. According to water users, the stored water is utilized, which may have declined the water quality due to the condition of storage[35]. Conversely, 70% of respondents had no complaints over water quality. There are even many opinions confirmed in the interviews with residents

[31] The BOD (effluent) concentration at K&C Valley improved from 60mg/ℓ to 9.5mg/ℓ, from 150mg/ℓ to 11.1mg/ℓfor SS (effluent) concentration, when the situation before and after the project was compared (see Table 8).

[32] Beneficiary surveys were conducted in the five residential areas (Indranagar, J. P. Nagar, Rajaji Nagar, R.B.I. Colony and Nandini Layout) near the project sites, where water and sewerage facilities were developed, with 100 beneficiaries in total; 41 of which male and 59 female. The age breakdown was: 18-30 years old for nine samples, 31-40 for 18 samples, 41-50 for 29 samples, 51-60 for 18 samples and over 60 for 26 samples.

[33] As mentioned in “Constraints during the Evaluation Study”, this ex-post evaluation was conducted ten years after project completion, which meant most beneficiaries had difficulties in properly comparing the situation before and after the project and in some cases, responses were not consistent with the result of interview surveys with neighbors.

[34] Water is supplied for three hours every other day in Bangalore city.

[35] Interviews with executing agency and residents.

at service stations for customers of BWSSB in Rajaji Nagar and other area during the site survey, " no more cases of mud in water is confirmed during rainy seasons, color of water is getting clear and no more smell is confirmed".

Table 10 Increase in Water Supply Volume
(per family per day, average four members per family)

Largely increased	Increased	Not increased	Not increased at all
1%	60%	31%	8%
Change in water supply volume confirmed with respondents About 26ℓ increased (Before project: About 335ℓ, After the project: about 361ℓ) on average			

Source: Result of beneficiary survey

Table 11 Frequency/Timing of Water Supply

Reliable	Fair	Not reliable
34%	35%	31%

Source: Result of beneficiary survey

Table 12 Improvement of Water Quality

Improved	Same	Worse	Largely Worse
28%	52%	17%	3%

Source: Result of beneficiary survey

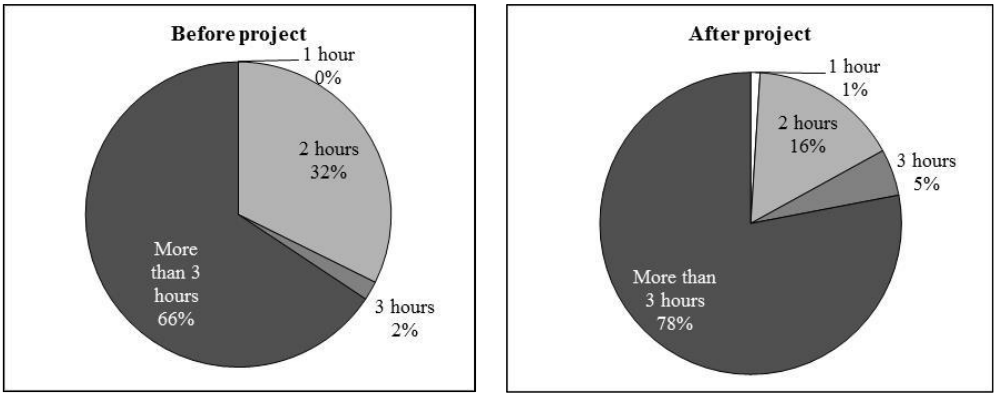


Figure 1 Change in Water Supply Volume before and after the Project

Source: Result of the beneficiary survey

When confirming the effects on aspects such as odor, insect infestation and visual appearance by developing sewerage facilities, respondents answered that the improvement was about 30% (See Table 13). As for insect infestation, 20% of respondents answered that it had worsened. As a reason, the effects generated by developing sewerage facilities were not easily visible and the fact that an ex-post evaluation was conducted a decade after project completion made it more difficult for people to apprehend the changes before and after the project properly, as mentioned in "2.3 Constraints during the Evaluation Study". On the other hand, in interview surveys with residents conducted at J. P. Nagar and R. B. I Colony, many answered that odor and insect infestations had improved, indicating a certain level of effectiveness was confirmed.

Table 13 Effects of Developing Sewerage Facilities
(Odor, Visual Appearance, Insect Infestations)

	Largely improved	Improved	No change	Worse	Much worse
Odor	0%	27%	66%	4%	3%
Vector attraction	0%	28%	52%	14%	6%
Aesthetics	0%	26%	68%	0%	2%

Source: Result of the beneficiary survey

3.4 Impacts

3.4.1 Intended Impacts

3.4.1.1 Improvement of Living Life and Foundation of Industry in Bangalore City

In Bangalore city, no statistical data to show the improvement in living life and foundation of industry in Bangalore city was available. However, the executing agency explained some impact, based on the fact that the “neighboring area where the CWR was developed through this project had developed as a software hub”, “many automobile companies had moved into the Bidadi area where the STP was developed under this project by the time of the ex-post evaluation”. Expanding the capacity of the water supply system and constructing sewerage facilities boosted the water supply, improved the hygiene environment and then contributed to IT and automobile companies setting up and expanding in Bangalore city.

3.4.1.2 Decrease in the Workload (Fetching Water) of Women

In the beneficiary survey, 18% of respondents answered that the time spent on fetching water had decreased and 73% cited no changes, as a certain volume of water was already supplied in some areas, even before the project. Meanwhile, neighbors of CWR in the Mailasandra area, 3km from water point, explained in the interview survey during the site surveys that water needed to be fetched several times a day previously. However, the regular water supply under the project helps eliminate the time formerly spent on fetching water, which can then be used to care for family, educate children and on leisure. As such, a reduced workload for women in some areas was confirmed.

3.4.2 Other Impacts

3.4.2.1 Impacts on the Natural Environment

During the project implementation, monitoring was conducted in line with the environment and safety plan set by the Public Health Department of the state government. No complaints concerning noises and odors were generated during and after the project, according to interviews with the executing agency and residents as well as the site survey. Sewerage discharged from STPs were regularly collected by farmers and used in fertilizers

and the quality of water discharged from STPs also met the water quality standard[36], thus no negative impact on the natural environment was confirmed.

3.4.2.2 Land Acquisition and Resettlement

120 hectare (ha) for laying the transmission line, 7 ha for the ground level reservoir and 11 ha as land for the STP were acquired under this project. The land was acquired in line with regulations set by the state government[37]. No resettlement took place as a result of implementing the project.

3.4.2.3 Increase in land value

According to interviews during the site survey with neighbors of the facilities developed under this project, the land price around the site at the time of the ex-post evaluation increased three times on average compared to before the STP construction. This increase can be considered largely attributable to economic development of the city, since land price also increased in Bangalore city as a whole. However, residents explained that this increase was because more people and companies had moved into the area thanks to the improved living environment and hygiene, e.g. odors after the development of facilities. Thus, this project is also considered to boost land prices to a certain level by improving the living and hygiene environment.

This project has largely achieved its objectives. Therefore effectiveness and impact of the project are high.

3.5 Sustainability (Rating: ③)

3.5.1 Institutional Aspects of Operation and Maintenance (O&M)

The O&M of water supply and sewerage facilities were commissioned to private contractors; supervised and managed by BWSSB. For three years after the project completion, the contractor which constructed the facilities took charge of the O&M of facilities. Contract periods changed to seven years in 2013 and tendering was repeated, whereupon private contractors were reselected and continued O&M activities. After the termination of the seven-year contract, tendering will be re-conducted and contractors selected. Under this project, since O&M after the project completion was conducted by the project contractors, the experiences and knowledge obtained during the project are considered to have been utilized effectively. This also contributed to satisfactory O&M activities.

[36] State water pollution board obliges BWSSB to draw up a daily report.
[37] Based on the responses of Questionnaire to executing agency.

Furthermore, a system for monitoring the contractor's work was also organized, with engineers of BWSSB stationed in each facility to monitor the contractor's O&M performance and to report to BWSSB head office regularly. Approximately 50 O&M staff at each water and sewerage treatment plants and 10 O&M staff at the CWR from contractors were dispatched on average, with one to two BWSSB staff members also assigned at each facility. Considering the O&M condition during the site survey at the time of the ex-post evaluation, the number of staff assigned is considered appropriate. Regarding the total number of BWSSB staff (2,580 staff members in total and 256 technical staff), a lack of staff was one of the concerns since appraisal. However, the O&M works of each facility were outsourced, reducing the number of staff needed for O&M. This resolved the problem of insufficient staff at the time of the ex-post evaluation and no major problems were seen in the O&M system[38].

3.5.2 Technical Aspects of Operation and Maintenance

According to BWSSB, their staff members have the necessary technical capacity and experience, gained through seminars, workshops and training programs. The turnover is very low, without any transfer to other cities, meaning knowledge obtained etc. through training can be accumulated within the organization. Contractors, which were commissioned to perform actual O&M activities, also received training in line with manuals for O&M of developed facilities during the project. The contractor has required technical knowledge of O&M activities because they oversaw construction and laying of facilities for this project. At the time of the ex-post evaluation, manuals for O&M were properly kept and utilized at each facility. Furthermore, taking into account the actual O&M situation during the site survey, no major problems were seen regarding technical capacity for O&M.

3.5.3 Financial Aspects of Operation and Maintenance

The balance of current transactions of BWSSB has recorded deficits in recent years (See Table 14)[39], given the increasing burden of power charges, which comprises 30-40% of the expenditure, interest payments on loans for investment projects[40] and water supply at public taps. However, its revenue from sales water secures most of the required O&M cost and proper O&M activities are conducted[41]. The rate of water charge collection is as high as 99% or so because of efforts made by BWSSB to apply new payment methods such as installing a kiosk allowing payment via ATM and introducing payment via website as well as the original payment method at the service stations. Furthermore, the site survey also showed that all

[38] Based on the responses of Questionnaire to executing agency.
[39] Although BWSSB is basically an autonomous entity, funding is invested by the state government based on the regulation, since water service is considered a public service.
[40] Project cost for the capital investment was allocated by the Government of Karnataka.
[41] Source: Interviews with financial department of BWSSB.

facilities were properly operated and maintained, thus there are no major issues in terms of securing the O&M cost at the time of the ex-post evaluation.

Table 14 BWSSB's Income and Expenditure

(Unit: Million Indian Rupees (INR))

	2012/2013	2013/2014	2014/2015
Income	**5,835**	**7,411**	**8,782**
Sales of Water	5,123	5,920	8,110
Other Income	713	1,491	671
Expenditure	**7,799**	**11,552**	**12,182**
Establishment	1,296	1,528	1,630
Power Charges	3,247	3,565	3,950
Repair and Maintenance	775	954	1,051
Cost of General Administration	510	865	793
Depreciation	882	1,633	1,661
Interest Payment on Loans	1,081	2,999	3,089
Provision	8	8	7
Surplus/Deficit	**▲1,963**	**▲4,141**	**▲3,400**

Source: Documents provided by BWSSB

Note: Some figures do not match in total because of the rounding.

BWSSB revised the water tariff during 2014/2015 to improve revenue, expecting to boost revenue in water sales from the next fiscal year and also continuously strove to save expenditure on power charges and other administration costs[42]. In addition, BWSSB is negotiating a water tariff setting plan which will be adjusted in proportion to the increased power tariff, since the power charge accounts for a large portion of expenditure. Regarding interest payments, BWSSB is working to reduce the burden by considering refinancing from institutions with lower interest rates[43] as well as approaching the state government to consider reducing interest on project loans.

3.5.4 Current Status of Operation and Maintenance

Facilities developed under this project are largely utilized properly at the time of the ex-post evaluation[44]. Though the utilization rate of some sewerage treatment plants was low as of the ex-post evaluation, those rates have been increasing yearly as shown in Table 9 and plan to be fully operational by 2020. Furthermore, steady progress was also confirmed by the time of the ex-post evaluation, though works to connect sewer lines remained relatively slow for a few years after project completion. Thus, BWSSB is expected to plan and make progress

[42] Interview with financial department of BWSSB.

[43] According to the financial department of BWSSB, by refinancing existing loans borrowed from the Life Insurance Cooperation (LIC) at a higher rate of interest to institutions like the Karnataka Urban Infrastructure Development and Financial Corporation (KUIDFC) which lend at lower rates, the burden of the interest payment would be reduced by 5%.

[44] Based on the interview survey to BWSSB and the site survey.

continuously to achieve the plan for full operation of sewerage treatment plants.

O&M works are commissioned to contractors. During the site survey, the evaluator observed that items and inspection frequency were recorded daily and preventive maintenance management sheets were utilized. Annual overhauls were also regularly conducted. All the necessary spare parts were procurable and each facility was properly operated. Sludge discharged from STPs was collected and used as fertilizer by farmers after being dried at a drying bed in the plants. Furthermore, taking into account the actual O&M situation during the site survey, no major problems emerged regarding the current O&M status.

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

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

This project was conducted with the purpose of increasing the water supply and sewerage treatment in Bangalore city by constructing water supply and sewerage systems. Its relevance is high, since the project purpose is consistent with the national development policy of India and State Water Policy of Karnataka, both of which aimed to increase the water supply and improve hygiene conditions and development needs of Bangalore city, amid rapid development as well as Japan's ODA policy. Because this was the first large-scale donor supported public project for the executing agency, the bidding process was delayed and since longer was required to secure the sites and gain approval from the related authorities, the project period largely exceeded the plan. The project cost also exceeded the plan due to price escalation and the increased cost of acquiring land, hence the project efficiency was low. Beacause of this project, the coverage rates of water supply and sewage treatment rose as well as the volume of water supply and wastewater treated. The overall quality of the treated water at STPs has also met the requirement set by the State Pollution Control Board. Living and hygiene conditions have also improved, while IT and automobile companies set up new business in the area where the water supply and sewerage systems were developed, meaning that this project also helped improve the conditions for the industrial foundation in the city, thus its effectiveness and impact were high. The sustainability of the project effect is also high as no serious issues were confirmed in terms of structural, technical and financial aspects of the O&M, while the facilities developed under this project have also been properly operated and maintained.

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

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

As the area of Bangalore city has continued to expand even after the project completion, there is a need to develop a sewer line to cover the sewerage services for the population. Accordingly, construction works to connect sewer lines continue as of now. BWSSB needs to carefully re-examine the feasible plan and make steady progress as planned toward full utilization of facilities in the future since the connection works showed slow progress after project completion.

4.2.2 Recommendations to JICA and Executing Agency

JICA has supported efforts to respond to the increased demand for water supply and sewerage system in Bangalore city by implementing this project and Phase 2. In terms of the predicted demand at the time of appraisal, since both projects need to be completed in order to meet the demand, delaying Phase 2 may affect to generate effects from those projects. Accordingly, to avoid any delay, the executing agency must make steady progress with Phase 2, which has been delayed. JICA also needs to monitor progress and support the smooth implementation of Phase 2.

4.3 Lessons Learned

・Support for the executing agency which lacked experience in conducting large-scale projects

This project was the first large-scale public works project for the executing agency, which delayed the project and made land acquisition problematic due to a lack of experience in tendering works. In future, if the executing agency lacks experience of conducting large-scale projects, the consultants and JICA must provide support with attention after the project starts, such as preparation of tendering documents, etc., through consulting services. In addition, to prevent any project delay, proposing a more careful monitoring plan in detail at the appraisal and including it in the project activities would be effective.

・Setting of the project period which allowed spare time for the sewerage sector project

In this project, the need to change the route of the sewer arose with the relocation of STPs, led to a longer time to obtain approval for these changes from related authorities (Bangalore Development Authority and Municipality of Bangalore) and became a cause for the project delay. When changing the output of sewers, a longer period would be needed, since changes to the route, as well as the design considering vertical interval and etc., is also required due to their function. In addition, there are also challenges, such as the fact that time frame required for new approval for a modified scope differs by authorities. Therefore, to support the sewerage sector project which includes laying the sewer, the related party making the project plans needs to set a project period which carefully considers the features of the sewerage sector at the time of appraisal.

・Efficient and effective selection method for O&M activities

Under this project, a contract for O&M activities was concluded for seven years after project completion with contractors having constructed the facilities of this project. The contracted contractors are familiar with project facilities as they were involved in O&M training for each facility and equipment during the project. As such, applying contract methods which assign contractors with sufficient knowledge of facilities for O&M activities for a certain period after the project completion helps facilitate proper daily O&M activities by utilizing sufficient technical experience. It also helps to maintain the project facilities in good condition.

Comparison of the Original and Actual Scope of the Project

Item	Plan	Actual
1.Project Outputs	Water Supply: Intake Structure 1 Raw water gravity Main. 1 Water Treatment Plant 1 CWR 3 approx. 36 million L in total Pumping Plants approx. 1,250KW x 8 Treated water transmission Pipe Steel approx. 75km WPRS Water transmission & distribution Reservoirs 7, approx. 217 million L in total Overhead tanks 5 Pumping stations 2 Distributing pipe 125km Procurement of equipment (seepage detection, flowmeter) Sewerage System: Expansion 2 (85MLD in total) New Construction 5(325 MLD in total) Pumping station 11 Trunk sewer Reinforced concrete approx.150km Cast iron pipe approx. 9km Others (Machinery & appliances for laboratory, cleaning equipment for sewer maintenance)	Water Supply: Intake Structure As planned Raw water gravity Main. As planned Water Treatment Plant As planned CWR As planned approx. 48 million L in total Pumping Plants approx. 1,100KW, 1,200KW, 1,300KW x 3 Treated water transmission Pipe Steel approx. 94km WPRS Water transmission & distribution Reservoirs7, approx.147 million L in total Overhead tanks Canceled Pumping stations As planned Distribution pipe 147km Procurement of equipment As planned Pilot project for non-revenue water Sewerage System: Expansion 1 (55 MLD in total) New Construction 7(245 MLD in total) Pumping station 8 Trunk sewer Reinforced concrete approx. 55km Cast iron pipe approx. 16km Others As planned
2.Project Period	January 1996– December 2001 (72 months)	January 1996 – May 2005 (113 months)
3.Project Cost Amount Paid in Foreign Currency	11,884million yen	Unknown[Note]
Amount Paid in Local currency	21,591million yen (7,471 million Indian rupee)	Unknown[Note]
Total	33,474million yen	36,253million yen
Japanese ODA Loan Portion	28,452million yen	23,047million yen
Exchange Rate	1 Indian rupee= 2.89 yen (As of April 1995)	1 Indian rupee = 2.76 yen (Average between January 1996 and May 2005)

Note: This ex-post evaluation was conducted more than ten years after the project completion. Although attempts were made to confirm the project cost written in the document provided by JICA during the surveys, no document including detailed information on foreign and local currencies was available, because the executing agency imposed a ten-year retention rule for project documents.

India

FY2015 Ex-Post Evaluation of Japanese ODA Loan

"Bisalpur Jaipur Water Supply Project (Transfer System)"

External Evaluator: Akiko Ishii, Ernst & Young Sustainability Co., Ltd.

0. Summary

The objective of the project[1] was to provide a stable and safe drinking water supply in Jaipur city, which is the capital of Rajasthan state, located in the northwestern part of India, by constructing and renovating related water supply facilities, such as water purification, transfer system and distribution systems, based on surface water from the existing Bisalpur Dam, located 120km from Jaipur city. Thereby the project would contribute to improve public hygiene standards and mitigate deterioration of the groundwater level.

The project has been relevant to the country's development policy, which stipulated the importance of supplying safe drinking water and mitigating deterioration of groundwater levels due to excess extraction, the development needs, as well as Japan's ODA policy. Therefore its relevance is high.

Implementing the project allowed the amount of water supplied and population served to meet the targets. Furthermore, the groundwater in Jaipur city, which had a high nitrate concentration and caused health problems before the project implementation, but the water quality was improved to meet the drinking water quality standards by alternating the water source from groundwater to surface water and the dependency ratio of groundwater was also significantly reduced to exceed the target level. Accordingly, the effectiveness and impact of the project are high.

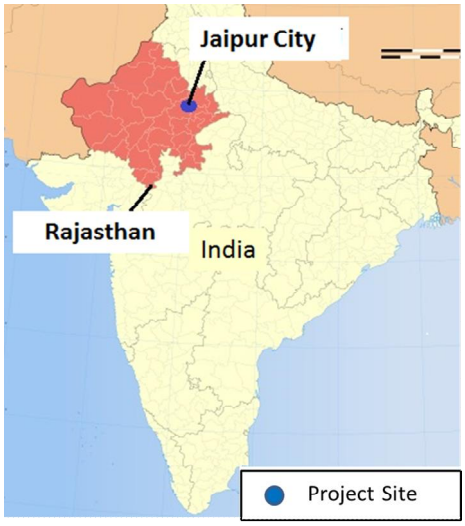
The project period was significantly longer than planned due to the delay in starting operations of consultants and longer time required to redesign the water pipe layout and pumping station caused by the relocation of pumping stations. The configuration change in the pumping stations and delays to the project caused increase in the construction cost and price escalation, thus the project cost also exceeded the planned cost. Therefore, efficiency of the project is low.

The operational and maintenance conditions of the project facilities, including the pumping stations and water pipes, were good, with no major problems observed in the institutional, technical and financial aspects of the operation and maintenance system. Therefore, the sustainability of the project effects is high.

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

[1] The project was implemented with co-financing from JICA and ADB; with a primary transmission system by ADB and a secondary transfer system by JICA.

1. Project Description



Location of Project Site

Balawala pumping station

1.1 Background

The State of Rajasthan is located in one of the most arid regions of India. In addition, because most of the river basins in the state are concentrated in the southern and south-eastern part of the state, there is almost no water source in the west of the state, where Jaipur city is located. At the time of appraisal, 97% of the water supply in Jaipur city (345,000m^3/day) came from groundwater and the remainder from Ramgarh Lake, which is the sole source of surface water. Ramgarh Lake actually provided a supply of only 10,000～15,000m^3/day against the assumed supply capacity of 72,000m^3/day[2]. Under these circumstances, the water supply situation was serious because the amount of groundwater extracted exceeded the natural recharging volume[3] and depletion was reported in some areas. Furthermore, the high nitrate concentration of the groundwater due to intensive groundwater usage and undeveloped city sewage facilities caused health problems such as methemoglobinemia[4] and diarrhea. In response to soaring demand for treated water to cope with the population increase, to mitigate any decline in groundwater level and improve water quality, developing a new water source based on surface water and establishing a water supply system were urgent issues faced by the Government of Rajasthan.

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[2] Source: Documents provided by JICA

[3] The natural recharging means the process which groundwater is recharged naturally by the surface water (rainfall and river water) penetration. The natural recharging volume is estimated by subtracting the amount of evapotranspiration from the amount of surface water measured hourly.

[4] Methemoglobinemia is a blood disorder in which an abnormal amount of methemoglobin -- a form of hemoglobin -- is produced. Hemoglobin is the protein in red blood cells that carries and distributes oxygen to the body. With methemoglobinemia, although the hemoglobin can carry oxygen, it is unable to release it effectively to body tissues.

1.2 Project Outline

The objective of this project is to meet the increasing water demand of Jaipur city, reduce groundwater abstraction to a sustainable level and improve the public hygiene standard by constructing related water supply facilities, such as a transfer system, based on surface water from the existing Bisalpur Dam, located about 120km southwest of Jaipur city, thereby contributing to improving public hygiene standard and mitigating deterioration of groundwater level.

Loan Approved Amount/ Disbursed Amount	8,881 million yen /8,873 million yen	
Exchange of Notes Date/ Loan Agreement Signing Date	March, 2004 /March 2004	
Terms and Conditions	Interest Rate Repayment Period (Grace Period) Conditions for Procurement:	1.3% 30 year (10 year) General Untied
Borrower / Executing Agency(ies)	The President of India/Public Heath Engineering Department, State Government of Rajasthan (PHED)	
Final Disbursement Date	October, 2013	
Main Contractor (Over 1 billion yen)	Larsen & Toubro Ltd.(India), Kirloskar Brothers Ltd.(India), Subhash Projects and Marketing Limited (India)	
Main Consultant (Over 100 million yen)	TCE Consulting Engineers Limited (India)/Lahmeyer International (INDIA) Pvt. Ltd.(India)/Nippon Koei Co., Ltd. (Japan) /Nihon Suido Consultants Co., Ltd. (Japan)/KRI International Corporation (Japan)/Louis Berger Group, Inc.(United States of America)(JV)	
Feasibility Studies, etc.	"Jaipur Water Supply and Sanitation Project Feasibility Study" Public Heath Engineering Department, State Government of Rajasthan, October, 2000 "Special Assistance for Project Implementation (SAPI) for Bisalpur Jaipur Water Supply Project (Transfer System)", JICA, October 2004	
Related Projects	"Capacity Development Project for Non-Revenue Water (NRW) Reduction in Jaipur"(August,2013-January, 2017) "Rajasthan Urban Infrastructure Development Project (RUIDP) (December, 1999 – June, 2009)	

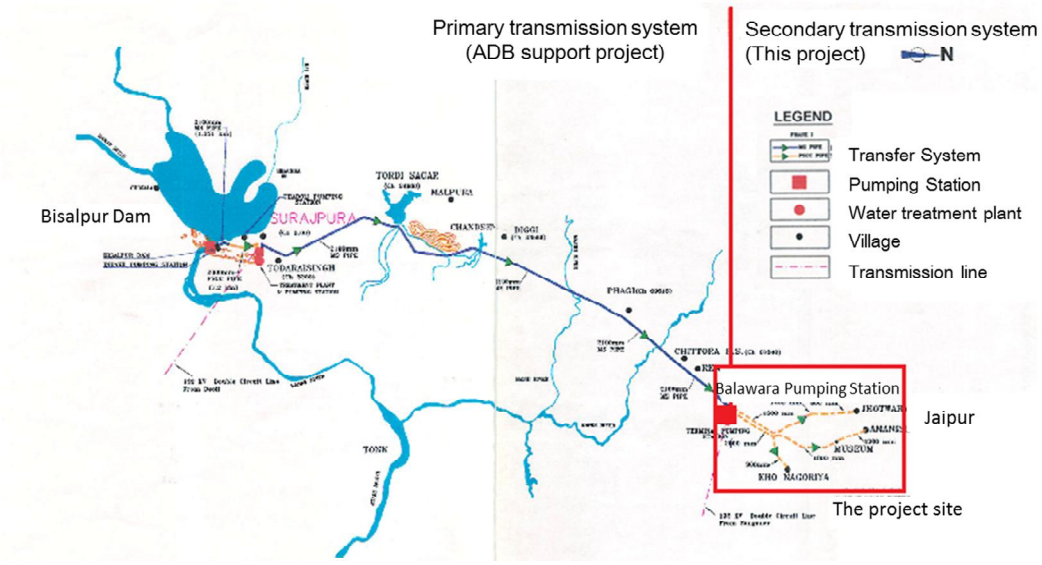

Figure 1. The Site of the Bisalpur Jaipur Water Supply Project

Source: Documents provided by PHED

2. Outline of the Evaluation Study

2.1 External Evaluator

Akiko Ishii, Ernst & Young Sustainability Co., Ltd.

2.2 Duration of Evaluation Study

The evaluation study was conducted as follows:

Duration of the Study: August, 2015 – September, 2016

Duration of the Field Study: November 18, 2015 – December 4, 2015, February 24, 2016– March 1, 2016

2.3 Constraints during the Evaluation Study

The project comprises eight packages of construction of transfer mains (packages 1 and 2), construction of pumping stations (packages 3 and 4), installation of Supervisory Control and Data Acquisition (SCADA) system (package 5), construction of electric supply facilities (package 6), upgrading existing distribution systems and construction of new distribution centers (package 7), and reducing Non-Revenue Water (NRW) measures (package 8). However, because the project cost exceeded the ceiling of the Japanese ODA Loan, packages 7 and 8 could not be covered by the Japanese ODA Loan and the decision was made to fund them from the Rajasthan state budget instead. Although the decision was made in the ex-post evaluation to include packages 7 and 8 as part of the project, the project efficiency was evaluated excluding packages 7 and 8 because the new distribution center planned under package 7 was still under construction at the time of ex-post

evaluation, and the level of completion of package 8 was unclear. Also, the information concerning the effectiveness of packages 7 and 8 was treated as a reference.

3. Results of the Evaluation (Overall Rating: B[5])

3.1 Relevance (Rating: ③[6])

3.1.1 Relevance to the Development Plan of India

Development Policy

At the time of appraisal, the development policy "Tenth Five Year Plan (2002-2007)" stipulated that every village should have access to drinking water within five years and a water supply for drinking purposes was considered the top priority over water supplied for irrigation and industry use. Furthermore, the "Master Development Plan-2011 Jaipur Region (1998)" prioritized a shift from groundwater to surface water and managing water resources effectively.

The country's development policy at the time of ex-post evaluation "Twelfth Five Year Plan (2012-2017)" stipulated that 60% of the country faced serious water quantity and quality issues and that urgent measures were required. In addition, the "Master Development Plan-2025 Jaipur Region (2011)" acknowledged the depletion of groundwater due to excess extraction and declining water quality as problems and stipulated the importance of taking measures against increasing water demand with the increasing population. The development policy estimated the water demand of the city in 2025 would be 1,170,000m^3 a day; 820,000m^3 of which would be supplied from Bisalpur Dam.

Sectoral Policy

The sectoral policy at the time of appraisal "National Water Policy 2002" prioritized supplying safe drinking water. At the time of ex-post evaluation, the revised version of the sectoral policy "National Water Policy 2012" stipulated that safe water for drinking and sanitation should be considered pre-emptive needs and stated that the domestic water supply should preferably be from surface water in conjunction with groundwater and rainwater.

Accordingly, the supply of safe drinking water and the shift in groundwater usage to surface water are emphasized in the national and city's development policy and the sectoral policy at the time of appraisal, as well as at the time of ex-post evaluation. Therefore, the project has been relevant to the development plan of India.

[5] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory
[6] ③ High, ② Fair, ① Low

3.1.2 Relevance to the Development Needs of India

At the time of appraisal, the population ratio of Jaipur city served by water remained 68%, as opposed to 90% in all of India and 84% in the state of Rajasthan[7]. Moreover, the depletion of groundwater had been reported in part of the region, since 97% of the water supply in Jaipur city was dependent on groundwater and the amount of groundwater extracted exceeded the natural recharging volume. Furthermore, since the water in the city was sourced mainly from groundwater and had high nitrate concentration causing health problems such as methemoglobinemia, obtaining safe water sourced from surface water was an urgent issue for Jaipur city.

At the time of ex-post evaluation, the population ratio served with water had improved to 92% and the quality of water was also improved to meet the nitrate concentration standard, while dependency on groundwater was reduced to 19%. Conversely, with the population increase from 2.3 million in 2001 to 3.6 million in 2011, and 6.5 million expected in 2025[8], daily water demand is expected to increase to 1,170,000 m^3 by 2025, of which 820,000m^3 is expected to be supplied from Bisalpur Dam[9]. The estimated amount of water supplied from Bisalpur Dam in 2025 is 1.7 times the total volume at the time of ex-post evaluation. In response, establishing and expanding the water supply system became urgent issues.

Accordingly, from the time of appraisal to the time of ex-post evaluation, the development of water supply system has been consistently recognized as an important issue and high needs.

3.1.3 Relevance to Japan's ODA Policy

At the time of ex-post evaluation, the Japanese government stipulated priorities of "alleviating poverty by developing agriculture and rural areas" and "environmental conservation" for Japanese ODA loans towards India during the Policy Dialogue Mission on Economic Cooperation (March 2002). In addition, JICA's "Strategy for Overseas Economic Cooperation Operation (2002-2005)", also raised "rural development benefitting the poor" and "improving the environment and sanitary situation which have been severely deteriorated especially in urban areas" as important. Accordingly, the project targeting improved public sanitation and preserving the aquatic environment by developing the water supply system was consistent with Japan's ODA policy.

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7 Source: Documents provided by JICA

8 Source: Master Development Plan-2025 Jaipur Region (2011), Jaipur Development Authority https://www.jaipurjda.org/page.aspx?pid=201&mid=31

9 Source: Master Development Plan-2025 Jaipur Region (2011), Jaipur Development Authority https://www.jaipurjda.org/page.aspx?pid=201&mid=31

This 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: ①)

3.2.1 Project Output

This project is comprised of eight packages. The original plan and actual output of the contents contained in each package are compared in Table 1, while the location of the transfer systems and pumping stations are shown in Figure 2.

Table 1. Comparison of original and actual scope

Package		Original (At the Appraisal)	Actual (At the Ex-post Evaluation)
1	Construction of transfer mains on central feeder (primary and secondary)	Total length: 95,597m	Total length: 75,114m
2	Construction of transfer mains on western and southern feeders (primary and secondary)	Total length: 77,843m	Total length: 69,507m
3	Construction of pumping stations at Balawala, Ramniwas Bagh and Amanishah	Three pumping stations at Balawala, Ramniwas Bagh and Amanishah	Mostly same as plan (Change in the specification of installed pump)
4	Construction of central, western and eastern booster pumping stations	Central/eastern: on-line booster pumping stations at Malviya Nagar and University Western: on-line booster pumping station	Central/eastern: Pumping station with storage reservoir at Jawahar Circle and on-line booster pumping station at Central Park Western: Pumping station with storage reservoir at Mansarovar
5	Installation of Supervisory Control and Data Acquisition （SCADA） system	11 units (Balawala main control center, intake pumping station, treatment plant, booster centers, distribution centers)	85 units (Balawala main control center 1, Sub monitoring centers 13, local control centers 71)
6	Construction of electric supply facilities	・ 132/33 kV station, two units ・ 132kVD/C distribution lines, two units	・ 132/33 kV station, one unit ・ 132kVD/C distribution line, one unit
7	Upgrading existing distribution systems and construction of new distribution centers	・ Three new distribution centers ・ Upgrading existing distribution systems: total length 70km	・ Three new distribution centers ・ Upgrading existing distribution systems: total length 70km
8	Implementation of reduction of Non-Revenue Water (NRW) measures	・ Installation of bulk meters at distribution centers ・ Installation of 100,000 consumer meters ・ Replacement of pipes with significant leakage problems	・ Implementation of pilot project of 24 hours' water supply and leakage test in the Mansarovar distribution zone (The installation of bulk meter is addressed in Table 2)

Source: Documents provided by JICA and PHED

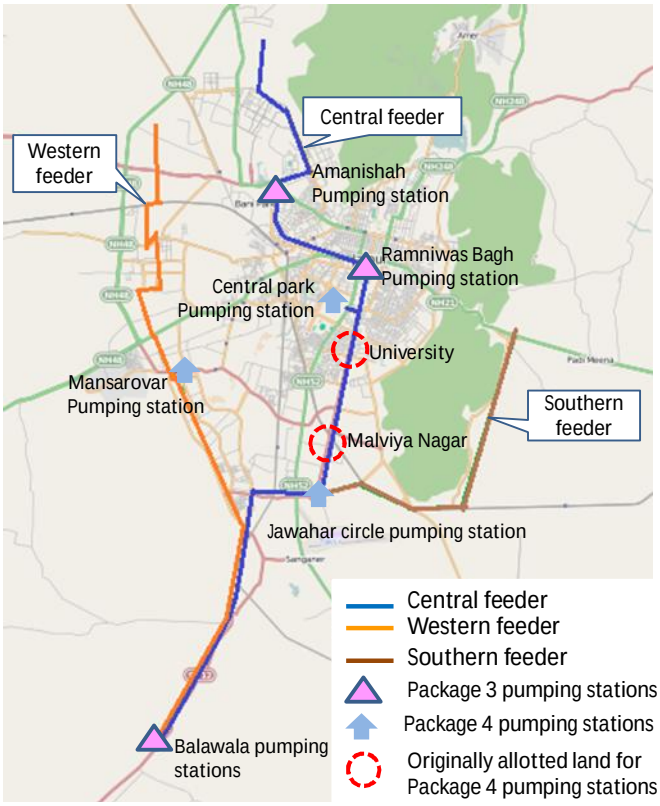

Figure 2. Overview of the Jaipur Water supply project site[10]
Source: Prepared by the evaluator based on documents provided by PHED

As shown in Table 1, the location of pumping stations was changed. In accordance with this change, the configuration of pumping stations and layout of water pipes were also changed. However, the water pipes distribute water to the zones as originally planned (details explained in Figure 2 and Table 2). Because the originally allocated land for pumping stations became unavailable, the change in the new location, configuration and specification of the facilities were made to supply water to the originally planned zones. These changes, which did not affect the function of the pumping stations and transfer mains, were thus justified as reasonable. The construction cost increased due to the changed configuration of the pumping stations and the price escalation caused by the project delay, which meant the project cost exceeded the ceiling of the Japanese ODA Loan. Exceeding the loan ceiling meant packages 7 and 8 could not be covered by the Japanese ODA Loan and the decision was made to fund them from the Rajasthan state budget instead. Under this situation, the decision to exclude those packages which would have minimal influence on the overall project effects from the scope of the Japanese ODA Loan and to implement them by the Rajasthan state budget was reasonable. The major reasons for the changes made for each package are listed in Table 2.

[10] The figure was prepared to show the relative position of transfer systems and pumping stations and does not show the exact location of these facilities.

Table 2. Major reasons for changes made to outputs

Packages 1 and 2: Changed layout of water pipe lines
Changes to the location and configuration of pumping stations as explained below caused changes to the layout of water pipes. Also, during detailed design, due to the lack of comprehensive information on terrain, hydrology, and underground buried objects used for the designing outline before starting the project, the design had to be revised to change the water pipe layout. According to PHED, although the total length of water pipe was shortened due to the above-mentioned revision and adjustment, the constructed water pipe lines supply water to the distribution zones as originally planned. Furthermore, the water pipe layout was changed even after the start of construction because of the structural change needed at two locations to traverse the river; and the change in route to avoid a major road, which had become unfeasible after the project delay to lay water pipes due to heavier traffic than at the time of appraisal.
Packages 3 and 4: Relocation and reconfiguration of pumping stations
a) Change in the location of pumping station The project took longer for the appointment of the consultant and detailed engineering and the construction start was delayed (Details described in "3.2.2.2 Project Period"). During the delay of the project, the land initially allotted for the pumping stations at Malviya Nagar and University was allotted for commercial purposes and became unavailable for this project. b) Change in the configuration of pumping station The pumping stations had to be reconfigured due to site restrictions at the new location, Jawahar circle and central park, to be constructed below ground level rather than above. c) Change in the configuration of on-line booster pumping facilities The relocation and reconfiguring of the pumping stations and water pipe lines meant the pressure condition changed and the on-line booster pumping facility originally planned became technically unfeasible. Accordingly, the water storage reservoir was constructed with the pumping stations.
Package 5: Increase in the number of installed SCADA systems
The installation of SCADA systems in each distribution center was not originally planned. However, to monitor the water distribution situation city-wide, including the distribution centers continuously from the main control center and control the distributed water at an appropriate pressure and volume, it was decided to install a SCADA system in each distribution center. Accordingly, the number of installed SCADA systems was increased.
Package 6: The number of substations and electricity transmission lines
The construction plan for electric supply facilities was changed in accordance with the change to the pumping station construction site. At the time of appraisal, the construction

for on-line booster pumping station was planned at Malviya Nagar and therefore the construction of substation and transmission lines were also planned to supply electricity to the pumping station. However, the pumping station was relocated to Jawahar circle from Malviya Nagar due to the unavailability of land. At Jawahar circle, two substations had been newly constructed near Jawahar circle during the delay of the project, which eliminated the need to construct a new substation and transmission facilities from the substation to supply electricity to Jawahar circle.
Package 7: Variation in the number of distribution centers and implementation of the package by the state government fund
The increased construction cost due to the reconfigured pumping stations and price escalation by an annual average of 12-13% in material and labor costs resulted in project costs exceeding the ODA Loan ceiling amount. Accordingly, it was decided to execute package 7 using the state government budget. At the time of ex-post evaluation, the construction of two distribution centers at Swage Farm and Kho Nagorian had been completed. Regarding the Swage Farm distribution center, although the construction was originally planned at Devi Nagar, the site was relocated to Swage Farm due to the unavailability of land at Devi Nagar. At Kho Nagorian, the construction launch originally scheduled for 2012 was delayed one year due to the delay in obtaining approval for land utilization from the Jaipur Development Authority. Construction of the remaining distribution center at Dev Nagar had not commenced at the time of ex-post evaluation due to opposition from local residents.
Package 8: Implementation of a 24-hour water-supply pilot project and leakage test by the state government. The number of installed flow-meters and the completion level of Non-Revenue Water (NRW) measures were unclear.
For the same reason as package 7, the project cost exceeded the ceiling amount of ODA Loan and it was decided to execute package 8 using the state government budget. For the component of NRW measures were originally planned as a pilot project in four among a total of 72 distribution zones, identification of pilot areas, a 24-hour water-supply pilot project, and the leakage test in the Mansarovar distribution zone were implemented. However, the actual number of flow-meters installed was unclear although 100,000 flow-meters were originally planned to be installed. As of July 2012, consumer meters were installed in approximately 340,000 households, an increase of 76,000 compared to 2007, although 37% were out of order[11]. In 2011, PHED introduced a new quality standard for the tender of consumer meters to improve the failure rate, which includes seven years'

[11] Benchmarking of Urban Water Supply Schemes of Rajasthan Milestone # 4: Problem Analysis and Remedial Measures –Jaipur City, Public Health Engineering Department, Government of Rajasthan, October 2012

operation and maintenance service after installing meters. Due to this change, no vender had participated in the tender since 2011, and therefore the consumer meters were not installed as planned. In February 2016, the vendor was selected and the decision to install 12,000 consumer meters was approved.

Regarding the NRW measures, the "Capacity Development Project for Non-Revenue Water (NRW) reduction in Jaipur" (August 2013 – January 2017) has been implemented after this project. This capacity development project supports PHED to strengthen the institutional capacity of the NRW reduction, provide technical training to detect leakage in the pilot area and establish a plan to expand NRW reduction measures city-wide. The pilot project of NRW was implemented in a limited area with installation of 1,144 consumer meters[12] as of July 2015 by Indian side.

Jawahar circle pumping station

Mansarovar pumping station

Ramniwas Bagh pumping station

Balawala main control center and SCADA monitor

3.2.2 Project Inputs

[12] Minutes of Meeting on the Capacity Development Project for Non-Revenue Water Reduction in Jaipur between the Public Health Engineering Department, Government of Rajasthan and JICA, November 27, 2014

3.2.2.1 Project Cost

The actual project cost was 12,113 million yen (the ODA Loan portion was 8,873 million yen) against the plan of 11,983 million yen (the ODA Loan portion was 8,881 million yen); 101% of the planned cost (Table 3). Although the total project cost was mostly as planned, the project cost was deemed to have exceeded the plan, given that packages 7 and 8 ended up outside the scope of the ODA Loan and partially remain incomplete; 113% of the planned cost excluding packages 7 and 8 (10,748 million yen). The planned budget was exceeded due to the increased construction cost caused by the delay in starting the project, reconfigured pumping stations, the changed layout of the water pipes and the price escalation.

Table 3. Planned and Actual Project Cost

Project Cost	Plan (million yen)		Actual (million yen) Note1), Note2)	
	Total	JICA Portion	Total	JICA Portion
1. Transfer mains	3,097	3,097	5,354	5,329
2. Pumping Stations	1,513	1,513	2,462	1,732
3. Distribution System	516	516	0	0
4. Supervisory Control & Data Acquisition (SCADA)	182	182	416	234
5. Electric Supply	1,052	1,052	689	593
6. Reduction of NRW	719	719	0	0
7. Price Escalation	536	536	1,087	144
8. Physical Contingency	379	379	17	0
9. Consulting Services	491	491	438	438
10. Tax & Duties	2,181	0	945	0
11. Administration Cost	741	0	254	0
12. Land Acquisition	180	0	33	0
13. Interest during Construction	396	396	359	359
Total	11,983	8,881	12,055	8,830

Source: Documents provided by JICA and PHED

Note1): The actual cost is based on the document provided by PHED. Because the JICA portion was shown in yen using the same exchange rate used at the time of appraisal in the document from PHED, the amount in yen was returned to INR and re-calculated at the IMF rate. Therefore, the total amount differs from the actual project cost previously mentioned.

Note2): Exchange rate used: JPY1 = 0.39 INR (At the time of appraisal) JPY1 = 0.43 INR[13] (At the time of ex-post evaluation)

3.2.2.2 Project Period

Because part of packages 7 remain incomplete, and the completion of the project planned under this Project was unclear since part of the project component is duplicated with the Technical Cooperation Project related to ODA Loan started in August 2013 as mentioned above, this makes it impossible to evaluate the project period including these packages. Accordingly, the project period is evaluated excluding the period for packages 7 and 8 as below. The actual project period, excluding packages 7 and 8, was 87 months from March 2004 to May 2011 as opposed to 46 months from March 2004 to December 2007. This was significantly longer than planned, constituting 189% of the planned project period.

[13] Source: Average IMF exchange rate between 2005 and 2013

Table 4. Planned and Actual Project Period

Item	Plan	Actual	Comparison
Signing of Loan Agreement	March 2004	March 2004	-
Completion of detailed engineering	February 2005	October 2007	-
Consulting services	October 2004 - December 2007 (39 months)	April 2005 - November 2009 (56months)	144%
Total project period	March 2004 - December 2007 (46 months)	March 2004 - May 2013[Note 1)] (87 months)	189%
Construction period of each package[14]			
Package 1	January 2006 - December 2007 (24 months)	February 2007 - November 2010 (46 months)	191%
Package 2	January 2006 - December 2007 (24 months)	July 2007 - July 2010 (37 months)	154%
Package 3	January 2006 - December 2007 (24 months)	July 2007 - December 2010 (42 months)	175%
Package 4	February 2006 - December 2007 (23 months)	October 2007 - December 2010 (39 months)	170%
Package 5	February 2006 - December 2007 (23 months)	April 2008 - July 2010 (28 months)	122%
Package 6	February 2006 - December 2007 (23 months)	Unknown[Note2)] - May 2011	-
Package 7	January 2006 - December 2007 (24 months)	Partly incomplete	-
Package 8	February 2006 - December 2007 (23 months)	Completion is unclear	-

Source: Documents provided by JICA and PHED

Note 1) Because package 7 is partly incomplete and the completion level of package 8 is not clear, the project period for packages 1 to 6 was used to calculate the ratio compared to the planned project period

Note 2) The construction of electric supply facilities was awarded to state power companies in December 2006. The start date of construction is unknown due to the unavailability of documents.

Major reasons for the delay were as follows:

1. The primary transmission system from the intake to the pumping station at the entrance point of Jaipur city, which was implemented with support from ADB loan,

[14] The actual completion dates indicated are those of the takeover certificate issued by the department to the respective contractors tasked with operation and maintenance, rather than the actual completion date of construction. (Source: Documents provided by PHED)

was necessary to implement this project, which meant approval of ADB loan for the primary transmission system was a prerequisite for the effectuation of JICA's loan agreement for this project. Due to the delay in ADB loan approval by six months compared to the original plan, the signing of the agreement with a consultant was also delayed by a similar period.

2. The lack of required information on terrain, hydrology and underground buried objects from the relevant organizations extended the time required to conduct detailed engineering, which caused seven months of delay.
3. During the above-mentioned project delay, the land initially allotted land for the pumping stations at Malviya Nagar and University was freed up for commercial purposes and no longer available for this project. Thus, the pumping stations had to be relocated and reconfigured and also led to site restrictions at Jawahar circle and central park, which means pumping stations had to be constructed below ground level for scenic reasons. More time was required to conduct detailed engineering for the pumping station and the layout of water pipes, which resulted in further delay over three months.
4. Considerable time was required when constructing water pipes along major roads and railway crossings to obtain permission from the authority agencies. In particular, the above-mentioned delay resulted in increased population and traffic volume during the delay, which forced a change of plan for water pipelines along major roads with heavy traffic and areas with a high population density. Consequently, obtaining construction permission from the authority agencies took a very long time.

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

At the time of appraisal, the Financial Internal Rate of Return (FIRR) was calculated as 8.3% and the Economic Internal Rate of Return (EIRR) was calculated as 16.5%. At the time of ex-post evaluation, FIRR was calculated at 5.0% and EIRR at 12.0% under the same condition used at the time of appraisal. Despite the estimation of a higher water tariff in the future when calculating the IRR at the time of ex-post evaluation, the actual NRW was higher than planned, which was set low based on the national target and used when calculating the IRR at the time of appraisal, whereupon water revenue was lower than planned. However, due to the high failure rate as explained later, the NRW is inaccurate. The condition used for the IRR calculation at the time of appraisal is shown in Table 5.

Table 5. Condition for calculation of FIRR and EIRR at the time of appraisal

	Condition for FIRR Calculation at the Time of Appraisal	Condition for EIRR Calculation at the Time of Appraisal
Cost	Initial investment, additional investment, operation and maintenance costs	Initial investment and operation and maintenance costs excluding tax and duties
Benefit	Revenue from incremental sold water valued at assumed tariff rates (based on the future water tariff)	Cost for PHED-connected households obtaining water from other sources and cost for Non-PHED connected households obtaining water from other sources
Project Life	30 years	30 years

Source: Documents provided by JICA

The project cost exceeded the plan and project period significantly exceeded the plan. Therefore, efficiency of the project is low.

3.3 Effectiveness[15] (Rating: ③)

3.3.1 Quantitative Effects (Operation and Effect Indicators)

At the time of appraisal, operation and effect indicators were set as targets for four years after completion. At the time of ex-post evaluation (2015), four years had elapsed since the completion of pumping stations, water pipes and electric supply facilities in May 2011. Accordingly, the quantitative effects were evaluated based on indicators set at the time of appraisal.

(1) Operation Indicators

The baseline (2003), Target (four years after completion), actual data one year after completion (2012) and actual data at the time of ex-post evaluation (2015) for operation indicators were summarized in Table 6. The population served, amount of water supply, facility utilization rate and water intake from Bisalpur Dam achieved the targets. Because both population served and the amount of water supplied exceeded the target, it can be said that the water supply facility constructed by this project significantly contributed to a stable water supply by transmitting and transferring water from a new water source, namely Bisalpur Dam. Conversely, it can be said that the NRW rate, accounted for water rate, and leakage rate were inaccurate because the failed consumer meters have not been fully replaced. Therefore, the actual data of these indicators are considered reference information.

[15] Sub-rating for Effectiveness is to be put with consideration of impact.

Table 6. Baseline, Target and Actual of Operation Indicators

	Baseline	Target	Actual	Actual
	2003		2012	2015
	At the Time of Appraisal	4 Years after Completion	1 Years after Completion	At the time of Appraisal
Population served (persons)	1,801,514	2,766,646	2,970,000	3,000,000
Amount of water supply (m^3/day)	345,030	477,500	372,200	480,000
Facility utilization rate (%)	N.A.	95.13	83.33	100.00
NRW rate (%)	37.0	20.0	35.0 Note1	37.0 Note3
Accounted for water rate (%)	63.0	80.0	70.0 Note2	63.0 Note4
Leakage rate (%)	30.0	15.0	28.0	13.0 Note5
Water intake from Bisalpur Dam (m^3/day)	N.A.	342,500	300,000	396,000

Source: Documents provided by JICA and PHED

Note 1-2: The data is based on the Project Completion Report provided by PHED. The value is shown as a reference since it seems inaccurate because the total amount does not reach 100.

Note 3-5: The data is provided by the PHED. However, the study[16] conducted in the four distribution zones from May 2014 to July 2015 showed that 45-81% of the consumer meters were out of order. Therefore, there is a high possibility that these indicators were not measured accurately.

(2) Effect Indicators

As shown in Table 7, the percentage of population served exceeded the target by 10%, while the water supply per capita also exceeded the target by 15%. The dependency rate on groundwater was limited to 19% as opposed to 97% before the project implementation, and exceeded the target by 5%. Furthermore, the water quality was improved by alternating the groundwater with surface water and the nitrate content declined significantly to a level below 45mg/L which is the quality standard of drinking water set by the Bureau of Indian Standards.[17] Accordingly, it was confirmed that the water supply facility constructed by the project helps supply safe drinking water and reduce the groundwater dependency rate.

16 Based on the study result conducted in Mansarovar, Adarsh Nagar, Chitrakoot, Banipark by "Capacity Development Project for Non-Revenue Water (NRW) reduction in Jaipur", the failure rates for the consumer meters in each zone were 45.3, 80.3, 77.0 and 81.0%, respectively.

17 Indian Standard Drinking Water Specification (Second Revision), Bureau of Indian Standards, May 2012 https://law.resource.org/pub/in/bis/S06/is.10500.2012.pdf

Table 7. Baseline, Target and Actual of Effect Indicators

	Baseline	Target	Actual	Actual
	2003		2012	2015
	At the time of Appraisal	4 Years after Completion	1 Years after Completion	At the time of Appraisal
Percentage of population served (%)	70.1	81.4	82.6	91.7
Water supply per capita to consumer (L/person/day)	121	138	125	160
Dependency rate of groundwater (%)	97.0	24.1	19.0	18.8
Water Quality (Nitrate content）（mg/L）	28-230	Below 45	Below 45	Below 45

Source: Documents provided by JICA and PHED

3.3.2 Qualitative Effects (Other Effect)

The effects in terms of (1) improved water quality, (2) improved water supply services (volume, service hours) raised as qualitative effects at the time of appraisal are described below:

(1) Improvement of water quality

Before the project implementation, the nitrate content in the supplied groundwater attributed to nitrate nitrogen in the soil was significantly high, which caused health problems in Jaipur city. After the project was implemented, water supply from the well was stopped at 80% of distribution centers and alternated by water from Bisalpur Dam. Following this change, the nitrate content in the water supplied was reduced to a level meeting the quality standard for drinking water. In addition, the quality of water supplied from all distribution centers was controlled to meet the drinking water standard by sampling and testing quality at the laboratory once a week.

(2) Improvement of water supply system (volume and time)

The per-capita volume of water supplied at the time of ex-post evaluation was increased by 32% compared to before the project implementation and exceeded the target by 15% as shown in Table 7. The result of a beneficiary survey[18] conducted at the

[18] To complement efforts to evaluate the quantitative effect and impact, a beneficiary survey was conducted among 100 neighbours at eight distribution zones (number of persons at each zone); Pratap Nagar (20), Vidhyadhar Nagar (17), Mansarovar (22), Jhotwara (15), Khatipura (4), Jawahar Nagar (15), Vaisali Nagar (4), Sahstri Nagar (3). Based on the discussion with PHED, eight distribution zones which were supplied water from this project were selected considering the geographic dispersion. Despite visiting households randomly in each distribution zone, judgement sampling was used considering the gender and age distribution among the respondents. The respondents included 45 males and 55 females, 18 of whom were aged below 30 years old, 17 between 31 and 40, 25 between 41-50, 20 between 51-60 and 20 respondents aged above 61.

time of ex-post evaluation among 100 beneficiaries at eight locations in Jaipur city showed that 38% of respondents were highly satisfied and 32% were satisfied with the volume of water supply (Table 8). Although the duration of water supply at the time of ex-post evaluation (1.5-2 hours) showed no significant difference from the duration at the time of appraisal (1.5 hours), 29% of respondents were highly satisfied and 36% were satisfied with the duration of water supply a day according to the result of the beneficiary survey (Table 8). Because residents in Jaipur city stored water for a day in a storage tank equipped to individual households, they tend to be satisfied with water supplied regularly on a daily basis, without any dissatisfaction over the duration of water supply.

Table 8. Satisfaction with the water supply volume and the daily duration of water supply

【Question】	Highly satisfied	Satisfied	Fair	Not satisfied	Not satisfied at all
How satisfied are you with the current volume of water supply?	38%	32%	14%	11%	5%
How satisfied are you with the current duration of water supply a day?	29%	36%	11%	22%	2%

Source: Results of the beneficiary survey

3.4 Impacts

3.4.1 Intended Impacts

(1) Improvement in living standards and public hygiene conditions

At the time of appraisal, improvement in living standards and public hygiene conditions among residents due to improvements in water quality were expected. Since residents of the project site had already been provided with water supply services via individual water pipe connections, even before project implementation, the type of water supply services remained unchanged before and after project implementation. Therefore, it cannot be said that the residents and beneficiaries of the project were fully aware of the relation between the project effect on improving living standards, the living environment and public hygiene conditions. However, 73% of the respondents stated that the living environment had improved (Table 9) and 76% stated that public conditions had improved (Table 9) following the implementation of the project according to the result of the beneficiary survey. With regard to living environment, “became convenient due to water supply at a regular time”, “sufficient water can be stored in the storage tank” were cited as examples of improvement. For public hygiene condition, “fewer incidents of sickness”, “cleaner laundry”, “less floating substances detected in the water” were raised as the reasons for improvement.

Table 9. Improvement in living standards (environment) and public hygiene conditions

【Question】	Significantly improved	Improved	Same	Worsened	Significantly worsened
Has the living standard (environment) improved?	10%	63%	17%	10%	0%
Has the public hygiene condition improved?	13%	63%	15%	9%	0%

Source: Result of the beneficiary survey

(2) Mitigation of the deterioration of groundwater level by reducing groundwater usage

Mitigating the deterioration of groundwater level by alternating groundwater usage with transferred water from Bisalpur Dam was expected as an impact of this project. As described in "3.3.1 Quantitative Effects (Operation and Effect Indicators)", the 97% dependency rate of groundwater before the project implementation was reduced to 19% afterward. The water supply sourced from groundwater was 334,679m^3 per day before project implementation but reduced to 90,240m^3 per day after, marking a reduction in groundwater usage of 244,439m^3 per day. Furthermore, it was expected that 465,600m^3 per day of groundwater would be required in 2015 if groundwater were supplied keeping pace with the same groundwater dependency, to cope with increasing demand for water in Jaipur city, and thus it can be said that 375,360m^3 per day of groundwater was saved by the project implementation. Accordingly, it can be said that the effect of the project on reducing deterioration in the groundwater level and conserving the groundwater is significantly high.

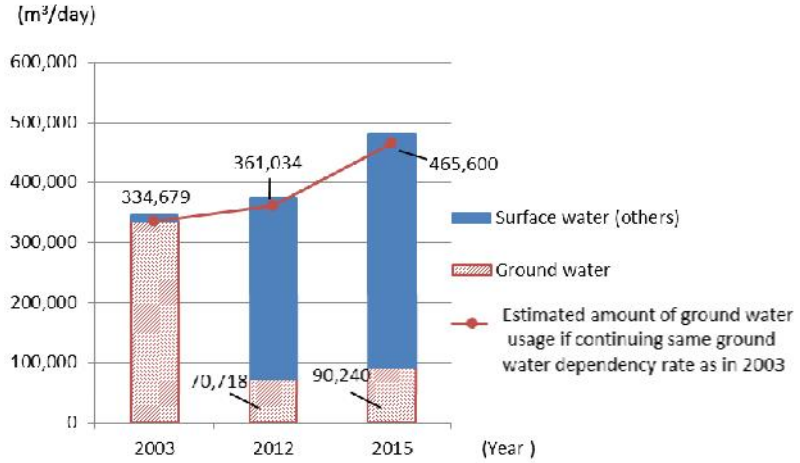

Figure 3. Change of amount of water supply and water source

Source: Prepared based on documents provided by PHED

3.4.2 Other Impacts

3.4.2.1 Impacts on the Natural Environment

This project was implemented to supply surface water from the existing Bisalpur Dam, which had been constructed to supply drinking water to Jaipur city before the

project implementation. Therefore, there was no negative impact on ecosystem expected by the project implementation. Also, the project was classified into Category B based on the "Environmental Guidelines for ODA Loans (1999)" （JICA）, reflecting the view that the project had no significant environmental impact. According to the Environmental Guidelines of the Government of India, an Environmental Impact Assessment (EIA) report and environmental clearance need not be prepared for this project, although PHED prepared an EIA report in 2000, in which environmental impact mitigation measures and a monitoring plan were established. Based on feedback following interviews among residents and a site visit, no negative environmental impacts have been observed during and after the project implementation.

In terms of the positive impact on the natural environment, the project contributed to mitigate depletion in the groundwater level by significantly reducing the amount of groundwater usage as described in "3.4.1 Intended Impacts".

3.4.2.2 Land Acquisition and Resettlement

Because the land acquired for this project implementation was originally owned by the state government, no procedures under the Land Acquisition Act were required, nor any resettlement as a result of this project.

As described above, targets were achieved for major effect indicators of this project, including the percentage of population served with water in Jaipur city, water supply per capita, dependency rate of groundwater, and water quality. In terms of the improvement of living standards and public hygiene conditions, these were recognized by the residents as constituting positive impacts, although the direct relation between these indicators and the project remained unclear. Furthermore, the positive impact of mitigating the depletion of groundwater level by reducing the amount of groundwater pumped was observed.

This project has largely achieved its objectives. Therefore effectiveness and impact of the project are high.

3.5 Sustainability (Rating: ③)

3.5.1 Institutional Aspects of Operation and Maintenance

PHED is responsible for developing, operating and maintaining of water supply facilities and collecting water bills in Rajasthan. At the time of ex-post evaluation, of a total 38,004 PHED employees, the number of engineers and technical staff were 3,275 and 28,531, respectively. The coordination team is also organized by area under chief

engineer. PHED Jaipur, the state agency of Jaipur, is divided into four departments, Circle North, Project Circle, City Circle South and District. All departments except District are responsible for the distribution of water throughout the Jaipur city and for the operation and maintenance (O&M) of facilities, including water pipes, pumping stations, SCADA and water distribution centers, all which were built under this project. At the time of ex-post evaluation, 1,919 PHED Jaipur employees were working for the O&M of project-related facilities. In addition, for the first few years, PHED outsources those O&M to the contractors who were engaged in constructing the facilities, in accordance with the laws and regulations of Rajasthan related to public services and staff appointments[19]. In fact, PHED had a two-year contract of the O&M with the contractors who engaged in the construction and selected a contractor by bidding afterwards. At the time of ex-post evaluation, November 2015, PHED made a bid for the O&M for the next five years. As a result, the current contractor has been selected again and continued its O&M. At the time of post-evaluation, the structure of O&M was well organized and adequate human resources had been secured. Therefore, no concerns were raised.

3.5.2 Technical Aspects of Operation and Maintenance

PHED is an organization overseeing the O&M of water supply facilities in Rajasthan and more than 80% of its employees are engineers or technical staff. PHED regularly sends its employees to take technical training at the Engineer's Staff Training Institute of the state training facility, which provides technical training related to water supply and sewerage, including computer skills and O&M.

The O&M of the project facilities have been outsourced to the contractor, who is selected under bid evaluation criteria requiring adequate technical skills and past performance. The O&M of the project facilities were conducted appropriately following the manual and no technical issues were observed at the time of ex-post evaluation.

3.5.3 Financial Aspects of Operation and Maintenance

The O&M budget of the project facilities is shown in Table 10. Water supply service of Rajasthan state is not financially independent but positioned as a public service, and the necessary O&M budget is allocated every year from the state budget. No issues arose during the procurement of spare parts. It was recognized that the O&M budget for the project facilities was appropriately ensured and there were no concerns regarding the same.

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[19] Rajasthan (Regulation of Appointments to Public services and Rationalization of Staff) Act.1999 http://finance.rajasthan.gov.in/aspxfiles/docs/rules/rapsar/rapsaract.pdf

Table 10. Annual O&M budget for the project facilities (Unit: 1,000INR)

	2012-2013	2013-2014	2014-2015	2015-2016
Annual O&M budget	287,544	411,206	384,309	289,975

Source: Documents provided by PHED
Note: Fiscal year is from April to March. For 2015, the data is up to end of October.

The financial status of PHED for the most recent three years is shown in Table 11. Because sales of water, have been far below direct expenses, including O&M costs, PHED has remained in persistent deficit and has declared a net loss. The water supply service of Rajasthan state is not financially independent but positioned as a public service, and its operation depends on the central government budget. One reason for this deficit is the fact that the water tariff for Rajasthan state has not been increased since 1998 and remains extremely low by Indian standards. However, water tariff of the state was revised in October 2015 after 17 years and raised by half in all sectors, including domestic, non-domestic and industry. In addition, it was announced that the water tariff would continue to increase by 10% annually for five years until the next review[20]. According to the PHED, it was planned to reduce the gap between expense and income gradually by increasing the tariff by 10% annually, considering annual inflation of around 8%. Although the water supply service is not expected to be financially independent, revising the water tariff can be considered a positive step toward improving the financial status.

Table 11. Financial status of PHED in past three years [Note]

(Unit: Million INR)

	2012-2013	2013-2014	2014-2015
Income			
Sales of water including meter rent	2,062	2,137	2,239
Miscellaneous Receipts	199	173	189
Total Income	2,261	2,309	2,428
Expenditure			
Direct Expense	9,136	10,306	10,416
Indirect Expense	3,203	3,544	3,795
Total Expenditure	12,339	13,850	14,211
Net profit and loss	-10,077	-11,541	-11,783

Source: Documents provided by PHED
Note: The year is based on PHED's fiscal year from April to March

3.5.4 Current Status of Operation and Maintenance

In general, the project facilities have been utilized and maintained without problems.

[20] Public Health Engineering Department Notification, Jaipur November 5, 2015, No. F/FA&CAO/RWSSMB/Mission/2014-2015

During the site survey, it was confirmed that pump and SCADA systems at all pumping stations and distribution centers were operated proficiently and the condition of transferring and distributing water in particular was constantly controlled by utilizing a SCADA system. The O&M contractor also monitored and recorded the operating condition of the transfer mains daily as well as recording the pumps and SCADA data on an hourly basis. The specification, storage method and inventory number for spare parts of facilities were decided by PHED. The O&M contractor procured spare parts as necessary following the procedure provided by PHED and maintained equipment without problem. In addition, monitoring and O&M records of the project facilities were submitted to PHED in the form of a monthly report. The manual related to O&M of facilities was proficiently managed and there was no problem observed in O&M.

In light of the above, no major problems were observed in the O&M system for PHED or the contractor. PHED has provided opportunities to employees to take a series of technical training and selected a contractor based on the past performance record for O&M services of water supply facility. Manuals were also prepared and utilized proficiently, which meant no major problems emerged in O&M, from a technical perspective. In terms of the financial aspects, the necessary budget for O&M of the project facilities and equipment was allocated from the state budget of Rajasthan and no concerns were observed. To improve the financial status, there are plans to raise the water tariff.

No major problems have been observed in the institutional, technical and financial aspects 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[21] was to provide a stable and safe drinking water supply in Jaipur city, which is the capital of Rajasthan state, located in the northwestern part of India, by constructing and renovating related water supply facilities, such as water purification, transfer system and distribution systems, based on surface water from the existing Bisalpur Dam, located 120km from Jaipur city. Thereby the project would contribute to improve public hygiene standards and mitigate deterioration of the groundwater level.

[21] The project was implemented with co-financing from JICA and ADB; with a primary transmission system by ADB and a secondary transfer system by JICA.

The project has been relevant to the country's development policy, which stipulated the importance of supplying safe drinking water and mitigating deterioration of groundwater levels due to excess extraction, the development needs, as well as Japan's ODA policy. Therefore its relevance is high.

Implementing the project allowed the amount of water supplied and population served to meet the targets. Furthermore, the groundwater in Jaipur city, which had a high nitrate concentration and caused health problems before the project implementation, but the water quality was improved to meet the drinking water quality standards by alternating the water source from groundwater to surface water and the dependency ratio of groundwater was also significantly reduced to exceed the target level. Accordingly, the effectiveness and impact of the project are high.

The project period was significantly longer than planned due to the delay in starting operations of consultants and longer time required to redesign the water pipe layout and pumping station caused by the relocation of pumping stations. The configuration change in the pumping stations and delays to the project caused increase in the construction cost and price escalation, thus the project cost also exceeded the planned cost. Therefore, efficiency of the project is low.

The operational and maintenance conditions of the project facilities, including the pumping stations and water pipes, were good, with no major problems observed in the institutional, technical and financial aspects of the operation and maintenance system. Therefore, the sustainability of the project effects is high.

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

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

・The effect on improving the water supply service, including the amount of water supply and water quality, was recognized by transferring surface water from Bisalpur Dam. Conversely, the ratio of Non-Revenue Water (NRW) remains high. To use water transferred by the project effectively and increase revenue from the water tariff to improve the financial status, PHED is expected to take measures to reduce NRW, including installing a flow meter and changing water pipes which leak continuously. In terms of NRW reduction, Technical Cooperation Project related to ODA Loan, which aims to expand NRW city-wide, is under implementation as mentioned above. It is expected that the Rajasthan state government will implement the NRW measures and disseminate them throughout the city based on the project expansion plan which is currently under preparation by that project.

・The revision of the water tariff by PHED in November 2015, ever since 1998, is

recognized as a positive point to be evaluated. In addition, it was also announced that the water tariff would keep rising by 10% every year from 2016 until the next review planned after five years. Although the water supply service of Rajasthan state is not financially independent, PHED is expected to revise water tariff as planned to ensure the sustainability of the project.

4.2.2 Recommendations to JICA

As mentioned above, the measures to reduce NRW is crucial to use surface water transferred and distributed by the project from Bisalpur Dam effectively and also to assure project sustainability. It is also considered very important to implement the technical assistance project of JICA "Capacity Development Project for NRW reduction in Jaipur" which is under implementation during the ex-post evaluation and strengthen the technical and institutional capacity of PHED to implement NRW reduction through the project to maintain project sustainability.

4.3 Lessons Learned

Operation and Maintenance by the contractor engaged in construction

In the project, O&M of the project facilities were outsourced to contractors, who then engaged in construction for the first two years after completing construction as a defect liability period. By a contractor with the necessary expertise and technical capacity to handle the facilities and equipment, the project facilities were operated and maintained well. The technical know-how, manual, records, reporting systems and procedures regarding O&M established over two years were continuously used to set the bidding conditions for selecting contractors and O&M system afterwards, and were thus considered effective for other projects to ensure sustainability.

Information sharing of the project plan with concerned entities

The project period was significantly longer than planned at 189%. One of the major reasons is because land initially allotted to construct pumping stations was used for another purpose and became unavailable for the project. The other reasons were the increased length of time to obtain permission to construct water pipes along major roads and railway crossings from authority agencies. In addition, construction of a distribution center under package 7, which was under implementation using the PHED budget at the time of ex-post evaluation, was delayed due to the delay in obtaining permission for land use. Considering that all permissions causing delay were for state-owned land, it was expected that the delay would have been mitigated to a certain extent if information sharing and coordination among the entities concerned had been established well before

starting the project. When implementing a similar project, it is desirable that the executing agency would put its utmost attention to share information and coordinate with concerned entities, such as the Jaipur Development Authority.

End

Comparison of the Original and Actual Scope of the Project

Item	Plan	Actual
1.Project Outputs Package: Item		
1 Construction of transfer mains on central feeder (primary and secondary)	Total length: 95,597m	Total length: 75,114m
2 Construction of transfer mains on western and southern feeder (primary and secondary)	Total length: 77,843m	Total length: 69,507m
3 Construction of pumping stations at Balawala, Ramniwas Bagh and Amanishah	3 pumping stations at Balawala, Ramniwas Bagh and Amanishah	Mostly same as plan
4 Construction of central, western and eastern booster pumping stations	Central/eastern: on-line booster pumping stations at Malviya Nagar and University Western: on-line booster pumping station	Central/eastern: Pumping station with storage reservoir at Jawahar Circle and on-line booster pumping station at Central Park Western: Pumping station with storage reservoir at Mansarovar
5 Installation of Supervisory Control and Data Acquisition （SCADA） system	11units (Balawala main control center, intake pumping station, treatment plant, booster centers, distribution centers)	85 units (Balawala main control center 1, Sub monitoring centers 13, local control centers 71)
6 Construction of electric supply facilities	・132/33 kV station, 2 units ・132kVD/C distribution lines, 2 units	・132/33 kV station, 1unit ・132kVD/C distribution line, 1 unit
7 Upgrading existing distribution systems and construction of new distribution centers	・3 new distribution centers ・ Upgrading existing distribution systems: total length 70km	・2new distribution centers ・ Upgrading existing distribution systems: total length 70km
8 Implementation of reduction of NRW measures	・ Installation of bulk meters at distribution centers ・ Installation of 100,000 consumer meters ・Restoration of pipes which have high leakage problems	・Implementation of pilot project of 24 hours water supply and leakage test in the Mansarovar distribution zone (The installation of bulk meter is addressed in Table 2)
Consulting Services	1) Project Management 2) Design and Supervision 3) PR	1) Project Management 2) Design and Supervision 3) PR (Contract was terminated during the project period by finishing M/M, which was used mostly for redesigning.)
2.Project Period	March 2004 – December 2007 (46 months)	March 2004 – May 2011 (87 months)
3.Project Cost Amount Paid in Foreign Currency Amount Paid in Local currency Total Japanese ODA Loan Portion Exchange Rate	 4,229 million yen 7,754 million yen (3,024 million INR) 11,983 million yen 8.881 million yen 0.39 INR = 1 yen (As of August 2003)	 541 million yen[22] 11,514million yen (4,950 million INR) 12,113 million yen 8,873 million yen 0.43 = 1 yen (Average between January 2005 and December 2013)

[22] The actual cost is based on a document provided by PHED. Because the JICA portion was shown in yen using the same exchange rate used at the time of appraisal in the document from PHED, the amount in yen were returned to INR and re-calculated using the IMF rate, hence the total amount differs from the actual project cost previously mentioned.

Democratic Socialist Republic of Sri Lanka

FY2015 Ex-Post Evaluation of Japanese ODA Loan

"Environmentally Friendly Solution Fund Project (II)"

External Evaluator: Yumi Ito, Japan Economic Research Institute Inc.

0. Summary

This project was implemented with an aim to encourage private companies to make environmental capital investments by providing medium/long-term funding. The relevance of this project is high, as it was consistent with the development policy and development needs of Sri Lanka as well as the ODA policy of Japan. In terms of project implementation, the efficiency of the project is fair, as the project cost was within the plan but the project period was longer than planned. With regard to the effectiveness of the project, it was inferred from the limited data available that the project effects had been mostly realized, but it was difficult to quantitatively evaluate the achievement of the project in its entirety due to limitations of available data. As impacts of the project, it was inferred that the project contributed to the reduction of environmental burdens created by activities of enterprises. However, since part of the effects realized through implementing this project cannot be evaluated due to limitations of available data, the effectiveness and impact of this project are regarded to be fair. With regard to operation and maintenance, their sustainability was judged to be fair. Although no particularly major issues were observed in the financial aspect, there were some concerns with the institutional and technical aspects because necessary institutional arrangements were still being prepared and the operation of the revolving fund had not yet started at the time of ex-post evaluation.

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

1. Project Description

Project Location (nationwide)

Waste water treatment facility installed at a rice mill utilizing the sub-loan from this project

1.1 Background

In Sri Lanka, agriculture & forestry mainly through plantation and fishery had been the major industry; however, industrial pollution became a serious issue through the progress of industrialization by the development of the manufacturing sector, mainly in textile and garment industries.

As to environmental laws and regulations, the National Environmental Act, enacted in 1980 to establish a basic legal framework, was amended in 1988. In this amendment, comprehensive regulations on air pollution, water contamination, waste and so forth were stipulated while a framework for the introduction of standards for discharge, noise and so forth as well as regulatory enforcement was formulated. However, it could not be said that the factories established before the amendment were complying with the regulations completely. Therefore, it was necessary to introduce an incentive mechanism that encouraged private companies to make environmental investments, along with an enhancement of regulatory enforcement and monitoring by administrative authorities.

Under these circumstances, the Government of Sri Lanka, with the support of the World Bank, engaged in building the capacity of the Central Environmental Authority (hereinafter referred to as 'CEA') to enforce environmental regulations. Meanwhile, the ODA Loan project "Environmentally Friendly Solution Fund Project" (hereinafter referred to as 'Phase I') was implemented to provide highly concessional medium/long-term funding toward private companies for making capital investments directed at environmental measures and technology transfer related to such measures.

The needs to acquire an Environmental Protection License (hereinafter referred to as 'EPL') were increasing further along with the strengthening of environmental regulations. However, the funds for taking environmental measures were not sufficiently supplied to companies and it was necessary to promptly improve the environment through the introduction of policy-based finance. In addition, the needs for energy saving were increasing year by year in Sri Lanka, but the funds for making such capital investment were lacking. This project was implemented, as it was necessary to continue the provision of funds because the disbursement of Phase I had finished at the end of 2003.

1.2 Project Outline

The objective of this project is to encourage companies' environmental capital investment by providing medium/long-term loans necessary to make such capital investment and to hire supporting consultants, and by providing training for the officers of the participating credit institutions (hereinafter referred to as 'PCI'), thereby contributing to the reduction of environmental burdens created by the companies eligible for this project.

<ODA Loan Project>

Loan Approved Amount/ Disbursed Amount	5,236 million yen / 5,172 million yen
Exchange of Notes Date/ Loan Agreement Signing Date	November, 2004 / December, 2004
Terms and Conditions	Interest Rate: 0.75% Repayment Period: 40 years (Grace Period): (10 years) Conditions for Procurement: General untied
Borrower / Executing Agency	Democratic Socialist Republic of Sri Lanka / Ministry of Industry and Commerce
Final Disbursement Date	December, 2011
Related Projects	[ODA Loan] "Environmentally Friendly Solution Fund" (September, 1998) [Technical Assistance] "The Project for Promoting Energy Efficiency Improvement in Sri Lanka" (2008-2011) [Other Donors] World Bank: Technical assistance and equipment provision to the CEA (1997) Kreditanstalt für Wiederaufbau (KfW): Creation of Pollution Control and Abatement Fund (Grant Aid, 1996)

2. Outline of the Evaluation Study

2.1 External Evaluator

Yumi Ito (Japan Economic Research Institute Inc.)

2.2 Duration of Evaluation Study

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

Duration of the Study: August, 2015 – October, 2016

Duration of the Field Study: November 22 – December 4, 2015 and February 22 – 27, 2016

2.3 Constraints during the Evaluation Study

The following paragraph details constraints in making the judgements for this ex-post evaluation study according to the five evaluation criteria.

In Sri Lanka, due to the reorganization of government ministries in 2010, the Ministry of Small and Medium Enterprise Development (hereinafter referred to as 'MSMED'), the former executing agency of this project was reorganized into the Ministry of Industry and Commerce (hereinafter referred to as 'MIC') and the Project Management Unit (hereinafter referred to as 'PMU'), in charge of this project, was transferred to MIC with an assignment of new staff members. In the current PMU, established within the MIC, there were no staff members who had engaged in the operation of this project before 2010. In addition, it seems that the transfer of the project's information such as relevant documents for the current PMU was not conducted sufficiently. Therefore, there were constraints in obtaining information during the implementation of this evaluation study. Furthermore, although this evaluation study was conducted about five years after the final disbursement of funding from JICA, more than ten years had passed since the inception of this project in 2004, thus not enough data for operation and effect indicators could be obtained.

Audits for the years 2009 and 2010 conducted by the Auditor General's Department of the Government of Sri Lanka pointed out the lack of eligibility clearance[1], loan approvals over the maximum amount, lack of proper approvals and so forth. The Ministry of Finance and Planning and the PMU made efforts to explain those issues by submitting evidence to the Auditor General's Department. However, the Government of Sri Lanka plans to refund to JICA the unsettled portion because of the difficulty in explaining the said issues due to a lack of documents and so forth. The total refund amount is planned to be about 1,260 million rupees[2] (about 23% of the total disbursement). For this evaluation study, sufficient information to evaluate the impact of this refund on the project effect could not be obtained and it was difficult to distinguish the refund portion from the information of the actual achievement of this project included in this report.

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

3.1 Relevance (Rating: ③[4])

3.1.1 Relevance to the Development Plan of Sri Lanka

At the time of project appraisal, it was stated that the Sri Lankan government would be

[1] The procedure of this project includes confirmation of the sub-loan eligibility given by the PMU in advance, and eligibility clearance is a document issued through this procedure.

[2] Equivalent to about 986 million Japanese Yen (calculated by an exchange rate 1 rupee = 0.78 yen (IMF, March 2016). This is reference information only, as the actual refund amount denominated in Japanese Yen to be agreed upon may be different depending on the exchange rate to be used.

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

[4] ③: High, ② Fair, ① Low

proactive in promoting socio-economic development and in particular rural development, environment protection and poverty reduction in "Creating Our Future, Building Our Nation"(2004), the economic policy framework of the Government of Sri Lanka. At the environmental sector level, the National Environmental Act was enacted in 1980 and the CEA was established. In 1988, with the amendment of this act, the comprehensive regulations were established as well as the framework for the introduction of the standards for discharge and so forth and regulatory enforcement was formulated. At the time of project appraisal, the National Environmental Policy (2003) stated to balance the needs for development and environmental integrity.

Although a national development plan was being prepared at the time of ex-post evaluation due to a change of administration after the presidential election in 2015 in Sri Lanka, an economic policy statement made by the prime minister to the parliament in November 2015 specified that an economy that would pave the way for sustainable development was planned to be built. In addition, the budget speech for the year 2016 that was prepared based on the aforementioned economic policy statement stated, "our government led by His Excellency the President and the Prime Minister have placed the highest importance in conserving the environment within the context of sustainable development", and the National Environmental Conservation Programme which includes environment pollution-control and so forth was planned to be implemented. Also, at the time of ex-post evaluation, the National Environmental Policy had not changed since the time of project appraisal. According to an interview with the Ministry of Environment conducted during the field survey of this ex-post evaluation study, an amendment to this policy was being prepared but no major changes were expected.

Based on the above, this project is to encourage companies' capital investment for environmental measures aiming at contributing to the reduction of environmental burdens, and was consistent with Sri Lanka's development policy as well as its environment sector policy, that is, to balance development and environment protection, at the time of project appraisal and ex-post evaluation.

3.1.2 Relevance to the Development Needs of Sri Lanka

At the time of project appraisal, measures to protect the environment and further efforts to encourage the implementation of such measures were considered necessary, as industrial pollution became a serious issue and it was estimated that only half of the companies involved obtained an EPL. In addition, it was expected that the environmental investment by private companies such as the introduction of pollution-control technology or energy saving measures would increase further, along with the tightening of regulations for environmental standards and the increasing awareness of environmental measures. According to interviews with PCIs, a

concessional financing scheme like the one introduced by this project was needed in order to encourage environment protection measures, because investment in environmental measures did not necessarily bring about an increase in a company's revenue directly.

At the time of ex-post evaluation, according to the CEA, the ratio of EPL acquisition is estimated to be about 70%, regarding the industries for which the CEA issues EPLs[5] (as of December 2015 when the interview with the CEA was conducted). As to the estimated 30% of the companies remaining which have not acquired an EPL, it is considered that they are not equipped with adequate pollution-control measures. Therefore, investment in environmental measures was still considered important at the time of ex-post evaluation. In particular, it was not easy for small and medium-sized enterprises to comply with the standards as the cost of making investment in environmental facilities was high. Also, companies tended to prioritize an investment that would generate revenue. Thus, it was inferred that companies would be prone to put less priority on environmental investment. In addition, according to interviews with PCIs, the demand for a concessional loan scheme to make environmental investment was still high at the time of ex-post evaluation.

As described above, the need for measures to protect the environment and further efforts to encourage the implementation of such measures, as well as the demand for environmental investments were still high at the time of both project appraisal and ex-post evaluation. In addition, there was a demand for policy-based finance in order to encourage companies' environmental measures. Therefore, this project can be considered consistent with the development needs.

3.1.3 Relevance to Japan's ODA Policy

The Japanese government's Country Assistance Program for Sri Lanka listed "assistance for environment-oriented tourism development" as a part of one of the priority areas "assistance for raising foreign-currency acquisition capabilities" at the time of project appraisal. The program pursued the promotion of environment-based tourism development entailing the preservation and protection of human and social environments (improvements in water supply and sewerage, air pollution control, waste disposal, etc.). Also, at the time of project appraisal, in the Mid-term Strategy for Overseas Economic Cooperation Operations of JICA, "assistance to the improvement of the environment and pollution control" was listed as one of the priority areas. In addition, in JICA's Country Assistance Strategy for Sri Lanka, it was specified to extend the assistance of ODA Loan in high policy priority areas such as assistance for environmental measures, while paying

[5] Industries requiring an EPL were classified under two categories (A and B) before, but in 2008 this classification was changed to one consisting of three categories (category A is for significantly high-polluting industrial activities, B for medium level polluting activities and C for low-polluting industrial activities). Under this new classification, EPLs of categories A and B are to be issued by CEA, while EPLs of category C are to be issued by Local Government Authorities.

attention to the role of policy-based finance in the process of financial sector reform. This project was consistent with the Japanese government's Country Assistance Program for Sri Lanka, JICA's Mid-term Strategy for Overseas Economic Cooperation Operations and Country Assistance Strategy for Sri Lanka at the time of project appraisal, as it was a project to support companies' efforts in taking environmental measures through the provision of an ODA Loan.

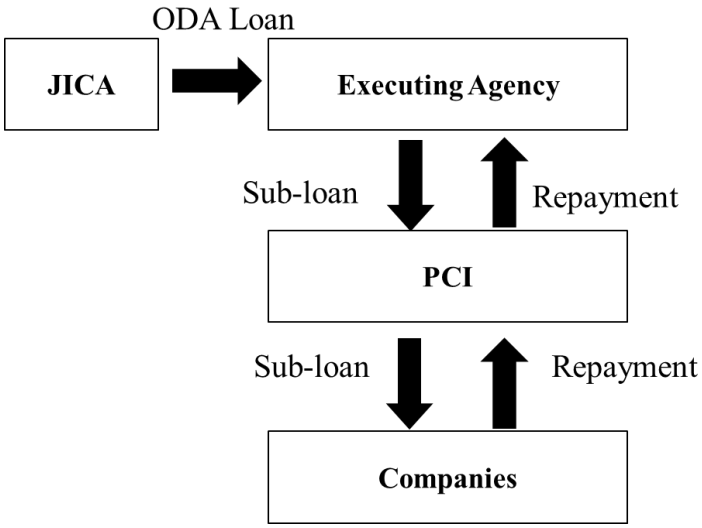
As described above, this project has been highly relevant to the Sri Lanka's development policy and development needs, as well as Japan's ODA policy. Therefore, its relevance is high.

3.2 Efficiency (Rating: ②)

3.2.1 Project Outputs

This project was for the Government of Sri Lanka to provide medium/long-term funding that would be necessary for companies to make environmental investments (General Loan) and funding for companies to hire consultants or conduct training necessary to make such investments (Technical Assistance Loan A, hereinafter referred to as 'TA Loan A') through financial institutions as well as funding for the PCIs to conduct employee training or public relations activities regarding this project (Technical Assistance Loan B, hereinafter referred to as 'TA Loan B'). As described above, there were two kinds of technical assistance loans; TA Loan A was for companies, while TA Loan B was for the PCIs. Funding schemes for each loan are shown in the diagrams below.

(General Loan and TA Loan A)



(TA Loan B)

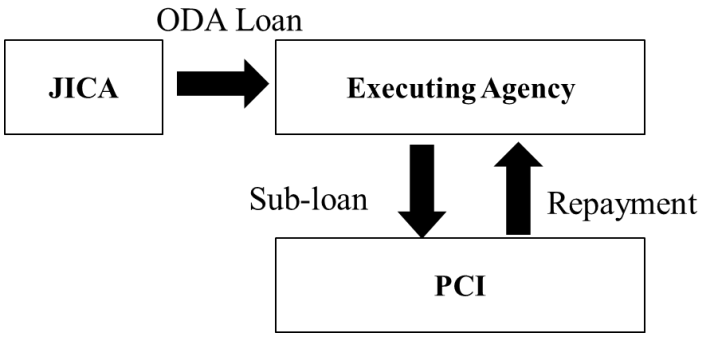


Figure 1. Funding Schemes of the Project

Source: Prepared based on the information provided by JICA

The outline of the project planned at the time of project appraisal is as follows.

(a) General Loan	・ Target beneficiary (end-users): Financially viable enterprises (sole proprietorships, cooperatives, private limited liability companies, corporations, etc.) ・ Eligible sectors: Manufacturing, industrial sectors and services sectors ・ Eligible projects: Projects for environmental protection and environmental measures, energy-saving projects ・ Eligible Items to be financed: Facilities for environmental measures (measures for emission control, etc.), facilities for the safety of work places, relocation costs to industrial estates equipped with pollution-control facilities, monitoring equipment ・ Maximum loan amount: 50 million rupees. 30% is to be borne by the end-user in case of profitable sub-projects. ・ Repayment period: Max. 10 years (including max. 2-year grace period) ・ Interest rates: (from executing agency to PCI) 3.75% (from PCI to end-users) Max. 6.5%
(b) TA Loan A	・ Target beneficiaries (end-users): Current and future end-users of the General Loan ・ Eligible items to be financed: Cost of management/financial

	or technical training, cost of hiring consultants ・Maximum loan amount: Not exceeding 750,000 rupees. More than 25% of the project cost is to be borne by the end-user. ・Repayment period: Max. 5 years (including max. 1-year grace period) ・Interest rates: (from executing agency to PCI) 0% (from PCI to end-users) Max. 2%
(c) TA Loan B	・Target beneficiary (end-users) : PCIs ・Eligible items to be financed: Cost of PCI employee training to administer this project, and cost of conducting public relation activities for this project. ・Maximum loan amount: To be determined by the PMU on a case-by-case basis ・Repayment period: 3 years (including 1-year grace period) ・Interest rate: 3.75%

Regarding the loan disbursement, as shown below, General loan and TA Loan A were disbursed to 755 sub-projects and 38 sub-projects respectively. There was no usage of TA Loan B, and no information could be obtained on the reason for this. The breakdowns of loan disbursements by PCI, by district and by purpose, are shown in the tables on the following pages.

According to the breakdown of loan disbursement by district, although the loans were disbursed in all provinces except the northern province, the western province consisting of Colombo, Gampaha and Kalutara accounted for about half of the number of sub-projects. However, there is a possibility that the proportion of the number of sub-projects in Colombo was presented higher than reality as there were cases in which the loan was disbursed in Colombo but the facility funded by the loan was installed at a factory located in a different district. In addition, the proportion of the number of sub-projects was small particularly in the northern and eastern provinces which were areas affected by conflicts (the background will be described in section 3.2.2).

According to the breakdown of loan disbursement by purpose, the numbers of sub-projects for the wastewater treatment plant and resource saving each cover a little less than 40 percent of all sub-projects, followed by emission control with a little more than 10 percent of the share.

Table 1. Loan Disbursement by PCI

PCI	Environmentally Friendly Solution Fund Project (II)			
			TA Loan A	
	Number of sub-projects	Disbursed Amount (unit: million yen)	Number of sub-projects	Disbursed Amount (unit: million yen)
Commercial Bank	255	1,501.8	25	7.2
DFCC	131	1,277.7	8	12.7
NDB	67	692.3	0	0
Sampath bank	83	497.2	2	0.6
Bank of Ceylon	61	421.6	3	1.7
Hatton National Bank	56	347.6	0	0
Lanka Orix Leasing	65	242.3	0	0
PLC	37	186.4	0	0
Total	755	5,166.8	38	22.2

Source: Prepared based on the information provided by the PMU

Table 2. Loan Disbursement by District

District	Number of Sub-projects	Disbursed Amount (unit: million yen)
Colombo	218	1,428.1
Gampaha	95	733.7
Galle	55	337.2
Kandy	57	354.4
Kalutara	57	364.3
Pollonnaruwa	42	314.8
Matara	30	232.5
Kurunegala	36	161.3
Ratnapura	28	205.9
Puttalam	30	219.7
Kegalle	24	165.3
Nuwara Eliya	20	213.6
Anuradhapura	14	94.3
Badulla	17	71.3
Matale	12	73.9
Hambantota	9	55.6
Ampara	5	50.1
Moneragala	3	43.7
Trincomalee	3	47.1
Total	755	5,166.8

Source: Prepared based on the information provided by the PMU

Notes: Prepared using the information on total disbursement, because the breakdown of General Loan and TA Loan A was not available.

Table 3. Loan Disbursement by Purpose

	Number of sub-projects	Disbursed Amount (unit: million yen)
Wastewater treatment plant	280	1,714.3
Resource saving	265	1,060.0
Recycling of waste	57	918.6
Emission control	96	803.1
Dust control	13	197.8
Noise control	15	134.0
Solid waste disposal	13	114.6
Relocation	3	103.5
Waste heat recovery	9	61.9
Liquid & solid waste disposal	2	49.9
Waste reduction	2	9.2
Total	755	5,166.8

Source: Prepared based on the information provided by the PMU
Notes: "Relocation" is costs of relocation to industrial estates equipped with pollution control facilities

3.2.2 Project Inputs

3.2.2.1 Project Cost

The total cost of this project was to be financed by the Japanese ODA Loan. At the time of project appraisal, the total project cost was planned to be 5,236 million yen. The actual project cost was 5,172 million yen[6] (98.8% of the plan), which was less than planned.

3.2.2.2 Project Period

At the time of project appraisal, the period of this project was expected to be 52 months. The actual project period was 66 months (127% of the plan), from December 2004 (the signing date of the loan agreement) until May 2010 (the date of the final disbursement[7]), which was longer than planned.

As described 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[8] (Rating: ②)

3.3.1 Quantitative Effects (Operation and Effect Indicators)

3.3.1.1 Operation Indicators

As quantitative effects to be achieved by implementing this project, cumulative

[6] Total loan amount including disbursed amount of 5,166.8 million yen and service charge of 5.2 million yen.
[7] At the time of project appraisal, a definition of the project completion was not decided; in 2006 it was agreed with JICA to define the project completion date as the "date of the final disbursement" from JICA. However, the "Final Disbursement Date" in the section 1.2 Project Outline on page 2 of this report is written as December 2011, because the unused amount was adjusted in 2011.
[8] Sub-rating for Effectiveness is to be put with consideration of Impact.

collection ratio, ratio of principal payment in arrears[9] and ratio of sub-projects in arrears[10] were set as operation indicators and the targets for each indicator were set as shown in the table below.

Table 4. Operation Indicators of This Project

	Baseline	Target	Actual				
	2003	2009	2010	2011	2012	2013	2014
	Year of Project Appraisal	Completion Year	Completion Year	1 Year After Completion	2 Years After Completion	3 Years After Completion	4 Years After Completion
Cumulative Collection Ratio	93%	93%	94.8%	95.6%	93.7%	93.1%	96.9%
Ratio of Principal Payment in Arrears	2.1%	2.1%	0.4%	0.5%	0.6%	0.7%	2.7%
Ratio of Sub-projects in Arrears	4.7%	4.7%	2.6%	2.1%	2.5%	2.4%	3.4%

Source: Prepared based on the information provided by JICA, PCIs and PMU

Notes: Actual achievement data are calculated weighted averages of the data provided by PCIs, by utilizing the disbursement share based on the information provided by the PMU. The calculation was done based on the actual data provided by four PCIs (disbursement share: 59%) in 2010, five PCIs (62%) in 2011 and four PCIs in 2012, 2013 and 2014 (53%, but the cumulative collection ration ratio in 2014 was based on the data provided by three PCIs (39%)). These data are for reference, as the analysis is not based on complete data.

All data could not be obtained as more than ten years had passed since project completion. However, the cumulative collection ratio calculated by the weighted average of the data provided by four PCIs in the project completion year (2010) is 94.8%, higher than the target of 93% as shown in the above table. The principal infection ratio and the infection number ratio, calculated in the same way, were 0.4% and 2.6% respectively, lower than their respective targets. Regarding the infection number ratio, which was calculated by each PCI, it is necessary to note that even if the actual number of non-performing loans is small, the ratio tends to become relatively higher in number in the event that the number of sub-loans of the PCI (the denominator of the calculation of the ratio) is not large. The ratios specified for the years after project completion (2010) are also mostly at the level of achieving the targets.

As described above, according to the limited data provided by the four PCIs, which accounts for 60% of the total disbursement, the cumulative collection ratio, the principal infection ratio and the infection number ratio achieved their targets in the project completion

[9] (Cumulative principal loans in arrears for 6 months or more) x 100/Cumulative principal loans

[10] (Number of sub-loans in arrears for 6 months or more) x 100/Total number of sub-loans

year (2010), the data from which are to be used as a comparison for the targets. However, the achievement of the project cannot be fully evaluated due to limitations of available data.

3.3.1.2 Effect Indicator

At the time of project appraisal, it was expected that the number of companies obtaining EPLs would reach 180 through implementing this project. As written above, it was difficult to obtain this data because more than ten years had passed since project completion. The available data for this indicator was 97, which was the total data provided by two PCIs. The other three PCIs answered, "About 20 customers obtained new EPLs, while others already had EPLs", "Most of the customers already had EPLs", and "We have ensured that all the projects funded under this project obtained EPLs when applicable".

As stated above, according to the limited data available, the realization of the project effect is inferred from the number of companies which obtained EPLs provided by two PCIs (accounting for 32% of the total disbursement) which exceeded more than half of the target number and from the status of EPL acquisition answered qualitatively by the three other PCIs. However, the achievement level of the entire project cannot be evaluated because the information was limited.

3.3.2 Qualitative Effects

At the time of project appraisal, improvement of the living environment of the residents nationwide, including those in areas of conflict, was expected as a qualitative effect of the project. Therefore, this evaluation study looked into whether the companies located in the former conflict areas had similar access to the policy-based finance of this project as companies located in other areas. The loan disbursement of this project to former conflict areas is as shown in the table below.

Table 5. Loan Disbursement in Former Conflict Areas

	Districts	Number of sub-projects	Disbursed Amount (unit: million yen)
Nothern	Jaffna	0	0
	Kilinochchi	0	0
	Mullative	0	0
	Mannar	0	0
	Vavuniya	0	0
Eastern	Trincomalee	3	47.1
	Batticaloa	0	0
	Ampara	5	50.1
Total		8	97.2

Source: Prepared based on the information provided by the PMU

Usage of this policy-based finance was limited in the former conflict areas as the disbursement to such areas accounted for only about 1-2% of the total amount and of the total number of sub-projects. This was because the ceasefire agreement signed in 2002 was not virtually observed, and it was not until May 2009 that the end of the conflict was declared. It can be inferred that the provision of funds through this project was difficult to be carried out, because according to the interviews with PCIs, access to the area was restricted during the conflict and there were only a few banks that had branches in the area. It is also inferred that there was little demand for loans, as the economic activities were not so vigorous in the area. Furthermore, it was inferred that the situation stated above was difficult to improve immediately following the conflict. Therefore, it is considered that the project was influenced by the conflict for the most part of its period. Based on the above, the effect of "securement of companies' access to the policy-based finance in the former conflict areas" was not realized; however, this result is not to be evaluated in this study, as the realization of the effect was affected by the conflict as stated above.

3.4 Impacts

3.4.1 Intended Impacts

"Reduction of the environmental burdens created by activities of enterprises" was expected as an impact through the implementation of this project. The result of the beneficiary survey conducted by this ex-post evaluation study[11] showed that 100 out of 102 companies expressed recognition that their sub-projects financed by this project had contributed to the reduction of environmental burdens created by business activities. As to the question, "How do you rate the contribution of your sub-project financed by this project to the reduction of environmental burden created by your companies business activities?", 88% of the respondents (90 companies) answered "Contributed a lot", 9.8% (10 companies) answered "Contributed" and 2% (two companies) answered "No Change". Although the beneficiary survey was conducted on only a part of the total beneficiaries of this project, it could be inferred that this project contributed to the reduction of environmental burden to a certain extent, as was expected at the time of project appraisal, based on the fact that the contribution was recognized by 98% of the respondents.

3.4.2 Other Impacts

3.4.2.1 Impacts on the Natural Environment

According to a check done with the eight PCIs, no negative environmental impacts of this project were reported. It could be thought that considerations to potential negative impacts on the natural environment were made during the project implementation, because

[11] Interview survey was conducted on a total of 102 companies in 15 districts that received a loan through this project, and were selected non-randomly considering: location, financing PCIs, industry and loan amount..

according to the PMU, it consulted the CEA if there was a possibility of negative environmental impacts occurring, and some PCIs required a document from a CEA regional office upon loan applications or sought advice from the PMU or a CEA regional office when necessary.

3.4.2.2 Land Acquisition and Resettlement

According to the eight PCIs, there was neither land acquisition nor resident resettlement by the sub-projects of this project.

With regard to the effectiveness of the project, it is inferred that the operation indicators mostly reached the targets according to the limited data available, and the project effect is considered to be mostly realized according to the effect indicator when taking into account qualitative information complementarily. However, as stated above, the achievement of the project as a whole cannot be evaluated sufficiently due to limitations of available data. In addition, as described in the section "2.3 Constraints during the Evaluation Study", sufficient information to evaluate how the refund will affect the project effects. It is therefore difficult to evaluate the achievement of this project in its entirety to be high. Regarding the qualitative effect indicator "securement of companies' access to the policy-based finance in the former conflict areas", it is not to be evaluated in this study although the effect was not realized, due to the conflict not having ended until May 2009.

Regarding the impacts, it was inferred that this project might have contributed to the reduction of environmental burdens created by companies' activities as concluded in the beneficiary survey. Also, there were no negative environmental impacts reported and it was thought that considerations were given at the time of sub-project appraisal. There was neither land acquisition nor resettlement for this project. Therefore, no particular problem was observed.

In light of the above, a part of the effects realized through implementing this project cannot be evaluated due to limitations of available data. Therefore, effectiveness and impact of the project are regarded as fair.

3.5 Sustainability (Rating: ②)

3.5.1 Institutional Aspects of Operation and Maintenance

At the time of project appraisal, it was planned that the PMU established under the MSMED would be the executing agency. In actuality, the PMU had been in charge of this project as planned; however, due to the reorganization of government ministries in 2010, the MSMED was reorganized into the MIC. Therefore, the PMU established under the MIC has become the executing agency of this project, operating since May of that year, and is to be in charge of operation of the revolving fund of this project. There were eleven officers in the

current PMU, including project assessment officers and so forth, but there were no environment officers in charge of evaluating the eligibility of the environmental aspects at the time of the field survey for this ex-post evaluation. However, the future employment of an environment officer has already been approved by the Ministry of Finance and Planning and the PMU is preparing the recruitment. Therefore, it is considered that the possibility of the PMU having an environment officer is high.

At the time of the ex-post evaluation, the operation of the revolving fund of this project had not yet started, although the project was completed in May 2010 and repayments made by the PCIs have been managed in an account at the Central Bank. According to the interview with the PMU, the reason the preparation for the revolving fund operation took such a long time after the transfer to the current PMU in 2010 was that the PMU had first undertaken the preparation of the revolving fund under another project supported by JICA (Small and Micro Industries Leader and Entrepreneur Promotion Project (III) [hereinafter referred to as 'SMILE III'], implemented from December 2004 until December 2010), and then began the preparation of the revolving fund of this project. The current PMU started the preparation of this project's revolving fund in 2014 and the operation guideline and format of the subsidiary loan agreement have already been prepared at the time of the field survey. In addition, according to the PMU, it took time to receive the settlement certificate issued by the Auditor General's Department regarding the issues pointed out in the audits that were stated in the section "2.3 Constraints during the Evaluation Study". Therefore the commencement of the revolving fund operation was delayed. Commencement of the revolving fund operation is expected once the settlement of the refund payment is completed.

Also, at the time of project appraisal, it was planned that the Policy Coordination Committee, consisting of the MSMED, other relevant ministries such as the Ministry of Finance, the PMU, the PCIs, the CEA and so forth was to be held once a year. In actuality, it was reported that the Project Steering Committee had been held twice a year during the project implementation period.

The current PMU is operating the revolving fund of the SMILE III project. As a framework for operation and supervision of the fund, the Project Steering Committee (to be held twice a year; consisting of JICA, representatives from Ministry of Finance and Planning, Ministry of Rural Economic Affairs and the PMU) supervises project management, while the Operational Committee (to be held every month; consisting of PCIs, representatives from the Central Bank, Ministry of Finance and Planning and the PMU) confirms the eligibility of sub-projects and the status of the revolving fund operation. According to the PMU, a similar framework is expected to be introduced for operation and supervision of the revolving fund of this project. In particular, the establishment of the Operational Committee is considered to be effective in securing transparency of fund operation.

Eight PCIs, i.e., Bank of Ceylon (BOC), Commercial Bank of Ceylon PLC (Commercial Bank), Hatton National Bank PLC (HNB), NDB Bank (NDB), Sampath Bank PLC、DFCC Bank PLC (DFCC), Lanka Orix Leasing Company PLC (LOLC), People's Leasing & Finance PLC (PLC), participated in this project. For the operation of the revolving fund of this project, selection of PCIs is to be conducted again, based on their eligibility criteria.

As explained above, the establishment of a highly transparent operation and supervision framework is expected premised on the experience of revolving fund operation from another existing project. However, the operation of the revolving fund of this project has not started and an environment officer was not recruited to the PMU yet, although the possibility of the recruitment of one was considered to be high. Therefore, the sustainability of the institutional aspects is considered to be fair.

3.5.2 Technical Aspects of Operation and Maintenance

During the project implementation, an environment officer was hired and placed at the PMU established within the MSMED as planned, and coordination with the CEA was conducted when necessary.

The current PMU, in charge of the revolving fund operation of this project, has been accumulating experience through the revolving fund operation of the SMILE III project since 2013; however, an environment officer has not yet been posted, as described above. Preparation has been done for the recruitment of an environment officer as of the time of this ex-post evaluation and the possibility of the recruitment is considered to be high. However, the revolving fund operation is expected to become difficult in case an environmental officer is not posted, as there would be no officer in charge of evaluating the eligibility of the environmental aspects within the PMU.

Regarding the loan appraisal and credit management capacities of the PCIs, no particular issue was observed, as human resource development such as in-house training and so forth is conducted as a financial institution. In regards to the environmental technical aspect, it was reported that reviewing a consultant's report submitted by a company, receiving support from an officer at the main office who had basic knowledge, or consulting technical matters with the PMU or the CEA were conducted during the project implementation period.

According to the PCIs, the operation guideline prepared for this project was utilized at the PCIs. The operation guideline for the revolving fund of this project has been prepared, so it is expected to be also utilized by the PCIs newly selected for the revolving fund operation.

As described above, the current PMU has been accumulating experience by operating the revolving fund of another project. However, the technical capacity to assess the environmental aspect has not been secured within the current PMU, as an environment officer

has not been recruited to the post yet. Therefore the sustainability of the technical aspects is considered to be fair.

3.5.3 Financial Aspects of Operation and Maintenance

The operation cost of the PMU is to be borne by the government. At the time of ex-post evaluation, the operation of the revolving fund had not yet started, and concrete information on the operation budget could not thus be obtained. However, the operation of the revolving fund had been prepared with approval of the Ministry of Finance and Planning, and the budget of the current PMU's revolving fund operation of another project has been allocated by the government. Therefore, it can be considered that there is little concern about the financial aspect, as the possibility of budget allocation by the government for this project's revolving fund operation is considered to be high.

PCIs participating in the revolving fund operation are to be selected again. In the case of the PCIs of this project, their capital adequacy ratios were above 5%, meeting the requirement of the Central Bank of Sri Lanka, and there were no major problems seen in their major financial indicators.

Therefore, the sustainability of the financial aspects is considered to be high.

Table 6. Major Financial Indicators of the PCIs

	Capital Adequacy Ratio	Non-Performing Loan Ratio	Total Assets (Unit: billion rupees)	Return on Assets
BOC	9.1	4.3	1,568.3	1.74
Com Bank	12.93	3.47	795.6	1.6
HNB	12.15	3.16	576.6	1.7
NDB	10.09	2.51	262.7	1.47
Sampath	7.90	1.64	525.3	1.9
DFCC	17.01	3.5	130.0	1.6
LOLC Finance	13.11	4.8	67.9	2.45
PLC	20.22	2.72	112.3	4.75

Source: Websites and Annual Reports of the PCIs and information provided by the PCIs
Notes: Information of BOC and Sampath are as of Dec. 31 2015, DFCC as of Sept. 30 2015, LOLC Finance and PLC as of March 31 2015 and the others as of Dec. 31 2014

3.5.4 Current Status of Operation and Maintenance

It was planned to set up a revolving fund account at the Central Bank, and the funds repaid by PCIs were to be used for lending with the same purpose and same conditions as those of this project. The balances of this project's revolving fund are shown in the below table. There were no particular issues observed regarding the repayment status of the PCIs. The planned refund to JICA based on the audit reports described above is to be allocated from this revolving fund.

Table 7. Balances of the Revolving Fund

(Unit: million rupees)

	2006	2007	2008	2009	2010
Beginning Balance	-	7	47	430	1,068
Repayment from PCIs	7	40	382	638	856
Ending Balance	7	47	430	1,068	1,923

	2011	2012	2013	2014	2015
Beginning Balance	1,923	2,745	3,631	4,479	5,298
Repayment from PCIs	821	887	848	819	415
Ending Balance	2,745	3,631	4,479	5,298	5,713

Source: PMU

The operation of the revolving fund had not yet started as of the time of this ex-post evaluation as stated above, but the preparation to start the operation, including preparation of an operation guideline, had been conducted. The revolving fund was to be utilized for lending with the same purpose and mostly the same conditions as those utilized for the sub-loans of this project (although the Technical Assistance Loan B was not to be implemented). Therefore, there were no major issues in particular observed regarding the current status of operation and maintenance.

Regarding the operation and maintenance of the revolving fund of this project in light of the above, although there are no issues with financial aspects anticipated, the operation of the revolving fund has not yet started and there are some concerns over a part of the organisational and technical aspects. Therefore, sustainability of project effects is fair.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

This project was implemented with an aim to encourage private companies to make environmental capital investments by providing medium/long-term funding that is necessary to do so. The relevance of this project is high, as it was consistent with the development policy and development needs of Sri Lanka as well as the ODA policy of Japan. In terms of project implementation, the efficiency of the project is fair, as the project cost was within the plan but the project period was longer than planned. With regard to the effectiveness of the project, it was inferred from the limited data available that the project effects had been mostly realized, but it was difficult to quantitatively evaluate the achievement of the project in its entirety due to limitations of available data. As impacts of the project, it was inferred that the project contributed to the reduction of environmental burdens created by activities of enterprises. However, since part of the effects realized through implementing this project cannot be evaluated due to limitations of available data, the effectiveness and impact of this project are

regarded to be fair. With regard to operation and maintenance, their sustainability was judged to be fair. Although no particularly major issues were observed in the financial aspect, there were some concerns with the institutional and technical aspects because necessary institutional arrangements were still being prepared and the operation of the revolving fund had not yet started at the time of ex-post evaluation.

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

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

Preparation to start the operation of the revolving fund has been conducted, including preparation of an operation guideline and formatting of a subsidiary loan agreement. It is desired to expedite the preparation work and to commence the operation of the revolving fund as soon as possible in order to sustain the effects of this project.

4.2.2 Recommendations to JICA

None

4.3 Lessons Learned

Project monitoring based on the operation and effect indicators

This ex-post evaluation was conducted about five years after the completion of the project at which point more than ten years had passed since the commencement of the project in 2004. It was very difficult to obtain the information related to the operation and effect indicators, as the members of the PMU had been changed due to the reorganization of government ministries; some end-users had already finished their loan repayment and there was a limitation of information storage at some PCIs. As seen in this project, in the event that a two-step loan project whose operation and effect indicators have been decided at the time of ex-ante evaluation, it would be useful for effective and efficient project monitoring and ex-post evaluation to make sure that stakeholders have a clear understanding of the definition of the indicators and require those indicators be regularly reported in the progress report, or to ensure adequate storage of the database after project completion.

Introduction of measures to check the project implementation status

In this project, the audits conducted by the Auditor General's Department of the Government of Sri Lanka pointed out a lack of eligibility clearance, loan approvals over the maximum amount, a lack of proper approvals and so forth, and based on this result, a refund of about 23 % of the total disbursement to JICA has been decided. In order to avoid such a situation in the future, it is worth considering the introduction of a mechanism to check whether

the project procedures are performed appropriately, including documentation management. For example, the procedure appropriateness, including documentation management, of some randomly selected sub-loans as well as sub-loans that require stipulated special procedures could be checked at a regular meeting of a project supervising committee and so forth. In particular, like in this project, in cases which a project executing agency from the previous phase is changed, the implementation status can be checked at an early stage in such a meeting as mentioned above; or, in cases which the PMU is transferred to another ministry due to reorganization of government ministries during the project implementation period, giving special attention to the complete transfer ought to be encouraged while the result of the transfer and implementation status of the new PMU can be checked at a regular meeting to be held immediately after the transfer takes place. It is considered that this would also contribute to enabling appropriate measures to be taken at an early stage

Comparison of the Original and Actual Scope of the Project

Item	Plan	Actual
1.Project Outputs	(a) General Loan: No planned value (b) Technical Assistance Loan A: No planned value (c) Technical Assistance Loan B: No planned value	(a) General Loan: 755 sub-loans (b) Technical Assistance Loan A: 38 sub-loans (c) Technical Assistance Loan B: 0 sub-loan
2.Project Period	December 2004 – March 2009 (52 months)	December 2004 – May 2010 (66 months)
3.Project Cost		
Amount Paid in Foreign Currency	0 million yen	0 million yen
Amount Paid in Local currency	5,236 million yen (4,257 million rupees)	5,172 million yen (5,597 million rupees)
Total	5,236 million yen	5,172 million yen
Japanese ODA Loan Portion	5,236 million yen	5,172 million yen
Exchange Rate	1 rupee = 1.23 yen (As of October, 2003)	1 rupee = 0.92 yen (Average between December, 2004 and December, 2011)

Democratic Socialist Republic of Sri Lanka

FY 2015 Ex-Post Evaluation of Japanese ODA Loan Project

"Pro-Poor Economic Advancement and Community Enhancement Project"

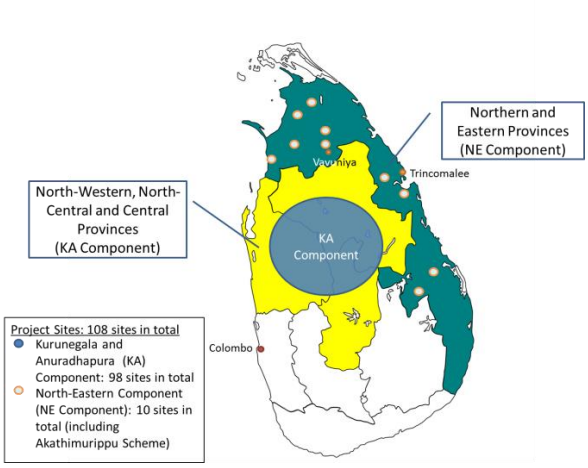
External Evaluators: Keisuke Nishikawa, Japan Economic Research Institute Inc.
Miyuki Sato, Japan Economic Research Institute Inc.

0. Summary

This project was implemented in the North-Western, North-Central, Central, Northern and Eastern Provinces of Sri Lanka to develop and reconstruct rural areas by rehabilitating irrigation systems and engaging in Income Generation Activities, thereby helping reduce poverty, improving agricultural productivity and achieving sustainable rural development. At the time of appraisal and ex-post evaluation, this project was highly relevant to the development policy, sector policies and development needs of Sri Lanka in terms of poverty reduction, rural development and rehabilitation of irrigation. This project was also relevant to Japan's ODA policy at the time of appraisal. Therefore, its relevance is high. Efficiency is fair because the total project period exceeded the plan following a three-year delay in commencement but the project cost was as planned. In terms of the project effectiveness and impact, positive qualitative effects and impacts were seen on the project sites. In terms of project effectiveness, positive qualitative effect and impacts were confirmed and the obtained data also shows that most of the actual project outcomes exceeded the target figures. Therefore, the effectiveness and impact of this project are high. As for the operation and maintenance for the project sustainability, organizational aspects and the current maintenance status does not seem to have any problems, although some technical and financial issues arose. Therefore, the sustainability was deemed fair.

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

1. Project Description



Project Locations

Field Canal: Rehabilitated during the project and maintained by the farmers (Anuradhapura District, North-Central Province)

1.1 Background

There were two major types of agriculture in Sri Lanka: one is the farmer's farm; focused on producing rice for domestic consumption; and the other is plantation farming, which mainly produces export crops. Rice comprised 22% of the total agricultural production and three major plantation crops (tea leaves, rubber and coconuts) made up 27% of the same, constituting a large proportion of Sri Lankan industry[1]. Although GDP from the agricultural sector declined to around 20%[2], this sector still contributed largely to the Sri Lankan economy in terms of acquiring foreign currencies by exporting plantation products, while the high rice-sufficiency ratio also saved on food imports for domestic consumption. Since about 70% of the total population in Sri Lanka inhabited rural areas, mostly farmers[3], one of the key national issues had been to ensure the employment opportunity in agriculture and related industry fields.

Dry and semi-dry areas of Sri Lanka, namely the North-Western, North-Central, Central Provinces and Northern and Eastern Provinces, were lagging behind in economic development with less income growth, and poverty ratio in rural areas were seriously high because of water shortages caused by the deteriorated irrigation systems and declining job opportunities. Rural areas in the Northern and Eastern Provinces in particular remained underdeveloped because of the civil war which lasted 20 years and required inclusive rural development projects with a view to promoting the return and resettlement of residents following the ceasefire agreement.

Based on this background, the Government of Sri Lanka (hereinafter referred to as "GOSL") adopted the policies to strengthen soft support such as capacity enhancement for maintenance and management of existing irrigation systems, facilitating Farmer Organization (hereinafter referred to as "FO") for water management, improvement of seeds and fertilizer distribution etc. In line with these policies, this project was formulated to help facilitate poverty reduction in the agricultural sector and return of farmers' home to the Northern and Eastern Provinces by leveraging Japanese experiences.

1.2 Project Outline

The objective of this project is to develop and reconstruct rural areas by rehabilitating irrigation systems and engaging in Income Generation Activities in the North-Western, North Central, Central and Northern and Eastern Provinces (pilot schemes), thereby helping reduce poverty, boosting agricultural productivity and achieving sustainable rural development.

[1] Information from JICA
[2] Sri Lanka Socio-Economic Data (2001), Central Bank of Sri Lanka
[3] Information from JICA

<ODA Loan Project>

Loan Approved Amount/ Disbursed Amount	6,010 million yen / 5,978 million yen
Exchange of Notes Date/ Loan Agreement Signing Date	March, 2003 / March, 2003
Terms and Conditions	Interest Rate: 2.2% Repayment Period: 30 years (Grace Period): (10 years) Conditions for Procurement: General Untied
Borrower / Executing Agency	The Government of Democratic Socialist Republic of Sri Lanka/ Ministry of Irrigation and Water Resources Management
Final Disbursement Date	May, 2013
Main Contractor (Over 1 billion yen)	-
Main Consultant (Over 100 million yen)	Nippon Koei Co., Ltd. (Japan)
Feasibility Studies, etc.	"The Study for Potential Realization of Irrigated Agriculture in the Dry and Intermediate Zones of Sri Lanka" (JICA, 2000) (Created agricultural master plan for increasing income and efficient use of agricultural water in dry and intermediate zone)
Related Projects	[ODA Loans] - Construction of the Inginimitiya Irrigation Dam Project (L/A signed in August, 1978) - Minipe and Nagadeepa Irrigation Rehabilitation Project (L/A signed in July, 1988) - Walawe Left Bank Irrigation Upgrading and Extension Project (E/S) (L/A signed in July, 1994) (I) (L/A signed in August, 1995) (II) (L/A signed in October, 1996) - Mahaweli System C Upgrading Project (L/A signed

	in August, 1997) [Technical Assistance] - The Study on Increasing Integrated Management Capacity on Irrigation Sector (October 2005 – July 2006) - Increasing the capacity of integrated management in irrigated agriculture in dry zone (June 2007 – May 2011) [Other Donors] - USAID: "Irrigation Management Policy Support Activity (IMPSA)" (1990-1991) - World Bank: Rich in implementing projects for rehabilitation of irrigation systems. Implemented an irrigation project for rehabilitation of basic production infrastructure in North-East area. e.g.) "National Irrigation Rehabilitation Project" (1991-1998), "Major Irrigation Rehabilitation Project" (1981 - 1990), "Village Irrigation Rehabilitation Project" (1981-1990), "Tank Irrigation Modernization Project" (1976-1984), "North-East Irrigated Agriculture Project" (1999-2005) - ADB: Establishment of National Water Resources Authority, implementation of capacity development training and provision of technical assistance on infrastructure development in Kelani River. e.g.) "North-East Community Restoration and Development Project" (2001-2009)

2. Outline of the Evaluation Study

2.1 External Evaluators

Keisuke Nishikawa, Japan Economic Research Institute Inc.

Miyuki Sato, Japan Economic Research Institute Inc.

2.2 Duration of Evaluation Study

Duration of the Study: August 2015 – October 2016

Duration of the Field Study: November 23 – December 5, 2016 and February 22 – 27, 2016

2.3 Constraints during the Evaluation Study

With regard to the operation and effect indicators set in 2013, baseline and target figures of "Production Volume of Major Crops" were found to be incorrect using an unclear calculating method[4]. Moreover, data collection was made by following the same approach as the baseline survey but some of the data were not available because the data was not updated after the completion of the project. As a result, it was difficult to compare the target figures and baseline figures with actual figures, which meant that there was limited scope for quantitative evaluation of effectiveness. As for Northern and Eastern Provinces, no indicator was set for the evaluation because most of the data in these provinces were totally or partially lost during the civil war. Accordingly, North East Component (hereinafter referred as "NE Component") had no choice but to evaluate the "Effectiveness" of the project qualitatively rather than quantitatively.

3. Results of the Evaluation (Overall Rating: B[5])

3.1 Relevance (Rating:③[6])

3.1.1 Relevance to the Development Plan of Sri Lanka

3.1.1.1 Policy on Poverty Reduction

At the time of appraisal, "Connecting to Growth: Sri Lanka's Poverty-Reduction Strategy (Poverty-Reduction Strategy Paper/PRSP, final draft was released in June 2002)", a development strategy of the GOSL, cited "revitalizing rural development" and "rural poverty reduction" as core issues to resolve. This project involved rehabilitating irrigation systems and conducting Income Generation Activities which could help develop plantations and manage water for poverty reduction in line with the PRSP.

At the time of ex-post evaluation, according to the Economic Policy Statement (2016) made by the Prime Minister on November 5, 2015 (hereinafter referred to as "Economic Policy Statement 2016"), 43% of the population lived at about 2 US Dollars per day, with low living standards. Therefore, GOSL focuses on increasing household income by generating job opportunities, which creates a wide and strong middle class in the country.

3.1.1.2 Agricultural Policy

At the time of appraisal, "The National Agriculture, Food and Nutrition Strategy (1984)" formulated by GOSL referred to the enhancement of export products, increasing income and expanding job opportunities in the agricultural sector as some of the highlighted goals. These highlights are consistent with goal of this project which is to boost a farmer's income. Also, according to the Government's mid- and long-term vision, "Regaining Sri Lanka:

[4] The total amount of targeted agriculture products far exceeded the total amount of whole agriculture products in Sri Lanka.

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

[6] ③: High, ②: Fair, ①: Low

Vision and Strategy of Accelerated Development" approved by the Cabinet in December 2002, aimed at improving efficiency in production of crops and processing competitive export products so as to compete more effectively in both domestic and overseas markets. This project which was designed to increase productivity and income for farmers by rehabilitating irrigation systems and a series of Income Generation Activities matches the vision of GOSL.

At the time of ex-post evaluation, agriculture remained one of the key sectors and agricultural policy is regarded as key in this country. "National Agricultural Policy", compiled and drafted by the present government in July 2015, set its vision of this policy as "to build a nation with the agricultural sector" by means of producing high-quality seeds and saplings, promoting side businesses (running animal husbandry and inland fisheries as well as farming) and promoting home gardening, etc. These recommended activities are very close to the project activities which were implemented as Income Generation Activities. Talking of the rehabilitation of irrigation systems, the Economic Policy Statement 2016 includes a note of the need to strengthen rural infrastructure facilities such as farm roads and water tanks.

Based on the above, this project is deemed to have been highly consistent with policy on poverty reduction and agricultural policies at the time of both appraisal and ex-post evaluation.

3.1.2 Relevance to the Development Needs of Sri Lanka

At the time of appraisal, 70% and more of the population lived in the rural areas and most of the workforces were in the agricultural sector. The agricultural sector was important from a poverty-reduction perspective. In order to improve agricultural productivity, it was necessary to develop the rural and agricultural sectors in dry and semi-dry zones which occupied almost 70% of the land in Sri Lanka. The target project areas, North-Western Province (Kurunegala and Puttalam Districts), North-Central Province (Anuradhapura District) and Central Province (Matale District), were located in dry and semi-dry zones, suffered from rural development bottlenecks such as water shortages, due to the deteriorated irrigation systems and declining job opportunities. In North East Province (this Province was divided into two provinces (Northern Province and Eastern Province) after the project started) after the ceasefire agreement was reached, an inclusive rural development focusing on rehabilitation of irrigation as a core value for the traditional rural society systems was needed in order to promote resettlement of returnees from the war as part of stable rural development.

At the time of ex-post evaluation, the Economic Policy Statement 2016 pointed out that production of the Northern Province only comprised around 4% of GDP although more than

five years passed after the end of civil war. Given the considerable disparity between economic development in Colombo and its surrounding areas and the rest of the country, GOSL confirms needs to focus specifically on Northern, Eastern and North-Central Provinces when promoting economic development.

The poverty headcount index (poverty rate), which is proportion of population living below the official national poverty line[7], is shown in Table 1. The poverty rate in Sri Lanka in 2012/2013 declined to 6.7% from 22.7% in 2002/2003. As for the poverty rate in rural areas, the rate declined to 7.6% in 2012/2013 from 24.7% in 2002/2003. However, about 43% of people in Sri Lanka still live on around 2 US Dollars per day, with low living standards

Table 1: Agricultural Data in Sri Lanka

Items	At the time of Appraisal (Year 2002/2003)	Ex-Post Evaluation (Year 2012/2013)
Agriculture Sector's Share in GDP	15.1% (187.1 billion Rupees.)	10.1% (353.8 billion Rupees.)
% of agricultural workers in the labor force	34.5%* (About 2.25 million people)	28.5% (About 2.4 million people)
Poverty Headcount Index (Sri Lanka)	22.7%*	6.7%
(Urban)	7.9%*	2.1%
(Rural)	24.7%*	7.6%

Source: Department of Census and Statistics of Sri Lanka

* Northern and Eastern Provinces are excluded from the data in 2002/2003. (Both are included in 2012/2013.)

According to an interview with the Irrigation Management Division (hereinafter referred to as "IMD") of Ministry of Irrigation and Water Resources Management (hereinafter referred to as "Ministry of Irrigation"), the target sites of this project covers 108 irrigation schemes (Major, Medium and Minor Irrigation Schemes + 10 pilot schemes in Northern and Eastern Provinces). Since there are around 5,500 Minor Irrigation Schemes in Kurunegala and Anuradhapura Components (hereinafter referred to as "KA Component"), covering Kurunegala, Anuradhapura, Puttalam and Matale Districts, high demand for rehabilitation still exists. While 10 irrigation schemes were selected as the pilot schemes under the NE Component, the demand for rehabilitation of the rest of the schemes also remains high.

3.1.3 Relevance to Japan's ODA Policy

According to the "ODA Country Data Book 2002" by the Ministry of Foreign Affairs of Japan, ODA policy for Sri Lanka advocated continuous support to develop agriculture and

[7] The official national poverty line was set at 1,423 Rupees per month in 2002. In 2012/2013, the poverty line was set at 3,624 Rupees. The poverty line in 2012/2013 is equivalent to about 1.5 US Dollars per day.

fisheries and to reduce poverty in the context of reconstruction in Northern and Eastern areas in line with a vision of medium- to long-term development. At the time of appraisal, JICA's ODA policy in Sri Lanka, "Country Assistance Policy for Sri Lanka (ODA Loan: November 2002)," raised prioritized areas as economic infrastructure development, foster industries, support for poor people, support for Northern and Eastern areas and this project was particularly consistent with "support for poor people" and "support for Northern and Eastern areas" of the Policy. The Policy mentioned that 85% of poor lived in rural areas and 25% of people in Sri Lanka lived on 14 US Dollars per month (1995/96 basis), which was below the official poverty line (excluding Northern and Eastern areas due to a lack of data). Accordingly, supporting the rural community and agricultural sector by rehabilitating irrigation systems was listed as measures for poverty reduction in the Policy. Also, the Policy proposed development of irrigation systems as part of a long-term support for Northern and Eastern areas. In line with the Policy advocating support for agricultural sector as part of poverty reduction, this project was expected to expand farm land, increase agricultural productivity and farmers' income through rehabilitating irrigation systems.

Accordingly, the relevance to Japan's ODA policy at the time of appraisal is deemed to have been high.

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

3.2 Efficiency (Rating:②)

This project comprises two components: the KA Component, which includes North-Western Province (Kurunegala and Puttalam Districts), North-Central Province (Anuradhapura District) and Central Province (Malate District) and the NE Component, which includes Northern Province (Vavunya, Mannar, Mullative and Kilinochchi Districts) and Eastern Province (Ampara, Batticaloa and Trincomalee Districts). Each Component also has an Executing Agency so that each Component virtually functioned as an independent project[8].

3.2.1 Project Outputs

This project encompasses five categories: 1) Civil Works, Procurement and Supporting Facilities (KA Component); 2) Soft Component (KA Component); 3) Consulting Services (KA Component); 4) North East Component; and 5) Others (KA and NE Components). There

[8] The Ministry of Irrigation was previously the only Executing Agency to handle all targeted areas when the project started. However, with the regime change in 2004, the new Government divided the project into two components (KA and NE components) and appointed the Ministry of Relief, Rehabilitation and Reconciliation (hereinafter referred to as MRRR, later changed as Ministry of Economic Development, now it was dismantled) as Executing Agency of the targeted areas in the former North East Province (Northern and Eastern Provinces at present).

are many activities other than rehabilitating irrigation systems; activities to enhance income such as farmer's training and microcredits etc. The activities in the NE Component were separate from those of the KA Component, because the status of NE Component was "pilot program", and the Executing Agency was the Ministry of Economic Development, unlike that of the KA Component.

The project was implemented as planned. The major project activities are shown in Table 2.

Table 2: Major Project Activities

At the time of Appraisal		Actual
1) Civil Works, Procurement and Supporting Facilities (KA Component: North-Western, North-Central, and Central Provinces)		
Rehabilitation of 8 Major Irrigation Schemes	Civil Works	Rehabilitation of 9 Major Irrigation Schemes (8 schemes + Abhayawewa scheme, Anuradhapura) + Akathimurippu Irrigation Scheme in Northern Province*
Rehabilitation of 12 Medium Irrigation Schemes		Rehabilitation of 9 Medium Irrigation Schemes
Rehabilitation of 80 Minor Irrigation Schemes		Rehabilitation of 80 Minor Irrigation Schemes
Farm road improvements		Farm road improvements
Construction of 27 Farmer Centers	Construction and Rehabilitation of Supporting Facilities	Construction of 1 Farmer Center
Upgrading Seed Farm in Galgamuwa, North-Western Province		Construction of a new water supply scheme (water distribution system) at Magadama Seed Farm in Galgamuwa, North-Western Province
Upgrading Integrated Farmer Training Center (hereinafter referred to as "IFTC") in Nikaweratiya, North-Western Province		Rehabilitation of the IFTC (training hall) in Nikaweratiya, North-Western Province
Upgrading of one Aqua-culture Extension Center		Changed to the following rehabilitation and construction: 1) Construction of two poultry sheds in Livestock Development Farm 2) Renovation of the office building at Department of Agriculture (hereinafter referred to as "DOA") in Anuradhapura 3) Construction of an auditorium for 60 persons at Provincial DOA, North-Central Province
Renovation of 10 Agrarian Development Centers		Rehabilitation of five facilities of Department of Agrarian Development (hereinafter referred to as "DAD"): training centers, conference halls of Agrarian Service Center in each area
Equipment necessary for implementing civil works and training sessions such as vehicles, training equipment, computers, etc.	Procure-ment	Vehicles for consultants, Executing Agency and PMU (including motorcycles and trucks) and office equipment
2) Soft Components (Awareness and Training) (KA Component: North-Western, North-Central, and Central Provinces)		
Income Generation Activities		Income Generation Activities: Provided training programs based on "Agriculture + other business (including development of minor entrepreneurship)" – livestock development, inland fisheries, manufacturing etc.
Awareness Training: To initiate a sense of ownership among government officers, Farmers'		Awareness Training: Conducted following activities as "Social Mobilization"

At the time of Appraisal	Actual
Organization (FO) leaders and farmers	- Awareness Program: Targeted government officials (Project Implementing Agencies, hereinafter referred to as "PIA": IMD, Irrigation Division (hereinafter referred to as "ID") and DAD) and farmers. The purpose of the program was to create awareness about the project and initiate a sense of ownership among those targeted. The program trainers for government officials were consultants. And the trainers for farmers of this program were the officials of PIAs: (30 officials from IMD, ID and DAD) who took training of trainers (hereinafter referred to as "TOT") .TOT was conducted by consultants. - CAP Workshop (CAP = Community Action Planning): Workshop for FO members. Farmers in FO attended the Workshop to identify their basic needs and discuss what they would like to do. Each FO clarified their needs and the kind of activities they had needed.
Organizational strengthening of FOs: Water management, agricultural extension, marketing etc.	Organizational strengthening of FOs: Conducted training sessions and workshops in terms of fund and contract management of FO, technical improvement of maintenance works for irrigation schemes etc.
	Improvement of agricultural extension services and technical improvement activities: increasing productivities of rice, diversifying agricultural products other than rice: maize, onions etc. Promoted commercial crops such as banana, mango, guava etc.
3) Consulting Services (KA Component: North-Western, North-Central and Central Provinces)	
Detailed design, reviewing bidding documents, assisting in bid evaluation process, construction supervision, designing detailed Microcredit schemes, supporting soft components such as marketing support etc.	- Planned and supervised rehabilitation works for sub-system in Major and Medium Irrigation Schemes and all works in Minor Irrigation Schemes - Prepared detailed design, bidding documents and assisted in bid evaluation process for sub-system in Major and Medium Irrigation Schemes and all works in Minor Irrigation Schemes - Supported the Social Mobilization Program (CAP Workshop and awareness programs), Income Generation Activities including Microcredit program and related coordination - Assisted the implementation of overseas training programs for government officers
4) North East Component (Northern and Eastern Provinces)	
Rehabilitation of 10 pilot schemes in Northern and Eastern Provinces	Rehabilitation of 9 pilot schemes in Northern and Eastern Provinces*
Procurement for Northern and Eastern Provinces: Vehicles and equipment (for maintenance and office use)	Procurement for Northern and Eastern Provinces: Purchased equipment for maintenance and office use, vehicles and motorcycles
Soft Component for Northern and Eastern Provinces: Income Generation Activities	Soft Component for the NE Component: Social Mobilization (CAP Workshop), Income Generation

At the time of Appraisal	Actual
(livelihood support assistance), awareness program, strengthening FO capacity, agricultural extension and marketing etc.	Activities, strengthening of FOs, technical improvement of agricultural works (workshop for crop cultivation other than paddies, supplying seeds etc.)
Consulting Services for Northern and Eastern Provinces	Consulting Services for NE Component: - Planned and supervised rehabilitation works for irrigation systems - Supported the preparation and implementation of bidding (prepared detailed design, bidding documents etc.) - Social Mobilization Program (CAP Workshop, awareness program), Income Generation Activities including Microcredit, related coordination
5) Others (KA and NE Component)	
Establishment of the "NGO Fund ": Grant support from GOSL for Non-Governmental Organizations (hereinafter referred to as "NGOs") to support synergetic works in the project area. The total amount would be 10 million Japanese Yen.	Not implemented: In the original plan, NGO Fund was established through funding source for Consulting Services. However, it was not established.
Microcredit for Farmers: consultants would design in detail and implement as part of Income Generation Activities during the project	Microcredit for Farmers: consultants of this project prepared a detailed plan, which was then implemented from 2008. Funds were lent to farmers, who would start up a business besides farming. The total credit amount was 82 million Rupees from the KA Component and 22 million Rupees for the NE Component. The consultants of the project supported an implementation and monitoring for the Rural Development Bank (hereinafter referred to as "RDB") in the KA Component and Rural Development Officer (hereinafter referred to as "RDO") in the NE Component

Source: Information from JICA and Executing Agency

*See (5) Transferring of the Akathimurippu Irrigation Scheme from NE Component to KA Component

The following changes were made after the commencement of the project from the appraisal:

(1) Partial change in target irrigation schemes

The Abhayawewa Scheme in Anuradhapura District was added as one of the targeted Major Irrigation Schemes for rehabilitation following a strong request from the respective beneficiaries. At the same time, the Akathimurippu Irrigation Scheme in Mannar District, Northern Province, was transferred to the KA Component (see (5) in detail). As for Medium Irrigation Schemes, three of the original 12 target schemes were cancelled due to land tenure issues and duplication of target under the ADB funded infrastructure development project.

(2) Partial change in construction and rehabilitation of supporting facilities

Following a discussion with the Executing Agency (Ministry of Irrigation) and JICA, priority was given to constructing and rehabilitating of facilities necessary to improve crop production and Income Generation Activities. Accordingly, the target facilities to be constructed or rehabilitated were partially changed from those at the time of appraisal. For example, poultry sheds at the Livestock Development Farm were constructed instead of upgrading the Aqua-culture Extension Center. According to interviews with the former Project Management Unit[9] (hereinafter referred to as "PMU") members and others involved in the project, the number of Farmer Centers constructed had declined. According to PMU, as FOs' requests for Farmer Centers went beyond budgetary limit, PMU introduced condition for application which require FOs to cover half of the total construction cost and consequently, the number of FOs applying for construction declined.

(3) Changing demarcation of scope between the Government and consultants on rehabilitating irrigation schemes

At the time of appraisal, the Consulting Services is in charge of designing and supervising rehabilitation for all irrigation systems in both KA and NE Components. However, after the regime change, the new Government expressed their intentions to handle the project by internally sourcing people (government officials) instead of "external people" such as consultants etc. Following several discussions between JICA and GOSL, they agreed to design and supervise the "main system (water tank – main canals – branch canals)" of the Major and Medium Irrigation Scheme by the Government and the rest, "sub-system (distribution canals – field canals)" of Major and Medium Irrigation Schemes, all Minor Irrigation Schemes in the KA Component and 10 pilot schemes in the NE Component, by the Consulting Services[10].

[9] PMU is a project management team which oversees preparation of the work plan, coordination of the agencies concerned, budget management, project monitoring and progress control. In this project, a PMU director from IMD and a deputy director from ID were appointed.

[10] Part of sub system rehabilitation was undertaken by the ID to reduce heavy workload of the consultants involved with the rehabilitation through FOs.

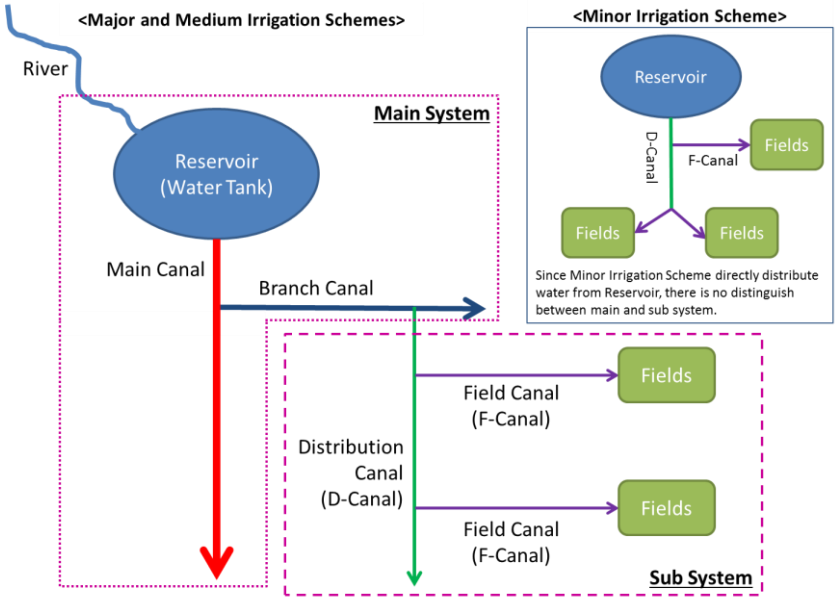


Figure 1: Irrigation Scheme (created according to interviews)

(4) Cancellation of NGO Fund

At the time of appraisal, a Community Action Planning Workshop (hereinafter referred to as "CAP Workshop") and awareness programs were supposed to be conducted by NGOs and these activities would be funded through NGO Fund. However, at the time of regime change in 2004, the new Government insisted on "not relying on external manpower" such as NGOs and the decision was made not to establish the NGO Fund. Instead, implementation of awareness programs such as CAP workshops was taken over by the Consulting Services.

(5) Transferring of Akathimurippu Irrigation Scheme from NE Component to KA Component

The Akathimurippu Irrigation Scheme, located in Mannar District, Northern Province, was one of the 10 pilot schemes in the NE Component. However, because of the opinion of the Ministry of Irrigation that all Major Irrigation Schemes should have been managed in the KA Component, and the fact of the delay in progress of NE Component, the Akathimurippu Irrigation Scheme was transferred to KA Component.

The purpose of above changes (1) – (5) was to complete the project efficiently within a limited timeframe. Except for some changes in target rehabilitation and construction works and the implementation structure, there was no major change in output overall. Moreover, although the NGO Fund was not implemented as mentioned in (4), consultants conducted activities which NGOs had been expected to do smoothly.

3.2.2 Project Inputs

3.2.2.1 Project Cost

The total project cost was planned to be 8,013 million yen (3,628 million yen for foreign currency portion and 4,385 yen for local currency portion), of which the ODA loan amount was 6,010 million yen.

Table 3 compares the planned and actual costs.

Table 3: Project Cost for Comparison: Planned and Actual

(Unit: million yen)

Description	Plan (At the time of appraisal)		Reallocation (2011)		Actual (2013)	
	ODA Loan	GOSL portion	ODA Loan	GOSL Portion	ODA Loan	GOSL Portion
Civil Works, Procurement, Training, and Other Related Facilities	3,294	0	3,149	0	3,145	3
North East Component	1,057	0	1,404	0	1,405	0
Consulting Services	927	0	951	0	939	0
Interest during Construction	615	0	506	0	489	0
Contingencies	117	252	0	252	0	136
Administration Cost	0	546	0	546	0	1,024
Tax	0	1,205	0	1,205	0	
Sub Total	6,010	2,003	6,010	2,003	5,978	1,163
Grand Total	8,013		8,013		7,141	

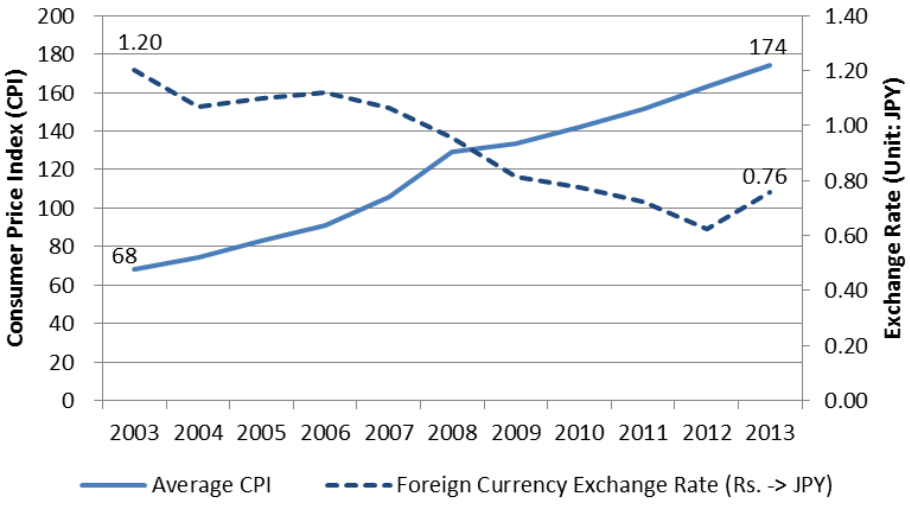
Source: Information provided by Executing Agency and JICA

*1: 1 US Dollar=124 yen =,1 Rupee =1.29 yen (Information from JICA)

*2: Actual (2013): Foreign Currency: 1 US Dollar=97 yen, 1 Rupee=0.85 yen (From IMF International Financial Statistics Yearbook 2015, period average between 2006 – 2013)

The cost of the project was within the plan (89% of the plan). There was a reallocation of funds for the "North East Component" and "Consulting Services" in May 2011 to cover additional manpower (M/M) in Consulting Services and the construction cost for rehabilitation work for irrigation schemes in NE Component. The actual cost was within budget. GOSL spent three million yen to cover the actual cost under the category of "Civil works, Procurement, Training and Other Related Facilities" for vehicles and some preparatory study for civil works, according to a breakdown of expenditure dated June 30, 2013 obtained from IMD. The actual administration cost of GOSL is lower than the plan. According to PMU, one of the factors was that PMU tried to save costs to retain funds for follow-up activities after the project completion.

From 2003 to 2013, the Consumer Price Index[11] (hereinafter referred to as "CPI") increased from 68 to 174, rising about 2.6 times over a decade (see Figure 2). Since necessary civil works and equipment procurement were conducted mostly through Local Competitive Bidding, the equipment and services were thought to be affected by price escalation. However, besides the price competition through the bidding, about 37% yen appreciation during the project (1 Rupee = 1.20 yen in 2003 → 0.76 yen in 2013) made the actual expenditure of the project within the plan.



Source: IMF World Economic Outlook Database, April 2016

Note: The average Consumer Price between January 2006 and December 2007 is set at 100.

Figure 2: Changes in Average CPI and Exchange Rate in Sri Lanka (2003 – 2013)

3.2.2.2 Project Period

The planned and actual project periods are shown in Table 4.

Table 4: Comparison Table of Planned and Actual Project Periods

	Plan	Actual	Comparison
Total Period	March 2003 – March 2010 (85 months)	March 2003 – May 2013 (123 months)	145% (exceeded the plan)

The total project period was 123 months (145% - exceeding the planning period). This was due to the delay in commencing the project.

This delay was attributable to the policy change by the new Government following the

[11] The average consumer price between January 2006 and December 2007 is set at 100.

election in 2004. The new Government stopped contract negotiation for Consulting Services. Following the regime change, the Ministry of Irrigation expressed its intention to appoint "internal human resources (government officials)" rather than "external resources" (people outside the government) to implement the project. Following several discussions between JICA and GOSL, both sides agreed to resume contract negotiation and concluded the contract for Consulting Services in May 2006, two and half years after the interruption. The substantive project period, from the commencement of Consulting Services to the project completion, was 85 months from May 2006 to May 2013. Accordingly, this project was virtually implemented as planned.

Table 5: Chronological Summary of Loan Agreement and Consulting Services

Year, Month	Description
March 2003	Signed L/A
August 2003	Request for proposal on Consulting Services
December 2003	Evaluation of proposals for Consulting Services
January 2004	Interruption on contract negotiation of Consulting Services
May 2006	Conclusion of the contract on Consulting Services
November 2009	Amendment of the contract on Consulting Services (No. 1)
May 2011	2 year extension of L/A period Reallocation of the Loan amount
November 2011	Amendment of the contract on Consulting Services (No. 2)
December 2011	Completion of the KA Component Consulting Services
October 2012	Completion of the NE Component Consulting Services
May 2013	Project completion*

Source: Information from JICA and interviews with the people concerned

*The "completion" of this project is defined as follows: All the construction works were completed, consultants completed the evaluation report of this project, and all the payments concerned were made.

Following the commencement of the project, the progress of NE Component was delayed due to the civil war. During wartime, construction at the pilot schemes was implemented by contractors, not by farmers because most of the farmers had evacuated and it was impossible to perform the irrigation construction work by farmers themselves. However, due to security issues, sufficient workers for the rehabilitation of irrigation systems could not be mobilized in NE Component. Furthermore, some project related members including workers and guards became victims of landmines[12] buried during wartime. Therefore, there were some constraints on efficient operation.

Given the above and the difficulty in completing the construction works within the planned project period, the Japanese Government and GOSL amended the date of final disbursement from May 2011 to May 2013, a two-year extension. At the same time, the

[12] The Embassy of Japan in Sri Lanka requested that GOSL not commence construction until "the certificate of landmine removal" had been officially issued and GOSL accepted the request.

Consulting Services contract was amended twice to cope with extended project period and increased M/M due to the additional tasks.

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

Due to unclear calculation sources of Economic Rate of Return (EIRR) and the non-availability of data for benefit analysis, recalculation was not performed.

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

3.3 Effectiveness[13] (Rating:③)

3.3.1 Quantitative Effects (Operation and Effect Indicators)

At the time of appraisal, no operational and effect indicators were set because it was considered difficult to calculate overall project effect and it was decided that the indicators would be set based on the Baseline Survey to be conducted after signing of the Loan Agreement. However, the project proceeded without setting indicators even after the Baseline Survey on KA Component. The indicators were finally set right before the project completion. The indicators were set based on the information from Baseline Survey results (2008) and the minutes of July 2003 but part of calculation basis adopted by the baseline survey and the minutes were unclear and therefore it was difficult to calculate actual value according to original definitions and the calculation basis.

[13] Sub-rating for Effectiveness is to be put with consideration of the impact.

Table 6: Achievement of Operation and Effect Indicators (KA Component)*1

Indicators (unit)		Baseline (Year)	Target	Actual		Notes
				May 2013	After 2014 *2	
		(Please see Notes)	After the project completion	At the time of project completion	After the project completion	
Operation Indicator	Irrigated Area (ha)	14,593 (1999)	Not set	16,472	17,906	Baseline: based on the Baseline survey conducted in 2008
	Production Volume of Major Crops (ton/ha)	3.63 (2003)	Not set	4.52	4.36	Baseline: Agricultural Data in 2003
	Number of FOs self-managed in Area	120 out of 215 FOs (2003)	215 out of 215 FOs	184 out of 185	--	Baseline and Target: agreed in July 2003
Effect Indicator	Average Annual Household Income in the Project Area (Rs.)	96,800 (2003)	146,600	140,000	--	
	Number of FOs Involved in Income Generation Activities in the Project Area	0 out of 215 (2003)	215 out of 215	185 out of 185	--	

Source: Documents provided by JICA and the Executing Agency

*1: Excluding the Akathimurippu Irrigation Scheme (Mannar District, Northern Province) which was transferred from the NE Component to the KA Component.

*2: Year of actual figures of the KA Component (at the time of ex-post evaluation): Irrigated Area (2016), Production Volume of Major Crops (2014)

According to Table 6, actual figures of both operation and effect indicators almost achieved or exceeded the targets, meaning the objective of the project is deemed to be mostly achieved. Although no target for irrigated areas and production volume for major crops were set, actual figures of both indicators exceeded the baseline and continuous effect of the project is observed after the project completion.

As for the indicators, supplementary information is described as follows:

(1) Production Volume of Major Crops

When setting the indicator, the baseline was set as 55.05 million tons according to the Baseline Survey Report, which was created in December 2008. There were 7 target crops: paddy, onion, chili, kurakkan, maze, gingelly and soy. At the time of the field survey for ex-post evaluation, some people concerned in Sri Lanka mentioned that the baseline (55.05 million ton) exceeded the total volume for all kinds of crops in Sri Lanka and they advised resetting the baseline with corrected data. According to "AgStat", the agricultural statistics published in 2014, the total volume of crops in Sri Lanka in 2013 was 6.68 million tons: paddy 4.62 million tons; vegetables: 1.09 million tons; fruits: 0.78 million

tons; OFC (other major crops such as maze, onion, soy, gingelly etc.): 0.39 tons, which showed only 10% of the original baseline. Following advice, the external evaluators reset the baseline as 55.05 tons/ha based on the Baseline Survey created in December 2008. However, the value still exceeds the level of data obtained from the Hector Kobbekaduwa Agrarian Research and Training Institute (HARTI, as an abbreviation), a governmental organization which collects Agricultural Data to create government statistics. The average volume per hectare (ha.) of targeted crops in 2003 was 3.63 tons, which concluded that the Baseline Survey result was 10 times higher than the data from the Agrarian Development Institute. Therefore, the external evaluators concluded to reset again.

The external evaluators adopted the production volume data and irrigation area data from the Agrarian Development Institute and calculated the average production volume per hectare in Kurunegala, Anuradhapura, Puttalam and Matale in 2003 as 3.63 tons/ha and set as alternative baseline.

(2) Number of FOs Self-managed in the Project Area and Involved in Income generation activities (total number of FOs and actual figures in the project area)

The total number of FOs in the project area at present has declined to 185 from 215 at the time of setting baseline and target. According to interviews with former PMU members, redefining of FOs in accordance with the policy change of GOSL after setting baseline and target figures and the fact that the number of FOs outside the project target was counted at the time of data collection in 2002, were the reason for this change. As for the actual number of FOs, IMD explained that they had not counted the number of FOs involved in the Income Generation Activities because these were individual activities, not involving FO participation. Also, IMD did not count the number of self-managed FOs either. Therefore, the actual figures related to relevant indicators could not be obtained.

(3) Average Annual Household Income

At the time of project completion in 2013, the average household income was recorded by PMU but no subsequent record was maintained. According to IMD, they have no chronological data of the average annual household income of farmers in the project area after 2014. Therefore, the external evaluators decided to adopt the average household income by District from the latest household income survey published by the Department of Census and Statistics of Sri Lanka. However, the latest data is 2012/2013, which is almost the same period as of project completion. According to a telephone interview with the Department of Census and Statistics of Sri Lanka, they are currently conducting a survey, the result of which will be released in 2017. Accordingly, the present referable data is 2012/2013, since actual data for 2014 onwards could not be obtained.

The baseline and target figures of operation and effect indicators were set for the KA Component, not including the NE Component implemented as a pilot project. Although the Baseline Survey in North and East areas was conducted in November 2009 the data required for indicators such as irrigated areas etc. could not be collected right after the civil war. GOSL was also unable to collect data in Northern and Eastern Provinces to create statistics.

For reference, Table 7 shows the irrigated area, the production volume of major crops and average annual household income in the project area in the NE Component. The baseline and target of the indicators of the NE Component was not set for the reasons mentioned above, but it is deemed that the project was beneficial to some extent according to the actual figures.

Table 7: Irrigated Areas, Production Volume of Major Crops, Average Annual Household Income of the NE Component (for reference)

Indicator (unit)	Baseline	Target (After the project completion)	Actual (After the project completion)
Irrigated Area (ha)	--	6,595 *3	8,901 (2016) *1
Production Volume of Major Crops (ton/ha)	2.35 *4	--	4.19 (2014) *5
Average Annual Household Income in the Project Area *2 (Rupee)	75,031 *4	--	80,472 (2012/2013)

Source: Information provided by JICA and Executing Agency, Department of Census and Statistics of Sri Lanka

*1: 10 Pilot schemes including the Akathimurippu Irrigation Scheme (Mannar District) which was transferred to the KA Component from the NE Component

*2: The average monthly household income (agricultural activities + non-agricultural activities in 7 Districts in Northern and Eastern Provinces (Mannar, Vavunia, Mullative, Kilinochchi, Batticaloa, Ampara and Trincomalee) multiplied by 12 (months)

*3: Target set in 2002 for project completion

*4: Calculated the data based on the Baseline Survey of the NE Component conducted in 2009. The available data from the survey are the following three crops: paddy; maze; and gingelly. Also, some data regarding the production volume and average income in Northern Province was missing due to the civil war.

*5: Total production volume of paddy, onion, chili, kurakkan, maze, gingelly and soy in 2003

3.3.2 Qualitative Effects

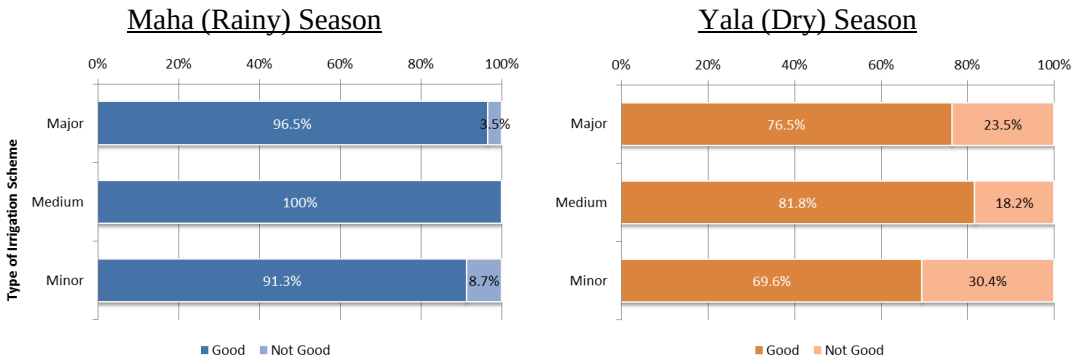
3.3.2.1 Improvement of Agricultural Production and Sustainable Productivity

Through interviews with FOs and a Beneficiary Survey[14], it was confirmed that this

[14] To confirm the qualitative effects and impact, a Beneficiary Survey was conducted for both the KA and NE Components in December 2015. The survey was conducted by interview to FO members whom FO leaders introduced. The detail of the survey conditions are as follows:
- Target Areas: Kurunegala and Anuradhapura(KA Component) and Trincomalee and Kilinochchi (NE Component)
- Interviewee: 190 FO members (Male: 169, Female: 21, KA Component: 121, NE Component: 69)
- Age groups: 20 – 29: 3 people, 30 – 39: 37 people, 40 – 49: 43 people, 50 – 59: 58 people, 60 and up: 59 people (KA + NE)

project helped technically improve irrigation maintenance and farming skills and enhance the capacity of self-sustainable organizational operations, even two years after the project completion. At an early stage of the project, consultants of this project visited FO leaders and members one by one on a daily basis to discuss the importance and purpose of the project, participated in the events in villages, built long-term mutual trust with farmers. As a result, farmers who effectively understood the necessity of the project acquired knowledge and skills through CAP Workshop and awareness programs.

After the active rehabilitation works and maintenance of irrigation schemes, the Beneficiary Survey shows that about 90% of 190 respondents in maha (rainy) season and 70% of those in yala (dry) season said that the water condition had improved.



Source: Beneficiary Survey

Figure 3: Water Supply Condition at the Time of Ex-Post Evaluation

Also, according to interviews conducted during the field survey, many FOs successfully increased their production volume due to expanded farmlands enabled by the improved water supply condition. The same result came from the Beneficiary Survey.

Table 8: Expansion of farmlands

(Unit: acre)

Schemes	Maha (Rainy) Season			Yala (Dry) Season		
	Before	After	Expansion (%)	Before	After	Expansion (%)
Major	382.25	443.25	115.96%	295.75	400.75	135.50%
Medium	84.5	101.5	120.12%	69.0	84.5	122.46%
Minor	101.5	113.75	112.07%	63.5	86.25	135.83%

Source: Beneficiary Survey
*1 The figure is the sum of farmland of farmers (respondents in the Beneficiary Survey). "Before" means "Before the rehabilitation works" and "After" means "after the rehabilitation works" by respective FOs

Table 9: Paddy Production Volume

(Unit: kg)

Schemes	Maha (Rainy) Season			Yala (Dry) Season		
	Before	After	Expansion (%)	Before	After	Expansion (%)
Major	361,450	410,802	113.7%	295,050	341,800	115.8%
Medium	136,800	190,825	139.5%	114,400	163,725	143.1%
Minor	165,950	192,100	115.8%	97,500	147,380	151.2%

Source: Beneficiary Survey
*1 The figure is the sum of farmland of farmers (respondents in the Beneficiary Survey). "Before" means "Before the rehabilitation works" and "After" means "after the rehabilitation works" by respective FOs

- District: Kurunegala: 3FOs (73 people), Anuradhapura: 2FOs (48 people), Trincomalee: 2FOs (44 people), Kilinochchi: 1FO (25 people)
- Questions: Maintenance conditions of irrigation systems, Water supply condition and paddy production after the rehabilitation, Inquiry about participation in Income Generation Activities and effect, knowledge-sharing among farmers after the project to brush up their skills

Particularly in the yala (dry) season, the rate of expansion of farmlands and paddy production volume exceeded those in maha (rainy) season. Many of the farmers who were unable to cultivate their lands in yala season, can now make paddies twice a year, thanks to the Project.

3.3.2.2 Capacity Enhancement of Executing Agencies and Extension of Farming Skills

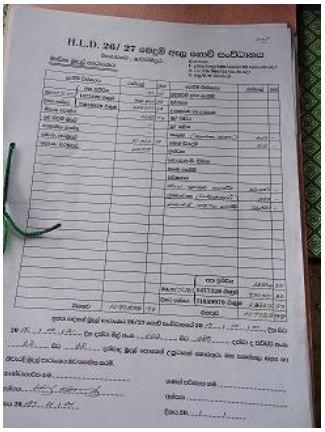
According to interviews during the field survey, the Ministry of Irrigation (both IMD and ID) said that many staff members realized the value of the trainer's training during the project. As for the extension of farming skills, FOs and the Provincial Department of Agriculture said that skills, including boosting cultivation of paddy and other crops and Income Generation Activities such as animal husbandry were still useful for farmers and well utilized. Also, some of the FO members who joined Income Generation Activities stated in the interviews that their income had increased by cultivating and selling mangos and coconuts.

3.3.2.3 Promoting Participatory Development

Among 7 FOs visited by external evaluators during the field study, five of the 7 FOs repaired the canals by themselves during and after the project. One FO leader in Nachchaduwa, in the outskirts of Anuradhapura District, said that they repaired the canal on their own because the construction quality was far better than that of outsourcing contractor. Although the other 2 FOs did not repair works by themselves, they hired contractors at their own expense. All the FOs conduct canal patrol and maintenance work (grass cutting along canals etc.) periodically once or twice a season (three or four times per year).

The interviews revealed that many FOs are managing their organizations by themselves through participating in training sessions provided by the project, such as rehabilitation work for irrigation, farming skills, financial management and legal management (dealing with unauthorized use of irrigation) for FO operation.

Also, there was another effect observed in this project that the maximum contract amount approved by the government for irrigation canal rehabilitation doubled from 2 million Rupees to 4 million Rupees, as the improvements in rehabilitation capacities of irrigation facilities by FOs were recognized by the government.



Accounting book for fund management of the FO in Nachchaduwa

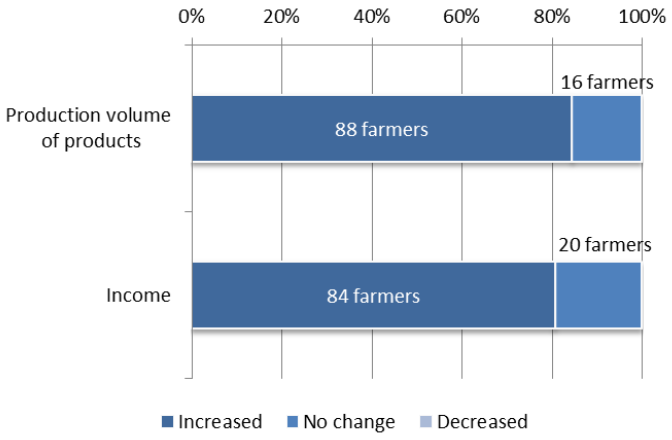
3.4 Impacts

3.4.1 Intended Impacts

The expected project impacts were “increasing income level and generating job opportunities for farmers”, “revitalizing the rural economy” and “recovery from the civil war for Northern and Eastern Provinces”. Since there was no chance to obtain data specifically for farmers in the project area, impacts were confirmed by the Provincial and District data published by the Department of Census and Statistics of Sri Lanka.

3.4.1.1 Increasing Income Level and Creating Job Opportunities for Farmers

According to the Beneficiary Survey of farmers in targeted areas, 104 farmers who participated in Income Generation Activities answered that 85% of farmers (88 farmers) had increased their production volume and 81% (84 farmers) answered that their income level had improved. This shows that many of the farmers themselves realized the positive project impact.



Source: Beneficiary Survey

Figure 4: Impact from Income Generation Activities

The average monthly household income of each district including the targeted area of the KA Component in 2012/2013 increased 1.6 times on average, up to about twice the level of 2006/2007. Although the scale of this project in each District is small, this project is thought to have helped increase farmer's income.

Table 10: Average Monthly Household Income from Agriculture and Other Activities (KA Component)

(Unit: Rupees)

District (Province)	2006/2007*	2012/2013	Growth Rate (%)
Matale (Central)	5,948	8,929	150%
Kurunegala (North-Western)	8,513	14,098	166%
Puttalam (North-Western)	6,516	12,984	199%
Anuradhapura (North-Central)	7,476	9,376	125%
(Reference) Sri Lanka (national average)	7,677	12,361	161%

Source: Department of Census and Statistics of Sri Lanka

*Total income from Agricultural + Non-Agricultural activities. The data in 2006/2007 was adopted instead of that in 2002/2003 (no data), before the project started.

In the NE Component, the average monthly household income for Northern and Eastern Provinces in 2012/2013 was 4.7 times as high as that in 2002/2003. According to the interviews and the Beneficiary Survey of residents in the NE Component, increases in the number of cropping through rehabilitating irrigation systems and the recovery of farmers' lives through Income Generation Activities after they returned home are considered to have contributed partly to the overall income increases in the northern and eastern areas.

Table 11: Average Monthly Household Income from Agricultural and Other Activities (NE Component)

(Unit: Rupees)

District (Province)	2002/2003*	2012/2013	Growth Rate (%)
Mannar (Northern)	2,181	6,887	316%
Vavunia (Northern)	2,181	8,355	382%
Mullative (Northern)	2,181	9,321	427%
Kilinochchi (Northern)	2,181	3,992	183%
Batticaloa (Eastern)	1,762	3,936	223%
Ampara (Eastern)	1,762	6,064	344%
Trincomalee (Eastern)	1,762	8,384	476%
(Reference)Sri Lanka (national average)	6,491	12,361	190%

Source: Department of Census and Statistics of Sri Lanka

*Data of 2002/2003 in each District are from the average agricultural and non-agricultural income of each of the Northern and Eastern Provinces as relevant data was not available.

The poverty headcount index (poverty rate) in Provinces relevant to KA and NE Components greatly declined with improving income of farmers. Since the targeted areas in

the KA Component could be cultivated even during the yala (dry) season, the cultivation area was expanded and production volume also increased, which meant farmers' income increased. In addition, since some FOs hired workers outside the FO during rehabilitation work for irrigation, this might have helped create job opportunities to some extent.

In the NE Component, the poverty rate of the targeted District also has been declined due to the increase in crop production volume and diversification of agricultural products by restarting agricultural activities. Moreover, having a side business in addition to farming through the project's Income Generation Activities also helped increase farmers' income. Furthermore, farmers who returned to their villages after the civil war might have contributed to a decline in the unemployment rate by restarting agricultural activities.

Table 12: Poverty Headcount Index and Unemployment Rate at the District Level

District (Province)	Poverty Headcount Index (%)		Unemployment Rate (%)	
	2002	2012	2002	2014
Matale (Central)	30	7.8	24.5	5.2
Kurunegala (North-Western)	25	6.5	21.2	4.0
Puttalam (North-Western)	31	5.1	24.5	4.0
Anuradhapura (North-Central)	20	7.6	17.2	3.3
Mannar (Northern)	-- *1	20.1	13.0 *2	2.9
Vavunia (Northern)	2.3 *1	3.4	13.0 *2	3.9
Kilinochchi (Northern)	-- *1	12.7	13.0 *2	7.6
Batticaloa (Eastern)	20.3 *1	19.4	15.9 *2	3.9
Ampara (Eastern)	11.8 *1	5.4	15.9 *2	6.0
Trincomalee (Eastern)	11.7 *1	9.0	15.9 *2	4.3
(Reference) Sri Lanka (national average)	22.7	6.7	8.8 *2	4.3

Source: Department of Census and Statistics of Sri Lanka

*1: Data in 2009/2010 was substituted because it is the oldest public data in Northern and Eastern Provinces (Poverty Indicators 2009/2010). No data for Mannar and Kilinochchi Districts.

*2: Average data of Provinces because there is no data at a District level.

Therefore, this project is deemed to have helped boost income and create job opportunities for farmers.

3.4.1.2 Microcredit Program for Revitalizing the Rural Economy

The microcredit program, a small loan program for farmers, was implemented for both KA and NE Components from 2008, as part of this project. The purpose of this program was to boost and stabilize farmers' income by doing side businesses (those other than paddy cultivation). For this purpose, the borrowers of the loan were supposed to take training sessions of Income Generation Activities. This microcredit program was applicable only to farmers, not to other sectors.

Table 13: Microcredit Program Summary

	KA Component	NE Component
Loan Amount*	138 million Rupees (82 million Rupees from original fund + 56 million Rupees from revolving fund)	33 million Rupees (22 million Rupees from original fund+ 11 million Rupees from revolving fund)
Fund Management	Regional Development Bank (RDB)	Rural Development Officer (RDO)
Tenor and Interest Rate	3 years, 12%	3 years, 12%
Number of End-borrowers*	1,138 farmers	1,257 farmers
Purpose of Use	Farming and side business (e.g. food processing, animal husbandry (procurement of cows), apparel (bag making) etc.)	Farming (paddies and other crops), animal husbandry, inland fisheries trading, small/ home businesses, agro-processing, etc.
Loan Recovery Rate*	95%	40%

Source: Information provided by JICA, interview in Sri Lanka

* The Revolving Fund of the loan amount and the number of end-borrowers in the KA Component are as of 2013 and those in the NE Component are as of 2012. The loan collection rates for both KA and NE Components are as of 2012.

The key difference in achievement between the KA and NE Components was the loan collection rate. The successful loan collection rate of the KA Component is thought attributable to the followings: 1) The target end-borrowers were selected by FO recommendations supported by consultants and were those who took training sessions of Income Generation Activities (the loan was targeted only for "good customers"); 2) A bank (RDB) was involved in this program as a financial intermediary to handle loan funds from lending to monitoring after the lending (checking repayment status, collection etc.); and 3) Consultants assigned a full-time staff member to exclusively support RDB for its monitoring activities. A loan officer of RDB mentioned that many farmers who utilized this program increased their income and repaid smoothly. This program is still active and some farmers have utilized loans again to further expand their business following full repayment. The microcredit program in the KA Components was deemed to be successful and funds were utilized effectively.

In the case of the NE Component, the loan collection rate is lower than that of the KA Component. The background to lower repayment is thought to be as follows: 1) Farmers misunderstood that they did not have to pay back because most of the support from international donor agencies was grant aid during the civil war; 2) Since RDO, which was in charge of credit appraisal and disbursement, was not a financial institution and lacked any experience in handling loans, there was insufficient monitoring after the loan disbursement. For the above reasons, there remain some questions regarding the effectiveness of financial support to increase farmers' income in the NE Component. However, since the microcredit program constituted only a minor portion of the project,

this result does not affect the evaluation of overall effectiveness.

[BOX: Case Study of Microcredit – Producing and Selling Yogurt (Kurunegala District, North-Western Province)]

- Before the project, the farmer's income was only from paddy cultivation but he learned how to make yogurt in the Income Generation Activity of the project. After the training, he started his yogurt business with microcredit support. Now he focuses on his yogurt business because the sales revenue has improved and all paddy cultivation was handed over to his son.
- The farmer utilized microcredit in 2009. He borrowed 200,000 Rupees to build a yogurt stand and purchase equipment for making yogurt. (Loan maturity: 3 years, interest rate: 12%)
- His business thrived and the loan was repaid within the loan period. He borrowed again in 2015 to expand his business.

Yogurt Stand
(built with a support of Microcredit)

Refrigerator for Yogurt-Making
(purchased with a support of Microcredit)

3.4.1.3 Recovery from the Civil War (NE Component)

Recovery from the civil war in Northern and Eastern Provinces was one of the project purposes and this project was thought to have helped resettle farmers affected by the civil war very effectively. To summarize the comments from those in charge of the project, such as the Provincial ID of Northern and Eastern Provinces, FOs and consultants, irrigation systems were totally destroyed during the civil war, however, many farmers could return to their villages earlier than expected and re-started farming right after completion of rehabilitation work for irrigation under this project.

The worst effect of the civil war was the fatalities of many leaders and major FO members, which was very detrimental to the organizational operation of many FOs. Due to this many FOs restarted their activity by reconstructing their FO from scratch through this project. In fact, consultants and other relevant project players explained that they conducted training sessions of FO's organizational management and Income Generation Activities for farmers based on the recognition that the NE Component was to increase self-confidence of

farmers. Consequently, farmers who were passive at the beginning became so proactive to express their opinions to improve activities. Farmers who accepted the interviews and government officials who had experience as CAP Workshop trainers highly evaluated the Consultant Team, who had continually encouraged the farmers and instructed activities during the project.

Since the training sessions were conducted after the civil war, the manuals of the training sessions were not lost during the turmoil of war.

3.4.2 Other Impacts

3.4.2.1 Impacts on the Natural Environment

This project was confirmed not to have conducted any construction or activities which adversely affected the environment, according to interviews and a Beneficiary Survey.

3.4.2.2 Land Acquisition and Resettlement

There was no land acquisition or resettlement to conduct civil works or income-generation activities.

This project was confirmed as highly effective judging from interviews with the Executing Agency and FOs and the Beneficiary Survey. The satisfaction of people (farmers and government officers) involved in the project was very high and it is deemed that the project was highly evaluated by people. The data obtained through this evaluation study showed that the indicators set in the project had mostly been accomplished.

This project has largely achieved its objectives. Therefore, effectiveness and impact of the project are high.

3.5 Sustainability (Rating:②)

3.5.1 Institutional Aspects of Operation and Maintenance

In both KA and NE Components, agencies concerned during the project period still have the organizational structures at present to undertake operation and maintenance (hereinafter referred to as "O&M") activities as necessary. Therefore, there is no particular problem for O&M activities after the project. There is no project-specific organization in either of the Components but IMD, ID and Provincial ID actually keep monitoring and conducting follow-up works.

As for operational structure in the KA Component after the project completion, the former Executing Agency, Ministry of Irrigation, plays a main role continuously. Soft components such as technical training sessions are conducted by IMD (for Major and Medium Irrigation Schemes) and DAD (for Minor Irrigation Scheme). ID (for Major and Medium Irrigation

Schemes) and Provincial ID take the role of maintaining and repairing the irrigation systems as per mentioned in Table 14.

Table 14: O&M structure of Irrigation (KA Components)

Types of Irrigation Schemes	Main System	Sub System	
	Water tank – Main Canal - Branch Canals	Distribution Canals	Field Canals
Major	ID	ID	FO *2 & 3
Medium	ID		
Minor *1	Provincial ID (water tank – distribution canals)		

Source: Interviews with those involved in the project

*1: The Minor Scheme does not distinguish main and sub systems because the distribution canals and field canals connect directly to a water tank.

*2: FO conducts minor repairs to both main and sub systems. If there is a need for any major repair, even in field canal(s), the ID or Provincial ID does the repair work.

*3: If the repair is beyond FO's rehabilitation capacity, the FO is supposed to contact Provincial ID for support.

In NE Component, a former Executing Agency, Ministry of Economic Development (hereinafter referred to as "MED"), was dismantled following regime change in 2015 and the Provincial ID in each of the Northern and Eastern Provinces took over the management of irrigation systems. No matter what type of irrigation scheme, FOs (including contractors hired by FOs) conduct minor repairs and Provincial IDs conduct major repairs to irrigation systems.

Therefore, in terms of institutional aspects for O&M in both KA and NE Components, there is no specific problem which prevents sustainability.

3.5.2 Technical Aspects of Operation and Maintenance

The technical capacity of O&M aspects in both governmental organizations and FOs had been improved. For the Ministry of Irrigation (Executing Agency) and PIAs such as IMD and ID, their capacity of instructing farmers and the management of rehabilitation works of irrigation systems were improved by taking trainer's training courses during the project. Conversely, one issue is no further opportunity for technical capacity enhancement provided at each organization after the project. Training on maintenance skills of irrigation facilities is included only partly in the internal training programs of each ministry and agency, and does not have contents useful for continuous rehabilitation of the irrigation systems after this project and maintaining the skills to train farmers. Therefore, concern remains over whether the O&M skill of these organizations will be retained even in the event of personnel changes.

For farmers, it is confirmed that they had developed a sense of ownership to run FO and rehabilitate irrigation systems through the project. After the project, they try to keep improving and enhancing their skills by sharing knowledge among members, meaning farmers have some chances to retain O&M skills. According to the Beneficiary Survey, more than half

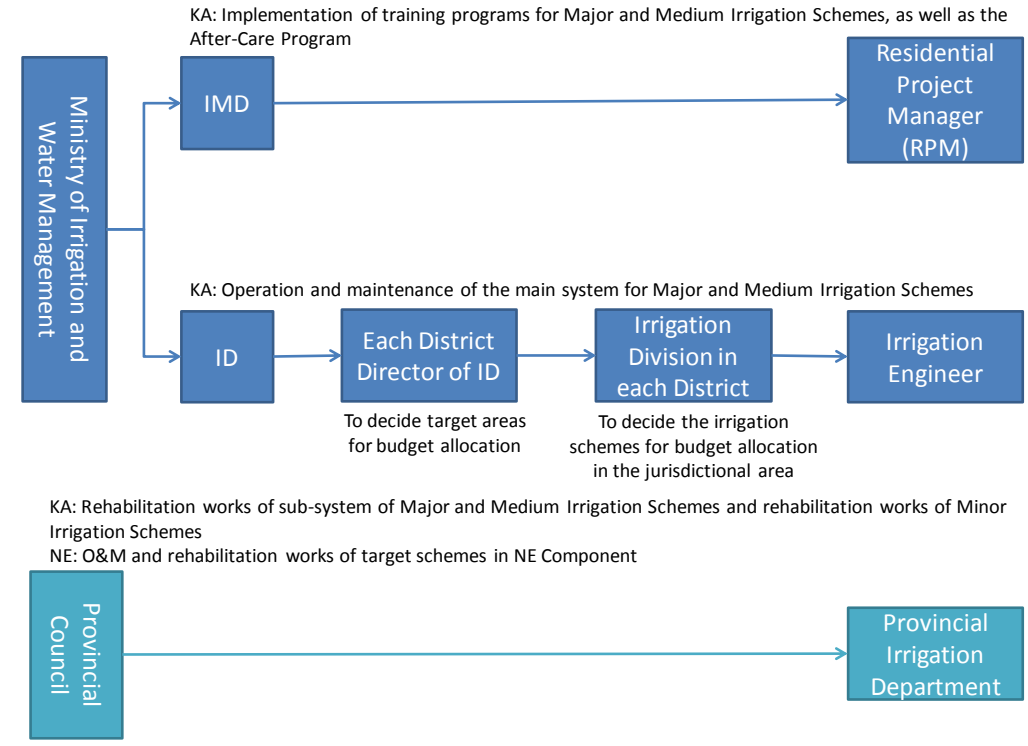
the total of 190 farmers answered that they were sharing knowledge with each other.

To summarize the above and from the perspective of sustainable O&M, this project can be highly evaluated on account of proactive self-improvement attitudes among farmers toward rehabilitation of irrigation systems and Income Generation Activities. Conversely, on the Government side, given the lack of training for upgrading and maintaining their skills, it is thought that further improvement of skill transfer system will be needed taking into account of personnel changes, in a mid- to long-term perspective.

3.5.3 Financial Aspects of Operation and Maintenance

3.5.3.1 Government Budget

The O&M budget is allocated in two ways corresponding to the size and functions of targeted schemes: from the Ministry of Irrigation and from the Provincial Council. The Ministry of Irrigation and Provincial Council are both trying to allocate adequate budgets for O&M cost after the project, but the present situation shows that the budget has not been secured in a long-term perspective. In particular, the Provincial ID lacks sufficient funds for rehabilitation as one Provincial ID stated that it was difficult to cover repair cost for water tanks and canals.



Source: Interviews with those involved in the project

Figure 5: Budget Allocation

At the time of ex-post evaluation, the main funding source for O&M costs of targeted areas came from "After-Care Program" and "farmers' own funding sources".

3.5.3.2 After-Care Program (KA Component)

In the KA Component, IMD had no plans to secure funds for follow-up activities after the project due to the budget limitation. Accordingly, PMU generated a source of funding for follow-up activities after the project completion by saving balance of GOSL budget during the project. After the project, an "After-Care Program" was implemented with this funding source.

The total amount of funding source of After-Care Program was 250 million Rupees. IMD managed the fund and conducted follow-up activities. The target program users were 21 FOs in the Major and Medium irrigation schemes in the KA Component. The program supported the rehabilitation of irrigation systems, facility improvements related to farming skills and Income Generation Activities (e.g. rehabilitation of dairy plants etc.), building additional Farmer Centers with meeting rooms and administration office for FOs. The budget and actual expenditure from 2013 to 2015 is shown in Table 15. According to IMD, the actual expenditure in each year was lower than the budget because this program was conducted on a request basis and the number of requests from target FOs was less than IMD had expected.

Table 15: After-Care Program – Budget and Actual Expenditure

Year	2013	2014	2015
Budget (Million Rupees)	132	140*	80*
Actual Expenditure (Million Rupees)	23	18	27.46
Purpose of Use	Improvements of dairy plant and poultry processing plant in Nirawewa Farm (Government farm in Anuradhapura District)	Supplementary operation cost and rehabilitation of facilities for Nirawewa Farm (continued from 2013)	- Rehabilitation fee to FO for repairing main system - Building 16 Farmer Centers and procurement of equipment (PCs etc.) - Posting 6,500 boundary polls to mark the management area for canal distribution

Source: Interviews with people involved in the project

* Budget including roll-over from the previous year

Funds for the After-Care Program were allocated from 2013 to 2015, but no further fund allocation was to be made after 2015 because the Auditor General of Sri Lanka pointed out that the project still seemed ongoing, despite already having been completed. IMD

explained that the remaining funds of the After-Care Program would be basically returned to the national account but that part of the funds would be allocated to the budget category "Land and Land Improvement" of the Ministry of Irrigation to be used to complete Farmer Centers and conduct training sessions for farmers. Although the After-Care Program itself is to be abolished, part of the fund seems to be utilized for the same purpose at least in 2016. However, it is uncertain whether such follow-up activities as After-Care Program will be conducted after that. There is a concern that there will be no improvement in rural areas which are unable to repair irrigation systems due to the shortage of budget.

3.5.3.3 Farmers' Own Funds for Activities

In terms of funds which are used for farmers' own activities, FOs collect membership fees from farmers periodically and/or set up Maintenance Fund for rehabilitation works. Maintenance Fund is set up by FOs in Major and Medium Irrigation Schemes mainly but some FOs in Minor Irrigation Schemes collect money for FO activities including rehabilitating irrigation. According to the Beneficiary Survey, the frequency of collecting fees for Maintenance Fund is once a season (twice a year in total, during maha (rainy) and yala (dry) seasons). The size of the fee normally depends on the area of farmland concerned, about 300 – 550 Rupees/acre for Major and Medium Schemes and about 100 Rupees/acre for Minor Schemes in average. In 2011, 77% of FOs in Major and Medium Irrigation Schemes in the KA Component had Maintenance Fund which was used for maintenance and irrigation.

In the NE Component, some FOs in Eastern Province had Maintenance Fund before the project started and most FOs in Northern Province usually collect fees when they need to repair their irrigation, instead of periodic fee collection.

From the findings above, the financial aspects of O&M by farmers are seen to be secured but some concerns still remain over the Government budget.

3.5.4 Current Operation and Maintenance Status

Judging from site visits, interviews with FOs, the Beneficiary Survey and other works, appropriate O&M works are conducted among farmers who are continually involved in the operation of FO and O&M works for irrigation systems proactively and properly even after the project completion. Also, facilities including Farmer Centers and poultry processing were built or renovated through utilizing After-Care Program even after the project completion.

Through the CAP Workshop and other training sessions, FO's capacity to run their organization improved as well as individual skill of farmers. The roles of the Government (in charge of main system) and farmers (in charge of sub system) were maintained, even after project completion.

As mentioned above, some minor problems have been observed in terms of technical and financial aspects of O&M sustainability. Therefore, the sustainability of the project effects is fair.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

This project was implemented in the North-Western, North-Central, Central, Northern and Eastern Provinces of Sri Lanka to develop and reconstruct rural areas by rehabilitating irrigation systems and engaging in Income Generation Activities, thereby helping reduce poverty, improving agricultural productivity and achieving sustainable rural development. At the time of appraisal and ex-post evaluation, this project was highly relevant to the development policy, sector policies and development needs of Sri Lanka in terms of poverty reduction, rural development and rehabilitation of irrigation and development needs. This project was also relevant to Japan's ODA policy at the time of appraisal. Therefore, its relevance is high. Efficiency is fair because the total project period exceeded the plan following a three-year delay in commencement but the project cost was as planned. In terms of the project effectiveness and impact, positive qualitative effects and impacts were seen on the project sites. In terms of the project effectiveness, positive qualitative effect and impacts were confirmed and the obtained data also shows that most of the actual project outputs exceeded the target figures. Therefore, the effectiveness and impact of this project are high. As for the operation and maintenance for the project sustainability, organizational aspects and the current maintenance status does not seem to have any problems, although some technical and financial issues arose. Therefore, the sustainability was deemed fair.

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

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

4.2.1.1 Continuous information sharing and capacity enhancement activities

Although there were some changes to the policy of GOSL related to project implementation, the project brought a good effect thanks to the concerted efforts and proactive participation of parties concerned, namely PIAs (IMD, ID, DAD etc.) on the Government side, consultants and farmers, and PMU's effort on creating support structure after the project. For the future, it may be necessary to retain the follow-up program for farmers conducted by IMD and/or ID in order to keep the FOs' skills in proactive organization management, irrigation management, activities to increase their income (e.g. farming, animal husbandry, inland fisheries etc.), even if there are any generational changes and/or any opportunities for receiving new member(s).

4.2.1.2 Continuous information management by the Ministry of Irrigation

After the dismantlement of Ministry of Economic Development, the Executing Agency of the NE Component, each provincial ID of Northern and Eastern Provinces is in charge of monitoring the irrigation schemes. Although there is no problem with the operation to date, it may be better for the Ministry of Irrigation (IMD), the central government ministry, to collectively capture information of these Provinces as well as of the KA Component. Also, for monitoring purposes, it may be important for the Ministry of Irrigation to keep collecting data from Provincial ID after the project completion to oversee the whole project.

4.2.2 Recommendations to JICA

None

4.3 Lessons Learned

4.3.1 Importance of awareness-raising activities for final beneficiaries during the project implementation

In this project, the consultants focused on awareness-raising for the first three years. They visited all FOs and explained importance of the project for the farmers. Also, government officers who took TOT courses and FOs collaborated closely in determining the present problems to be tackled through the CAP Workshops. These activities resulted in successful rehabilitation works and Income Generation Activities. Therefore, for similar project in future, it is important to secure adequate time for awareness-raising activities so as to meet the needs of each target FO.

4.3.2 Sustainable supporting structure for microcredit program

The loan recovery rate of the microcredit program in NE Component was lower than that of the KA Component because there was no suitable intermediate financial institution, which caused insufficient credit appraisal and monitoring. In the NE Component at the time, there was no suitable financial institution like RDB in the area because of the civil war. For the purpose of securing project effectiveness, when implementing a microcredit program in future, it will be effective to involve intermediary financial institutions like RDB in the KA Component and utilize their capacity of credit appraisal and monitoring after disbursements.

4.3.3 Planning and implementation of a follow-up program after project completion

After the completion of this project, a certain follow-up period was needed (1) to enable

smooth handover of tasks when the responsible government officers were changed, (2) to check the level of established skills of FOs and farmers and (3) to provide additional support as necessary, so that the project effects would be continuously sustained. In this project, PMU planned and prepared funds for the follow-up activities during the project implementation because there had been no specific plan for follow-up by the Executing Agency due to the budget limitation. For similar projects in future, it is important for the Executing Agency to keep in mind about the necessity of a follow-up program even before commencement of the project. After a certain period of time passed from project commencement and needs for follow-up activities are emerged, the Executing Agency is expected to design a follow-up program for a suitable period after the project completion and budgetary arrangement through consultation with concerned organizations. For the better and sustainable effect of the project, it may be preferable that some PMU members including project director will be continuously involved in the follow-up activities.

4.3.4 Setting indicators in a timely manner

The operation and effect indicators of the project were set right before the project completion and the indicators were set without adequate verification, using unclear method of calculation, definition and incorrect values. Therefore, it was difficult to compare the figures before and after the project. Also, monitoring of project indicators during the implementation stage was not possible because the indicators had been set right before the project completion. In order to measure project effects accurately, it would be effective to keep monitoring during the project implementation with the indicators set and defined clearly before the project starts.

Comparison of the Original and Actual Scope of the Project

Item	Plan	Actual
1.Project Outputs	- Rehabilitation of irrigation schemes (Major: 8, Medium: 12 and Minor: 80) and farm roads - Construction and upgrading supporting facilities (Construction of 27 Farmer Centers, Upgrading of Seed Farm, IFTC, Aqua-culture Extension Center and Renovation of 10 Agrarian Development Centers) - Procurement of equipment (vehicles, office equipment etc.) - Soft component (Income Generation Activities, awareness programs, capacity building for FOs) - Consulting services (designing detailed works, bidding support, supporting implementation of microcredit, supporting implementation of soft component, etc.) - Supporting North East area (rehabilitation of 10 pilot irrigation schemes in North East Province, procurement of equipment, soft component and consulting services) - NGO Fund - Design and implement microcredit program	- Rehabilitation of irrigation schemes (Major: 10, Medium: 9, Minor: 80) and farm roads - Construction and upgrading supporting facilities (Construction of 1 Farmer Center, water distribution facility in Seed Farm and 2 poultry sheds in livelihood development farms, rehabilitation of IFTC and 5 DAD training facilities etc.) - Same as planned - Soft component (Income Generation Activities, awareness-raising programs, capacity building for FOs, training sessions for enhancement of farming skills and capacity enhancement) - Consulting services (designing detailed works, bidding support of sub-system in Major and Medium Irrigation Schemes and all systems in Minor Irrigation schemes, supporting implementation of microcredit, supporting implementation of soft component, assisting the implementation of overseas training programs for government officers, etc.) - Supporting North East area (rehabilitation of 9 pilot irrigation schemes in Northern and Eastern Provinces, procurement of equipment, soft component and consulting services) - NGO Fund was not implemented - Design and implement microcredit program (including monitoring)
2.Project Period	March 2003 – March 2010 (85 months)	March 2003 – May 2013 (123 months)

Item	Plan	Actual
3.Project Cost		
Amount Paid in Foreign Currency	3,628 million yen	5,545 million yen
Amount Paid in Local currency	4,385 million yen	1,596 million yen (1,892million Rupees)
Total	8,013 million yen	7,141million yen
Japanese ODA Loan Portion	6,010 million yen	5,978 million yen
Exchange Rate	1Rupee = 1.29 yen (As of November 2002)	1 Rupee= 0.85 yen (Average between 2006 and 2013)

Democratic Republic of Sri Lanka

FY2015 Ex-Post Evaluation of Japanese ODA Loan Project

"Tourism Resources Improvement Project"

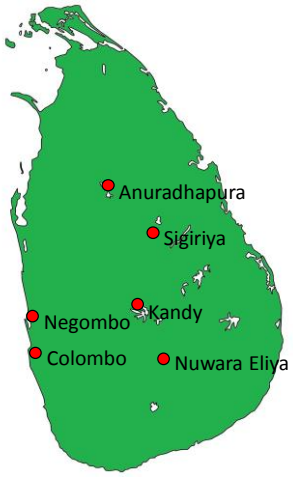
External Evaluator: Keisuke Nishikawa, Japan Economic Research Institute Inc.

0. Summary

In this project, tourism-related infrastructure and human resources were developed to grow the tourism industry at six tourist destinations in Sri Lanka. This project was consistent with the development plans and needs of Sri Lanka at the time of appraisal and ex-post evaluation as well as the priority areas of Japan's ODA policy at the time of appraisal. Therefore, the relevance of this project is high. With regard to project implementation, while the components were implemented mostly as planned and the project cost was inferred to have been within the plan, the efficiency is fair as the project period exceeded the plan. With respect to project effectiveness, the tourism industry had grown rapidly since the civil war ended in 2009, and it was assumed that many of the targets of the indicators expected in this project had been achieved ahead of time and that the unachieved indicators would generally have reached their targets by the target year (2015). As for the impact of the project, it was confirmed that the tourism industry had significantly contributed to increases in employment and foreign exchange earnings, and this project made contributions to the development of the industry. Therefore, the effectiveness and impact of this project are high. Regarding sustainability, there were no issues in terms of institutional, technical and financial aspects of operation and maintenance of this project, but the sustainability of the effects generated in this project is fair as there were some issues found in the current status of operation and maintenance.

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

1. Project Description



Project Locations

Hotel School Constructed in this Project (In Kandy)

1.1 Background

Sri Lanka has a wealth of tourism resources such as beautiful natural scenery, beaches and its Buddhist culture, in addition to seven World Heritage Sites. The Sri Lankan government's efforts to develop the nation's tourism industry began with the formulation of the Ceylon Tourist Board Act in 1966. A surge in the number of foreign visitors to Sri Lanka from approximately 340,000 in 2001 to approximately 550,000 in 2005 had been observed after the ceasefire agreement was reached between the Liberation Tigers of Tamil Eelam (LTTE) and the Government of Sri Lanka in 2002. As a result, the tourism sector came to form a strategic part of Sri Lanka's economy in terms of foreign currency earnings and the generation of new employment.

However, sub-standard infrastructure at tourist destinations and shortages of human resources in the tourism sector resulted in fewer foreign visitors compared to its Asian neighbors[1]. Specifically, since Sri Lanka failed to undertake adequate marketing or promotional activities not only in Japan but also other parts of East Asia, it received few tourists from these parts of the region.

Under these circumstances, the Government of Sri Lanka set forth a policy aimed at developing the tourist sector which involved the development of tourist infrastructure at six sites, including Sigiriya and Anuradhapura, which were World Heritage Sites, and a summer resort of Nuwara Eliya. Simultaneously, the government held a policy to target the Japanese market with a potentially large demand expected. With this background, this project was implemented to support these policies of the Sri Lankan government.

1.2 Project Outline

The objective of this project was to increase the number of foreign visitors to Sri Lanka and to stimulate the country's tourism industry by developing infrastructure at six tourist destinations, including Sigiriya and Anuradhapura, by providing support for human resource development, and by carrying out marketing and promotional activities in Japan, thereby contributing to the socioeconomic development of Sri Lanka in terms of generating new employment, acquiring foreign currency and so forth.

Loan Approved Amount / Disbursed Amount	2,604 million yen / 2,514 million yen
Exchange of Notes Date / Loan Agreement Signing Date	March 2006 / March 2006

[1] For example, while approximately 600,000 tourists visited the Maldives (in 2006), a neighboring country with 1/60 of Sri Lanka's population, Sri Lanka had only 560,000 tourists (in the same year).

Terms and Conditions	Interest Rate Repayment Period (Grace Period Conditions for Procurement	0.9% 20 years 6 years) General Untied
Borrower / Executing Agency	Government of the Democratic Socialist Republic of Sri Lanka / Ministry of Tourism Development and Christian Religious Affairs	
Final Disbursement Date	May 2013	
Main Contractor	–	
Main Consultant	Oriental Consultants Co., Ltd. Nihon Keizai Advertising Co., Ltd.	
Related Projects	[Technical Cooperation] Development of Culture-oriented Tourism in Sigiriya (2008 – 2010) [Grant Aid] Construction of Sigiriya Museum (2006 – 2009) The Project for the Improvement of Display Equipment of the Sigiriya Museum (2007 – 2009) [Other International / Aid Organizations] Norway: Implemented a project to install signs in Sigiriya and Anuradhapura (2006)	

2. Outline of the Evaluation Study

2.1 External Evaluator

Keisuke Nishikawa, Japan Economic Research Institute Inc.

2.2 Duration of Evaluation Study

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

Duration of the Study: August 2015 – October 2016

Duration of the Field Study: November 16 – December 9, 2015, and February 17 – 29, 2016

2.3 Constraints during the Evaluation Study

While the executing agency of this project when it commenced was the Ministry of

Tourism, the ministry was integrated into the Ministry of Economic Development (MED) in 2010 at which time the MED became the executing agency of this project through to its completion in 2013. According to the executing agency at the time of ex-post evaluation (Ministry of Tourism Development and Christian Religious Affairs) however, when the MED was dissolved at the beginning of 2015, no ministry was assigned to follow up with this project, and the documents and data related to this project were lost during this time, before the ex-post evaluation was started in late 2015[2]. As a result, some information such as detailed components of project activities and project costs could not be obtained. In this ex-post evaluation, judgements have been made to the most accurate extent possible based on the information collected.

3. Results of Evaluation (Overall Rating: B[3])

3.1 Relevance (Rating:③[4])

3.1.1 Relevance to the Development Plan of Sri Lanka

At the time of appraisal, the Government of Sri Lanka had made it clear to promote development in the tourism sector as seen in the 'Economic Policy Framework' formulated in July 2004, also in which a plan to make Sri Lanka an ecological paradise was set. In the 'Tourism Plan 2005' formulated in 2004 by the Sri Lanka Tourism Promotion Bureau (hereinafter referred to as 'SLTPB'), a goal was set to increase the number of foreign tourists to one million by 2010. As for the implementation structure, the 'Sri Lanka Tourism Act' was enacted in 2005, allowing the employment of experts from the private sector and increasing the independence of government organizations to implement a tourism administration. With the enactment of this Tourism Act, the Sri Lanka Tourism Development Authority (hereinafter referred to as 'SLTDA'), in charge of tourism development planning, the Sri Lanka Institute of Tourism and Hotel Management (hereinafter referred to as 'SLITHM'), responsible for the development of tourism-related human resources, and the SLTPB, assuming the role of tourism marketing for Sri Lanka, were officially established.

With respect to the national development policies at the time of ex-post evaluation, a long-term plan had yet to be formulated, as the new government had just been formed at the beginning of 2015. Therefore, the Economic Policy Statement announced at the end of that year and the 2016 budget speech made by the Minister of Finance were referenced for the purpose of evaluation. In the Economic Policy Statement of the new

[2] While the Ministry of Tourism Development and Christian Religious Affairs was described as the executing agency in this evaluation, the ministry was not officially delegated by the Sri Lankan government as the government agency responsible for this project after the dissolution of the Ministry of Economic Development.

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

[4] ③: High, ②: Fair, ①: Low

government announced in November 2015, a strategy to develop a productive and result-based tourism industry was put forward to double or triple the amount of daily expenditures by tourists and to promote tourism development of Cultural Triangle[5] and Central Highlands[6], the target areas of this project. Also in the budget speech made in December of the same year, the strengthening of tourism promotion, the development of tourism-related human resources, the implementation of obligatory registration and rating of all hotels in the country, and so forth were put forward as a policy direction. In this way, the tourism sector was positioned with importance in the economic policy.

In the 'Tourism Development Strategy 2011 – 2016[7]', which was a tourism sector policy at the time of ex-post evaluation, a goal related to this project was set (1) to increase the number of foreign tourists from 650,000 (2010) to 2.5 million (2016), (2) to increase tourism-related employment, (3) to distribute the economic benefit to the entire society, and (4) to increase foreign exchange earnings. According to the executing agency, although this plan is set to come to an end in 2016, a subsequent four-year tourism promotion strategy is to be formulated during the same year, and the overall policy is to remain unchanged. Therefore, this project is consistent with the tourism sector policy.

3.1.2 Relevance to the Development Needs of Sri Lanka

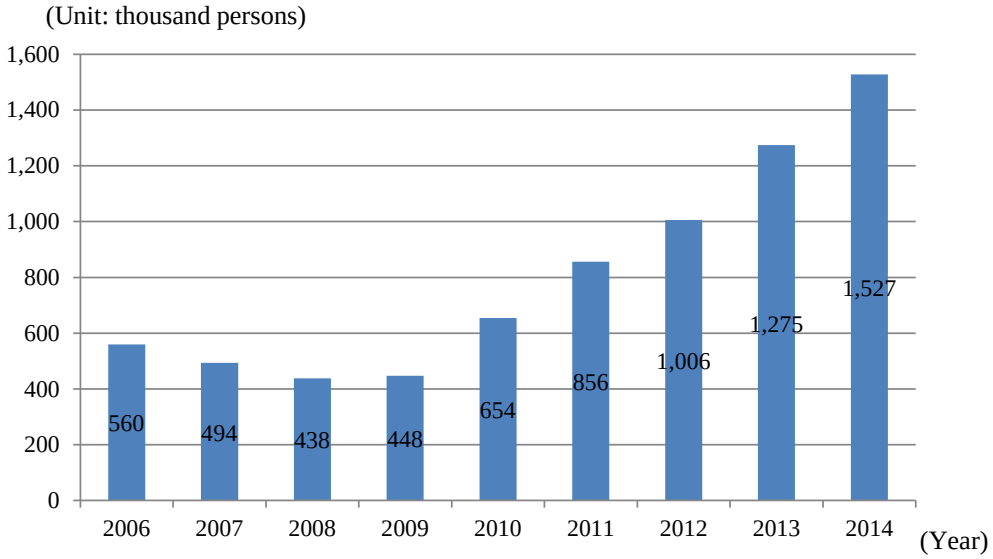
When this project was being planned, Sri Lanka had various tourism resources, and the tourism industry had an important position within the country's economy in terms of foreign exchange earnings and employment generation. However, there were several issues, including a lack of adequate infrastructure at tourist destinations and a shortage of human resources to underpin the tourism industry. Moreover, while it was thought that a demand for inbound tourism from Japan would potentially be high, tourist numbers were stagnant partly due to a lack of sufficient knowledge and experience in marketing to the Japanese tourist market[8].

These issues on tourism development remained the same at the time of ex-post evaluation, and it was pointed out in the above-mentioned 'Economic Policy Statement' (November 2015) and 'Budget Speech' (December 2015) that domestic tourism resources were not being utilized sufficiently and adequate branding to expand the tourism industry and tourism-related human resources were not sufficient. In interviews

[5] An area connecting three cities of Anuradhapura, Sigiriya and Polonnaruwa (approximately 40km from Sigiriya), with a concentration of ancient ruins including a number of world cultural heritage sites
[6] An area including the Central Highlands which became the World Natural Heritage Site in 2010 and Nuwara Eliya, a city targeted in this project
[7] While this strategy was formulated during the previous government, it is an effective sector plan under the current government, according to the executing agency at the time of ex-post evaluation. Annual action plans of tourism-related organizations have been prepared based on this strategy.
[8] The number of tourists from Japan was 17,178 (2003), 19,641 (2004), 17,148 (2005) and 16,189 (2006).

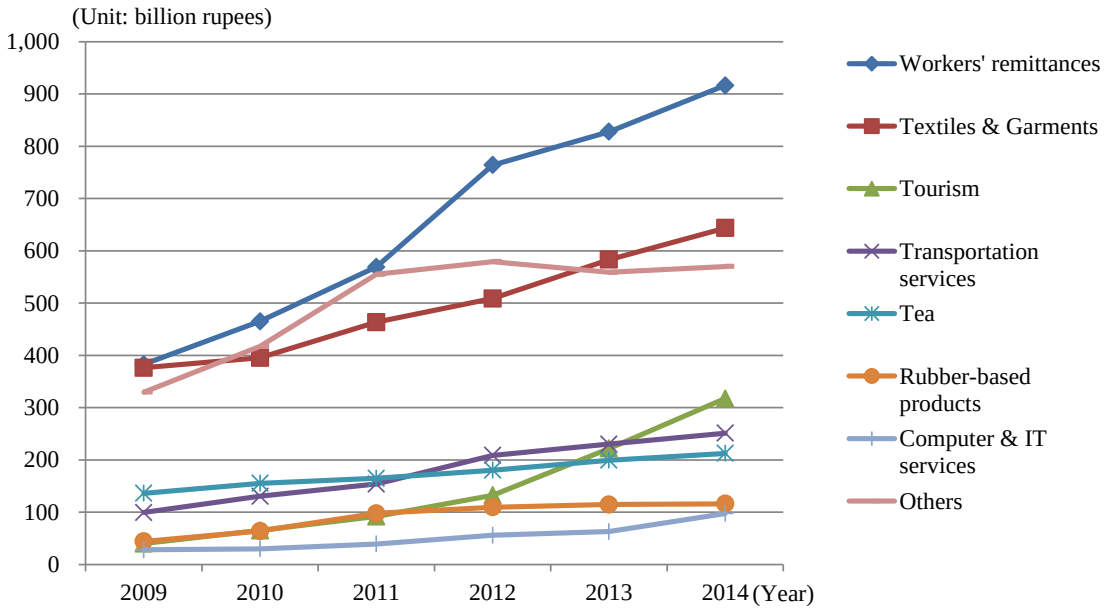
with tourism-related government organizations during the ex-post evaluation, it was recognized that while more human resource development in line with the growth of the tourism industry was needed, the capacities of hotel schools (operated by the government) responsible for human resource development were not sufficient and needed to be expanded further. Moreover, tourism-related infrastructure and other related infrastructure facilities in tourist areas such as water supply and sewerage systems were in need of development. In this way, it became clear that infrastructure development, human resource development, marketing, and so forth were still necessary.

The background for the need of infrastructure development, human resource development and marketing was the rapid increase of the number of foreign tourists and foreign exchange earnings, as indicated in figures below.



Source: 'Annual Statistical Report' various years, the SLTDA

Figure 1: Number of Tourists from Overseas



Source: 'Annual Statistical Report' various years, the SLTDA

Figure 2: Foreign Exchange Earnings by Industry

The number of foreign tourists rapidly increased after the civil war[9] ended in 2009, and it grew to 1.527 million visitors five years later in 2014, which was 3.4 times larger than that in 2009. In line with the growth, the importance of tourism as a source of foreign exchange earnings by industry had consistently become higher. Although the tourism sector comprised only 2.8% of the foreign exchange earned in 2009, it grew to 10.2% in 2014.

As stated above, it was found that development needs for the tourism sector was high both at the time of appraisal and ex-post evaluation, and that this project was consistent with the development needs.

3.1.3 Relevance to Japan's ODA Policy

In the 'Country Assistance Policy for Sri Lanka' prepared in 2004, Japan prioritized assistance to improve foreign exchange earning capacities in the medium and long-term perspectives, in which assistance for tourism development while conserving the natural environment and historical heritage was specified. In addition, in JICA's 'Medium-Term Strategy for Overseas Economic Cooperation Operations', effective in 2006,

[9] A civil war continued intermittently from 1983 till 2009 between the government and an anti-government group. Although a ceasefire had been achieved for some time at the time of appraisal of this project, peace negotiations did not progress smoothly after that and Sri Lanka went back into the civil war again from 2006. A series of civil wars, which lasted for 26 years, finally ended in 2009 when the government force brought the country under control.

'infrastructure development for sustainable growth', 'assistance to human resource development' and so forth were listed as overall priority areas. In the strategy, 'economic infrastructure development and industrial development to achieve sustainable economic growth led by the private sector' was the priority area of assistance to Sri Lanka. Furthermore, in JICA's 'Country Assistance Strategy for Sri Lanka', effective in 2005, priority areas were specified to provide assistance to fields of the tourism sector conducive to employment generation and to foreign exchange earnings as part of the support for private sector development in which support for strengthening of tourism promotion measures for Japan, development of tourism-related infrastructure and development of human resources in the tourism sector were listed as strategic components.

In this way, this project was the one intended to materialize the assistance policy for Sri Lanka in order to support tourism development from the viewpoint of foreign exchange earnings, and was consistent with the Medium-Term Strategy for Overseas Economic Cooperation Operations in terms of infrastructure development for sustainable growth, human resource development, industrial promotion, and so forth. Also, this project supported the tourism sector as stipulated in the Country Assistance Strategy at the time of planning which was formulated under the Medium-Term Strategy for Overseas Economic Cooperation Operations. Therefore, a high level of consistency with Japan's ODA policy during the time of planning was observed.

This project supported the development of tourism as specified in the national development plan and tourism sector plan of Sri Lanka at the time of appraisal and ex-post evaluation, and a high level of consistency was confirmed. Since 2009, when the civil war ended, the tourism industry had grown and development needs in terms of infrastructural and non-infrastructural aspects were high both at the time of appraisal and ex-post evaluation. In relation to Japan's ODA policy, this project was consistent with each the Country Assistance Policy to Sri Lanka, the Medium-Term Strategy for Overseas Economic Cooperation Operations and the Country Assistance Strategy.

In light of the above, this project had been highly relevant to Sri Lanka'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

In this project, (1) Marketing and Promotion, (2) Human Resource Development, (3) Development of Tourism-related Infrastructure, and (4) Community Development

Activities for Local Residents were planned for implementation through the provision of consulting services. Table 1 summarizes the original and actual project scope obtained during the ex-post evaluation.

Table 1: Original and Actual Project Scope of this Project

Project Scope	Original	Actual
(1) Marketing and Promotion	➢ Market survey and strategy formulation for Japan, and promotion activities in Japan	➢ Revision of tourism website (established a Japanese language website) ➢ Advertising campaign Placement of advertisement on trains and articles in magazines ➢ Media-related activities in Japan Conference for the media, visit to several media outlets ➢ Activities for travel agents and consumers in Japan ・ Seminars and workshops for travel agents, visit to major travel agents ・ Participation in travel seminars and workshops for consumers ➢ Development of promotional videos and brochures, etc.
(2) Human Resource Development	➢ Colombo Hotel School: Equipment procurement ➢ Kandy Hotel School: Construction of school buildings, Equipment procurement ➢ Training to the academic staff of both schools, and curriculum improvement ➢ Conducting of workshops for hotels and restaurants providing services to foreign guests	➢ Colombo Hotel School Procurement of kitchen equipment and installation (bakery and laundry sections) ➢ Construction and equipment procurement at Kandy Hotel School Slight changes such as addition of an access road and development of school's garden, elimination of principal and staff rooms, etc. ➢ Human resource development program Training of Hotel School academic staff, Curriculum development and training of those in the tourism industry. Additional implementation of support for accreditation of vocational training qualification, and training on hospitality using English
(3) Infrastructure Development	➢ Negombo: Rehabilitation and dredging of Hamilton Canal (7km), Fishermen's Wharf development, and Town beautification ➢ Sigiriya: Site rehabilitation (development of paths and	➢ Negombo: Rehabilitation and dredging of Hamilton Canal (7km), Fishermen's Wharf development, and Town beautification (Change) Elimination of maintenance road, Addition of canal protection work, Extension of rehabilitated section of Hamilton Canal (2.5km)

Project Scope	Original	Actual
	rest area), access road rehabilitation (14km) ➢ Anuradhapura: Ring road rehabilitation (23km), Beautification of Malwathu Oya ➢ Nuwara Eliya: Rehabilitation of Gregory Lake and Victoria Park, Town beautification	➢ Sigiriya: World Heritage site rehabilitation (development of paths, rest area and parking), access road rehabilitation (14km) (Change) Elimination of some components such as a toilet, elimination of installation of road signs in some sections ➢ Anuradhapura Ring road rehabilitation (23km), Beautification of a park along Malwathu Oya ➢ Nuwara Eliya Rehabilitation of Gregory Lake and Victoria Park, Town beautification
(4) Community Development Program for Local Residents	➢ Tourism awareness campaign for local residents, Clean-up campaign	➢ Clean-up campaign, Conducting of community awareness workshops, Familiarization visits among the project sites, Support to site-specific tourism product development, etc.
(5) Consulting Services	➢ Implementation support for marketing and promotion ➢ Implementation support for human resource development programs ➢ Detailed design, preparation of tender documents and tender support related to infrastructure development, Environmental and social impact monitoring, Construction supervision ➢ Implementation support for community development programs	➢ Implementation support for marketing and promotion ➢ Implementation support for human resource development programs ➢ Detailed design, preparation of tender documents and tender support related to infrastructure development, Environmental and social impact monitoring, Construction supervision ➢ Implementation support for community development programs

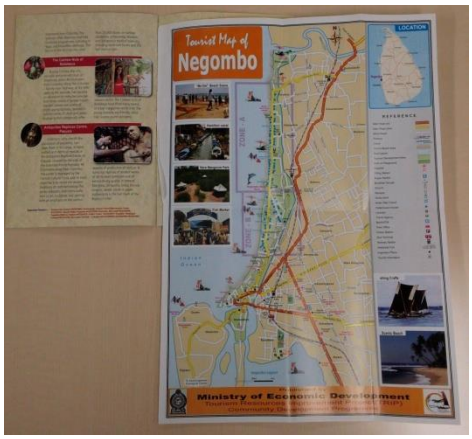
Source: Information provided by JICA, Interviews with related agencies during the field visit

With regard to marketing and promotion, information on actual activities was obtained from the SLTPB and shows that the planned activities to increase the number tourists from Japan were generally implemented with the cooperation of the Sri Lankan embassy in Japan. According to SLTPB, a number of media articles were prepared by them for the media and it is considered that the activities were implemented generally as planned.

Other project components were implemented mostly as planned despite some changes

seen in Negombo's Hamilton Canal, and there were no major changes to the plan. No change to lower the effects of this project was observed, and it was thought that there were no problems as a whole.

Example of an Article in a Media Magazine (Gekkan Leisure Sangyo Shiryo (Feb. 2013))



Tourism Information Brochure Prepared in this Project (with a map)

3.2.2 Project Inputs

3.2.2.1 Project Cost

This project was planned to cost 3,472 million yen, including the ODA loan amount of 2,604 million yen. The largest component was tourism-related infrastructure development (1,374 million yen), followed by human resource development (491 million yen), consulting services (345 million yen), marketing and promotion (236 million yen) and the community development program (12 million yen). These components were entirely covered by the ODA loan, and other components, including some of the interest during construction, administration cost and taxes, were planned to be borne by the Sri Lankan side.

However, while the actual amount of the ODA loan was revealed to have been 2,514 million yen, based on the information provided by JICA, it was not possible to capture the exact amount spent by the Sri Lankan side (administration cost and taxes), as described in '2.3 Constraints during the Evaluation Study'. This is because the Ministry of Economic Development, which was the executing agency when this project was completed, was dissolved, and no information on the project cost was stored at the subsequently-established Ministry of Tourism Development and Christian Religious Affairs. A calculation of the approximate cost was attempted based on the information about the project cost mentioned in the material prepared by the executing agency at the time of project completion, showing an overall project cost of 2,799 million yen (81% of the plan). As the ODA loan amount was 97% of

the plan despite the additional development of tourism-related infrastructure, it is highly possible that the overall project cost was also within the planned amount.

3.2.2.2 Project Period

The implementation period of this project was planned to be 56 months until December 2010 after the Loan Agreement was signed in March 2006. However, the actual period was 84 months, from March 2006 to March 2013, exceeding the planned period (150% of the plan).

Table 2: Comparison of Original and Actual Project Period by Component

Sub-Program	Original	Actual
Marketing and Promotion	April 2007 – December 2010	September 2011 – March 2013
Human Resource Development		February 2011 – March 2013
Tourism Infrastructure Development		July 2008 – March 2013
Community Development Program		May 2011 – January 2013
Consulting Services		October 2007 – March 2013

Source: Prepared based on the information provided by JICA
Note: A definition of project completion date was the day that the contractors completed their civil work and the consultants completed their consulting services.

As shown in Table 2, all the sub-programs were commenced later than the planned time, leading to the delay of project completion. The main reasons for the delay, according to the executing agency, were that the preparations for procurement and of tender documents were delayed as there was no procurement specialist assigned to the division in charge of this project resulting in a subsequent delay in selecting the consultants and contractors, and the commencements of marketing, human resource development and the community development program were delayed as a lengthy period of time was required for the planning of detailed activities. Interview surveys during the ex-post evaluation with those concerned with this project showed that various approval processes within the executing agency (Ministry of Tourism) after the signing of the Loan Agreement required a lot of time, and a transfer of personnel involving officers responsible and those in charge of this project occurred when the Ministry of Tourism was dismantled and reorganized under the Ministry of Economic Development in 2010, which practically brought about a temporary suspension of this project, thus, becoming the largest factor for the delay.

In light of the above, the implementation period of this project is judged to have exceeded the plan by 50%.

3.2.3 Results of Calculations of Internal Rates of Return (Reference only): Economic Internal Rate of Return (EIRR)

At the time of appraisal of this project, the EIRR for marketing and promotion, infrastructure development, and human resource development were calculated under the following assumptions respectively.

Table 3: Economic Internal Rate of Return (EIRR) at the Time of Appraisal

	Marketing and Promotion Infrastructure Development	Human Resource Development
EIRR	23.6%	28.5%
Benefit	Revenue from tourism	Productivity improvement of the graduates, Increases in revenues from tuition fees
Cost	Project cost Operation and maintenance cost	Project cost Operation and maintenance cost
Project Life	25 years	25 years

Source: Information provided by JICA

A recalculation of EIRR based on the same assumptions was attempted during the ex-post evaluation, but it was not possible as the basis of the figures used for calculation at the time of appraisal was unclear and no data could be found due to the several changes of executing agency for this project.

In this project, the project outputs necessary for generating project effects were generally achieved with some changes to their detailed components. The project costs for them were highly likely to have been within the plan. However, the efficiency of this project is fair as the project period exceeded the plan by 50%.

3.3 Effectiveness[10] (Rating:③)

3.3.1 Quantitative Effects (Operation and Effect Indicators)

At the time of appraisal of this project, increases in the number of foreign tourists, including Japanese nationals, tourism revenues, the number of hotel guests and the number of graduates from hotel schools were expected as effect indicators through implementing this project.

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

Table 4: Effect Indicators of This Project

	Baseline	Target	Actual	Actual
	2004	2012	2013	2014
	Appraisal Year	2 Years After Completion	Completion Year	1 Year After Completion
Number of tourists from Japan (thousand tourists/year)	20	120	33.5	42.1
Total number of tourists (thousand tourists/year)	566	1,452	1,275	1,527
Negombo	58	148	No data	
Sigiriya	99	253		
Anuradhapura	6	16		
Nuwara Eliya	29	75		
Tourism revenues (Sri Lanka as a whole, million Sri Lankan rupees / year)	42,000	108,000	221,720	317,502
Number of hotel guests (in the project area, thousand stays / year)	4,394	11,250	—	—
Number of foreign guests at hotel (in the project area, thousand stays / year)	—	—	3,908	4,370
Number of foreign guests at the hotels in the project area / Number of foreign guests at the hotels throughout Sri Lanka (%)	—	—	57.5	56.1
Number of graduates from hotel schools (graduates per year)	721	1,081	1,978	2,135

Source: Data provided by JICA, the SLTDA and the SLITHM

As this project was planned to be completed in 2010, the target year of the effect indicators was expected to be 2012, two years after the project completion. However, as this project was actually completed in 2013, a level of achievement in 2015, two years after the completion, was estimated for the evaluation judgment of quantitative effects.

While one of the objectives was to increase the annual number of tourists from Japan, the number plunged to a little over 10 thousand per year in 2008, down from almost 20 thousand in 2004 (appraisal year). However, it rapidly recovered from 2009 and increased to 42 thousand in 2014. It was presumed that the marketing activities in this project made certain contributions in addition to the stabilization of security of travel. As will be stated later, the SLTPB resumed the marketing activities for the Japanese market from the beginning of 2016, and it is expected that this trend will continue unless there is another civil war.

Despite the civil war, until 2009 in Sri Lanka, the total number of foreign tourists and tourism revenues had already achieved their targets in 2014 (one year after project completion). Regarding the number of hotel guests, definitions of the obtainable data were different (while the guest numbers at all hotels in the project areas were expected as

the indicator, the data obtained in the ex-post evaluation were limited to the foreign guests at government-registered hotels), but the number of hotel guests was estimated to have achieved the target considering that foreign tourist numbers and tourism revenues had exceeded their targets.

Gregory Lake Park Developed and Kiosks
(In Nuwara Eliya)

With regard to the foreign tourist numbers by project area, no data were available according to the interviews with the related organizations during ex-post evaluation. Therefore, as an alternative, the numbers for visitors to the tourist attractions in Sigiriya and Anuradhapura were obtained, as indicated in Table 5. It was found that, as of 2014, both of the sites had exceeded the target foreign tourist numbers by project area (Sigiriya: 253 thousand visitors, Anuradhapura: 16 thousand visitors), indicating that there were more visitors to each area. In Nuwara Eliya, the two parks developed and improved in this project were earning increasing revenues through admission fees (Table 6), bringing positive effects to the city's financial revenues. A certain level of effect to local employment was also observed as a number of kiosks were established in the parks.

Table 5: Number of Visitors to the Archaeological Areas in Sigiriya and Anuradhapura

(Unit: thousand visitors)

		2012	2013	2014
Sigiriya Rock	Foreigner	227	270	355
	Sri Lankan	296	399	369
	Total	524	669	724
Anuradhapura Ancient City	Foreigner	54	70	80
	Sri Lankan	33	38	32
	Total	87	108	112

Source: Data provided by Central Cultural Fund[11]

[11] A government organization under the Ministry of Education in charge of conserving cultural properties of Sri Lanka

Table 6: Admission Ticket Revenues at Parks in Nuwara Eliya

(Unit: thousand Rupees)

	2011	2012	2013	2014	2015
Gregory Lake	0	943	18,511	26,000	27,780
Victoria Park	13,256	24,882	19,061	22,447	23,263

Source: Data provided by Nuwara Eliya Municipal Council

Concerning the foreign tourist numbers of the city of Negombo, located approximately 40km north of the city of Colombo, the effect was checked by obtaining the number of foreign guests at hotels in the 'North of Colombo Region', released by the SLTDA, as the infrastructure facilities developed through this project were not collecting admission fees. The foreign guests were steadily increasing in recent years as shown in Table 7. Since Negombo is the city closest to Colombo International Airport, a gateway to Sri Lanka, the number of hotel guests was expected to continue increasing.

Table 7: Number of Foreign Hotel Guests in the North of Colombo Region

(Unit: thousand stays / year)

	2004	2010	2011	2012	2013	2014
Number of Foreign Hotel Guests	578	723	832	799	973	1,084

Source: "Annual Statistical Report" various years, the SLTDA

Along with this kind of tourist increase, the need for tourism-related human resources had also become high, and the number of graduates from seven hotel schools owned by the SLITHM in the country was also substantially higher than the target. According to the SLITHM, the demand had reached a level where the existing facilities could not accommodate any more students.

As stated above, many of the indicators set at the time of appraisal as a whole were achieved sooner than the plan, implying that quantitative effects have been largely generated.

3.3.2 Qualitative Effects (Other Effects)

At the time of appraisal of this project, the following qualitative effects were expected through implementing the project:

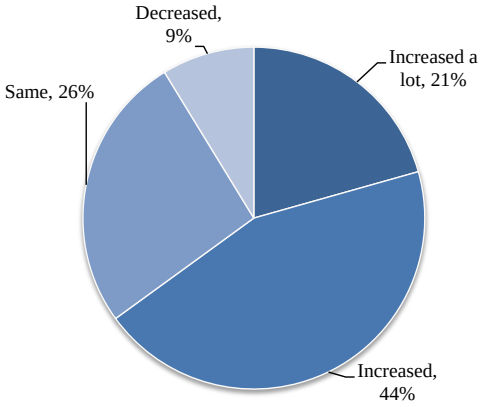
- Improvement in Sri Lanka's visibility and image as a tourist destination
- Improvement in convenience for foreign tourists and their safety
- Improvement in awareness of tourism resource conservation and the tourism

industry by local residents

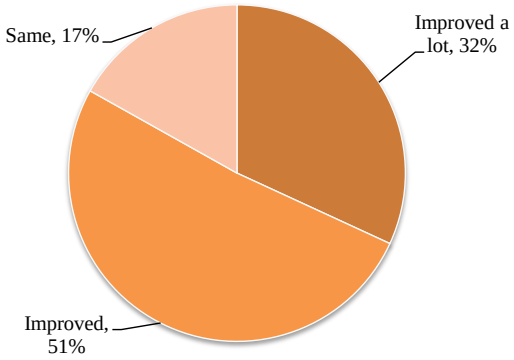
With regard to the improvement in Sri Lanka's visibility and image as a tourist destination, it can be said that the visibility and image as a tourist destination have sufficiently improved post civil war, as seen in the significant increase in the number of foreign tourists to this country, which is endowed with a number of World Heritage Sites. It was heard from the SLTPB that the marketing activities in this project to attract foreign tourists had certain effects on the improvement of the country's image in Japan.

Two other effects were assessed by conducting interviews with the municipal councils of Anuradhapura, Nuwara Eliya and Negombo, which developed tourism-related infrastructure, and the Central Cultural Fund, which managed the facilities in Sigiriya and Anuradhapura. According to these organizations, recognition of tourism by local residents had improved with the growing number of tourists in recent years, and convenience and safety had also improved with the development of roads at various locations. At the world heritage site of Sigiriya Rock, better safety was observed with the development of walkways and staircases. In the section of the beneficiary survey[12] conducted in the project areas, 65% of the respondents felt increases in tourist numbers, and 83% of them expressed their opinions that the local economies had also improved with the growth of the tourism industry, demonstrating that the residents were feeling the contributions of the tourism industry. However, while the workshops for communities and the clean-up campaigns to clean up their local areas were conducted, their effects were not shown in a visible way, and no voluntary activities by residents were seen after the end of this project.

[12] A beneficiary survey was conducted to verify the qualitative effects and impacts by interviewing residents in the tourist destinations where infrastructure development was implemented.
Survey areas: Negombo, Sigiriya, Anuradhapura and Nuwara Eliya
Interviewees: A total of 160 interviews (valid response numbers) including local residents (69 in total), tourism business operators (30 in total), shop owners (36 in total), local government officers (7 in total), and others (18 in total). Convenient sampling with 40 people at each location
Key questions: Improvement of infrastructure, changes in the tourist numbers, impact on local economies, environmental and social (resettlement and land acquisition) impacts, human resource development in tourism, changes in local economies through tourism development, and maintenance of tourism-related infrastructure



‘In recent years, have you seen any changes in tourist numbers?’



‘Do you think that the local economy improved with the development of the tourism industry?’

Figure 3: Recognition of Local Residents on the Tourism Industry (Beneficiary Survey)

This was a project which underpinned the tourism industry, implemented infrastructure development and workshops for local residents, and conducted overseas marketing and tourism-related human resource development in the country. Interviews with the related organizations revealed that this project was of some help to the improvement of the visibility and image of Sri Lanka as a tourist destination. Based on the project site visit and interviews with related organizations, better convenience and safety can be judged to have been achieved by the development of roads and walkway improvements at the World Heritage Sites.

3.4 Impacts

3.4.1 Intended Impacts

At the time of appraisal, this project was expected to contribute to ‘socioeconomic development in terms of generation of employment and the acquisition of foreign currency and so on’.

According to Annual Statistical Reports published by the SLTDA, the number of direct employments in the tourism industry had rapidly increased in recent years [shown as well in Table 8], particularly in the hotel and restaurant category and the travel agent and operator category, growing by 2.6 times and 2.1 times respectively during the three years from 2011 to 2014 and becoming the major drivers of the overall increase. The SLITHM commented that a demand for graduates of hotel schools had been very high, and it can be said that this project played a part in the increase in the supply of human resources.

Table 8: Direct Employment in the Tourism Industry

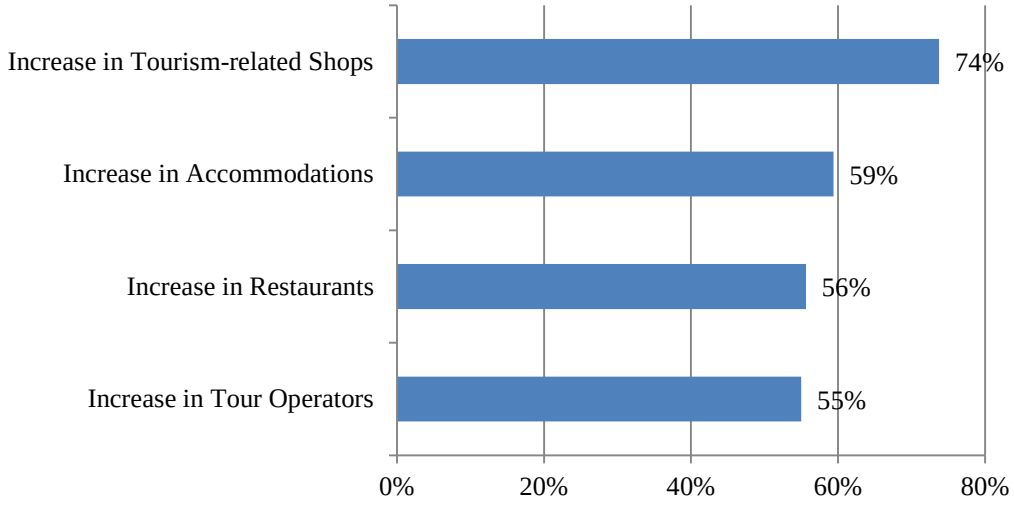
(Unit: person)

Category	2011	2012	2013	2014
Hotel and restaurant	39,901	47,761	90,444	105,001
Travel agent and operator	4,236	6,409	7,011	9,092
Airline	5,655	5,630	5,862	5,936
Tour guide	3,548	3,896	4,295	4,420
Other	4,446	4,166	4,938	5,341
Total	57,786	67,862	112,550	129,790

Source: ‘‘Annual Statistical Report’ various years, the SLTDA

Foreign exchange earnings from the tourism industry have been steadily increasing as shown in Figure 2 and Table 4. The increase was remarkable, growing almost eight times from 40.1 billion rupees in 2009, when the civil war ended, to 317.5 billion rupees in 2014, five years after the war. According to SLTDA’s Annual Statistical Reports previously mentioned in this report, the hotel occupancy rate was 48% in 2009, when the civil war ended, but increased to a rate of 70% and was 74% in 2014. The number of hotel rooms also increased from 14,461 (in 2009) to 18,150 (in 2014).

In the beneficiary survey, a question on whether local economies improved due to tourism development was asked and showed that 83% replied positively. 84% also provided a positive response to a question on whether they think that the infrastructure development and tourism-related human resource development underpinned tourism development. Regarding the concrete question on what kind of economic impact was observed in the project area after project implementation (multiple answers allowed), opinions were heard that they saw more tourism-related shops (74%), more accommodations (59%), more restaurants (56%) and more tourism operators (55%), which are shown in Figure 4.



Source: Beneficiary survey

Figure 4: Proportion of Beneficiaries Feeling Concrete Economic Impacts in the Project Areas

As stated above, increases in hotel rooms and improvements in occupancy rates were seen simultaneously and were in line with the increases in the number of tourists and the steady increase in the number of tourism industry employments as well as the consistent increases in foreign currency earnings. Positive answers to the local contribution of tourism were generally obtained in the beneficiary survey. Therefore, this project is considered to have contributed to economic and social development through the support extended to the tourism industry.

3.4.2 Other Impacts

3.4.2.1 Impacts on the Natural Environment

At the time of planning, the undesirable impacts of this project measured against JICA's Environmental Guideline were not serious, and no negative impacts to the natural environment were expected. In addition, the Environmental Impact Assessment (EIA) was not required according to Sri Lanka's domestic law, and an approval to implement this project was already obtained from the Central Environmental Agency (CEA). However, as dredging of the lake and canal in Nuwara Eliya and Negombo were planned, it was required prior to the commencement of civil works to confirm the harmlessness of dredging the earth and sand, as was it required to obtain an approval from CEA before using the earth and sand again for reclamation and so on. It was also required of the executing agency, in terms of other environmental measures, to monitor air quality, water quality and noise levels during

construction.

At the time of ex-post evaluation, the existence of negative impacts on the natural environment was checked together with the related organizations such as the municipal councils of Anuradhapura, Nuwara Eliya and Negombo, the Central Cultural Fund and the SLITHM in areas where tourism infrastructure and a hotel school were developed. All of them replied that there were no such impacts either during or after the project. The approvals for dredging in Nuwara Eliya and Negombo were obtained from CEA, and it was confirmed from interviews that the project was thereafter implemented and monitored. In the beneficiary survey, all the respondents commented that no negative impacts on the natural environment were observed either during or after project implementation.

Based on the above, the matters for consideration expected at the time of appraisal were all carried out without any problems, and no issues were found in the beneficiary survey. Therefore, it is considered that there are no environmental problems.

3.4.2.2 Land Acquisition and Resettlement

In this project, the acquisition of one hectare of land and the resettlement of 23 households (21 in Negombo and 2 in Nuwara Eliya) were expected due to project implementation. At the commencement of the project, it was planned that the Negombo Municipal Council would make a detailed plan for resettlement, carry out the actual resettlement and award compensations in Negombo with support from project consultants. In Nuwara Eliya, the municipal council had already agreed with the residents on their resettlement in a manner that the council would compensate them for their land and houses.

Interviews with Negombo Municipal Council and Nuwara Eliya Municipal Council conducted during the ex-post evaluation revealed that the land sections for this project were owned by the government outright and no land acquisition from private owners took place. Regarding the resettlement, 21 households in Negombo and 3 in Nuwara Eliya were resettled but the residents had all been residing in the project areas illegally, meaning that the councils were not legally bound to compensate them. However, it was confirmed in Negombo that, as an act of humanity, new houses were developed in the nearby area and the residents were resettled. In Nuwara Eliya, it was heard that three households affected by the improvement work done at Gregory Lake were provided with alternative housing. Interviews were conducted in the residential area of the resettlement in Negombo, and the affected residents commented that their living environment improved substantially compared to that before their resettlement. In the beneficiary survey, no one claimed to hear of anyone negatively affected by

land acquisition and resettlement.

Based on the above, it can be judged that there were no problems in terms of the land acquisition and resettlement processes.

3.4.2.3 Other Positive/Negative Impacts

In implementing this project, an Archaeological Impact Assessment (AIA) was required on the following sub-projects as some of the tourism-related infrastructure facilities had historical and cultural values:

- Rehabilitation of Hamilton Canal in Negombo
- Rehabilitation of the site and the access road in Sigiriya
- Improvement of ring roads in Anuradhapura

The AIA for these sub-projects were actually implemented and their implementation approvals were issued respectively. With regard to the rehabilitation and development in the World Heritage Sites of Sigiriya and Anuradhapura, there were points to be noted such as the requirement to abide by the rules of the United Nations Educational, Scientific and Cultural Organization (UNESCO). According to the Central Cultural Fund, they were all implemented in accordance with the aforementioned rules and without any negative impacts. Therefore, it is considered that there were no problems on this matter.

While the generation of project effects such as an increase in tourist numbers was delayed due to the civil war that occurred during the implementation period, the delay was regarded as an inevitable external factor in this survey. After the civil war in 2009 ended, the tourism industry had been growing rapidly and many of the indicators expected in this project achieved their targets ahead of schedule, and other unachieved indicators were expected to mostly achieve their targets by their respective target years. Regarding the impact, it was found that the tourism industry contributed significantly to an increase in employment and foreign exchange earnings and that this project contributed to the development of the industry. There were no particular issues found in the environmental and social aspects.

In light of the above, this project has largely achieved its objectives. Therefore, the effectiveness and impact of the project are high.

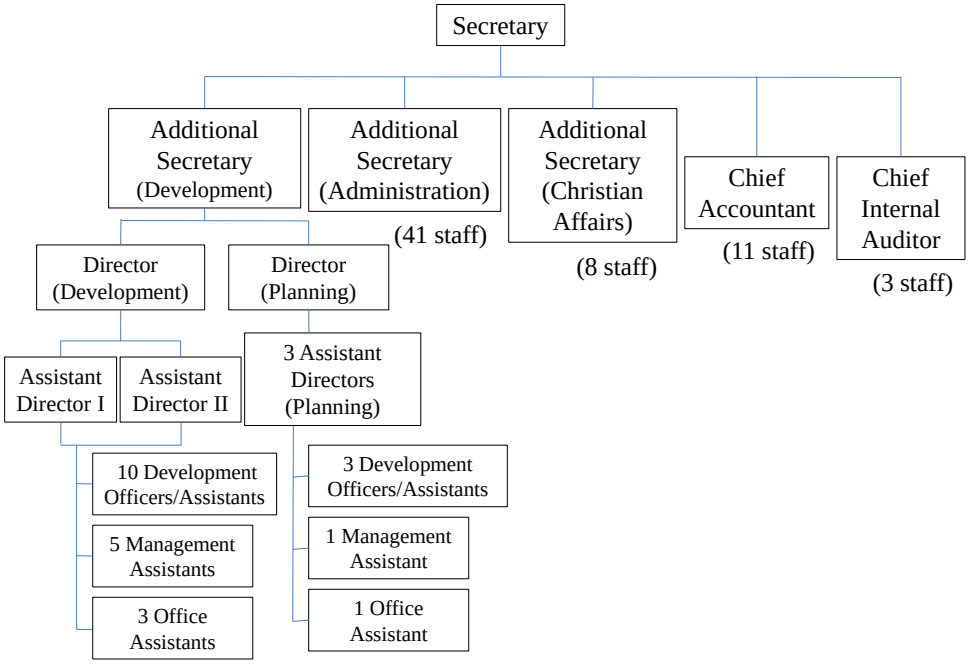
3.5 Sustainability (Rating:②)

3.5.1 Institutional Aspects of Operation and Maintenance

The Ministry of Tourism was selected to be the executing agency, within which a Project Management Unit (PMU) would be established and would coordinate the following organizations as implementing agencies to carry out each activity of this project:

- Marketing: Sri Lanka Tourism Promotion Bureau (SLTPB)
- Human Resource Development: Sri Lanka Institute of Tourism and Hotel Management (SLITHM)
- Infrastructure Development: Road Development Authority (including its provincial offices), Central Cultural Fund, Negombo Municipal Council, Anuradhapura Municipal Council, Nuwara Eliya Municipal Council
- Community Development Program: Project Management Unit and consultants

However, as stated above, the Ministry of Tourism, which had been the executing agency, was integrated into the Ministry of Economic Development in 2010 and became one of its divisions as part of the government reshuffle; but, the Ministry of Economic Development was also dissolved after the establishment of a new government in 2015. As a result, no ministry was officially assigned to control this project integrally at the time of ex-post evaluation. As this project falls within the scope of the tourism industry, the Ministry of Tourism Development and Christian Religious Affairs, established in 2015, was appointed by the Ministry of Finance as the ministry to follow up with this project in practice. The number of staff under the secretary at the ministry is 98, and the tourism sector has 30 staff members under the deputy secretary in charge, who is mainly responsible for policy planning.



Source: Drawn from the information provided by the Executing Agency

Figure 5: Organization Chart of the Ministry of Tourism and Christian Religious Affairs (simplified version)

At the time of ex-post evaluation, as implementing agencies under the ministry, the SLTDA was in charge of development planning and general coordination of operation, including statistical development, the SLTPB was in charge of marketing, the SLITHM was in charge of tourism-related human resource development, and the Sri Lankan Convention Bureau (SLCB) was responsible for the invitation of international conventions. The SLTPB, SLITHM, Road Development Authority, Central Cultural Fund and the municipal councils[13] of three cities were confirmed to have been in charge of operation and maintenance of the components implemented in this project, and they had remained unchanged.

In this project, the Project Steering Committee (PSC) was established during the project implementation by the executing agency, External Resources Department of the Ministry of Finance, Department of National Planning and JICA to check the project's progress and achievements. During the project period, discussions were held by PSC 10 times, but the PSC did not play a role in easing the delay of the project associated with the government reshuffle, and so forth. According to the executing agency, however, the PSC was functioning as a platform for information sharing and discussions on issues shared among the organizations concerned. The PSC was dissolved when the project

[13] Maintenance activities of the Hamilton Canal in Negombo have been outsourced to the Sri Lanka Land Reclamation and Development Corporation (SLLR&DC) by the Negombo Municipal Council.

was completed, but there were no particular organizational issues observed thereafter as operation and maintenance activities had been appropriately undertaken by each implementing agency.

3.5.2 Technical Aspects of Operation and Maintenance

Since all the facilities developed in this project (hotel schools, roads, parks, the canal, World Heritage Sites and a fish market) did not require high-level maintenance techniques, no technical problems were identified in particular. The related agencies (the SLITHM, Road Development Authority, Central Cultural Fund, and the municipal councils of Negombo, Anuradhapura and Nuwara Eliya) commented that there were no technical issues in the area of maintenance. As to be stated later in this report, while some problems were seen in terms of maintenance status, they were not technical issues, and it was thought that their technical skills for maintenance as a whole were at appropriate levels.

Regarding training conducted by the executing and implementing agencies toward the improvement of technical skills in the field of operation and maintenance, there were few agencies with a systematic program as there was no routine maintenance work requiring special skills. But, the Road Development Authority in charge of regular maintenance of roads had been conducting maintenance training sessions for its technical staff several times a year at their training institute in Colombo. As for operation, there were several training programs held once a year by the executing agency for each staff in the fields of tourism management, tourism-related project evaluation, and so forth[14].

3.5.3 Financial Aspects of Operation and Maintenance

At the time of appraisal of this project, no particular issues with implementing the project were expected as the maintenance budget for the facilities constructed with external loans was set and to be allocated by the government according to priority; and the Ministry of Tourism was responsible for allocating the budget in case the agency in charge of maintenance could not sufficiently afford a maintenance budget.

The budget information was collected during ex-post evaluation, confirming that the operation and maintenance budget required by each implementing agency, allocated though the system for doing so, was different from what was expected at the time of

[14] In Sigiriya, a museum was constructed as a grant aid project, and a technical cooperation project 'Development of Culture-oriented Tourism in Sigiriya' was implemented between FY2008 and FY2010. On another hand, this project mainly focused on improving the Sigiriya Rock and rehabilitating the access roads, and there were no particular linkages observed with the past JICA projects that would raise the effectiveness and sustainability (technical aspects) of this project.

appraisal by the Ministry of Tourism, which was integrated during the project implementation. In particular, there was a mechanism to allocate revenues from the tourism development levy, imposed upon hotel guests, and the departure tax, levied on departing passengers, to the four organizations under the Ministry of Tourism Development and Christian Religious Affairs; it was basically determined 70% to the SLTPB, 14% to the SLTDA, 12% to the SLITHM and 4% to the SLCB. It was found in the revenues and expenditures report of the SLTPB and the SLITHM, the implementing agencies of this project, that the revenues from these taxes (in 2013) represent a very high percentage of their total revenue, at 91% and 82% respectively, as shown below in Table 9 and Table 10.

Table 9: Revenues and Expenditures of the SLTPB

(Unit: million rupees)

	2012	2013
[Revenue]		
Tourism Development Levy	566.3	712.2
Departure Tax	813.2	1,121.8
Other revenues	64.6	186.8
Total	**1,444.1**	**2,020.8**
[Expenditure]		
Salaries, etc.	28.3	31.5
Consumables	34.0	37.7
Operation cost	549.0	1,939.6
Depreciation	3.8	3.6
Other expenditures	0.6	2.0
Total	**615.9**	**2,014.6**
Balance	**828.3**	**6.2**

Source: the SLTPB Annual Report 2013

Table 10:Revenues and Expenditures of the SLITHM

(Unit: million rupees)

	2010	2011	2012	2013
[Revenue]				
Tourism Development Levy	55.8	71.3	90.7	100.5
Departure Tax	117.0	142.4	139.4	192.3
Tuition fees	29.1	37.1	40.5	37.6
Other revenues	2.1	2.4	3.2	4.2
Hotel revenues	13.2	11.8	15.6	21.6
Total	**217.2**	**265.0**	**289.4**	**356.1**
[Expenditure]				
Salaries, etc.	66.5	73.9	85.2	106.4
Consumables	73.9	98.2	120.2	134.1
Depreciation	33.8	36.8	32.5	34.9
Other expenditures	1.3	0.5	0.6	2.4
Total	**175.5**	**209.4**	**238.5**	**277.9**
Balance	**41.7**	**55.6**	**50.9**	**78.3**

Source: the SLITHM Annual Report, various years

In this way, revenues from tourism development levy and the departure tax had been increasing with the growth of foreign tourist numbers, and it was expected that this increasing trend would continue. However, discussions were ongoing at the time of ex-post evaluation as to whether this system would be reviewed from the mechanism which automatically allocates the tax revenues to tourism-related organizations at a certain ratio or from a project-based allocation system. Therefore, revenues and expenditures of these organizations could change in the future. Having stated that, the budget for tourism is not expected to decrease substantially though the allocation of budget to each organization could change significantly, as the tax revenues are to be used for the development of the tourism industry. Therefore, there is no problem as a

whole.

It was seen that the Road Development Authority, Central Cultural Fund and each municipal council secured a budget as well as operated and maintained the facilities developed in this project. The following tables show (Table 11 and Table 12) the actual expenditures of the Road Development Authority and Central Cultural Fund for maintenance activities as examples.

Table 11: Actual Expenditure for Road and Bridge Maintenance (Road Development Authority)

(Unit: million rupees)

Province	2012	2013	2014
Western Province (Negombo)	626	742	860
Central Province (Sigiriya, Nuwara Eliya)	849	941	2,066
Southern Province	625	718	950
Northern Province	236	263	349
Eastern Province	346	394	686
North-Western Province	552	387	796
North-Central Province	663	582	565
Uva Province	337	423	600
Sabaragamuwa Province	536	606	896
Total	4,770	5,057	7,768

Source: Data provided by the Road Development Authority

Table 12: Actual Expenditure for Maintenance in Sigiriya World Heritage Area (Central Cultural Fund)

(Unit: thousand rupees)

Item	2013	2014	2015
Garden maintenance	2,079	33,148	30,171
Building maintenance	5,319	3,119	670
Road maintenance within the area	1,292	162	488
Scientific maintenance	1,613	3,843	3,455
Other expenses	1,009	0	25,937
Total	11,312	40,272	61,568

Source: Data provided by the Central Cultural Fund

In addition, maintenance work of Hamilton Canal in Negombo was outsourced to the Sri Lanka Land Reclamation and Development Board (SLLR&DC) by the city with the growing amount of budget allocated: 16 million rupees (in 2013), 17 million rupees (in 2014), 18 million rupees (in 2015) and 19 million rupees (in 2016).

The Road Development Authority did not necessarily consider the road maintenance budget to be sufficient, but the amount had been increasing. It was confirmed that the maintenance budget for the Sigiriya area had been increasing, backed by the growth in the number of admission tickets sold, enabling the development of related facilities, toilets and so on. At the municipality level, as described in the section on quantitative effect, 'Effectiveness', allocation of a sufficient maintenance budget had become possible, as evidenced by the significant increase in park revenues in Nuwara Eliya. Negombo's budget for outsourcing the canal maintenance was at a sufficient level, according to the SLLR&DC. Judging from the status of maintenance, it was thought that a sufficient budget had been generally allocated.

Based on the above, there were no major issues found in terms of marketing and

promotion, human resource development and operation as well as maintenance of infrastructure facilities, and it was thought that a generally sufficient level of budget had been allocated.

3.5.4 Current Status of Operation and Maintenance

In this project, various activities such as marketing and promotion, human resource development, the community development program and infrastructure development were implemented. The current statuses of these activities were captured in the ex-post evaluation and it was found that maintenance of the facilities developed through this project as a whole were conducted in line with the annual plans at many locations; but, some locations where maintenance was not necessarily sufficient were also spotted. It was thought that this insufficiency was not a matter either technical or financial issues but rather one of less priority having been given to routine maintenance of the facilities developed in this project as they were relatively new ones, while the maintenance of other dilapidated facilities were prioritized.

Individual statuses are described as follows:

- The World Heritage Site in Sigiriya was being maintained thoroughly, including cleaning of the entire premises. However, a motor for a winch for lifting materials to the top of Sigiriya Rock, provided through this project, had been broken-down for several months and a spare part for repair had been ordered. The developed roads were generally maintained in good condition, but damages to road shoulders as well as evidences of insufficient cleaning of drainage and pruning of trees along the roads were spotted at several locations.
- Gregory Lake in Nuwara Eliya was routinely maintained in a sufficient manner and dredging work was being implemented during the site inspection. Victoria Park was also maintained in generally good condition.
- In Anuradhapura, while the roads were mostly in good condition, a few sections were damaged. A park along Malwathu Oya was closed and not sufficiently utilized at the time of ex-post evaluation after having been flooded in 2015.
- In Negombo, there were some locations to be improved, such as scattered rubbish and damage to a developed walkway along Hamilton Canal. Also, some kind of countermeasure was thought to be necessary for water discharge at the fish market.
- The hotel school in Kandy, newly developed through this project, was generally maintained in good condition. Regarding the equipment, including at the hotel school in Colombo, the majority were being utilized for tourism-related human resource development, except for a cafeteria and some burners in the kitchen. On

the other hand, while curriculum improvement activities were carried out in this project, no further efforts to utilize the outcomes of the development of new curriculum were observed.

- Concerning the marketing and promotion activities, various activities had been implemented based on the annual plan of the SLTPB. While it was difficult to say that activities specific to the Japanese market were continuously conducted over several years after the completion of this project, it was confirmed that Japan was positioned as a priority market again in 2016, and a budget was allocated to start activities such as participating in tourism expos, holding tourism seminars in Japan, resuming advertising activities, promoting media-related activities, and so forth.

In this way, the facilities developed in this project were generally maintained in good condition, especially at tourist attractions in Sigiriya and Nuwara Eliya. However, as the developed facilities were relatively new and in better condition, they were given moderately lower priorities, resulting in poor cleaning and neglect in repairing of damages. At hotel schools, facilities and equipment were basically used for human resource development purposes, and the programs which had improved through this project were taken by many students. However, there was an issue in terms of further improvements in the curriculum. Regarding marketing activities, Japan-specific activities were resumed from 2016.

Therefore, while operation and maintenance status was generally favorable, further improvement was desirable for some activities and facilities.

There were no issues found in terms of the institutional aspects of operation and maintenance in this project. Regarding technical and financial aspects, no significant deficiencies were observed in the skills of the organizational staff members concerned nor were there issues with the budget situation. However, while there were positive aspects of the status of operation and maintenance, some concerns were felt in terms of the sustainability of the project effects.

In light of the above, no major problems had been observed in the institutional, technical and financial aspects of the operation and maintenance system; however, there were some issues with the current status of operation and maintenance. Therefore, the sustainability of the project effects is fair.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

In this project, tourism-related infrastructure and human resources were developed to

grow the tourism industry at six tourist destinations in Sri Lanka. This project was consistent with the development plans and needs of Sri Lanka at the time of appraisal and ex-post evaluation as well as the priority areas of Japan's ODA policy at the time of appraisal. Therefore, the relevance of this project is high. With regard to project implementation, while the components were implemented mostly as planned and the project cost is inferred to have been within the plan, the efficiency was fair as the project period exceeded the plan. With respect to project effectiveness, the tourism industry has grown rapidly since the civil war ended in 2009, and it is assumed that many of the targets of the indicators expected in this project were achieved and the unachieved indicators would generally reach their targets by the target year (2015). As for the impact of the project, it was confirmed that the tourism industry had significantly contributed to increases in employment and foreign exchange earnings, and this project made contributions to the development of the industry. Therefore, the effectiveness and impact of this project are high. Regarding sustainability, there were no issues in terms of institutional, technical and financial aspects of operation and maintenance of this project, but the sustainability of the effects generated in this project is fair as there were some issues found in the current status of operation and maintenance.

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

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

Despite the influences from the civil war, this project underpinned the recent growth of Sri Lanka's tourism industry. After the completion of this project, it was observed that the maintenance of infrastructure, in relation to the tourism industry bringing revenues to the project area and the revision of curriculum for tourism-related human resource development, was not necessarily continued sufficiently. While the tourism industry has been rapidly growing post the civil war, it will be an important step, when the current growth of the tourism industry begins to slow, to make a plan for how to utilize the outcomes of this project during the growth period of the industry, that is, to find a way to strengthen the human resource development curriculum and to maintain the infrastructure which is already damaged. Further in this regard, it will be important that the organizations concerned such as the SLITHM, Road Development Authority, and each municipal council, being in charge of operation and maintenance, strongly recognize the viewpoint of sustainability of the tourism sector and continue its operation and maintenance.

4.2.2 Recommendations to JICA

None

4.3 Lessons Learned

Establishment of Project Implementation and a Monitoring Mechanism

A lengthy time was required for various administrative matters in this project, and the project was delayed further due to the change of executing agency. The executing agency to be responsible for the sustainability of this project had not been assigned when this ex-post evaluation commenced. Taking from these occurrences, it will be necessary when implementing projects to consider the possibility of a project delay due to a change of government or ministry-in-charge, depending on the country. When such possibilities can be foreseen, it will be important to delegate stronger authorities to the PMU and PSC established in the project for its implementation. Also, it is considered important to ensure mid-term sustainability by maintaining a system to sustain the project effects for at least several years after project completion. An example would be the necessity of the PMU members remaining assigned to their posts for a certain period of time even after the project completion in order to collect and maintain the related data.

Coordination between the Project Components

While this project aimed to respond simultaneously to various issues in the tourism sector by integrating not only the development of tourism-related infrastructure but also marketing and promotion, human resource development and a community development program, insufficient coordination between each project component was observed. In planning and implementing a project with various components under a certain strategy, it is important to have a viewpoint on (1) what kinds of infrastructure and human resources are required and where they are needed, (2) how marketing activities should be conducted, and (3) how the local residents should be involved. Therefore, it is considered important for those in the executing and implementing agencies, from planning to post-completion stages, to have a common recognition of what kind of relationship each activity has and what kind of effect as a whole they will achieve by taking part in an opportunity such as the PSC to exchange information so that the consistent effects of the entire project will be generated.

Comparison of the Original and Actual Scope of the Project

Item	Plan	Actual
1. Project Outputs		
・ Marketing and Promotion	Market survey and strategy formulation for Japan, and promotion activities in Japan	Implemented as planned
・ Human Resource Development	Colombo Hotel School: Equipment procurement Kandy Hotel School: Construction of school buildings, Equipment procurement Training to the academic staff of both schools, and curriculum improvement Conducting of workshops for hotels and restaurants providing services to foreign guests	Implemented as planned
・ Infrastructure Development	Negombo: Rehabilitation and dredging of Hamilton Canal (7km), Fishermen's Wharf development, and Town beautification Sigiriya: Site rehabilitation (development of paths and rest area), access road rehabilitation (14km) Anuradhapura: Ring road rehabilitation (23km), Beautification of Malwathu Oya Nuwara Eliya: Rehabilitation of Gregory Lake and Victoria Park, Town beautification	Negombo: (Change) Deletion of maintenance road, Addition of canal protection work, Extension of rehabilitated section of Hamilton Canal (2.5km) Sigiriya: (Change) Deletion of some components such as a toilet, no installation of road signs in some sections Anuradhapura: Implemented as planned Nuwara Eliya: Implemented as planned
・ Community Development Program	Tourism awareness campaign for local residents, Clean-up campaign, etc.	Implemented as planned
・ Consulting Services	Implementation support for marketing and promotion Implementation support for human resource development programs Detailed design, preparation of tender documents and tender support related to infrastructure	Implemented as planned

	development, Environmental and social impact monitoring, Construction supervision Implementation support for community development programs	
2. Project Period	March 2006 – December 2010 (56 months)	March 2006 – March 2013 (84 months)
3. Project Cost Amount Paid in Foreign Currency Amount Paid in Local Currency Total Japanese ODA Loan Portion Exchange Rate	 842 million yen 2,630 million yen (2,369 million Rupees) 3,472 million yen 2,604 million yen 1 rupee = 1.11 yen (as of November 2005)	 2,392 million yen 407 million yen (484.39 million Rupees) 2,799 million yen 2,514 million yen 1 rupee = 0.84 yen (Average between March 2006 and March 2013)