EX-POST PROJECT EVALUATION 2014

PACKAGE I-2

(Maldives, Sri Lanka)

July 2015

JAPAN INTERNATIONAL COOPERATION AGENCY

SANSHU ENGINEERING CONSULTANT

EV
JR
15-06

Disclaimer

This volume of evaluations, the English translation of the original Japanese version, shows the result of objective ex-post evaluations made by external evaluators. The views and recommendations herein do not necessarily reflect the official views and opinions of JICA. JICA is not responsible for the accuracy of English translation, and the Japanese version shall prevail in the event of any inconsistency with the English version.

Minor amendments may be made when the contents of this volume is posted on JICA's website.

JICA's comments may be added at the end of each report when the views held by the operations departments do not match those of the external evaluator.

Republic of Maldives

Ex-Post Evaluation of Japanese ODA Loan

"Maldives Tsunami Reconstruction Project"

External Evaluator: Akemi Serizawa

Sanshu Engineering Consultant

0. Summary

The objective of the project was to provide efficient transportation and reliable sewerage services by reconstructing the harbours in eight islands and sewerage systems in three islands in Maldives damaged by the tsunami caused by the Indian Ocean earthquake in December 2004, thereby contributing to the improvement of the living conditions of the affected people and to the recovery of the economic conditions of the country.

Relevance of this project is high, as it has been highly relevant to the country's development plan and development needs, as well as Japan's ODA policy. Efficiency is fair, as the outputs were produced as planned and the project cost was lower than planned, but the project period was significantly longer than planned. Effectiveness is high as the expected outcomes were realized. The harbours are fully utilized as expected because all commodities have been delivered to the islands through them and the people live the normal lives using these commodities, and the number of vessels using the project target harbours is likely to have increased along with the increase of the number of registered vessels per atoll to which the project target harbours belong. Although BOD data[1] did not exist at the time of ex-post evaluation, the sewerage service is also likely to have been provided as expected because BOD5 before treatment was lower than anticipated and that after treatment was much better than the target value at the defect liability inspection in 2011, and the sewerage system is functioning without major problems and the users are satisfied. The effect indicators of the sewerage (population treated, number of connections and percentage of population treated) have achieved the target. Regarding impacts, the living conditions of the people in the islands have been improved compared to those before the tsunami as the commodities available in the islands have increased in terms of number and variety, access to the social facilities such as health centres and schools has improved, and the hygiene and the quality of ground and seawater have improved according to the beneficiary surveys. In total, effectiveness and impact of the project are high. Regarding sustainability, there are no major problems in institutional aspects as the roles of each organization are established, while the operation and maintenance organizations at ex-post evaluation are different from the plan due to the

[1] Biochemical Oxygen Demand (BOD) is an indicator to measure the degree of water pollution from organic substances. Collected water is kept in a sealed glass bottle for five days (＝BOD5) at 20 degrees Celsius, and quantity of oxygen required to discompose the organic substances is measured. (Source: Yokohama Environmental creation station website)

changes of the national administration structures and government policies. Some minor problems have been observed in terms of technical and financial aspects. Therefore the sustainability of the project effects is fair.

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

1. Project Description

1.1 Background

Maldives suffered an enormous damage due to the tsunami caused by the Indian Ocean earthquake (also known as the Sumatra-Andaman earthquake) on 26 December 2004. The harbours of about 25% of the inhabited islands were destructed, and the damaged septic tanks caused contamination of groundwater. The government of Maldives formulated the National Recovery and Reconstruction Plan, and JICA implemented this project to support the reconstruction of harbours and sewerage systems, which had not had sufficient funding from donors.

Project location (Maldives)
(Source: Ministry of Foreign Affairs, Japan)

Part of Malé Northern Quay Wall,
rehabilitated by the project

1.2 Project Outline

The objective of the project was to provide efficient transportation and reliable sewerage services by reconstructing the harbours in eight islands and sewerage systems in three islands damaged by the tsunami caused by the Indian Ocean earthquake in December 2004, thereby contributing to the improvement of the living conditions of the affected people and the economic conditions of Maldives. The location of the project sites is shown in Figure 1.

Harbours (eight project sites)	Funadhoo (Shaviyani Atoll)
	Maafushi (Kaafu Atoll) Replaced by Ukulhas (Alif Alif Atoll) after the project started
	Malé northern quay wall
	Dhiyamigili (Thaa Atoll)
	Isdhoo (Laamu Atoll)
	Isdhoo-Kalaidhoo (Laamu Atoll)
	Fonadhoo (Laamu Atoll)
	Dhaandhoo (Gaafu Alifu Atoll)
Sewerage (three project sites)	Funadhoo (Shaviyani Atoll)
	Eydhafushi (Baa Atoll)
	Muli (Meemu Atoll)

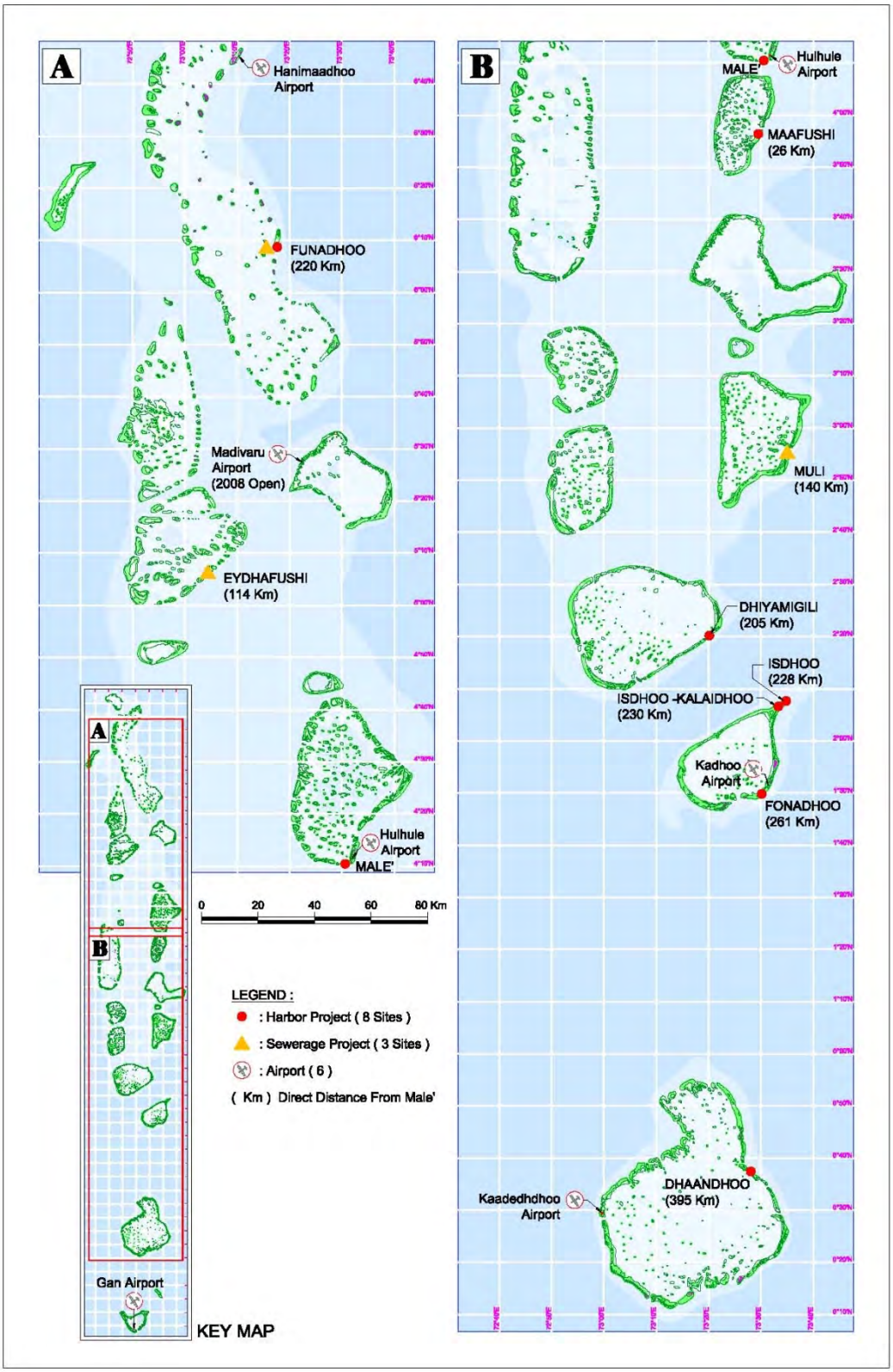


Figure 1. Project sites
(Source: JICA documents)

Loan Approved Amount/ Disbursed Amount	2,733 million yen /2,616 million yen
Exchange of Notes Date/ Loan Agreement Signing Date	June 2006 / July 2006
Terms and Conditions	Harbours: Interest rate: 0.8%, Repayment Period: 30 years (Grace Period 10 years), Conditions for procurement: General Untied Sewerage: Interest rate: 0.75%, Repayment Period: 40 years (Grace Period 10 years), Conditions for procurement: General Untied Consulting services: Interest rate: 0.8%, Repayment Period: 30 years (Grace Period 10 years), Conditions for procurement: General Untied
Borrower / Executing Agencies	Department of External Resources, Ministry of Foreign Affairs Ministry of Construction and Public Infrastructure[2] Ministry of Environment, Energy and Water[3]
Final Disbursement Date	October 2012
Main Contractor (Over 1 billion yen)	MT Hojgaard A/S (Denmark)
Main Consultant (Over 100 million yen)	Yachiyo Engineering Co., Ltd. (Japan) / Oriental Consultants Co., Ltd. (Japan)
Feasibility Studies, etc.	Joint Needs Assessment by World Bank-Asian Development Bank-United Nations on Tsunami Impact and Recovery (2005) (JICA also participated) JICA Study on the Recovery, Rehabilitation, and Development of Islands in the Maldives (2005) JICA Special Assistance for Project Formation (SAPROF) for projects for recovery from Tsunami (2005)
Related Projects	JICA Technical Cooperation Projects: ・Study on the Recovery, Rehabilitation, and Development of Islands in the Maldives (March 2005) ・Sewerage and Groundwater Management Project (January2009 – December 2010) JICA Grant Aid Projects: ・Non-project Grant Aid (January 2005) International organizations: ・World Bank: Cash grant aid for people affected by Tsunami and assistance for the recovery of education sector (March

[2] Ministry of Construction and Public Infrastructure (until November 2008) → Ministry of Housing, Transport and Environment (November 2008 – July 2010) → Ministry of Housing and Environment (July 2010 – May 2012) → Ministry of Housing and Infrastructure (May 2012 -)

[3] Ministry of Environment, Energy and Water (until November 2008) → Ministry of Housing, Transport and Environment (November 2008 – July 2010) → Ministry of Housing and Environment (July 2010 – May 2012) → Ministry of Environment and Energy (May 2012 -)

	2005) ・World Bank: Assistance for education and health sectors (2006) ・Asian Development Bank: Budget support and assistance for recovery of infrastructure (March 2005)

2. Outline of the Evaluation Study

2.1 External Evaluator

Akemi Serizawa, Sanshu Engineering Consultant

2.2 Duration of Evaluation Study

Duration of the Study: July 2014 - May 2015

Duration of the Field Study: September 13-27, 2014, February 7-21, 2015

2.3 Constraints during the Evaluation Study

Due to limited time of the field study, the evaluator visited nine project sites among eleven. They were six harbour sites (Malé, Dhaandhoo, Isdhoo, Isdhoo-Kalaidhoo, Fonadhoo, Funadhoo) and three sewerage sites (Eydhafushi, Funadhoo, Muli).

3. Results of the Evaluation (Overall Rating: B[4])

3.1 Relevance (Rating: ③[5])

3.1.1 Relevance to the Development Plan of Maldives

Following the Joint Needs Assessment by the World Bank, Asian Development Bank (ADB) and the United Nations on Tsunami Impact and Recovery (January 2005) on the damages by the tsunami caused by the Indian Ocean earthquake on 26 December 2004, the Government of Maldives developed the National Recovery and Reconstruction Plan in March 2005. By December 2005, bilateral and multilateral donors had offered 262 million US dollars in total out of 375 million needed for this Plan. The transport sector including harbours had a shortage of 41 million US dollars out of 73 million required. Similarly, the water and sanitation sector including sewerage had a shortage 20 million out of 45 million US dollars required. JICA decided to implement this ODA loan project to fill this gap in funding.

There are about 1,190 islands in Maldives, among which 199 are inhabited by about 290 thousand people in total. According to the Article 23 of the National Constitution of 2008, equitable access to transport and access to sewerage systems of adequate standards in all inhabited islands are among the basic rights of the Maldivian citizens.

The Seventh National Development Plan (2006-2010) mentioned not only about the reconstruction from the tsunami damages, but also about the development needs of

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

harbours as Maldives relied on maritime transport and also those of sewerage systems because inappropriately treated wastewater caused pollution of groundwater and seawater. The Seventh National Development Plan was replaced by the Strategic Action Plan (2009-2013) in the midway due to the change of government, which also prioritized the improvement of domestic transport networks including maritime transport as well as water supply and sewerage systems.

After the presidential elections in November 2013 and the parliamentary elections in March 2014, there is no national development plans. The manifest of the current leading party in the presidential elections shows the directions of national development and promises that all inhabited islands would have appropriate harbours which allow access to facilities such as airports, health centres and schools. It also prioritizes the improvement of sewerage systems.

The Maritime Transport Master Plan which was developed in collaboration with ADB and approved by the Government in November 2013 aims to improve ferry networks and harbours. Concerning sewerage services, there are no laws or guidelines to regulate operation and maintenance. The Ministry of Environment and Energy (MEE) is drafting the Water and Sewerage Act, which is to be approved by the Parliament in 2015. MEE plans to install sewerage systems in 45 islands between 2013 and 2015 in addition to the 30 islands that had sewerage systems as of 2012 out of 199 inhabited islands in Maldives.

As mentioned above, at appraisal and at ex-post evaluation, the implementation of the project conforms to the development policies of Maldives.

3.1.2 Relevance to the Development Needs of Maldives

Harbours are very basic infrastructure in the Maldivian islands as all people and commodities come and go through them. Fishery, which is the only industry in many islands, is not possible to survive without harbours. Rehabilitation of the tsunami-damaged harbours was urgently needed. Sewerage systems did not exist before the tsunami in 2004 in most islands, and inappropriately treated wastewater by individual septic tanks was discharged to the ground or to the sea with a risk of pollution of groundwater and seawater. The Government of Maldives decided to introduce sewerage systems in selected islands after the septic tanks were damaged by the tsunami. The selection criteria for this JICA project sites were as follows:

- Damaged by the tsunami.
- Included in the Recovery and Reconstruction Plan of the Government, which was based on the Joint Needs Assessment.
- Not supported by other donors.
- No serious negative impacts on the environment were foreseen.

- The affected people strongly demanded the recovery/reconstruction of the damaged facilities.
- The population[6] of the island was more than 500.

Duplication of assistance was avoided by the coordination between the Government of Maldives and the donors in selection of the sites to support. While the JICA project was originally to support eleven harbours sites and eight sewerage sites at the request of the Government, the target sites were reduced to eight harbours and three sewerage sites after the assessment of damage[7] and also considering the Government's limited capacity of handling ODA loan project in the deteriorated economic situations after the tsunami.

At the ex-post evaluation, needs for the improvement of harbours and sewerage systems still exist because they continue to be the basic infrastructure for the islands. Only about a half of the inhabited islands has proper harbours. The ferry services in the areas far from Malé do not have regular timetables and the fares are expensive. Malé harbours are always congested as 90% of the cargoes delivered to other islands are handled there[8]. Only 30 among 199 inhabited islands had sewerage systems as of 2012. In other islands without sewerage systems, the groundwater is contaminated by inappropriately treated wastewater coming from septic tanks, and availability of safe drinking water is limited[9].

From the above, at appraisal, there was a necessity to urgently rehabilitate the facilities damaged by the tsunami as they were basic infrastructure in the target islands. At ex-post

6 Population statistics of the project target islands

Island	2000	2006	2014
Malé	74,069	103,693	153,379
Ukulhas	535	615	918
Dhiyamigili	484	452	562
Isdhoo/ Isdhoo-Kalaidhoo	1,432	1,559	1,411
Fonadhoo	1,740	1,762	2,203
Dhaandhoo	1,150	1,113	1,106
Funadhoo	799	1,599	2,099
Eydhafushi	No data	2,409	2,626
Muli	No data	746	862

(Source: Year 2000: questionnaire response from the Ministry of Housing and Infrastructure. Year 2006 and 2014: Population and Housing Census 2014, Preliminary Draft 13 Nov. 2014, by the National Bureau of Statistics)

7 These harbor sites were originally to be covered by this Project but were finally excluded. They were all rehabilitated by other funds:

・Makunudhoo: Being reconstructed by the fund of European Investment Bank.

・Lhohi: Reconstruction was completed in 2008 by the fund of the Maldivian Government.

・Hirilandhoo: Reconstruction was completed in 2014 by the OPEC Fund for International Development (OFID).

・Maafushi got fund of the Maldivian Government in 2007 and reconstruction was completed in 2010. Ukulhas was originally to be supported by USAID, but excluded later because it needed more budget than planned. The JICA project decided to support Ukulhas instead of Maafushi because Ukulhas met the criteria of the site selection and other funding was not available.

8 ADB Interim Country Partnership Strategy: Maldives, 2014–2015

9 Report of Ministry of Environment and Energy presented at Fifth South Asian Conference on Sanitation in Nepal, 2013

evaluation, there is still a need to improve these facilities. Therefore, this project is in line with the development needs of Maldives at the time of appraisal and ex-post evaluation.

Dhaandhoo harbour

Muli wastewater treatment plant

3.1.3 Relevance to Japan's ODA Policy

At the time of appraisal, JICA's Medium-Term Strategy for Overseas Economic Cooperation Operations (2005) prioritized assistance to the worldwide issues and peace building including mid- and long term support to recovery and reconstruction from disasters as well as prevention. Japan's Country Assistance Policy for Maldives at that time prioritized basic social infrastructure and social development including health, education and community development, considering the development needs and the potential benefits. The project conformed to these assistance policies at appraisal.

3.1.4 Relevance of project planning and approach

Relevance of indicators

As explained in the section of Effectiveness, "the number of vessel arrival per week" was selected as an operational indicator for the harbours. However, it was not possible to measure it because such data had not been collected. This section discusses the relevance of selection of such indicator which is difficult to collect especially in emergency relief projects after natural disasters.

According to JICA documents, the baseline numbers of "vessel arrival per week" of Funadhoo, Maafushi, and Fonadhoo harbours were obtained from the Island Chiefs. As there is no system to record vessel arrival in Maldives islands, the obtained figures are likely to have been just assumptions. The target numbers of vessel arrival per week after the project completion were calculated by the SAPROF team based on expected economic growth and other factors. According to JICA documents at appraisal, there was an opinion in the Government of Japan that the project target harbours must have been reduced only

to these three because of lack of the data, which concerned the capacity of the Government of Maldives to monitor the indicators during the post-tsunami reconstruction. JICA argued that it was unrealistic to agree with all target Island Development Committees (headed by the Island Chiefs) about the indicators and targets because they were all busy for recovery/reconstruction after the tsunami in the emergency situation. The Government of Maldives and JICA agreed on the target values of vessel arrival per week of these three harbours. However, JICA's documents at appraisal also showed the target values of other harbours, the reasons of the agreement of these target values are not clear. The Island Development Committers were replaced by the Island Councils in 2011, and the institutional memory about the agreement on the project indicators does not remain in the Island Councils at the time of ex-post evaluation. Also, current staff members of the Ministry of Housing and Infrastructure (MHI) do not know the process how the project indicators were agreed. Setting such an indicator could have been inappropriate, as it is not realistic for such small and basic harbours to record the number of vessel arrival as vessels come and go anytime, and there is no system, procedure or person to record it.

The World Bank and ADB set only output indicators such as the length of harbours rehabilitated or the number of classrooms constructed to measure the outcomes of projects to support recovery from tsunami damages. Since the JICA project was also emergency assistance for the quick recovery of normal life of the affected people, this project also should have used output indicators but not indicators without actual data and therefore monitoring of which was unrealistic. All the same, the project was still relevant despite this indicator problem because they did not hinder the achievement of expected outcomes of the project.

While there was a problem in setting indicators to measure Effectiveness, this project has been highly relevant with the Maldives' development plan and development needs, as well as with Japan's ODA policies. Therefore its relevance is high.

3.2 Efficiency (Rating: ②)

3.2.1 Project Outputs

The outputs of the project (plan and actual) are shown in Table 1 and 2. Although there are some discrepancies between the original plan and actual outputs after the detailed design, the actual outputs are more or less same as the plan. According to the project consultants, the harbours were upgraded compared to those before the tsunami. Better materials were used to reduce the maintenance cost and frequency, and the size of the quay walls were widened in some sites where the geographical and financial conditions

allowed so that as many vessels as possible could moor. The replacement of one harbour site (from Maafushi to Ukulhas) was reasonable as Ukulhas did not have other source of funding and met the selection criteria of the JICA project.

The outputs of the sewerage systems were also almost same as the plan. According to the project consultants, the original system consisted of individual septic tanks, sewer pipes connecting septic tanks and the treatment plants, and treatment plants from where treated wastewater was to be discharged to the ground. The sewer pipes were combination of "gravity system" by which wastewater is carried by gravity and "force feed pumping system" which uses pumps where the pitch is not steep enough. The actual design falls basically in the same system as the plan, but there are no individual septic tanks, and wastewater is directly carried by the sewer pipes to the treatment plant, and treated in aeration tanks in which pollutants are decomposed by air blown by electric power and then discharged to the sea. At appraisal, the Ministry of Environment, Energy and Water Resources was against the system with septic tanks because sludge treatment and securing space at each house were difficult and the wastewater from septic tanks would contaminate the groundwater. The change of sewerage systems was based on the request of the Government of Maldives, and technically and environmentally appropriate.

Table 1. Comparison of Outputs: harbours (plan and actual)

Harbours	Original Scope (At time of L/A)	Actual Scope
Funadhoo Width of quay wall before Tsunami 370m	Quay wall (370m), Breakwater (120m), Seawall (350m), Pavement and navigation aid (110m), Dredging (18,000 ㎥)	Same as the plan Quay wall (370m), Breakwater (A1 112m, A2 305m), Seawall, Pavement and navigation aid, Dredging (Basin 40,800 ㎥, Channel 26,108 ㎥)
Maafushi Width of quay wall before Tsunami 100m	Quay wall (150m), Breakwater (150 m), Seawall (240m), Pavement and navigation aid (160m), Dredging (21,000 ㎥)	**Replaced by Ukulhas**
Ukulhas No repair of quay wall	(N/A)	Breakwater, Pavement and navigation aid, Dredging (Basin 2,899 ㎥ , Channel 1,753 ㎥)
Malé Quay wall was partly repaired by this Project	Quay wall（110m）	Same as the plan Quay wall (110m), Pavement and navigation aid
Dhiyamigili Width of quay wall before Tsunami 158m	Quay wall (158m) , Breakwater (300 m), Seawall (170m), Pavement and navigation aid (150m), Dredging （17,000 ㎥）	Same as the plan Quay wall (200m), Breakwater (A1 70m, A2 135m), Pavement and navigation aid, Dredging (Basin 29,884 ㎥, Channel 10,378 ㎥)
Isdhoo Width of quay wall before Tsunami 150m	Quay wall (14m), Pavement and navigation aid (50m), Dredging (2,900 ㎥)	Same as the plan Quay wall (140m), Breakwater (132m), Seawall, Pavement and navigation aid, Dredging (Basin 21,270 ㎥ , Channel 1,700 ㎥)
Isdhoo-Kalaidhoo Width of quay wall	Quay wall (19m), Pavement and navigation aid (110m), Dredging	Same as the plan Quay wall (100m), Breakwater (A2

before Tsunami 93m	(4,250 ㎥)	80m), Seawall, Pavement and navigation aid, Dredging (Basin 8,910 ㎥, Channel 6,830 ㎥)
Fonadhoo Width of quay wall before Tsunami 170m	Quay wall (220m), Breakwater (70 m), Seawall (172m), Pavement and navigation aid (301m), Dredging (21,500 ㎥)	Same as the plan Quay wall (267m), Breakwater (A1 57m, A2 193m, Repair 928 ㎥), Seawall, Pavement and navigation aid, Dredging (Basin 53,901 ㎥, Channel 25,471 ㎥)
Dhaandhoo Width of quay wall before Tsunami 150m	Quay wall (150m), Breakwater (130 m), Pavement and navigation aid (100m), Dredging (12,000 ㎥)	Same as the plan Quay wall (223m), Breakwater (A2 216m), Seawall, Pavement and navigation aid, Dredging (Basin 38,721 ㎥, Channel 5,012 ㎥)

(Source: JICA documents)

Table 2. Comparison of Outputs: sewerage (plan and actual)

Island	Original scope (at the time of L/A)	Actual scope
Funadhoo	238 septic tanks, 12 small wastewater treatment plants, etc.	The actual system is basically classified as the same system as the plan. The difference is that the system does not have septic tanks and has one wastewater treatment plant in each island from where treated wastewater is discharged to the sea. The plants have aeration tanks.
Eydhafushi	354 septic tanks, 17 small wastewater treatment plants, etc.	
Muli	136 septic tanks, 7 small wastewater treatment plants etc.	

(Source: JICA documents, interview of consultants)

Sewerage pumping station, Funadhoo

Sewerage pumping station, Eydhafushi

The consulting services included provision of assistance in project management, detailed design, tendering, construction supervision, environmental research and monitoring, incorporation of social aspects, and training of government staff and target population and technology of transfer. They were implemented as planned. The actual man-months were 245.8 and almost the same as the original plan (244.8).

3.2.2 Project Inputs

3.2.2.1 Project Cost

The project cost was lower than planned. The planned project cost was 3,252 million yen, 2,733 million yen of which was to be funded by the Japanese ODA loan. The actual project cost was 3,011 million yen in total (93% of the plan), 2,648 million yen of which were funded by the Japanese ODA loan (97% of the plan).

Table 3. Project cost

(Unit: million yen)

Item	Plan (2006)					Actual (2011)				
	Yen loan (Foreign currency)	Local currency		Total		Yen loan (Foreign currency)	Local currency		Total	
		Local funding	Yen loan	Total	Yen loan		Local funding	Yen loan	Total	Yen loan
Harbours	1,690	0	89	1,779	1,779	1,757	0	0	1,757	1,757
Sewerage	301	0	16	317	317	459	0	0	459	459
Price escalation	52	0	0	52	52	0	0	0	0	0
Contingency	102	0	5	107	107	4	0	0	4	4
Consulting services	406	0	72	478	478	428	0	0	428	428
Operation cost	0	137	0	137	0	0	107	0	107	0
Tax	0	309	0	309	0	0	256	0	256	0
Interest (local funding)	(73)	0	0	73	0	0	0	0	0	0
Total	2,551	446	182	3,252	2,733	2,648	363	0	3,011	2,648

Source: JICA documents
Exchange rate: At appraisal (June 2005) 1 US$ =107 JPY, 1 US$ =12.8 Rufiyaa, 1 Rufiyaa＝8.36 JPY
Average exchange rate in the project period (July 2006-December 2011): 1 US$ = 98.32 JPY
Price escalation: Foreign currency 1.3% per year, local currency 0.0% per year
Contingency: 5%

According to the project consultants, the actual project cost of the sewerage systems was higher than planned because the original cost estimate (317 million yen for three islands, which meant about 100 million yen for one island) was much lower than the required cost. Other donors' similar projects (UNICEF and French Red Cross) needed about 200 million yen for one island. As the shortage was obvious at the beginning of the project, the consultants requested Ministry of Environment, Energy and Water Resources to reduce the number of target islands from three to two. However, the project kept the original three islands as the Ministry wanted to avoid political issues. The actual cost for the sewerage systems increased, but the total project cost was lower than planned as the increase was absorbed by the contingency.

3.2.2.2 Project Period

The project period was significantly longer than planned. The original project period was from July 2006 (L/A) to November 2009 (completion of consulting services) of 41 months in total. The actual project period was from July 2006 (L/A) to December 2011 (completion of consulting services) of 66 months in total, which was 161% of the plan.

Table 4. Project period (comparison of plan and actual)

	Plan (At time of L/A)	Actual
Consulting services (including selection of consultants) May 2006 – November 2009 (43 months) in the appraisal documents	Selection May 2006 – July 2007 (15 months) Work August 2006 – November 2009 (41 months)	Selection May 2006 – December 2007 (20 months) (JICA documents state that it began in May 2007, which is likely to be an error) Work February 2008 – December 2011 (47 months)
Tender and contract August 2006 – June 2007 (11 months) in the appraisal documents	Total August 2006 – January 2007 (6 months) Harbours August 2006 – November 2006 (4 months) Sewerage August 2006 – January 2007 (6 months)	Total February 2008 – September 2008 (8 months) Harbours February 2008 – September 2008 (8 months) Sewerage February 2008 – September 2008 (8 months)
Construction April 2007 – November 2008 (20 months) in the appraisal documents	Total April 2007 – October 2008 (19 months) Harbours April 2007 – July 2008 (16 months) Sewerage July 2007 – October 2008 (16 months)	Total June 2009 – March 2011 (34 months) Harbours June 2009 – March 2011 (34 months) Sewerage July 2009 – October 2010 (16 months)

(Source: JICA documents)

Main reasons for the extension of the project period were as follows:

- This project was the first Japanese ODA loan project in Maldives and the executing agencies were not familiar with its procedures. It took 11 months to prepare tender documents for the selection of project consultants as the executing agencies did not have sufficient capacity to manage many projects, of their own and by donors, for recovery from tsunami damages. While the selected consultants provided assistance during project implementation, the project did not provide support for selection process itself. Approval process of the selection results by the relevant agencies also took long time. According to the JICA documents at appraisal, there was a discussion that this project should have been Grant Aid because the Government of Maldives might not have sufficient capacity in management of ODA loan project during the tsunami recovery. However, loan was selected because additional Grant Aid was not possible after the Japanese government had already implemented a non-project Grant Aid assistance of two billion yen.
- The period of consulting services was reasonably extended due to the extension of civil works for the replacement of one of the harbours. Maafushi was replaced by

Ukulhas in September 2010. Ukulhas was to be supported by USAID, but was excluded due to lack of funding. JICA project took it as it met the site selection criteria and it did not receive support from the Government of Maldives or other donors. The period of harbour construction was extended until March 2011.

3.2.3 Results of Calculations of Internal Rates of Return

At appraisal, internal rate of return was calculated just for reference as it was not obliged in projects of reconstruction from disasters. The calculated Economic Internal Rate of Return (EIRR) was 18.2% for the harbours and 22.5% for the sewerage. The "costs" to calculate EIRR were project costs and operation and maintenance costs for both harbours and sewerage. The "benefits" were "shortened waiting time for tides in bad weathers", "decreased damage to the moored vessels" and "increased fish catches" for the harbours. For the sewerage, "benefits" were "decrease of costs to cover the shortage of water due to contamination of groundwater". As these data were not available at the time of ex-post evaluation, EIRR could not be re-calculated.

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

3.3 Effectiveness[10] (Rating ③)

3.3.1 Quantitative Effects (Operation and Effect Indicators)

Operation and effect indicators shown below were set at the time of appraisal to achieve the project objectives of "recovery of efficient movement of people and commodities and reliable sewerage services". There were no baseline data because the harbours were destroyed by the tsunami and the sewerage systems did not exist in the target islands at the time of appraisal.

3.3.1.1 Operation Indicators

(1) Harbours

As there are no data of the vessel arrival per week, it is difficult to measure the achievement of the target.

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

Table 5　Vessel arrival per week

Harbour	Baseline data from information from the Island Chief (July 2005)	Target (2011, two years after the completion of the Project)	Ex-post evaluation (2015)
Funadhoo	175	＊310	No data
Maafushi	245	＊434	Excluded from the project
Ukluhas (added after the project started)	-	N/A	No data
Malé	-	420	No data
Dhiyamigili	-	352	No data
Isdhoo	-	678	No data
Isdhoo-Kalaidoo	-	229	No data
Fonadhoo	210	＊372	No data
Dhaandhoo	-	431	No data

(Source: JICA documents)
Note (*): Target numbers were agreed only about Funadhoo, Maafushi and Fonadhoo between the Government of Maldives and JICA.

As explained in the section of relevance, there is no system to capture the “number of vessel arrival” at the time of appraisal or at ex-post evaluation.

In Malé, about 200 vessels pay monthly mooring fees. Thus vessel arrival per week is likely to exceed 420 (the target of the project). As this project repaired only a part of the Malé harbour, it is impossible to know exactly the causality of the use of the relevant part of the Malé harbour and the effectiveness of the project. . The vessel arrival was not recorded in other project target islands. However, the residents know very well about the vessels using the harbours as the islands and harbours are so small. The Island Councils consider that the number of vessels that use the harbours may exceed the project targets.

The Ministry of Economic Development has the register of vessels per atoll as shown in Table 6 below, while there are no statistics per island. The project target islands are atoll capitals or populated islands, thus considerable part of the registered vessels is likely to use the project target harbours. Along with the increase of the number of registered vessels in past six years, the number of the vessels that use the project target harbours is also likely to have increased.

Table 6. Registered vessels per atoll

Atoll	Harbours rehabilitated by this project in the atoll	2007	2013
Shaviyani	(Funadhoo)	383	520
Kaafu	(Maafushi, Malé)	3,323	4,354
Alif Alif	(Ukulhas)	208	278
Thaa	(Dhiyamigili)	394	605
Laamu	(Fonadhoo, Isdhoo, Isdhoo-Kalaidhoo)	225	293
Gaafu Alif	(Dhaandhoo)	147	275
Nationwide		8,370	11,600

(Source：Maldives Statistical Yearbook)

From the above, it is likely that the number of vessels that use the target harbours of this project has increased along with the increase of the registered vessels per atoll while the data of vessel arrival per week are not available. There is no choice not to use the harbours as all commodities come through the harbours. As observed during the field visits of ex-post evaluation, people in the islands are living normal lives with adequate clothing and food. It means that the harbours are certainly utilized as expected.

(2) Sewerage

It is impossible to decide the level of achievement of the target because there are no BOD data at ex-post evaluation.

Table 7. BOD at discharge（Funadhoo, Eydhafushi, Muli）

Indicator	Target (2011, two years after the completion of the Project)	Ex-post evaluation (2015)
BOD at discharge（mg/L）	Less than 30	No data

(Source: JICA documents)

Fenaka Corporation, which runs the sewerage services in the three target islands, did not measure BOD at the time of ex-post evaluation. Its Eydahafushi office does water quality testing once a month, but BOD is not measured. It measures pH of the second aeration tank, clarity in the pre-treatment pump and that in discharge pump as well as the water colour in every step of treatment. Data of pH and clarity meet the standard values set by Fenaka Eydahafushi office. Fenaka Funadhoo office used to do water quality testing almost every day until 2011, but it did not measure BOD. They think that they are not obliged to do water quality testing after the defects liability period expired. Fenaka Muli office does not perform water quality testing at all.

At appraisal, Island Development Committees were supposed to be responsible for the operation and maintenance of the sewerage systems. However, the function was transferred to regional utility companies in 2009 and in the following years. JICA technical cooperation project titled “Sewerage and Groundwater Management Project” (2009-2010) aimed at improvement of management capacity of the utility companies, but the companies measured different items using different formats of water quality testing.

The JICA technical cooperation project developed the “Standard procedure of sewerage concept design”, the “Guidelines of sewerage concept design and design review”, and the “Guidelines for operation and maintenance of sewerage system”, which were approved by the Ministry of Housing and Environment and Environment Protection Authority in December 2010. The “Standard procedure of sewerage concept design” and the “Guidelines of sewerage concept design and design review” were about the design of

wastewater treatment facilities, and they required the design to conform to the standard set by the National Waste Water Quality Guidelines (January 2007), which set the limit of BOD at 40mg/L at discharge to the sea and 5mg/L at discharge to the ground. The "Design Criteria and technical specifications for conventional gravity systems 2013", currently valid, were developed based on these guidelines and require the facilities to make BOD at discharge to the sea below 20mg/L. The operation and maintenance guidelines of sewerage treatment plants do not exist as of 2015. Those developed by the JICA technical cooperation project did not intentionally set the standard of items to be measured. They just introduced some examples of other countries including Japan and expected the Government of Maldives to set the target later by its own initiative. According to current MEE, the operation and maintenance guidelines developed by the JICA technical cooperation project and the water quality guidelines in 2007 are not valid any more. Their contents will be compiled into the Water and Sewerage Act, which is being drafted and to be approved by the Parliament in 2015. MEE is not able to regulate sewerage services as there are no regulations.

Table 8. BOD5 in September 2011

Project site	Wastewater before treatment (mg/L) (Raw sewage pump pit)	Wastewater after treatment (mg/L) (Discharge pump pit)
Funadhoo	77	6
Eydhafushi	112	7
Muli	190	7

(Source: JICA documents)
Note: the figures are of the defect liability inspection on 13 September 2011, after the completion and handover of the project facilities in October 2010.

At the defect liability inspection in 2011, BOD5 of treated water was better than the target of this project (30mg/L). In the project design, BOD5 of wastewater before treatment was estimated about 400mg/L and that of after treatment was about 100mg/L[11]. According to the project consultants, the actual BOD5 after treatment was lower than anticipated because the actual BOD of pre-treatment wastewater was much lower than the original estimate. Muli's water quality after treatment did not meet the requirement at the defect liability inspection due to weak capacity of staff. In other two sites, water quality met the requirement and the capacity of staff was considered satisfactory.

3.3.1.2 Effect Indicators

(1) Harbours

No effect indicators were set at appraisal. At ex-post evaluation, the number of

[11] The reason for the discrepancy between these figures and the target of this project (30m/L) is unknown.

passengers or volume of cargo handled at the target harbours were considered as effect indicators, but such data did not exist and it was not possible to measure.

(2) Sewerage

At appraisal, “population treated”, “the number of connection to the sewerage systems”, and “the percentage of population treated” were agreed as effect indicators with the Government of Maldives. As the definitions of these indicators were not stated in the documents, general definitions as follows are utilized at the ex-post evaluation.

Population treated: Population in the areas served by the sewerage systems. It includes households in the area but not connected to the sewerage systems.
Number of connection to the sewerage systems: Actual number of connections.
Percentage of population treated: Percentage of “Population treated” (above) in the total population of the administrative unit (in this project, population of the island)

Population treated achieved the target (4,800 in the three islands) as shown in Table 9. The reason for the discrepancy between the number from MEE and the census results in October 2014 is unknown. The census was implemented in 2014 for the first time since March 2006, so the trend of population change is not captured as there are no population data per island between the two censuses.

Table 9 Population treated

(Unit: person)

	Target	Actual				Census results
	2011	2011 (Project completion)	2012 (1 year after the project completion)	2013 (2 years after the project completion)	2014 (3 years after the project completion)	October 2014 (Preliminary results)
Funadhoo		2,300	2,341	2,390	2,424	2,099
Eydhafushi		3,047	3,121	3,168	3,197	2,626
Muli		893	918	936	959	862
合計	4,800	6,240	6,380	6,494	6,480	5,588

(Source: Population served is from the questionnaire response from MEE. Census results are from Population and Housing Census 2014, Preliminary Draft 13 Nov. 2014, National Bureau of Statistics)

Number of connection to the sewerage systems and Percentage of population treated

The number of connection achieved the target. The percentage of population treated also achieved the target because all households in the target islands were connected to the sewerage systems according to the Island Councils and Fenaka offices in the islands.

Table 10. Number of connection to the sewerage system and Percentage of population treated

	Number of connection to the sewerage system			Percentage of population treated (Target: 100%)
	Target (2011)	Actual (2014) 3 years after project completion	Number of household (2006)	Actual (2014) 3 years after project completion
Funadhoo		380	231	100%
Eydhafushi		709	344	100%
Muli		208	132	100%
合計	730	1,297	707	100%

(Source: Number of household in 2006 is from the census. Number of connection in Eydahafushi is from the website of Fenaka Corporation. The number of connection and number of household in Funadhoo and Muli are from the confirmation of the Island Councils and Fenaka in the islands that all households were connected.)

According to the project consultants, almost all houses in the three islands were connected to the sewerage systems except for five buildings such as barns that did not need sewerage. Since the project completion, new housing areas have been developed by reclamation, but the houses are not built or not inhabited yet, and they are not connected to the sewerage. Therefore all inhabited houses are connected to the sewerage systems. Fenaka Funadhoo office mentioned that there would be no technical or equipment problem to connect new houses to the system. Fenaka in other two islands do not have necessary equipment and are not confident. Fenaka island offices do not charge connection fees from users.

3.3.2 Qualitative Effects

The beneficiary reported that the harbours became safer and more user-friendly according to the beneficiary surveys[12] (Figure 2) and the interviews during the site visits. The quay walls were simple before the tsunami, but the height and the side of the quay walls were improved and the loading and unloading of cargo became easier.

Effectiveness is high as the expected outcomes are considered realized. The harbours are fully utilized as expected because all commodities come to the islands through them and the people live the normal lives, and the number of vessels that use the project target harbours is likely to have increased along with the increase of the number of registered vessels per atoll to which the project target harbours belong. Regarding the sewerage, while BOD data did not exist at the time of ex-post evaluation, BOD5 before treatment was lower than anticipated and that after treatment was much better than the target at the

12 The beneficiary surveys were conducted by the local consultants with 70 people in Fonadhoo for the harbour part (36 men and 34 women from age 17 to 72 of various occupations) and 63 people in Eydahafushi for the sewerage part (18 men and 45 women from age 18 to 80 of various occupations) using the prepared questionnaire. The participants in the surveys were selected to represent different sex, age and occupation with assistance of the Island Councils.

defect liability inspection in 2011, and the sewerage system was functioning without major problems at the time of ex-post evaluation and the users were satisfied as shown in the beneficially survey results shown in the next section. Therefore the sewerage service is provided as expected. The effect indicators of the sewerage have also achieved the target.

3.4 Impacts

3.4.1 Intended Impacts

(1) Improvement of living conditions

According to the beneficiary survey, the living conditions in the islands has improved compared to those before the tsunami, such as the volume and variety of commodities available in the islands has increased and access to the schools and health facilities has improved. The activities of fishers did not change in particular. The majority of respondents did not see the increase in the frequency of travel to other islands, the increase of income or the increase of employment opportunities.

Figure 2. Result of beneficiary survey (Fonadhoo harbour)

The respondents compared the situation before Tsunami and current conditions after the project completion (70 respondents).

Harbour is safer than before Tsunami.	60%
Harbour is more user-friendly than before Tsunami.	75%
Harbour is more solid against earthquakes or tsunami	2%

Frequency of travel to other islands	Increased 51%	Did not increase 49%
Income	Increased 31%	Did not increase 69%
Employment opportunities	Increased 34%	Did not increase 66%
Volume and variety of commodities available in the island	Increased 80%	Did not increase 20%
Condition of harbour	Improved 98%	Did not improve 2%
(fishers) number of fishing days	Increased 12%	Did not increase 88%
(fishers) damage to the vessels	Decreased 7%	Did not decrease 93%
(fishers) fish catches	Increased 6%	Did not increase 94%

New or increased employment opportunities include staff of ferries. Commodities with more varieties and volume available in the island include food, clothing, daily necessities, and construction materials.

Migration to other islands	Increased 45%	Same 36%	Decreased 19%
Migration to this island	Increased 86%	Same 14%	Decreased 0%
Access to social services (schools and health facilities)	Increased 76%	Same 24%	Decreased 1%
Business	Increased 88%	Same 12%	Decreased 1%
Income of the island and atoll	Increased 68%	Same 12%	Decreased 0%
Safety	Improved 46%	Same 44%	Deteriorated 10%
Tourism	Improved 53%	Same 44%	Deteriorated 3%
Quality of seawater	Improved 24%	Same 61%	Deteriorated 14%
Environment	Improved 27%	Same 58%	Deteriorated 15%

The results of the beneficiary survey show that people are satisfied with the sewerage systems in general. Since the drinking water comes from wells (groundwater) and rainwater, the sewerage is expected to mitigate the contamination of groundwater. While there are no data about the quality of groundwater and waterborne diseases, many respondents confirmed the improvement of quality of groundwater and seawater.

Figure 3. Result of beneficiary survey (Eydahafushi sewerage)
The respondents compared the situation before Tsunami and current conditions after the project completion (63 respondents).

Treatment of wastewater from home	Improved 84% (there was no sewerage before)	Did not improve 14% (there is odour sometime)
Hygiene in house	Improved 92%	Did not improve 8%
Quality of water of the well	Improved 82% (less odour)	Did not improve 18% (bad smell and salty taste)
Quality of seawater	Improved 78% (cleaner than before)	Did not improve 22% (in some areas seawater is dirty)
Satisfaction with the sewerage system	Satisfied 95%	Not satisfied 5%

Some respondents pointed out odour around the wastewater treatment plant.

(2) Economic recovery of the country

There were no data available to show that this project contributed to the economic recovery at the national level. Even if data are available, it is not possible to assume the causality between the effectiveness of this project and economic recovery of the country because this project rehabilitated harbours of only eight islands among 199 inhabited islands in Maldives and the tourism industry, the biggest source of income of the country, is operated in the resort islands which are virtually detached from the normal islands. Still, the result of the beneficiary survey shows that the project contributed to economic recovery of the project target islands because the volume and variety of commodities available in the islands increased compared to the period before Tsunami, and many assume that business opportunities in the islands as well as income of the island and atoll increased.

3.4.2 Other Impacts

(1) Impacts on the natural environment

At appraisal, the project was classified as a “B” category[13] project according to the

[13] Category A: to be applied to the project, in which seriously unfavorable impacts to the environment and community are concerned. Category B: to be applied to the project, in which unfavorable impacts to the environment and community are considered smaller compared with Category A.

"JBIC Environmental Guidelines to be used for Safeguard Issues under the ODA Loan Project (April 2002)", which would not have big negative impact on natural environment. The project areas and the areas around them were not a preserve and there were no coral leafs around the harbours. Thus no severe negative impacts on natural environment were foreseen. Methods to prevent contamination of the seawater during dredging and excavation were to be used during the construction of harbours. Therefore no negative impact on the quality of seawater was anticipated. The quality of treated wastewater was to meet the international standards and also no negative impact on the quality of seawater was anticipated.

The Ministry of Environment, Energy and Water Resources gave this project an environmental approval just after the detailed design and before the selection of contractors of civil works, as planned. During the project implementation period and at the project completion, environmental monitoring was carried out according to the Environmental Impact Assessment Decision Statement of the Environmental Protection Authority and the Ministry of Environment, Energy and Water Resources as shown in Table 11.

Table 11. Result of environmental monitoring

Items to be monitored	Result
Condition of coral leafs	No change before/after the Project.
Change of fishes around the island	No change before/after the Project.
Change of the current of the sea in the harbour and at the entrance of the harbour	No change before/after the Project.
Quality of seawater inside and outside of the harbour	The measured items always met the standard.
Change of the current of the sea around the island	There was sedimentation of mud in the bottom of the sea in some areas, but there was no serious impact on the natural environment. Some coast lines were eroded and protection works were done using rocks.
Waste management	Wastes were segregated and appropriately disposed.

(Source: JICA documents)

The beneficiary survey result shows that many people in the islands consider that quality of groundwater and seawater improved, and there were no information to indicate negative impact of the sewerage on the natural environment. Similarly, there was no information to indicate negative impact of the harbours on the natural environment.

(2) Land Acquisition and Resettlement

MHI and MEE confirmed that there was no resettlement or land acquisition in the project.

(3) Other Positive and Negative Impacts

Some people in the islands were employed and trained during the construction and test runs of the sewerage facilities. Some of them continue working in the current Fenaka offices. The project has contributed to employment creation in the islands to some extent.

Effectiveness is high as the expected outcomes were realized. The harbours are fully utilized as expected because all commodities are delivered to the islands through them and the people live the normal lives using these commodities, and the number of vessels that use the project target harbours is likely to have increased along with the increase of the number of registered vessels per atoll to which the project target harbours belong. The sewerage service has been provided as expected. While BOD data did not exist at the time of ex-post evaluation, BOD5 before treatment was lower than anticipated and that after treatment was much better than the target at the defect liability inspection in 2011, and the sewerage system is functioning without major problems and the users are satisfied. The effect indicators of the sewerage have achieved the target. Regarding impacts, the living conditions of the people in the islands have been improved compared to those before the tsunami as the commodities available in the islands have increased in terms of number and variety, access to the social facilities such as health centres and schools has improved, and the hygiene and the quality of ground and seawater has improved according to the beneficiary surveys. In total, effectiveness and impact of the project are high as it has largely achieved its objectives.

3.5 Sustainability (Rating: ②)

3.5.1 Institutional Aspects of Operation and Maintenance

Until 2010, the Island Chief appointed by the President headed the Island Development Committee, the administrative structure of an island. The Island Development Committee was responsible for operation and maintenance of the harbours and it did minor repair using their annual budget. Major repairs were conducted under the Atoll Chief using the atoll budget, based on the request from the Island Chief. More serious repairs were requested to the Ministry of Atoll Development and budget from the Ministry of Planning and National Development was obtained[14].

Since sewerage systems did not exist in the project target islands, there was no operation and maintenance structure at the time of project appraisal.

At appraisal, operation and maintenance structure of the harbours and sewerage rehabilitated by the project was planned as follows:

[14] JICA documents

Harbours (except for Malé): The Island Development Committee is responsible for daily operation and maintenance such as patrolling, management of mooring, repair of the facilities and dredging. The Ministry of Construction and Public Infrastructure monitors the harbours and provides funding.

Malé harbour: The Ministry of Construction and Public Infrastructure is responsible for operation and maintenance.

Sewerage: The Island Development Committee establishes operation and maintenance committee to do daily operation and maintenance including cleaning of septic tanks, management of sludge, exchange of pumps, management of wastewater treatment plant and repair, by collecting user fees and employing staff. The Ministry of Environment, Energy and Water Resources provides monitoring and funding. The Ministry develops guidelines of the funding and organizations of operation and maintenance as well as operation and maintenance plan of each target island.

(Source: JICA documents, interview of project consultants)

After restructuring of ministries several times, the harbours are under the jurisdiction of MHI and the sewerage systems are under MEE since 2012. By the Decentralisation Act 2010 and Local Council Election Act 2010, the local administrative structure of Maldives consists of 20 Atoll Councils, two City Councils for the island with population of more than 25,000 (Malé and Addu) and 189 Island Councils[15]. Decentralization Act 2010 designates the Island Councils to conduct the operation and maintenance of basic infrastructure and provision of services such as maintenance of roads, utility services (electricity, water supply and sanitation), education and health care[16]. Thus the Island Councils are responsible for the operation and maintenance of the harbours, which is same as planned at appraisal. However, the Island Councils are not related to the former Island Development Committees.

Despite the Decentralization Act, sewerage services are provided by the utility companies and the role of the Island Councils is limited to coordination with the companies. MEE started shifting of the utility services from the local administration to the public companies in 2009, and six regional public utility companies were established in 2009 and 2010. In December 2010, operation and maintenance of sewerage systems began to be transferred to the utility companies in some regions. The reconstruction of sewerage systems by this project were completed in October 2010 and they have operated by the regional utility companies since the beginning of 2011. The Presidential Decree of 18 June 2012 declared establishment of Fenaka Corporation, a 100% state owned company which was to provide utility services in all regions except for Malé. All regional utility companies were merged to Fenaka[17].

The institutional arrangement of operation and maintenance is as follows at the time of

[15] Elections of local councils were held twice in February 2011 and February 2014. The number of Island Council members is between five and nine according to the population of island.

[16] Commonwealth Local Government Forum, Country Profile. http://www.clgf.org.uk

[17] Website of President's Office of Maldives and information from the project consultants

ex-post evaluation. The government clarifies the responsibility that, , while provision of basic infrastructure and services is the role of the Island Councils, the utility services are provided by Fenaka.

(1) Harbours

MHI develops the construction and maintenance plan of all harbours and implements major repairs. MHI considers that once a harbour went through major repair or maintenance work, only minimum maintenance work would suffice for ten years. MHI prioritizes the harbours that have not been repaired yet, and it does not intend to repair the project target harbours. In general, dredging in the harbour is necessary after about five years of major maintenance work and the Public Works Services Department of MHI is developing the dredging plan of all harbours. Staff employed for the project has already left MHI, but the section remains to be responsible for operation and maintenance and started monitoring in 2014. [18]

Daily operation and maintenance of Malé harbours are handled by Malé City Council which has five administrative staff and 15 patrol staff for the harbours. They patrol the harbours, collect user fees and do minor repairs such as mooring hooks. The City Council has annual operation and maintenance plan of the harbours, but it is not necessarily able to implement all items due to shortage of funds and human resources.

In other islands, Island Councils do daily operation and maintenance of harbours. They do not have a system to record the physical status or operation of the harbours, but they are always aware of the status through information from people and own experience as users, and take necessary actions as required such as reporting to MHI. The Island Councils do minor repairs such as dents of quay walls using the budget of the Councils. They do not have designated staff or experts in harbours and their role is in principal coordination with MHI and relevant companies. This is same in other sectors such as electricity, water and sanitation, education and health services[19].

[18] From the interview and questionnaire response of MHI.
[19] From the interviews of Island Councils, and interview and questionnaire response of MHI.

Figure 4. Operation and maintenance structure of harbours planned at appraisal

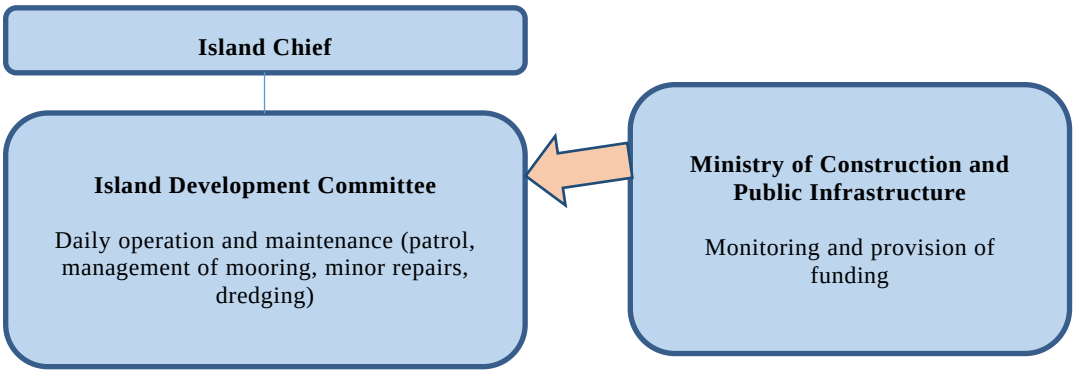
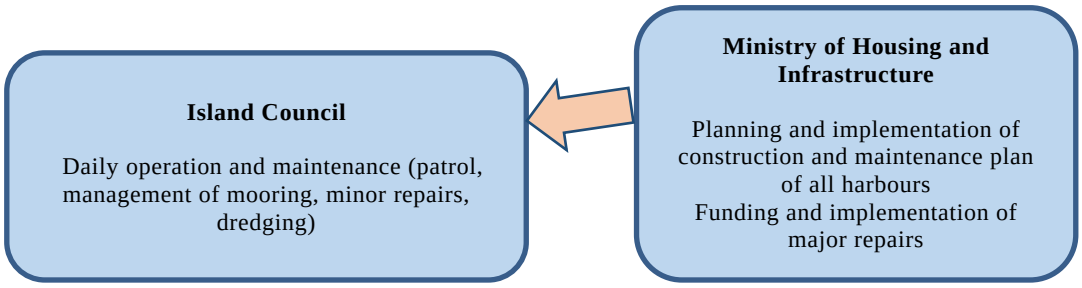


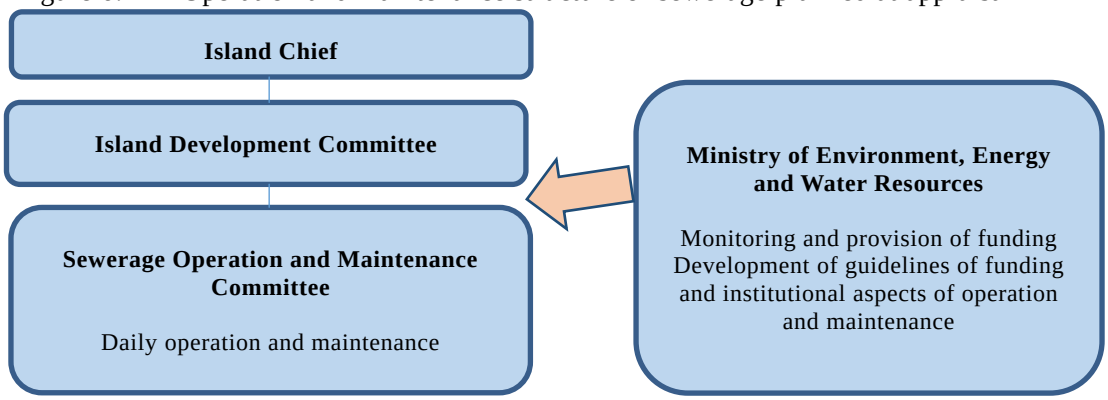
Figure 5 Current operation and maintenance structure of harbours



(2) Sewerage

Each Fenaka island office has about two to three staff for sewerage in addition to those for electricity[20]. According to Fenaka Head Office and its island offices, the number of staff is minimal to perform the duties. Daily operation and maintenance are implemented by Feneka island offices and replacement parts are purchased by the head office[21].

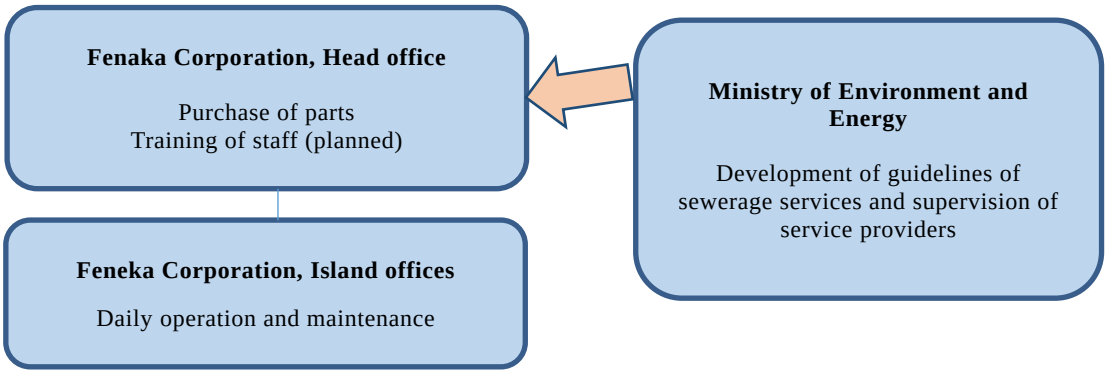
Figure 6. Operation and maintenance structure of sewerage planned at appraisal



[20] While water supply and sewerage services are usually provided by the same entity and the user fees are collected together in many countries, Fenaka does not provide water supply services in the three target islands because there are no water supply network and people obtain water from individual wells and rainwater tanks. Almost 100% of Feneka's income is from the electricity fees as stated in the section of financial sustainability below.

[21] From the interview and questionnaire response of MEE and interview of Feneka.

Figure 7　Current Operation and maintenance structure of sewerage (project target islands)



The original plan at appraisal to assume the Island Development Committees the role of operation and maintenance of sewerage systems and the residents participate as volunteers was realistic under the administrative structure at that time. However, it is no longer appropriate to have volunteers who provide operation and maintenance works under the Island Councils because of technical constraints and moral issues even if the system is relatively simple. Under the current administrative structure, it is reasonable that the Island Councils monitor the condition of the facilities and do minor repairs of the harbours and that Fenaka Corporation provides sewerage services.

3.5.2 Technical Aspects of Operation and Maintenance

(1) Harbours

MHI has enough technical capacity to implement harbour maintenance works because the harbours in Maldives have not had major problems except for the large damages by the tsunami. However, MHI was not able to provide information about the technical levels of staff and their training record.

Malé City Council has enough technical capacity to carry out minor repairs such as mooring hooks. While Island Councils do not have technical experts, they can arrange necessary human resources for minor repairs when necessary. There seem to be no problem with repaired parts of the harbours, which supports the assumption that the Island Councils have capacity to arrange and supervise such minor repair works.

(2) Sewerage

According to MEE, the sewerage is a new sector in Maldives and there are no regulations or water quality guidelines. Therefore MEE is not able to regulate the sewerage service providers. As explained above, the JICA technical cooperation project developed operation and maintenance guidelines of the wastewater treatment plants and

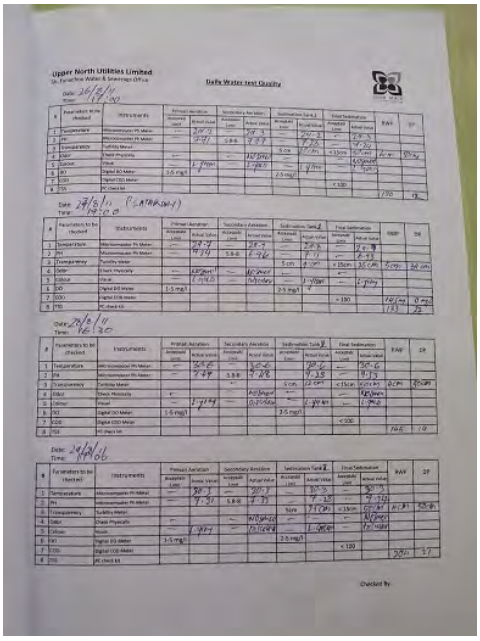
trained staff of the regional utility companies including the sites of this project. However, these guidelines are no longer valid, and the contents are going to be incorporated in the Water and Sewerage Act which is being developed and is to be approved by the Parliament in 2015. From the above, the technical capacity of MEE is not sufficient.

In the target islands, volunteers were to be trained to handle operation and maintenance works under the Island Development Councils. However, volunteers were not trained because these works were designated to the regional utility companies. As this project and the JICA technical cooperation project were not able to train the utility companies directly, the technical cooperation project supported the Ministry of Housing, Transport and Environment in implementation of training for the companies. During the construction and test run, three to five staff of each utility company were trained in operation and water quality control. At the defect liability inspection in September 2011, which was one year after the completion of this project, the utility company offices in Eydhafushi and Funadhoo continued water quality testing, but Muli had stopped it because the trained staff left. At that time, the quality of treated water in Muli did not meet the standard due to insufficient capacity of staff and insufficient treatment of solid matters in the first treatment tank because of insufficient aeration. In other two sites, there was no problem with the quality of treated water and technical capacity.

In Fenaka Eydhafushi office, two of three trained staff already left, and two new members recently joined. Therefore, the technical capacity is not enough. Funadhoo office has four technicians and all of them were trained either by the project or previous jobs such as water supply project supported by other donors. The two staff of Muli office have not received any training as they joined the team after the project ended. According to the head office, Fenaka has not implemented trainings in sewerage operation and maintenance since its establishment in 2012. They were not able to provide information of their human resources. Therefore, technical capacity of Fenaka Corporation is not sufficient.

From the above, the technical capacity in operation and maintenance is only partially appropriate.

Control panel of wastewater treatment plant, Fenaka (Eydhafushi)



Water quality testing record, Fenaka (Funadhoo)

3.5.3 Financial Aspects of Operation and Maintenance

(1) Harbours

Major repairs of the harbours are supposed to be financed by MHI, but figures of such funding were not provided by them. The project target harbours have not experienced major repairs since the project completion. MHI was not able to provide budget information of the repair plan of harbours in Maldives.

Malé City Council collects mooring fees of 75 Rufiyaa per vessel per month. As about 200 vessels pay mooring fees, the Council receives about 15,000 Rufiyaa per month. Council's budget for operation and maintenance of harbours is about 10 million Rufiyaa per year, which covers also the salary of staff and cleaning cost. This budget is sufficient to perform daily operation and maintenance such as minor repairs, patrol and cleaning.

Other Island Councils do not charge user fees of harbours. Minor repairs are carried out by the Councils using their budget when necessary. Funadhoo Island Council repairs dents on the quay wall regularly (once every six months) and pays about 35,000 Rufiyaa each time, which amounts to 70,000 Rufiyaa per year. As about 20 dents are repaired every time, the repair of a dent costs about 1,700 Rufiyaa. Funadhoo Island Council owns power plants and operates electricity business without transferring it to Fenaka, and it earns about 1.8 million Rufiyaa per year from it. The Council uses this income for repair of the harbour and other development projects such as waste management and construction of school buildings. Other Island Councils repair dents and other defects of the harbours at ad-hoc basis. Information of actual expenditure of such repair was not

available, but as the size of quay walls is smaller than that of Funadhoo, it is assumed that other Councils pay about 10,000-20,000 Rufiyaa every time. The amount is small and there is no particular problem in finance.

Table 12. Income and expenditure of Funadhoo Island Council (2015)

Income		Rufiyaa
Allocation from the government		R4,000,000
Income from electricity business		R1,800,000
Income from cable TV business		R36,000
	Sub total	R5,836,000
Expenditure		
Council operations（Recurrent cost）		R4,000,000
Development Project		R1,800,000
Repair of the harbour: R70,000 per year		
Construction of waiting space for the users of the harbour: R280,000 (total budget)		
Waste management, construction of school buildings		
	Sub total	R58,000,000

(Source: Funadhoo Island Council)

Fonadhoo harbour: dent on quay wall
(other harbours have similar dents)

Fonadhoo harbour
Unloading of cargo

(2) Sewerage

Feneka Corporation does not charge fees for sewerage services, nor for water supply services, while it does not provide water supply services in the project target islands. Almost all income of Fenaka comes from electricity fees, and operation and maintenance cost of the sewerage facilities is also covered by it. Fenaka island offices do not know about their operation and maintenance budget and expenditure because they do not count additional human resource cost for operation and maintenance works as they are within the regular work. Spare parts are purchased by the head office and island offices do not have to budget the cost.

Fenaka Corporation is a 100% state owned company to provide utility services, and it

does not aim to produce profit. It might consider charging fees of sewerage services in the future, but it does not have an immediate plan to do so. It was not able to provide information about its financial status.

Both harbours and sewerage facilities are not likely to have immediate financial problems as daily operation and maintenance are performed. However, as MHI and Fenaka Corporation did not provide financial information, the financial aspects are partially appropriate.

3.5.4 Current Status of Operation and Maintenance

(1) Harbours

The harbours are in good condition in general and well utilized. While they experience minor damages such as a breakage of mooring hooks due to tensions by strong winds and dents of the quay walls, there is no major problem. Dents and cracks of quay walls occur due to leakage of sands in the structure into the sea, and the Island Councils repair them using their budget when necessary. Funadhoo Island Council repairs them regularly.

In Funadhoo harbour, there are panels which indicate the designated mooring spaces for vessels according to size and type (passenger boats or cargo vessels). It also has a plan to construct a covered waiting space for passengers. It seems that Funadhoo Island Council has stronger ownership to perform operation and maintenance than other Island Councils.

Funadhoo harbour

Funadhoo harbour
Panel to show the mooring space of vessels according to size (from 35 to 100 feet)

(2) Sewerage

The sewerage facilities are in good condition in general and utilized without major problems. Fenaka island offices inspect the facilities about once a month. During four

years after the project completion, they have not experienced major repairs while there are minor deteriorations such as painting in the manholes. Fenaka offices fix the blockage or flooding when necessary. They are not always able to obtain spare parts in time, and there are occasions that only some pumps are working. In Funadhoo, one of the two generators has been broken down since 2014 and Fenaka island office is still waiting for a replacement from the head office. Some pumps in the underground were broken at some time, and they were all repaired by February 2015. There are some other problems as follows:

- Sewerage systems are sometimes blocked as users dispose materials in connection pits or toilets. The project consultants trained the users not to do so, but some lack moral of residents were observed.
- Flooding occurs sometime during heavy rains while the project adopted the sewerage system to separate rainwater and wastewater, and rainwater cannot enter into the system from the manholes. The roads in the target islands are not paved and rain water are usually absorbed in the ground. However, paddles of water can appear in the lower parts of the roads. Clogging in the connection pits could lead to overflow.

Some minor problems have been observed in terms of technical aspects in inheritance of skills and training, as well as in terms of financial aspects. Therefore sustainability of the project effects is fair.

4. Conclusions, Recommendations and Lessons Learned

4.1 Conclusions

The objective of the project was to provide efficient transportation and reliable sewerage services by reconstructing the harbours in eight islands and sewerage systems in three islands in Maldives damaged by the tsunami caused by the Indian Ocean earthquake in December 2004, thereby contributing to the improvement of the living conditions of the affected people and to the recovery of the economic conditions of the country.

Relevance of this project is high, as it has been highly relevant to the country's development plan and development needs, as well as Japan's ODA policy. Efficiency is fair, as the outputs were produced as planned and the project cost was lower than planned, but the project period was significantly longer than planned. Effectiveness is high as the expected outcomes were realized. The harbours are fully utilized as expected because all commodities have been delivered to the islands through them and the people live the normal lives using these commodities, and the number of vessels using the project target harbours is likely to have increased along with the increase of the number of registered vessels per atoll to which the project target harbours belong. Although BOD data did not

exist at the time of ex-post evaluation, the sewerage service is also likely to have been provided as expected because BOD5 before treatment was lower than anticipated and that after treatment was much better than the target value at the defect liability inspection in 2011, and the sewerage system is functioning without major problems and the users are satisfied. The effect indicators of the sewerage (population treated, number of connections and percentage of population treated) have achieved the target. Regarding impacts, the living conditions of the people in the islands have been improved compared to those before the tsunami as the commodities available in the islands have increased in terms of number and variety, access to the social facilities such as health centres and schools has improved, and the hygiene and the quality of ground and seawater have improved according to the beneficiary surveys. In total, effectiveness and impact of the project are high. Regarding sustainability, there are no major problems in institutional aspects as the roles of each organization are established, while the operation and maintenance organizations at ex-post evaluation are different from the plan due to the changes of the national administration structures and government policies. Some minor problems have been observed in terms of technical and financial aspects. Therefore the sustainability of the project effects is fair.

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

4.2 Recommendations

4.2.1 Recommendations to the Executing Agencies

The sewerage sector in Maldives does not have sufficient capacity and experience in operation and maintenance because the sector is new in the country. MEE is planning to have the new Water and Sewerage Act in 2015 and the Act will become the basis to regulate the sewerage service providers. It is recommended that MEE should establish the water quality standards of the treated and discharged wastewater and require the service providers to perform water quality testing.

4.2.2 Recommendations to JICA

None.

4.3 Lessons learned

(1) Indicators of emergency assistance projects

The data of indicators set by the project did not exist and were difficult to monitor, but it seems to have missed the objectives of the project to aim at quick recovery of normal lives of the people affected by the disaster. The data to show the utilization of harbours do not exist, but the fact that people in the islands live normal lives means that the necessary

commodities come to the islands through the harbours, and therefore they are utilized. However, there are no data to show that the people live normal lives except for the subjective impression of the beneficiaries and the consumption of food or purchase of commodities, but collection of such data would not be realistic in terms of cost and benefit. There would not be any other appropriate indicators or data. The World Bank and ADB set up only output indicators such as length of repaired quay walls, and this project, therefore, also could have set up output indicators as such.

(2) Provision of assistance in project management in emergency project

This project was the first Japanese ODA loan project for Maldives and the government were not familiar with the procedure of the selection of project consultants and it is likely to be difficult to handle it along with its own and many donor-supported recovery/ reconstruction projects. It took long time for the selection of the project consultants and the project period was considerably longer than the plan. This project did not support the selection of consultants itself. Such emergency projects would need assistance in project management such as experts to support selection of consultants.

Comparison of the Original and Actual Scope of the Project

Item	Original	Actual
1. Project Outputs		The actual outputs were as planned with slight modification as a result of the Detailed Design.
Civil engineering	Funadhoo Quay wall (370m), Breakwater (120m), etc. Maafushi Quay wall (150m), Breakwater (150m), etc. Malé Quay wall (110m) Dhiyamigili Quay wall (158m), Breakwater (300 m), etc. Isdhoo Quay wall (14m), etc. Isdhoo-Kalaidhoo Quay wall (19m), etc. Fonadhoo Quay wall (220m), Breakwater (70 m), etc. Dhaandhoo Quay wall (150m), etc.	Funadhoo Quay wall (370m), Breakwater (112m+305m), etc. Ukulhas (replaced Maafushi) Breakwater etc. Malé Quay wall (110m), Pavement and navigation aid Dhiyamigili Quay wall (200m), Breakwater (70m+135m) Isdhoo Quay wall (14m), Breakwater (132m), etc. Isdhoo-Kalaidhoo Quay wall (100m), Breakwater (80m), etc. Fonadhoo Quay wall (267m), Breakwater (57m+193m), etc. Dhaandhoo Quay wall (223m), Breakwater (216m), etc.
Sewerage	Funadhoo Eydhafushi Muli	The actual outputs were same as planned while they were without individual septic tanks. Both types belong to the same sewerage system.
Consulting services	i) Management of the project ii) Detailed design iii) Tendering iv) Construction supervision v) Environmental research and monitoring vi) Incorporation of social aspects vii) Training of government staff and target population	Same as planned
2. Project Period	July 2006-November 2009 (41 months)	July 2006 -December 2011 (66 months)
3. Project Cost		
Amount paid in Foreign currency	2,551 million yen	2,648 million yen
Amount paid in Local currency	628 million yen (75 million Rufiyaa)	363 million yen (39 million Rufiyaa)
Total	3,252 million yen	3,011 million yen

Japanese ODA loan portion	2,733 million yen	2,648 million yen
Exchange rate	1 US$ =107yen, 1 Rufiyaa＝8.36yen (As of June 2005)	1US$ = 98.32yen, 1 Rufiyaa＝9.34 yen (Average between July 2006 and December 2011)

Democratic Socialist Republic of Sri Lanka

Ex-Post Evaluation of Japanese ODA Loan Project
"Colombo City Electricity Distribution Development Project"

External Evaluator: Yasuhiro Kawabata,
Sanshu Engineering Consultant

0. Summary

The objective of the project was to provide stable electric supply by reinforcing the electricity distribution network, and reducing the system loss in order to respond to the expected load level of 350 MW as of 2005 in Colombo, thereby contributing to promotion of economic activities in the Colombo district. The project has been highly relevant to the development plans and needs of Sri Lanka, as well as Japan's ODA policies. Thus, its relevance is high. Regarding the efficiency, the originally planned project scope has been implemented almost as planned. However, the quantity of cables under the 11kV/low voltage work was revised due to the budget constraints, as it could be easily adjusted. Thus, the project scope was slightly changed. The project cost was higher than planned and the project period was significantly longer than planned, therefore, efficiency of the project is low. Since reinforcing the electricity distribution network under the project was implemented as planned and the transmission/distribution loss was reduced, the interruption duration was substantially reduced. Consequently, the project has contributed to realization of stable power supply and to promotion of economic activities in the Colombo district. Thus, the project has largely achieved its objectives, and the effectiveness and impact is high. No major problems have been observed in the institutional, technical and financial aspects of the operation and maintenance system, therefore sustainability of the project effect is considered high.

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

1. Project Description

Project Location

Kelanitissa Substation (inside)

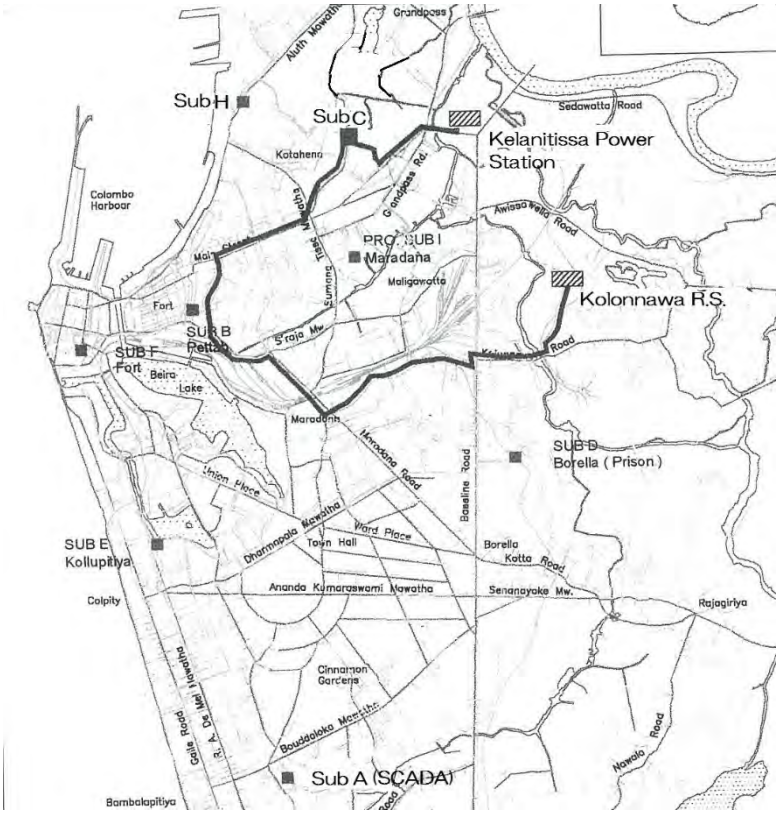
1.1 Background

At the appraisal time (2001), Sri Lanka had achieved the economic growth rate of about 5% per annum during the last 5 years (1996-2000). The generated electricity recorded increase of about 6.8% per annum as well because of progress of industrialization, penetration of home electrical appliances, expansion of rural electrification and other reasons during the same period. However, while electricity demand had been increasing at about 7% per annum, the capacity of generating facilities was only 1,691 MW as of 1999, and Sri Lanka had suffered from lack of electricity supply. In 1999, since hydraulic power generation was limited due to drought, use of air conditioners was restricted, and planned or unplanned electricity outage occurred. Such unstable electricity supply situation was a major constraining factor for people's life and economic activities such as attracting investment.

In order to respond to such situation, the Sri Lankan government identified major agenda and issues in the power sector including development and improvement of facilities for transmission, transformation, and distribution, and enhancement of the electrification rate in order to address aged facility issues and expansion of generation capacity, and disclosed action plans aiming at providing stable electricity supply in the "6-year Development Plan" and "Public Investment Plan".

1.2 Project Outline

The objective of the project was to provide stable electric supply by reinforcing the electricity distribution network, and reducing the system loss in order to respond to the expected load level of 350 MW as of 2005 in Colombo, thereby contributing to promotion of economic activities in the Colombo district. The location of the project site is shown in Figure 1.



Source: Ceylon Electricity Board

Note: A solid line shows 132kV underground transmission cables

Figure 1 Location of Project Site

Loan Approved Amount/ Disbursed Amount	5,959 million yen/5,957 million yen
Exchange of Notes Date/ Loan Agreement Signing Date	October 2001/December 2001
Terms and Conditions	For civil work: Interest Rate: 2.20%, Repayment Period: 30 years (Grace Period: 10 years) Conditions for Procurement: combined For consulting services: Interest Rate: 0.75% Repayment Period: 40 years (Grace Period: 10 years) Conditions for Procurement: combined
Borrower / Executing Agency(ies)	Government of Democratic Socialist Republic of Sri Lanka/Ceylon Electricity Board (CEB)
Final Disbursement Date	April 2012
Main Contractor (Over 1 billion yen)	ABB AG（Germany）、Siemens AG（Germany）、Viscas (Japan)
Main Consultant (Over 100 million yen)	Fichtner GMBH & Company KG. (Germany) / J Power/ Tokyo Electric Power Services Company
Feasibility Studies, etc.	・Feasibility Study, “Development Plan for Electricity Network in Colombo City: Development Plan”, Worley International Ltd., New Zealand, 1997 ・JICA Development Study: “Transmission Network Development Plan Study”, 1997
Related Projects	Technical Cooperation： ・JICA Power Sector Master Plan Study (2004 - 2006) ODA Loan: ・Greater Colombo Transmission and Distribution Loss Reduction Project (L/A signed in 2013) Other International Organizations: ・Asian Development Bank: Power Sector Development Project (2005)

2. Outline of the Evaluation Study

2.1 External Evaluator

Yasuhiro Kawabata, Sanshu Engineering Consultant

2.2 Duration of Evaluation Study

Duration of the Study: July 2014 - May 2015

Duration of the Field Study: September 13 - 28, 2014, December 7 - 20, 2014

3. Results of the Evaluation (Overall Rating: B[22])

3.1 Relevance (Rating: ③[23])

3.1.1 Relevance to the Development Plan of Sri Lanka

In the "6-Year Development Plan (1999 - 2004)" and "Public Investment Plan (1999 - 2001)" , which were effective at the appraisal time (2000), the followings were listed up as agendas to be urgently tackled: i) enhancement of efficiency and reliability; ii) expansion of generating capacity corresponding to the demand; iii) development of transmission, transformation, and distribution facilities corresponding to deterioration of facilities and expansion of generating capacity, and enhancement of electrification rate; iv) rationalization of tariff charging system; and others. The most prioritized agendas among the above mentioned agendas are as follows: 1) the well balanced power generation system (change from "hydro-main and thermal-sub-main" to "thermal-main and hydro-sub-main"); 2) development of transmission and distribution networks; 3) promotion of power sector reforms (streamlining of the whole power sector, reinforcement of finance and management, enhancement of reliability and promotion of private investment); and 4) enhancement of electrification rates in rural areas. Development of distribution related networks at the appraisal stage had been implemented according to "Medium Voltage Distribution Network Development Plan" (1995-2005), which was prepared based on the forecasted electricity demand in each province.

At the ex-post evaluation stage, in the revised version of "Mahinda Chintana" ("Future Vision"), issued in 2010, it aimed at doubling the economic magnitude in 2010 by 2016 (GDP per capita shall be US$4,000) through economic structural reforms. Simultaneously, it also aimed at achieving the well balanced economic development in order to avoid the enlargement of gaps between urban and rural areas. Regarding the power sector, in Chapter 3 of the revised "Mahinda Chintana", it is stated that the government would take necessary measures including installation of distribution network in order to supply electricity to all the households without power interruption by end 2012, and promote development and improvement of low/medium voltage distribution network in order to achieve the high quality and reliable electricity supply without power interruption. Moreover, the government plans to take necessary measures to respond to the increasing electricity demand by constructing all the required power plants with least generating costs by end 2020.

As mentioned above, at appraisal and at ex-post evaluation, the implementation of the

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

project conforms to the development policies of the Sri Lankan Government.

3.1.2 Relevance to the Development Needs of Sri Lanka

At the appraisal time, substation facilities for distribution in Colombo City, where the project is located were seriously deteriorated and could not respond to rapidly increasing loading level. (The loading level at that time was 231 MW, and it was forecasted to be increased up to 350 MW by 2005.) Under these circumstances, the interruption duration in Colombo City as of 1999 was 8.5 hours/year/customer, which was about 80 times of that in Japan and the reliability was low. Thus, achievement of provision of stable electric supply in a short term by reinforcing the deteriorated distribution network in Colombo City and enhancing reliability in order to promote the socio-economic activities in Sri Lanka was considered to be extremely essential and to be an urgently tackled agenda.

At the ex-post evaluation stage (2014), the economic growth rate for the past four years (2010 - 2013) in Sri Lanka was 7.5% per annum, and the demand for electricity has been increasing. Thus, in order to respond to the increasing demand, development of power generation has been actively promoted. However, development of transmission and distribution networks cannot catch up with increasing demand, and improvement of transmission and distribution losses and reinforcement of the transmission and distribution capacity are still agendas to be addressed. Particularly, since the electricity consumption in the Greater Colombo Region (occupies about 50% of the country's GDP), which is the core of economic activities in the country, has been increasing by 10% every year, the capacity of existing transmission and substation facilities cannot respond to the increasing electricity demand. Moreover, correspondence to increasing transmission and distribution losses due to increase of the transmission and distribution loading level is an urgently addressed agenda. (Source: Ex-ante evaluation report for Greater Colombo Transmission and Distribution Loss Reduction Project)

The project aiming at provision of stable electric supply by reinforcing the electricity distribution network, and reducing the system loss conforms to the development needs in Sri Lanka at appraisal and at ex-post evaluation,

3.1.3 Relevance to Japan's ODA Policy

In the "Country Assistance Policy for Sri Lanka" (1999), which was effective at the appraisal time, the followings were listed up as the priority agendas: 1) development/improvement of economic infrastructure; 2) development of mining and industrial sectors; 3) development of agriculture and fishery sectors; 4) human resources development; and 5) improvement of health and medical system. Particularly, on development and improvement of economic infrastructure, fundamental development and

improvement of underdeveloped transport, power and telecommunication sectors was considered essential in order to promote industry in Sri Lanka. Thus, the assistance policy was to be pursued not only focusing on those in the Colombo District, but also taking into consideration networking in the whole country. The project conformed to the assistance policies at the appraisal stage.

Accordingly, the project has been highly relevant with the Sri Lankan development plan and needs, as well as Japan's ODA policies. Its relevance is therefore considered high.

3.2 Efficiency (Rating: ①)

3.2.1 Project Outputs

The original and actual output of the project is shown in Table 1.

Table 1 Output (Original and Actual)

	Project Scope at Appraisal Stage	Project Scope at Project Completion
Work:	1) 132kV Work ・ Construction/Upgrading of 3- 132kV Substations (Primary Substation "C", Kelanitissa Grid Substation , Kolonnawa Grid Substation) ・ Installation of 132kV transmission cables (8km) 2) 33kV Work ・ Upgrading a 33kV Substation (Primary Substation "H") 3) 11kV/Low voltage work (a) Installation/replacement of 11kV underground cables (130km) (b) Construction of 11kV compact distribution substations (100 units) (c) Replacement of 11kV RMU (Ring Main Units) (50 units) (d) Installation of low voltage cables (40km) (e) Installation of low voltage feeder pillars (200 units) (f) Replacement of 11kV switchgears (474 units) 4) Others	1) 132kV Work ・ Construction/Upgrading of 3- 132kV Substations as planned ・ Installation of 132kV transmission underground cables (9.3km) almost as planned 2) 33kV Work ・ Upgrading a 33kV Substation as planned 3) 11kV/Low voltage work slightly revised (a) Installation/replacement of 11kV underground cables (82km) (b) Construction of 11kV compact distribution substations (40 units) (c) Replacement of 11kV RMU(Ring Main Units) (380 units) (d) Installation of low voltage cables (16km) (e) Installation of low voltage feeder pillars (72 units) (f) Replacement of 11kV switchgears (175 units) (g) Installation of optical fiber cables (77km) (these are for automatic distribution, and were originally included in the SCADA system) 4) Others (automatic distribution system)

	・Installation of SCADA (Supervisory Control And Data Acquisition) system	・Installation of SCADA system as planned
Consulting services	1) Detail designs and assistance in bidding 2) Construction supervision 3) Training of engineers of the executing agencies 4) Environmental protection 5) Others Foreign experts: 154M/M Local experts: 180M/M	1) Change to review of detail designs and assistance in bidding 2) Construction supervision as planned 3) Training of engineers of the executing agencies as planned 4) Environmental protection as planned 5) Others Foreign experts: 161M/M Local experts: 213M/M

Source: JICA documents, and Interview survey with the executing agencies

The original project scope was completed almost as planned. However, the original type of contract, in which a consultant undertakes detail designs and a contractor supplies/installs the equipment was changed to the "turnkey[24]" contract as proposed by the executing agency and subsequently concurred by JICA. Thus, some item among the scope of work for a consultant, which is "undertaking detail designs" was changed to "review of designs to be made by a contractor". The bill of quantities for some items under the 11kV/low voltage work was also changed. The reason for the change is that since quantities of cables, which could be easily adjustable were revised due to budget constraints and the project scope (quantities and items) was changed. These changes are considered rational and appropriate.

Primary Substation "H" (Outside)

Primary Substation "H" (Inside)

3.2.2 Project Inputs

[24] It is a sort of lump sum contract in which the facility is delivered in the condition, ready for immediate use by unlocking a key (the scheme in which detail designs and supply/installation of equipment are in a package).

3.2.2.1 Project Cost

The estimated project cost at appraisal was 7,945 million yen, of which the Japanese ODA loan was 5,959 million yen. The actual project cost was 9,919 million yen, of which the Japanese ODA loan was 5,957 million yen. The actual project cost was higher than planned, and is equivalent to 125% of the planned cost.

The main reason for increase of the project cost is that since commencement of the actual work was delayed until 2008 from the originally planned 2003, the estimated cost made in 2001 was increased due to price escalation, particularly the cost of copper, which is the main material for cables during the delayed period.

Table 2　Comparison of Project Cost (Planned and Actual)

(Unit: million yen)

Item	Planned					Actual				
	ODA loan (foreign)	Local currency		Total		ODA loan (foreign)	Local currency		Total	
		Own fund	ODA loan	Total	ODA loan		Own fund	ODA loan	Total	ODA loan
・Work	3,525	0	1,010	4,535	4,535	3,738	2,707	1,123	7,568	4,861
1. Package A	-	-	-	-	-	-	-	-	1,685	-
2. Package B	-	-	-	-	-	-	-	-	2,390	-
3. Package C	-	-	-	-	-	-	-	-	2,750	-
4. Package D	-	-	-	-	-	-	-	-	743	-
Price escalation	87	0	88	175	175	-	-	-	-	-
Contingency	362	21	97	479	459	-	-	-	-	-
・Consulting services	407	0	16	423	423	633	0	223	856	856
・Taxes	0	1,391	0	1,391	0	0	853	0	853	0
・Land acquisition	0	115	0	115	0	0	0	0	0	0
・Management and others	0	459	0	459	0	0	402	0	402	0
・Interest during construction	367	0	0	367	367	234	0	0	234	234
・Service charges	-	-	-	-	-	6	0	0	6	6
Total	4,748	1,986	1,211	7,945	5,959	4,611	3,962	1,346	9,919	5,957

Source: JICA documents

Exchange rates: at appraisal　1 Rupee＝1.44 yen,　1 US$ =112 yen,
average during implementation (2008.10–2012.6)：1 Rupee＝0.76 yen, 1 US$=87 yen,
1 EUR=118 yen

Price escalation: foreign currency 0.8%/year, local currency 2.8%/year

Contingency：Civil work 10%

Cost base year：February 2001

Note 1: Total amount does not match due to rounding.

Note 2: Originally planned procurement package
Package A: Upgrading of two 132kV substations
Package B: Upgrading of a 132kV substation, installation of a 132 kV transmission cables (8km)

Package C: Upgrading of a 33kV substation, installation/replacement of 11kV underground cables (130km), construction of 11kV compact distribution substations (100 units), installation of low voltage cables (40km), installation of low voltage feeder pillars (200 units)
Package D: Replacement of 11kV RMU (50 units), replacement of 11kV switchgears (474 units), installation of SCADA system

3.2.2.2 Project Period

The originally planned project period was from December 2001 (signing of the Loan Agreement) to August 2006 (work completion) with a total period of 57 months. The actual project period was from December 2001 (signing of the Loan Agreement) to June 2012 (completion of work) with a total period of 127 months, or equivalent to 223% of the plan. Thus, the project period was significantly longer than planned.

Table 3 Comparison of Project Period (Planned and Actual)

	Planned (at the Loan Agreement signing)	Actual
Selection of a consultant	2002.01 - 2002.09	2003.03 - 2005.07
Land acquisition	2001.02 - 2001.12	
Bidding for work	2002.10 - 2003.06	2006.02 - 2008.04
Work	2003.07 - 2006.08	2008.10 - 2012.06
・Package A		2008.10 - 2012.02
・Package B		2009.06 - 2011.01
・Package C		2008.10 -2011.01
・Package D		2008.11 - 2012.06
Consulting services	2002.10 - 2006.04	2005.09 - 2012.03

Source : JICA documents
Note: Numbers show year and month.

Main reasons for extension of the project period are as follows:

1) According to the original implementation plan, it was planned that selection of a consultant would be made by September 2002. However, selection was delayed by 35 months and was actually completed in July 2005. As mentioned above, the delay of selection was caused by the longer time needed for internal clearance process due to changes of the scope of work for consulting services because the supply and installation of equipment was changed to the turnkey scheme by the intention of the executing agencies after the loan agreement was signed.
2) Bidding for work was originally planned to be completed in 9 months. However, it actually took 27 months resulting in about 18 months delay. Delay in stages in the consultant selection and bidding for work is considered to be mainly caused by that the procedure and clearance process for the international competitive bidding (for selection of a consultant and contractors) was not implemented as planned since the

appropriate project implementation institution, including delayed mobilization of the originally proposed Project Director of the executing agency (CEB) was not timely established.

3) The period for work was originally planned to be 38 months. However, that of the Package D with the longest work period is 45 months, which is slightly longer than planned. The reason for the longer work period is that detail designs were added to the scope of work for contractors due to change to the “turnkey” scheme.

The project cost was higher than planned, and the project period was significantly longer than planned. Therefore, efficiency of the project is considered low.

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

Since it was considered extremely difficult to identify benefits at the appraisal stage, calculation of Internal Rates of Return of the Project was not made. Thus, at the ex-post evaluation stage, calculation of IRRs was not also made.

3.3 Effectiveness[25] (Rating: ③)

3.3.1 Quantitative Effects (Operation and Effect Indicators)

The outcome of the project is to provide stable electric supply by reinforcing the electricity distribution network, and reducing the system loss. Hereinafter, quantitative effects are examined.

(1) Electricity Sales in Colombo City

Electricity sales for the past four years in Colombo City are shown in Table 4. Since the data on electricity supply from each substation, which was planned at the appraisal stage, is not available, electricity sales (GWh), which are more or less equivalent to the electricity supply from each substation, were examined as an operational indicator.

Table 4　Electricity Sales in Colombo City

(Unit: GWh)

	Baseline	Target	Actual			
	2000	2010	2010	2011	2012	20113
	Baseline year	4 Years after original completion			Year of completion	1 Year after completion
Electricity Sales	786	1,479	1,170	1,239	1,247	1,244

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

Source: JICA documents, CEB Annual Report (2011), Data provided by CEB
Note: Originally planned project completion date: August 2006

Although the electricity sale in 2013 was increased by about 58% compared with that in the base year, the sales volume has been constant at about 1,240 GWh for the past three years. Comparing the actual value in 2013 with the target in 4 years after the originally planned project completion, the actual sales are lower than targeted by about 14%.

(2) System Average Interruption Duration in Colombo City

The system average interruption duration for the past four years in Colombo City is shown in Table 5.

Table 5 System Average Interruption Duration in Colombo City

(Unit: hours/year/customer)

	Baseline	Target	Actual			
	2000	2010	2010	2011	2012	2013
	Baseline year	4 years after original completion			Year of completion	1 year after completion
Interruption Duration	8.7	6.5	0.64	0.3	0.34	n/a

Source: JICA documents, CEB Annual Report (2011), Data provided by CEB
Note: Originally planned project completion date: August 2006

Interruption duration in Colombo City in 2012 was only 0.34 hours/year/customer, which is substantially lower than that in the base year (2000).

(3) Transmission and Distribution Losses in Colombo City

Transmission and distribution losses in Colombo City is shown in Table 6.

Table 6 Transmission and Distribution Losses in Colombo City

(Unit: %)

	Baseline	Target	Actual			
	2000	2010	2010	2011	2012	2013
	Baseline year	4 years after original completion			Year of completion	1 year after completion
Transmission Loss	n/a	9.0	3.11	1.99	2.02	2.59
Distribution Loss	9.5		9.78	9.55	8.59	8.50

Source: Data provided by CEB
Note 1: Originally planned project completion date: August 2006
Note 2: The target value for 2010 is the loss combining both transmission and distribution

losses. (JICA documents)

Although the transmission loss in Colombo City was once substantially improved in 2011, it has been slightly worsened since then. Regarding the distribution loss, since 2011 when the main project component was completed, it has been fairly improved.

3.3.2 Qualitative Effects

(1) Alleviation of Over-loading Condition of Distribution Equipment

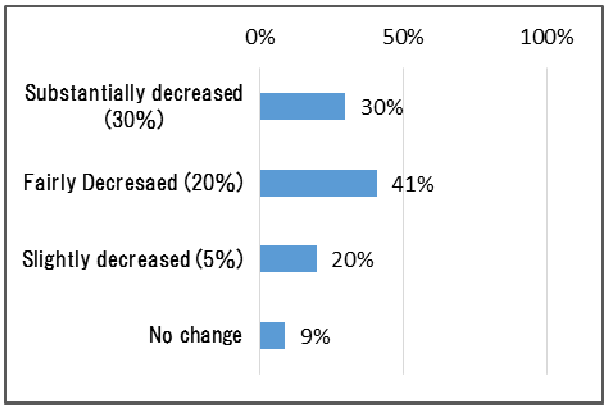
The installed capacity in Sri Lanka as of 2013 was 3,362 MW, while the maximum demand was 2,164 MW. Thus, the over-loading condition of distribution equipment has been alleviated. The contribution of the project to increase of substation capacity is about 79MW. (Source: CEB Statistical Digest 2013)

In order to verify the qualitative effects by the project (stable electricity supply), the beneficiary survey[26] was undertaken.

Results of Beneficiary Survey:

1) Decrease of Interruption Occurrence

Survey results on decrease of the interruption occurrence are shown in Figure 2.



Note: Numbers in ( ) show the level of decrease.

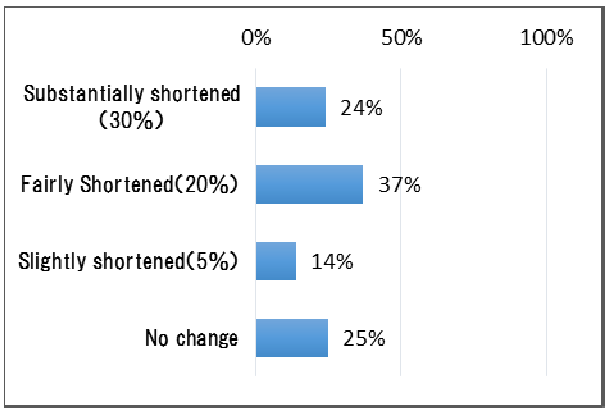
Figure 2 Decrease of Interruption Frequency

About 91% of respondents recognize that the interruption occurrence has been decreased after the project was completed in 2012. Regarding the level of decrease, about 71% of respondents recognize that it is “substantial” or “fair”.

2) Reduction of Duration in case of Interruption

Survey results on reduction of duration in case of interruption are shown in Figure 3.

[26] Number of samples: total 100 (residents in Colombo City; government employees (16%), private company employees (24%), businessman (15%), self-employed (12%), housewife (10%), student (14%), others (9%); male (64%), female (36%); method: interview with a Questionnaire



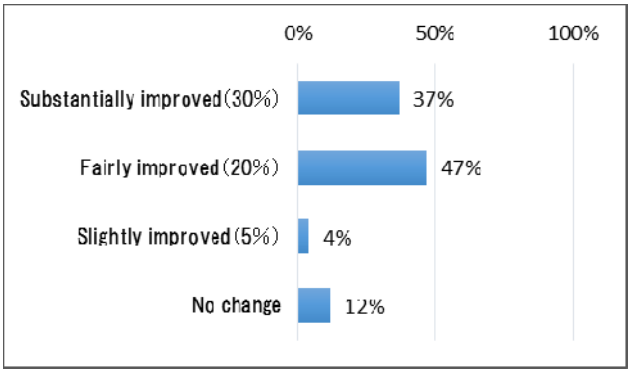
Note: Numbers in ( ) show the level of reduction.

Figure 3　Reduction of Duration in case of Interruption

About 75% of respondents recognize that the duration in case of interruption has been reduced after the project was completed in 2012. Regarding the level of reduction, about 61% of respondents recognize that it is “substantial” or “fair”.

3)　Enhancement of Reliability on Electric Supply

Survey results on enhancement of reliability on electric supply are shown in Figure 4.



Note: Numbers in ( ) show the level of enhancement.

Figure 4　Enhancement of Reliability on Electric Supply

About 88% of respondents recognize that reliability on electric supply has been enhanced after the project was completed in 2012. Regarding the level of enhancement, about 84% of respondents recognize that it is “substantial” or “fair”.

3.4　Impact

3.4.1　Intended Impacts

In order to verify contribution of the project to promotion of the economic activities in the Colombo District, the relevant information and data on the transition of electricity consumption by category and the economic activities were collected. Results of analysis

are shown in Tables 7 and 8.

(1) Transition of Category Distribution of Electricity Sales

The transition of category distribution of electricity sales is shown in Table 7.

Table 7 Transition of Category Distribution of Electricity Sales (%)

(Unit: %)

	2005	2011	2012	2013
Domestic	33.1	33.7	33.6	32.8
Religious	0.6	0.5	0.5	0.5
General purpose	17.3	19.2	19.5	19.4
Hotel	-	1.6	1.5	1.6
Industrial	33.7	31.2	31.4	31.5
Government	-	-	-	0.8
Supply to LECO	14.2	12.6	12.4	12.3
Street lighting	1.1	1.1	1.0	1.0

Source: CEB Statistical Digest 2011, 2012, 2013

Note 1: General purpose: shops, offices, banks, warehouses, hospitals, schools

Note 2: LECO：Lanka Electricity Company

Regarding the share of electricity consumption by category before and after the project, no major variation is found.

(2) Economic Activities

Indicators on economic activities in Sri Lanka are shown in Table 8.

Table 8 Indicators on economic activities in Sri Lanka

	2001	2010	2011	2012	2013
Economic growth rate (country) (%)	-1.55	8.02	8.25	6.34	7.30
Number of establishments in Colombo (units)	-	3,211	3,428	-	-
New jobs created in Colombo (persons)	-	104,179	187,846	68,223	-
Unemployment ratio (%)	-	3.3	2.9	2.9	-
Trade balance (million $)	-	-4,825	-9,710	-9,417	-7,609

Source：IMF World Economic Outlook Databases, Sri Lanka Labor Force Survey Annual Report 2010-2012 , CEB Statistical Report 2010-2013,

The economic growth rate of Sri Lanka rose from 3.54% in 2009, when the conflict ended to 8.02% in 2010, and since then the economic growth has been in good shape. The unemployment ratio in 2012 was 2.9%, which is lower than the ratio of Japan (4.03%) in 2013. According to the executing agency, it is likely that the contribution of the project aiming at stable electricity supply is high in order to keep the strong economic growth.

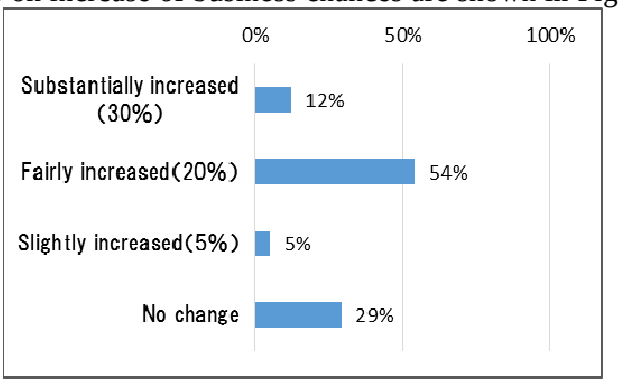
Results of Beneficiary Survey:

From the beneficial survey, the following survey results were revealed on the contribution of the project to promotion of the economic activities in the Colombo

District.

1) Increase of Business Chances

Survey results on increase of business chances are shown in Figure 5.



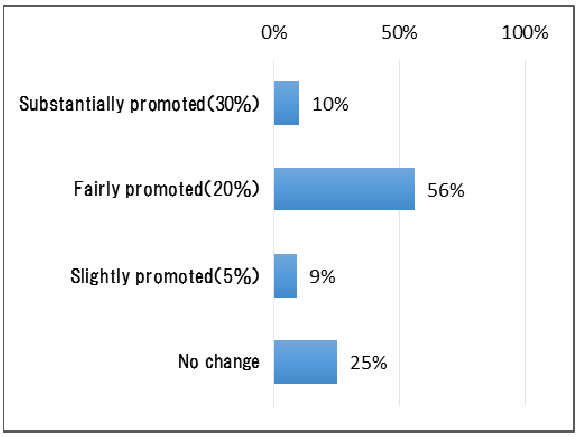
Note: Numbers in ( ) show the level of increase.

Figure 5 Increase of Business Chances

About 71% of respondents recognize that business chances have been increased by stable electricity supply after the project was completed. Regarding the level of increase, about 66% of respondents recognize that it is “substantial” or “fair”.

2) Promotion of Regional Economic Activities

Survey results on promotion of regional economic activities are shown in Figure 6.



Note: Numbers in ( ) show the level of promotion.

Figure 6 Promotion of Regional Economic Activities

About 75% of respondents recognize that regional economic activities have been promoted by stable electricity supply after the project was completed. Regarding the level of promotion, about 66% of respondents recognize that it is “substantial” or “fair”.

3.4.2 Other Impacts

(1) Impacts on the natural environment

Since the project did not fall under the "A" category[27] project in terms of regional and project characteristics at the appraisal stage, the project was classified as a "B" category project according to the "JBIC Environmental Guidelines to be used for Safeguard Issues under the ODA Loan Project". According to the domestic legislation in Sri Lanka, preparation of an Environmental Impact Assessment (EIA) was not required since the project was to construct the distribution cables. As an environmental issue to be addressed during the project implementation, traffic management at the construction sites was foreseen and a monitoring was to be made by a supervision consultant during the project implementation.

According to the executing agency, since construction work was planned to be undertaken during the night time (from 8:00 PM to 5:00 AM), the traffic management issue (traffic congestion) due to installation of transmission cables (a total length of about 9 km) under the existing roads was substantially alleviated.

(2) Land Acquisition and Resettlement

At the appraisal stage, land acquisition for construction of compact distribution substations was planned at about 100 sites (4 m^2 per site). However, since majority of land to be acquired was owned by Colombo Municipality, no issues were foreseen on land acquisition. No resettlement due to implementation was also foreseen.

Since compact distribution substations were all constructed in the publically owned land during the project implementation, no land acquisition/resettlement has occurred.

Entrance of Substation "C"

Inside of Substation "C"

(3) Other Positive and Negative Impacts

[27] Category A: to be applied to the project, in which seriously unfavorable impacts to the environment and community are concerned. Category B: to be applied to the project, in which unfavorable impacts to the environment and community are considered smaller compared with Category A.

None.

Since reinforcing the electricity distribution network under the project was implemented as planned and the transmission/distribution loss was reduced, the interruption duration was substantially reduced. Consequently, the project has contributed to realization of stable power supply and to promotion of economic activities in the Colombo District.

Thus, the project has largely achieved its objectives, and the effectiveness and impact is high.

3.5 Sustainability (Rating: ③)

3.5.1 Institutional Aspects of Operation and Maintenance

At the appraisal stage (2001), Ceylon Electricity Board (CEB) was expected to be subdivided in 2003. However, in 2009 a new Electricity Act was enacted, and the power sector business was converted to the license system. CEB became the licensee, responsible for generating, transmitting and distribution, and subdivision of the organization did not take place. The organization of CEB as of 2014 consists of ten divisions including Corporate Strategy, Generation, Transmission, 4-Distribution (by region), Asset Management & Centralized Services, Projects and Finance. Divisions in charge of operation and maintenance of the facilities and equipment after the project was completed are two divisions including Transmission and Distribution 1 (Colombo City). The total number of CEB employees as of end 2013 is about 16,300.

The organization chart of the office, in charge of operation and maintenance of the Colombo District under the Transmission Division is shown in Figure 7.

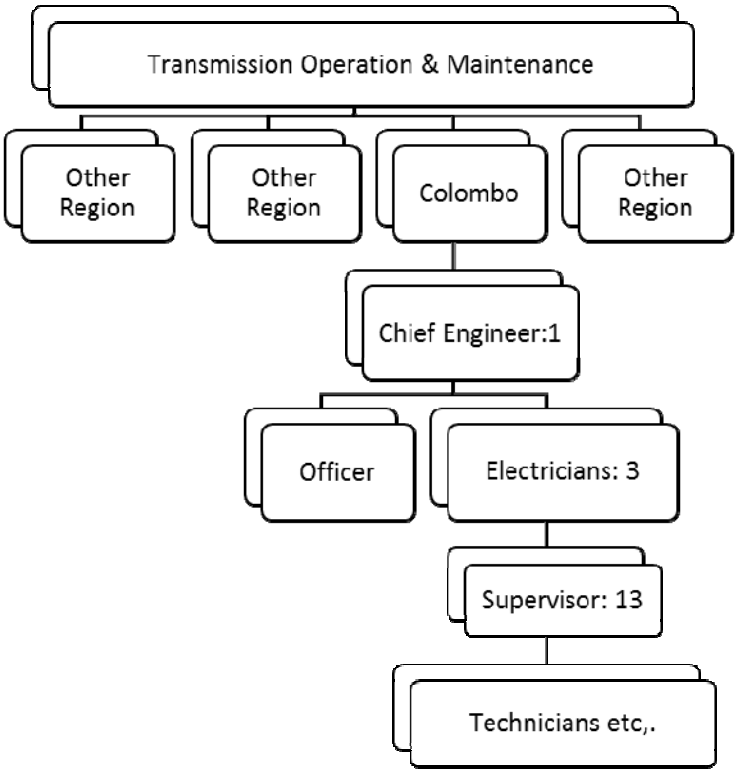


Figure 7 Organization chart of the office, in charge of operation and maintenance of the Colombo District under the Transmission Division

The office, in charge of operation and maintenance of the Colombo District is staffed with 3 Electrical Engineers, 13 Supervisors, and other staff such as administrative staff, technicians, and skilled labors totaling about 250 under Chief Engineer.

The organization chart of the office, in charge of operation and maintenance of the Distribution 1 (Colombo) is shown in Figure 8.

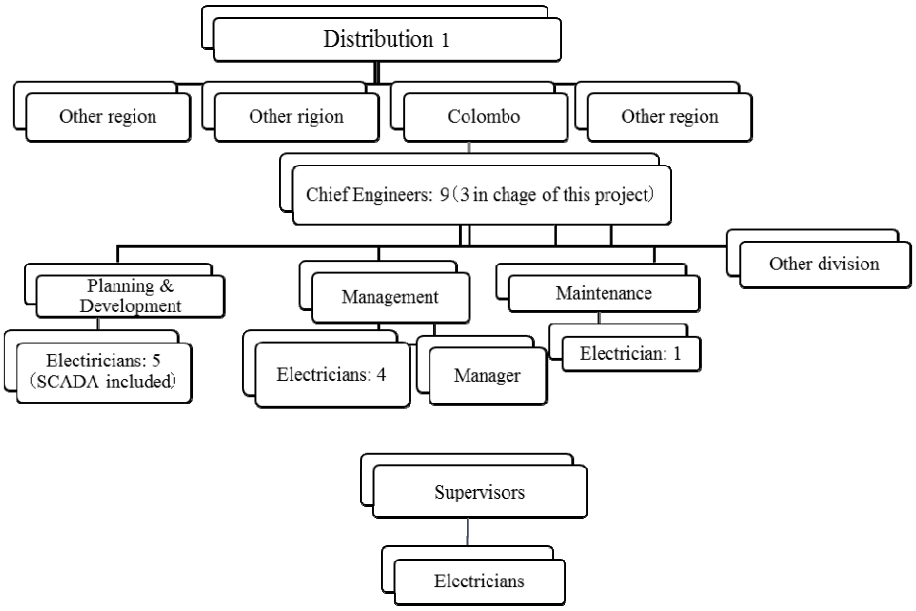


Figure 8　The organization chart of the office, in charge of operation and maintenance of the Distribution 1 (Colombo)

The office, in charge of operation and maintenance of Distribution 1 (Colombo) is staffed with 9 Chief Engineers, and staffs in charge of operation and maintenance of equipment/facilities installed/constructed under the project are following three Chief Engineers: Chief Engineer for Planning/Development (supervising 5 electrical engineers including an engineer responsible for SCADA), Chief Engineer for Operation (supervising 4 electrical engineers and a manager), and Chief Engineer for Maintenance (supervising an electrical engineer). The total number of staffs in charge of operation and maintenance under Distribution 1 (Colombo City) is about 150. According to the management of the offices in charge of operation and maintenance of transmission and distribution work, the number of staffs allocated to operation and maintenance is considered appropriate. (source: CEB Statistical Digest 2013 and responses to the Questionnaire to the Operation and Maintenance Divisions）

The current institutional setup for operation and maintenance is well established and the number of staffs allocated is considered appropriate.

3.5.2 Technical Aspects of Operation and Maintenance

According to the management of offices in charge of operation and maintenance of equipment/facilities constructed/installed under the project, as far as Transmission Division is concerned, there is no problem on skills of technical staffs and the technical capacity required for operation and maintenance work. However, regarding Distribution 1 (Colombo), as some of trained staffs moved to other units, there is some minor problem at this moment. It is planned that vacant positions would be filled shortly.

In order to be an "Engineer", he/she needs to acquire the qualification as an "engineer", which is accredited by Institute of Engineers. All of Engineers allocated to the operation and maintenance offices have this qualification. The orientation and training is provided to the newly recruited technical staff when joining CEB, and they are required to take training on relevant subjects regularly even after joining the firm. Some of training subjects that technical staffs under Transmission Division took are operation and maintenance methods of transformers, substation automation, protection/control, switchgear and general principal of these equipment, which are provided by suppliers and contractors. The training programs generally last for 1 - 2 weeks. Guidelines and manuals required for operation and maintenance of the above mentioned equipment and facilities are well prepared.

Some of training subjects that technical staffs under Distribution 1 took are: training on operation of SCADA[28] undertaken in India (3 - 4 weeks), training on automation of substations undertaken in Germany (5 days), and training on routers[29] and various switches undertaken in Canada (10 days). Various guidelines and manuals including those for operation of SCADA, management system in case of outage, and management of planned outage are well prepared. Regarding the periodic maintenance, as it is still a few years since the work and installation of equipment/facilities were completed, a simple inspection is regularly undertaken.

Technical staffs with well qualified skills are allocated. Undertaking of training and preparation of manuals are appropriately addressed and no specific problems are observed. Thus, no technical issues are observed to sustain the project effects.

3.5.3 Financial Aspects of Operation and Maintenance

The revenue and expenditure status of CEB for the past three years is shown in Table 9.

---

[28] Supervisory Control and Data Acquisition (remote surveillance/control system)

[29] facility determines routes for data transmission

Table 9　Revenue and Expenditure Status of CEB

(Unit: million Rupee)

Item	2011	2012	2013
Turnover	132,460	163,513	194,167
Direct cost	151,449	222,420	166,926
Gross profit	-18,989	-58,907	27,221
Administration expenses	1,636	2,997	2,597
Operating profit	-16,814	-57,679	29,730
Profit before tax	-20,185	-61,447	18,594
Average selling price (Rupee/kWh)	13.21	15.56	17.93

Source: CEB's Financial Statement 2011, 2012, 2013
CEB Statistical Digest 2012, 2013
Note: Table includes only major items.

The balance of CEB had a deficit for two years in 2011 and 2012. The main factor for a deficit is that hydro power generation stations could not be regularly operated, since there was no sufficient precipitation for the said two years. However, in 2013 hydro power generation stations could be fully operational (generated about 60% of all the generated electricity) because of sufficient precipitation, and thus operation of thermal power stations, which use diesel oil as fuel was reduced (generated about 30% of all the generated electricity. Operation of thermal power stations occupied about 60% of the generation made in 2012.), resulting in reduction of direct costs. Thus, the balance went to black.

CEB has recently promoted the generation development based on the "thermal power main and hydro power sub-main" policy in order to achieve the stable electricity supply. The second phase work for Puttalam Power Station, which uses coal as fuel and has a capacity of 900,000 KW in total including both phase 1 and 2, was substantially completed by end 2013. Then, stable electrical supply became feasible since a newly completed power plant became fully operational. The average selling price of electricity was increased consecutively for two years, and it is also one of factors for moving to surplus in the 2013 balance sheet.

According to the management of CEB, it is expected that the 2014 balance sheet would be break-even from black in the previous year since the precipitation of this year was less and thus, operational ratio of hydro power stations was lowered. If it goes into red, CEB would borrow from the State Bank with concurrence of the government, and repay the loan when the balance sheet moves to surplus. Actually, CEB repaid the loan previously made in 2013.

Transition of operation and maintenance costs of Transmission Division (Colombo) is shown in Table 10 and that of Distribution 1 Division (Colombo) is shown in Table 11.

Table 10 Operation and Maintenance Costs of Transmission Division (Colombo)

(Unit: million Rupee)

	2011	2012	2013
Operation cost	n/a	n/a	185
Maintenance cost	n/a	n/a	25

Source: Responses to the Questionnaire

Table 11 Operation and Maintenance Costs of Distribution 1 Division (Colombo)

(Unit: million Rupee)

	2010	2011	2012
Operation cost	125	149	156
Maintenance cost	115	77	90

Source: Responses to the Questionnaire

Operation and maintenance costs shown in Tables 10 and 11 are both actual figures, and both Transmission and Distribution 1 Divisions report that these costs were sufficient for making operation and maintenance regularly.

Operation and maintenance costs of equipment/facilities installed under the project are covered by sales (in 2013). Thus, there is no specific problem on financial aspects for operation and maintenance.

3.5.4 Current Status of Operation and Maintenance

Daily inspection and repairs of equipment/facilities installed under the project have been regularly undertaken by relevant operation and maintenance offices and entrusted contractors. However, the maintenance contract for SCADA has been under negotiation with the supplier.

In two years after the project was completed, minor irregularities/defects are observed in some equipment, and countermeasures are under consideration or countermeasures have been negotiated with equipment suppliers. However, these irregularities/defects do not cause serious obstacles for operation so that transmission and distribution needs to be stopped. Such minor irregularities/defects include the followings.

- Sudden freeze of computers installed in the control room of a substation (a minor issue); and
- Automation system in main substation “C” under the management of Distribution 1 Division (Colombo) does not function as planned, and sometimes it automatically

stops and restarts.

The one-year defect liability period after the project was completed has already ended. Thus, the executing agency has been negotiating on necessary countermeasures to the above mentioned problems with suppliers taking into account the compatibility with the potential equipment to be introduced in the near future. Regarding the automation system, upgrading of equipment is needed, and it is expected that it would be included in the project scope under the next JICA-funded project (Greater Colombo Transmission and Distribution Loss Reduction Project).

Daily inspection and repairs of equipment/facilities installed under the project have been regularly undertaken by relevant operation and maintenance offices and entrusted contractors. In a few years after equipment/facilities were installed under the project, minor irregularities/defects are observed in some equipment. However, these irregularities/defects do not cause serious obstacles for operation so that transmission and distribution needs to be stopped. Countermeasures have been negotiated with suppliers.

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 sustainability of the projects effect is considered high.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

The objective of the project was to provide stable electric supply by reinforcing the electricity distribution network, and reducing the system loss in order to respond to the expected load level of 350 MW as of 2005 in Colombo, thereby contributing to promotion of economic activities in the Colombo district. The project has been highly relevant to the development plans and needs of Sri Lanka, as well as Japan's ODA policies. Thus, its relevance is high. Regarding the efficiency, the originally planned project scope has been implemented almost as planned. However, under the 11kV/low voltage work, the quantity of cables, which could be easily adjusted, was revised due to the budget constraints. Thus, the project scope was slightly changed. The project cost was higher than planned and the project period was significantly longer than planned, therefore, efficiency of the project is low. Since reinforcing the electricity distribution network under the project was implemented as planned and the transmission/distribution loss was reduced, the interruption duration was substantially reduced. Consequently, the project has contributed to realization of stable power supply and to promotion of economic activities in the

Colombo district. Thus, the project has largely achieved its objectives, and the effectiveness and impact is high. No major problems have been observed in the institutional, technical and financial aspects of the operation and maintenance system, therefore sustainability of the project effect is considered high.

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

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

None.

4.2.2 Recommendations to JICA

None.

4.3 Lessons Learned

(1) Inappropriate Review of Project Details (Procurement Implementation Plan) at the Appraisal Stage and Negotiations with the Executing Agency

As mentioned above, the original project scope has been completed almost as planned. However, the original type of contract, in which a consultant undertakes detail designs and a contractor supplies/installs the equipment was changed to the “turnkey” contract as proposed by the executing agency, and subsequently concurred by JICA. Thus, some item among the scope of work for a consultant, which is “undertaking detail designs” was changed to “review of designs to be made by a contractor”. Thus, more time was spent to process the internal clearance procedures within JICA and CEB due to revision of the scope of work. Moreover, at the succeeding tendering stage for work, more time was spent to process the clearance procedures within the relevant authorities (JICA and the Sri Lankan Government) due to changes on the scope of work to be included in the contract and the project scope of procurement packages for work, resulting in substantial delay of the project period. These facts hint that discussions on the procurement implementation plan with the executing agency at the appraisal stage were not thorough enough. Regarding the procurement package which includes plants and equipment for power generation and substations such as this project, a contract package covering supply of equipment, installation and commissioning is more general. It is recommended that JICA’s “Standard Bidding Documents under Japanese ODA Loans: Procurement of Plant Design, Supply, and Installation, February 2013 Version 1.1” is used in the succeeding similar type of work. It is a common practice that a concept design in which fundamental

and absolutely needed specifications are stated is provided to bidders as a bidding document, since in a power sector project, equipment to be supplied includes numerous specific items, and that detail designs are submitted by a winning bidder.

In case discussions and negotiations between JICA and the executing agency at the appraisal stage on the procurement implementation plan (on procurement method (International Competitive Bidding, National Competitive Bidding, Shopping), format and contents of bidding documents, procurement package, procurement implementation schedule (including planning of time span required for each procurement step) are not thorough enough, revisions on “procurement arrangements” quite often occur during the implementation stage, and thus delay of project implementation arises.

In the discussions on the procurement implementation plan at the appraisal stage, details on the above mentioned items need to be discussed and what was agreed should be recorded in writing.

Comparison of the Original and Actual Scope of the Project

Item	Original	Actual
1. Output 1) Work	1) 132kV Work ・ Construction/Upgrading of 3- 132kV Substations (Primary Substation "C", Kelanitissa Grid Substation, Kolonnawa Grid Substation) ・ Installation of 132kV transmission cables (8km) 2) 33kV Work ・ Upgrading a 33kV Substation (Primary Substation "H") 3) 11kV/Low voltage work (a) Installation/replacement of 11kV underground cables (130km) (b) Construction of 11kV compact distribution substations (100 units) (c) Replacement of 11kV RMU (Ring Main Units) (50 units) (d) Installation of low voltage cables (40km) (e) Installation of low voltage feeder pillars (200 units) (f) Replacement of 11kV switchgears (474 units) 4) Others ・ Installation of SCADA (Supervisory Control And Data Acquisition) system	1) 132kV Work ・ Construction/Upgrading of 3- 132kV Substations as planned ・ Installation of 132kV transmission underground cables (9.3km) almost as planned 2) 33kV Work ・ Upgrading a 33kV Substation as planned 3) 11kV/Low voltage work slightly revised 1. Installation/replacement of 11kV underground cables (82km) 2. Construction of 11kV compact distribution substations (40 units) 3. Replacement of 11kV RMU (Ring Main Units) (380 units) 4. Installation of low voltage cables (16km) 5. Installation of low voltage feeder pillars (72 units) 6. Replacement of 11kV switchgears (175 units) 7. Installation of optical fiber cables (77km) (these are for automatic distribution, and were originally included in the SCADA system) 4) Others (automatic distribution system) ・ Installation of SCADA system as planned
2) Consulting Services	1) Detail designs and assistance in bidding 2) Construction supervision 3) Training of engineers of the executing agencies 4) Environmental protection 5) Others Foreign experts: 154M/M Local experts: 180M/M	1) Change to review of detail designs and assistance in bidding 2) Construction supervision as planned 3) Training of engineers of the executing agencies as planned 4) Environmental protection as planned 5) Others Foreign experts: 161M/M Local experts: 213M/M
2. Project Period	December 2001 - August 2006 (57 months)	December 2001 - June 2012 (127 months)
3.Project Cost Amount paid in	4,748 million yen	5,308 million yen

Foreign currency	3,197 million yen	3,197 million yen
Amount paid in Local currency	7,945 million yen	9,919 million yen
Total	5,959 million yen	5,957 million yen
Japanese ODA loan portion	1 Rupee = 1.44 yen	1 Rupee = 0.76 yen
Exchange rate	(as of February 2001)	(average between October 2008 and June 2012)

Democratic Socialist Republic of Sri Lanka

Ex-Post Evaluation of Japanese ODA Loan Project
"Pro-Poor Eastern Infrastructure Development Project"

External Evaluator: Yasuhiro Kawabata,
Sanshu Engineering Consultant

0. Summary

The objective of the project was to enhance logistic efficiency in the Eastern Province and improve accessibility to neighboring provinces by widening and paving sections under National Roads A4 and A15 in the eastern coastal regions in Sri Lanka, thereby contributing to reconstruction of the regional economy and alleviate the economic gaps between provinces in the country. The project has been highly relevant to the development plans and needs of Sri Lanka, as well as Japan's ODA policies. Thus, its relevance is high. Regarding the efficiency, the originally planned project (civil work) has been implemented as planned. Since the project cost was higher than planned and the project period was significantly longer than planned, therefore, efficiency of the project is low. Upon completion of the project, the travel time in the subject road section has been reduced by half and thus the project contributes to enhancement of logistic efficiency. Moreover, the traffic volume on the road sections has increased highly, by 8% per annum, and the project has contributed to reconstruction of the regional economy. Regarding the contribution (impact) by the project to economic reconstruction in the Eastern Province, 95% of interviewed people acknowledge that the business chances have been substantially or fairly increased. With respect to alleviation of economic disparity between regions, 88% of interviewed people note that the household income has been increased either substantially or fairly. Thus, the project has largely achieved its objectives, and the effectiveness and impact is high. No major problems have been observed in the institutional, technical and financial aspects of the operation and maintenance system, therefore sustainability of the project effect is considered high.

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

1. Project Description

Project Location

Kallady Bridge

1.1 Background

Because of the conflict, which had lasted for about thirty years, much infrastructure had been destroyed together with the numerous human damage in the Northern and Eastern Provinces. The share of Domestic Gross Product (DGP) by both provinces was lowered from 15% in 1980s to 4% in 1997. Thus, since the economical gap with other provinces was enlarged, the Sri Lankan government noted that the Northern and Eastern Provinces were the priority regions for development taking into account reconstruction of economy and assurance of peace. Roads and bridges in the Eastern province were constructed before independence (1948) and had design standards with narrower road width. Moreover, pavement surface had been severely deteriorated due to insufficient maintenance during the conflict time and it was further damaged by Tsunami and flooding due to the Great Sumatra-Andaman Earthquake, which occurred in end December 2004. Ampara and Batticaloa districts in the project area have abundant fishery resources, and Ampara is also a leading rice-producing area in the country. However, due to undeveloped road network, access for transporting agricultural products to larger markets was limited, and it was a bottleneck for development of regional economy.

Particularly, Eastern Province was most severely damaged by Indian Ocean Tsunami, and the economic gap was further enlarged. Thus, rehabilitation and reconstruction of infrastructure, which is fundamental for reconstruction of economic activities was considered to be a most urgently tackled agenda. Particularly, it was expected that development of roads would provide various effects including promotion of investment and development of regional industries, increase of employment opportunities outside communities, and enhancement of access to social services such as education and health.

1.2 Project Outline

The objective of the project was to enhance logistic efficiency in the Eastern Province and to improve accessibility to neighboring provinces by widening and paving sections under National Roads A4 and A15 in the eastern coastal regions in Sri Lanka, thereby contributing to reconstruction of the regional economy and alleviate the economic gaps between provinces in the country. The location of the project site is shown in Figure 1.

Source: Road Development Authority

Figure 1 Location of Project Site

Loan Approved Amount/ Disbursed Amount	4,460 million yen/4,459 million yen
Exchange of Notes Date/ Loan Agreement Signing Date	March 2006/March 2006
Terms and Conditions	For civil work: Interest Rate: 0.75%, Repayment Period: 40 years (Grace Period: 10 years) Conditions for Procurement: General untied For consulting services: Interest Rate: 0.75% Repayment Period: 40 years (Grace Period: 10 years) Conditions for Procurement: General untied
Borrower / Executing Agency(ies)	Government of Democratic Socialist Republic of Sri Lanka/Road Development Authority (RDA) and Institute for Construction Training and Development (ICTAD)
Final Disbursement Date	May 2012
Main Contractor (Over 1 billion yen)	China Overseas Engineering Group CO. LTD. (China), State Development & Construction Corp. (Sri Lanka)
Main Consultant (Over 100 million yen)	Nippon Koei (Japan)/ Oriental Consultants (Japan)
Feasibility Studies, etc.	Feasibility Study (JICA: Emergency Development Study, March 2005)
Related Projects	Technical Cooperation: ・JICA Construction Equipment Training Centre in Sri Lanka (1996 – 2001) Other International Organizations: ・World Bank: Road Sector Assistance Project (2005), Sri Lanka Tsunami Emergnecy Recovery Program (2005) ・Asian Development Bank: National Highways Sector Project (2005)

2. Outline of the Evaluation Study

2.1 External Evaluator

Yasuhiro Kawabata, Sanshu Engineering Consultant

2.2 Duration of Evaluation Study

Duration of the Study: July 2014-May 2015

Duration of the Field Study: September 13-28, 2014, December 7-20, 2014

3. Results of the Evaluation (Overall Rating: B[30])

3.1 Relevance (Rating: ③[31])

3.1.1 Relevance to the Development Plan of Sri Lanka

In the "10-Year Development Framework", which was developed based on the economic strategy stated in the former President's (inaugurated in November 2005 for the first term) election manifesto, "Mahinda Chintana", the following strategic priority sectors for promoting economic policies were selected: 1) Food security/increase of income of small scale farmers; 2) agriculture development aiming at converting to commercial agriculture; 3) development and improvement of sectors such as power, harbors, transport, communications and small/medium enterprises; 4) rural development and poverty alleviation; 5) enhancement of social services (education, health/medical, water supply and social security) to the lagged regions; 6) acquisition of foreign currency through tourism development and securement of employment; 7) promotion of trade and investment agreement; 8) continuous implementation of reconstruction of Northern and Eastern provinces damaged by Tsunami. Project objectives conform to the agendas 3), 4), 5) and 8) in the above mentioned strategic agendas. In the Framework, the road sector aimed at provision of transport services (including improvement of rural roads), which could meet the nation's demand. (Source: 2007 Third party evaluation report by Ministry of Foreign Affairs of Japan (Evaluation Study Report for Sri Lanka))

In 2010, the revised version of "Mahinda Chintana" ("Future Vision") was issued and it aimed at doubling the economic magnitude in 2010 by 2016 (GDP per capita shall be US$4,000) through economic structural reforms. Simultaneously, it also aimed at achieving the well balanced economic development in order to avoid the enlargement of gap between urban and rural areas. Regarding the road sector, in Chapter 4 of the revised "Mahinda Chintana", it is stated that the government would give priority to the improvement projects, in which the road network in Sri Lanka would be upgraded to good quality roads during the period of 2011-2020, since it was considered that improvement of roads is essential to integrate the nation and to achieve the politically stable status. In the "National Road Master Plan" (2007-2017), issued in 2007, widening and improvement of national roads was listed as one of priority agendas, cognizant of that development of road network connecting with all the economically growing hubs in the country is essential. Batticaloa in the project area was also one of

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

national level growth hubs.

On January 8, 2015, the Presidential Election was undertaken, and Mr. Maithripala Sirisena inaugurated as a new president on the following day, January 9, 2015. However, new development policies on the highway/road sector have not been issued (as of March 2015).

As mentioned above, at appraisal and at ex-post evaluation, the implementation of the project conforms to the development policies of the Sri Lankan Government.

3.1.2 Relevance to the Development Needs of Sri Lanka

Roads and bridges in the project area, Eastern Province (three districts including Trincomalee, Batticaloa and Ampara with a total population of 1.5 million) were constructed during the colonial period (became independent in 1948) and had design standards with narrower road width. Moreover, pavement surface had been severely deteriorated due to insufficient maintenance during the conflict time. It was further damaged in some road sections by Tsunami and flooding due to Great Sumatra-Andaman Earthquake occurred in 2004. Eastern Province has abundant agricultural and fishery resources. However, since access to major larger markets was limited due to undeveloped road network, it was a bottleneck for development of regional economy. Thus, widening and paving the national roads and improvement of bridges in the eastern coastal regions in Sri Lanka was considered to be urgently addressed agenda in order to achieve economic reconstruction in Eastern Province and redress the economic gap between regions.

National Road A4 at Addalachchena
Before project

National Road A4 at Addalachchena
After project
(Picture provided by Oriental Consultants Co., LTD.)

In Sri Lanka, a road is the most important transport mode, and 90% of passengers and 98% of cargoes are transported by roads as of 2009. The total road length, including national roads, provincial roads, and rural/agricultural roads is about 110,000 km, and

ratios of paved roads of national and provincial roads are 99% and 70%, respectively. However, ratio of national roads with good surface condition as of 2009 is only 40%. (The government has a plan aiming at increasing the ratio up to about 60% by 2015.) Under such condition, at the ex-post evaluation stage, the government considers that it is essential to improve and develop road networks and make efforts to enhance the "quality" of roads in order to cope with growing economic condition and likely increasing traffic demand. Simultaneously, the government is keen to develop human resources and enhance the institutional capacity of the relevant road agencies. (Source: Chapter 4 of the revised "Mahinda Chintana")

Even at the ex-post evaluation stage, the government considers that it is essential to make efforts to enhance the "quality" of roads in order to cope with traffic demand. Thus, the project aiming at enhancing access through road improvement conforms to the development needs.

3.1.3 Relevance to Japan's ODA Policy

According to the Medium-Term Strategy for Overseas Economic Cooperation Operations, which was effective at the appraisal time, the followings were listed up as the priority agendas for assistance to Sri Lanka: 1) assistance for reconstruction of mainly Northern and Eastern Provinces considering the balance of regions and ethnic groups; 2) development of economic infrastructure targeting the sustainable economic development led by the private sector; 3) fostering industries; and 4) assistance to poor. In the 2006 Country Assistance Strategy for Sri Lanka, rehabilitation and reconstruction of roads in regions damaged by Tsunami was considered to be a priority sector together with development of road networks connecting between Colombo Metropolitan Area and regions, and alleviation of traffic congestion in the capital region. Thus, the project conforms to the assistance policies at the appraisal stage.

Accordingly, the project has been highly relevant with the Sri Lankan development plan and needs, as well as Japan's ODA policies. Its relevance is therefore considered high.

3.2 Efficiency (Rating: ①)

3.2.1 Project Outputs

The original and actual output of the project is shown in Table 1.

Table 1 Output (Original and Actual)

	Project Scope at Appraisal Stage	Project Scope at Project Completion
Civil Work	・Reconstruction and widening of roads (Akkaraipattu – Trikkandimadu section with a total length of about 98km)	As planned Among the whole sections, about 10km sections have 4 lanes and the remaining 88km has 2 lanes. The pavement structure consists of 50 mm asphalt pavement on top of 20 cm base course on the existing surface, which adjusts the existing uneven surface. Repair/reconstruction of 136 culverts or small bridges.
	・Bridge construction in parallel to Kallady Bridge (291m), which is located in the central area of Batticaloa	As planned New construction of a 2-lane bridge in parallel to the existing 1-lane bridge. The type of superstructure is box-girder and that of substructure is reinforced concrete pier. The type of foundation is pile.
Consulting Services	・Review of bidding documents and designs ・Construction supervision ・Recommendation and assistance in maintenance and road safety aspects ・Monitoring of safeguard issues ・Monitoring of assistance activities for employment of graduates from vocational training ・Baseline survey Foreign experts: 70.0M/M Local experts: 449 M/M Local assistants: 1,062 M/M	Almost as planned Review of bidding documents and designs was deleted from the scope of work. Since construction of Kallady Bridge was dropped from the original contract and rebidded during the project implementation, assistance in tendering activities was added to the scope of work. The baseline survey was not undertaken. Foreign experts: 100.35M/M Local experts: 482.92M/M Local assistants: 1,173.68M/M
Vocational Training	・Planning　training program on operation of construction equipment and maintenance skills ・Selection of trainees ・Coordination of local governments and regional communities ・Undertaking　training (668 participants） ・Assistance for employment	As planned In 2007 and 2008, 668 staff took vocational training to 16 training modules (increased by 2 modules from the original plan)

Source: JICA documents, and Interview survey with the executing agencies
Note 1: Originally, each civil work (through ICB) and vocational training was to be procured in one package.

Review of bidding documents and designs was originally included as one of scope of work under the consulting services. However, in order to expedite the implementation of the project, it had been completed with the separately arranged funds (a consultant was directly recruited by JICA) before the construction work commenced. Other consulting assignments were undertaken during the project implementation. However, since it was delayed to coordinate on the implementation arrangements between the executing agency and the consultant, and the proper timing was missed, the baseline survey, which was to be undertaken to examine the impact by the project after completion of the project, was not carried out.

The vocational training, which was one of project components was aimed at enhancing

operational sustainability of Institute for Construction Training and Development[32] (ICTAD) by establishing an organizational structure, strengthening the relationship with industry and promoting the business activities. Regarding vocational training, appropriate subjects were selected from the prospectus, which was prepared by ICTAD every year, and ICTAD recruited trainees from government agencies, local governments and private construction companies and conducted the training. About 70% of trainees are government staffs and the remaining 30% are employees of private industries (contractors). Most of training subjects are learning of operating skills of various construction equipment, and some staffs, who were involved in the maintenance work at Road Development Authority (RDA) District Offices also participated in the training program.

Congestion at Kallady Bridge
Before project

Kallady Bridge
(Left bridge is an old bridge)
(Picture provided by Oriental Consultants Co., LTD)

3.2.2 Project Inputs

3.2.2.1 Project Cost

The estimated project cost at appraisal was 5,691 million yen, of which the Japanese ODA loan was 4,460 million yen. The actual project cost was 5,870 million yen, of which the Japanese ODA loan was 4,459 million yen. The actual project cost was higher than planned, and is equivalent to 103% of the planned cost.

[32] Established in 1986 aiming at enhancing the efficiency and competitiveness of the construction industry in Sri Lanka. Main business services are human resource development in the construction industry, training for skill up of construction workers, establishing technical standards and others. Construction Equipment Training Center under ICTAD was founded by the Japanese Grant, and the capacity building program was undertaken under the JICA Technical Cooperation scheme during the period from 1966 to 2001.

Table 2　Comparison of Project Cost (Planned and Actual)

(Unit: million yen)

Category	Planned					Actual				
	ODA loan (foreign)	Local currency		Total		ODA loan (foreign)	Local currency		Total	
		Own fund	ODA loan	Total	ODA Loan		Own fund	ODA loan	Total	ODA Loan
・Civil work	3,462	0	0	3,462	3,462	1,644	326	2,233	4,203	3,876
Price escalation	62	0	0	62	62	-	-	-	-	-
Contingency	353	0	0	353	353	-	-	-	-	-
・Consulting services	446	0	0	446	446	272	0	206	478	478
・Vocational training	34	0	0	34	34	33	0	0	33	33
・Land acquisition	0	56	0	56	0	0	0	0	0	0
・Management cost	0	523	0	523	0	0	293	0	293	0
・Tax	0	652	0	652	0	0	791	0	791	0
・Interest during construction	103	0	0	0	103	72	0	0	72	72
Total	4,460	1,231	0	5,691	4,460	2,021	1,410	2,439	5,870	4,459

Source: JICA documents
Note: Summation of rows and lines does not necessarily match due to rounding numbers.
Exchange rates: at appraisal　1 US$ =111 yen,　1 US$ =100 Rupee, 1 Rupee=1.11 yen
average during implementation (2007-2013)：1 Rupee=1.26 yen
Price escalation: foreign currency 1.3%/year, local currency0.0%/year
Contingency: Civil work 10%, Consulting services 5%
Cost base year: October 2005

Main reasons for cost increase are as follows:

1) Since the construction schedule was substantially delayed due to poor performance of a contractor after the project commenced, construction of a bridge (Kallady Bridge) was dropped from the original contract, and rebidding was conducted. Then, a newly awarded contractor continued construction of the remaining work of bridge construction. (Even after the loan was closed, work of an incomplete bridge construction was continued and the bridge was open to traffic in September 2013.)
2) Since the beam span of Kallady Bridge was long (48m), installation of beams needed to be separately given to a specialized contractor.
3) Piling work at sites with adverse foundation condition (soft ground) was extremely tough and resulted in cost increase.
4) During the project implementation (2007-2013), Japanese yen depreciated and the exchange rate became from 1 Rupee = 1.11 yen to 1 Rupee = 1.26 yen (in average).

National Road A15 in Batticaloa
Before project

National Road A15 in Batticaloa
After project
(Picture provided by Oriental Consultants Co., LTD)

3.2.2.2 Project Period

The originally planned project period was 43 months from March 2006 (signing of the Loan Agreement) to September 2009 (civil work completion). The actual project period was 91 months from March 2006 (signing of the Loan Agreement) to September 2013 (completion of a bridge construction) , or equivalent to 212% of the plan. Thus, the project period was significantly longer than planned. The consulting services commenced in November 2007 and ended in November 2013.

Table 3　Comparison of Project Period (Initially Planned and Actual)

	Planned (at the Loan Agreement signing)	Actual
Selection of a consultant	March 2006 – January 2007	March 2006 – October 2007
Consulting services	February 2007 – October 2009	November 2007 – November 2013
Land acquisition	January 2006 – December 2006	n/a
Preparation for bidding	January 2006 – July 2006	March 2006–March 2007 (road reconstruction and widening) October 2009– November 2009（bridge construction）
Bidding and contact	August 2006 – March 2007	
Civil work	April 2007 – September 2009 (Reconstruction of roads and bridge construction was planned to be implemented simultaneously.）	December 2007– October 2010 (road reconstruction and widening) April 2010– September 2013(bridge construction)
Vocational training	June 2006 – December 2007	Implemented in 2007 and 2008

Source : JICA documents

Note 1: The originally planned defect liability period after the work completed was from October 2009 to September 2010.

Note 2: The actual defect liability period after the work completion was from January 2011 to December 2011 on the road reconstruction/widening work and from September 2013 to September 2014 on the bridge construction.

Main reasons for extension of the project period are as follows:

1) Selection of a consultant was delayed by about 9 months (more time was needed to secure clearance during the internal process)
2) At the time for preparation of bidding documents (in 2006), as security around the project sites was deteriorated, and the field reconnaissance for identifying quarries and borrow pits could not be implemented as planned, delay of preparation of bidding documents occurred.
3) As mentioned previously, since the remaining work of bridge construction was continued by a new contractor selected through rebidding, the project period for the whole civil work was delayed for about 48 months.
4) In the urban 4-lane sections (about 10km), design changes and succeeding additional work such as installation of additional drainage were undertaken.

The project cost was higher than planned, and the project period was significantly longer than planned. Therefore, efficiency of the project is considered as low.

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

Economic Internal Rate of Return (EIRR) of the Project calculated at the appraisal stage was 12.7%. Regarding the EIRR at the ex-post evaluation stage, since relevant data on costs and benefits needed to calculate the EIRR was not provided by the executing agency, EIRR are not recalculated.

3.3 Effectiveness[33] (Rating: ③)

3.3.1 Quantitative Effects (Operation and Effect Indicators)

At the appraisal stage, as an operational indicator, daily traffic volume (vehicles/day in PCU[34]) and as an effect indicator, reduction of travel time (million Rupees/year) were established.

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

[34] passenger car unit

(1) Daily Traffic Volume and Travel Time

Table 4 Daily Traffic Volume and Travel Time

(Unit: Vehicles/day in PCU)

Indicators	Baseline	Target	Actual		
	2005	2010	2009	2013	2014
	at appraisal	1 Year After Completion (Note 1)	under implementa-tion	Completion Year	1 Year After Completion
Indicator 1:Traffic volume (Notes 2 &3) ・Daily traffic：5km North of Batticaloa along A15 route	No traffic count data	Not established	No traffic count data	No traffic count data	15,400
・Daily traffic: 23km South of Batticaloa along A4 route	4,150	Not established	4,920	8,190	8,510
Indicator 2: Reduction of travel time (minutes) (Notes 4 &5)	100	Not established	50	50	45

Source: JICA documents, Responses to the Questionnaire (information provided by RDA Planning Department)
Note 1: Originally planned completion date: September 2009, Actual completion date: September 2013 (Opening of Kallady Bridge). Regarding the actual values, year 2014 is defined as “1 Year After Completion” counting from the actual completion date.
Note 2: Regarding “Indicator 1: Traffic volume”, traffic counting stations for baseline data at the appraisal stage (in 2005) were Kalmunai and Kattankudi along A4 Route. However, since then traffic counts have not been undertaken at these locations. The information available at the post evaluation stage is the traffic volume actually counted at two locations (5km North of Batticaloa along A15 route, and 23km South of Batticaloa along A4 route). The location of current counting stations differs from the location at the appraisal stage (Kalmunai and Kattankudi). Since comparison between actual volumes and planned (projected volume) is not appropriate, the planned (projected) traffic volume is not shown in the table.
Note 3: Actual traffic volume provided by RDA Planning Department is the daily traffic counted on a specific day and converted to PCU.
Note 4: Regarding “Indicator 2: Reduction of travel time”, at the appraisal stage, reduction of travel time was to be measured in term of million rupees per year. In order to quantify the impact on the reduction of travel time in the monetary term, it is needed to collect the information and data on the following items: traffic volume by type of vehicle, time value of drivers/passengers and cargo type/volume of cargo hauled and others. Since it was difficult to collect the information and date on these items, reduction of travel time was examined in term of time (minutes). (Information was provided by RDA Planning Department)
Note 5: Measured travel time is the average travel time by a passenger car for the section between Batticaloa and Karativu with a total length of about 50km. The number for 2013 is the travel time before Kallady Bridge was completed in September 2013. (Information was provided by RDA Planning Department)

The daily traffic volume at 23km south of Batticaloa along A4 Route was almost doubled in nine years from 2005 to 2014 (growth rate is 8%/year). The traffic volume at 5km north of Batticaloa along A15 Route is 15,400 vehicles/day as of 2014, which is considered high. The reason for high volume is partly that the location is in the urban area.

Regarding reduction of travel time (the average travel time by a passenger car for the section between Batticaloa and Karativu with a total length of about 50km), it was reduced from 100 minutes before the project to 45 minutes after the project, resulting in reduction by almost half.

3.3.2 Qualitative Effects

As qualitative effects by the Project, the following three items were expected.

1) Improvement of transport efficiency

According to the RDA Batticaloa and Akkaraipattu District Offices, compared to the situation before the project, since the smooth driving on the paved roads was secured, the travel time has been substantially reduced, and damage and repairs of vehicles caused by rough roads before the project were also reduced.

2) Improvement of access to other provinces

The travel time to reach Colombo from Batticaloa via National Road Route A15, A11, and A6, which is the shortest route, was reduced by about 10 minutes. However, in terms of improvement of access to other provinces, the reduced time is only about ten minutes among the average travel time of about 7 hours, and thus contribution of the project is limited.

3) Activation of regional economy

Because of restoration of security in the project targeted regions, and improvement of roads by the project, the investment to the subject region including the tourism related development has tended to be increased.

In order to verify the qualitative effects by the project (improvement of transport efficiency, improvement of access to other provinces and activation of regional economy), the beneficiary survey[35] was undertaken.

Results of Beneficiary Survey:

1) Improvement of transport efficiency

The survey result on reduction of travel/commuting time to the commonly visited sites is shown in Figure 2 and that on alleviation of traffic congestion is shown in Figure 3.

[35] Number of samples: total 100 (road users and residents along the project road; government employees (38%), private company employees (25%), businessman (company executives, 21%), self-employed (4%), housewife (5%), others (7%); male (68%), female (32%); method: interview with a Questionnaire

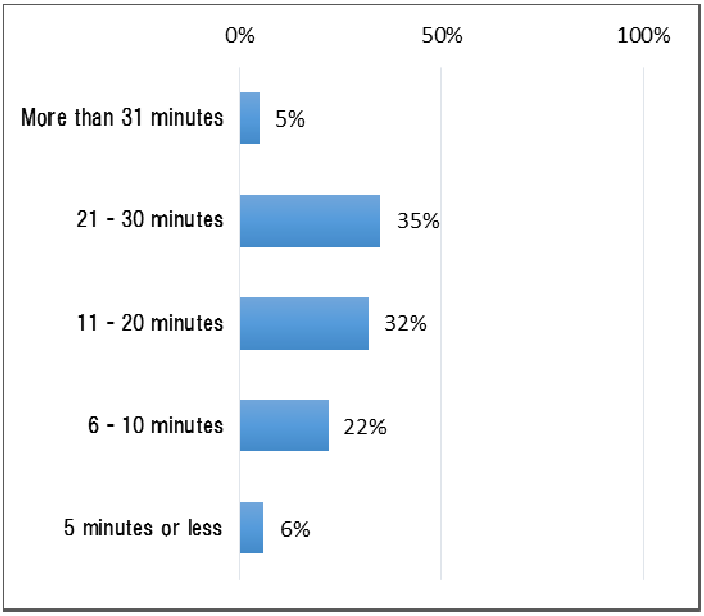
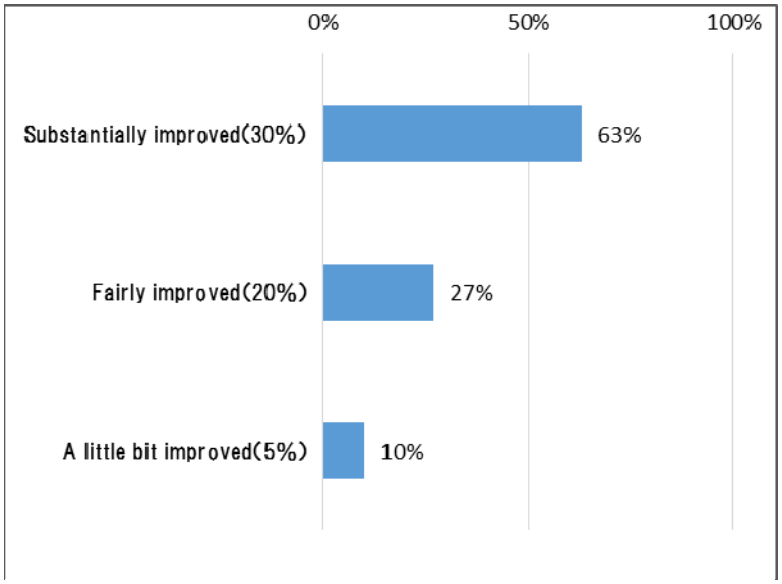


Figure 2 Reduction of Travel/Commuting Time



Note: Numbers in ( ) show the level alleviated.

Figure 3 Alleviation of Traffic Congestion

Regarding reduction of travel/commuting time, road users and residents along the road recognize that the travel time was reduced by about 17 minutes in average.

With respect to contribution to alleviation of traffic congestion by improvement of the project road, about 60% of respondents recognize that it was “substantially” improved.

National Road A15 at Trikkandimadu
Before project

National Road A15 at Trikkandimadu
After project
(Picture provided by Oriental Consultants Co., LTD)

2) Improvement of access to other provinces

Regarding improvement of access to the economic centers in other provinces (e.g. Anuradhapura in the North Central Province), about 67% of respondents recognize contribution of the project.

3) Activation of regional economy

The survey result on activation of regional economy is shown in Figure 4.

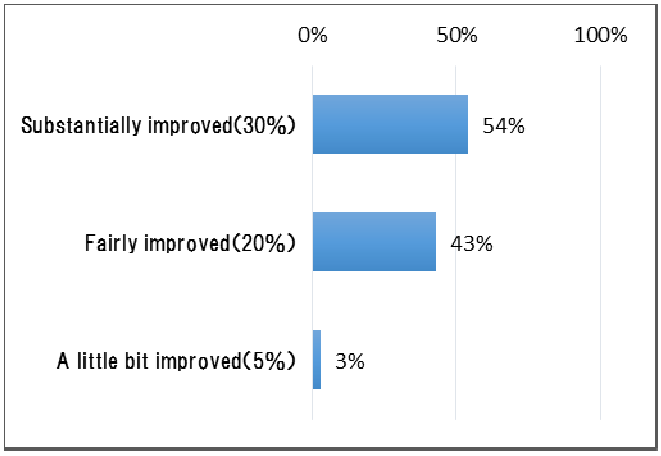


Figure 4 Contribution to Activation of Regional Economy

With respect to contribution to activation of regional economy by improvement of the project road, about 97% of respondents recognize that it was “substantially” or “fairly”.

3.4 Impact

3.4.1 Intended Impacts

In order to verify contribution of the project to improvement of regional economy and rectification of economic gap between regions, the relevant information and data on fluctuation of land value, increase of investment, transition of population, promotion of tourism development and average household income was collected. Results of analysis are shown in Tables 5-8.

1) Land value

Fluctuation of the land value in Batticaloa, which is a core city in the project site was examined and the following results became apparent.

Table 5 Fluctuation of Land Value in Batticaloa (average value)

(Unit: Rupee/m^2)

Year	2006	2010	2011	2012	2013
Land Value	6,900	23,500	27,500	27,500	27,500

Source: Market value (RDA Batticaloa District Office)

Since the conflict in Sri Lanka, which commenced in 1983 was almost settled in mid-2007 in the Eastern Province and the project also started, the land value went up abruptly. (According to the beneficial survey, about 85% respondents clearly admit that contribution of the project is "substantially" or "fairly"). The current land value in Batticaloa is about four times of that of "before the project".

2) Increase of Investment

The trend of investment to the project area is shown in Table 6.

Table 6 Trend of Investment in the Project Area

Year	2010	2011	2012	2013
Number of projects	5	6	10	15
Invested amount (million Rupee)	250	400	600	800
New employment (persons)	1,750	3,000	6,000	8,000

Source: RDA Batticaloa District Office

Investment to the project area has been steadily increasing year by year.

3) Transition of population

Transition of population in Batticaloa is shown in Table 7.

Table 7　Transition of Population

(Unit: 1,000 people)

Year	2006	2010	2011	2012
Population	581	598	588	586

Source: RDA Batticaloa District Office

There is no substantial fluctuation in population of Batticaloa. The population in 2011 and 2012 has been reduced from that in 2010. The reason for this reduction is that farmers evacuated to the urban area during the conflict returned to their original inhabited place.

4)　Promotion of Tourism Development

According to RDA Batticaloa District Office, from around 2010 after security was restored and roads were improved, the tourism related development started in Passikudah located at about 25km north of Batticaloa and has shoaling beaches with calm waves. As of 2014, hotels with a total of 2,000 rooms including five 5-star hotels have been completed, and it is expected that the number of rooms would be expanded to 4,000 by 2016. Moreover, it is expected that tourists will be transported by air from Colombo. An airport is being constructed in Batticaloa and is expected to be open in the first half year.

5)　Average Household Income

Transition of the average household income in Batticaloa is shown in Table 8.

Table 8　Transition of Average Household Income in Batticaloa

(Unit: Rupee)

	2006/07	2009/10	2012/13
Average in Sri Lanka	26,286	36,451	45,878
Average in Batticaloa	21,032	22,844	25,483
Ratio to the national average (%)	80	63	56
Average in Eastern Province	20,811	23,922	30,676

Source: Household Income & Expenditure Survey 2012/13, 2009/10, 2006/07 (Department of Census and Statistics)

Note 1: Income in Eastern Province is the lowest in Sri Lanka（2012/13）

Note 2: Ratio to the national average = Average in Batticaloa/ Average in Sri Lanka

In the past, the income in Eastern Province has been the lowest. Even now this situation is unchanged, and conversely the discrepancy between regions has been widened. As development of an expressway network progresses and travel time to/from Colombo is shortened in the future, promotion of regional economic activities will be induced.

Results of Beneficiary Survey:

Regarding contribution of the project to reconstruction of the regional economy in Eastern Province and rectification of the economic gaps between regions in the country, the following results became apparent through the beneficiary survey.

1) Increase of business chances

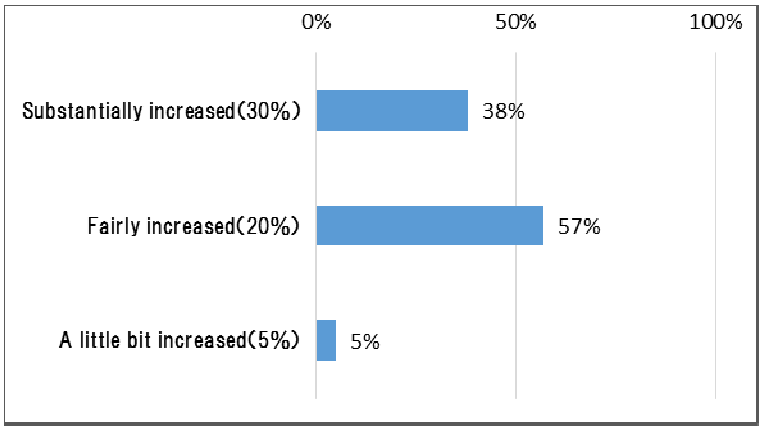


Figure 5 Increase of Business Chances

Regarding contribution to increase of business chances by improvement of roads, about 95% of respondents recognize that the project contributed “substantially” or “fairly”.

2) Increase of household income

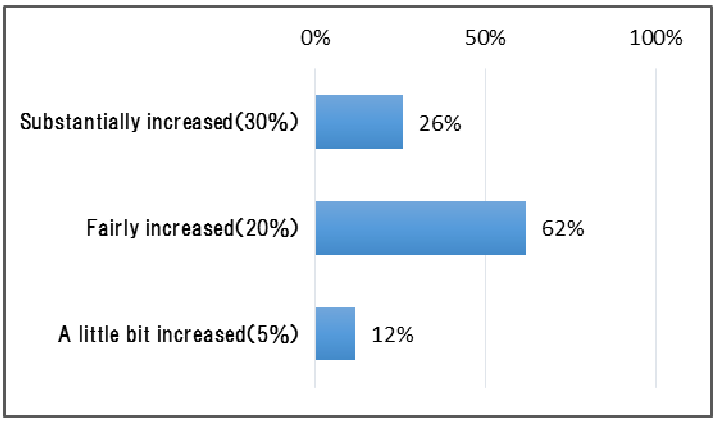


Figure 6 Increase of Household Income

Regarding contribution of the project to increase of household income, since business chances were increased by improvement of roads, 88% of respondents recognize that the contribution was either “substantially” or “fairly”. However, since

the average annual growth rate of Sri Lanka for the past four years (2010-2013) was 7.5% and the growth rates in other regions were also high, contribution has not reached rectification of the economic gaps between regions.

3.4.2 Other Impacts

(1) Impacts on the natural environment

According to the「JBIC Guidelines for Safeguard Verification, issued in April 2002」, the project was classified as Category B[36], taking into account the sector characteristics, project characteristics, and geographical features. According to the domestic legislation in Sri Lanka, preparation of an Environmental Impact Assessment (EIA) was not required, and implementation of the project along the coast had been cleared by Coastal Conservation Bureau at the appraisal time. Exhausted gas, noise and dust were considered to be environmental issues during the construction stage, and thus, watering and appropriate management of construction equipment were to be implemented together with the environmental monitoring.

It is reported that during the implementation stage, watering was frequently undertaken in order to reduce dust. It is also reported that regarding issues on exhausted gas, noise, and vibration, engines of the construction machine were switched off when it is not used. According to the executing agency, the consultant conducted the environmental monitoring as planned during the project implementation. As the major project component is improving and paving the existing roads, deterioration of the natural environment from what it was has not been observed after the project was completed.

(2) Land Acquisition and Resettlement

The estimated land area to be acquired at the appraisal stage was about 1 ha, and compensation was to be made according to the domestic legislation. However, resettlement was not foreseen under the project. Since the improvement and widening work were actually undertaken within the existing right-of-way during the project implementation, land acquisition and resettlement did not take place.

(3) Other Positive and Negative Impacts

At the appraisal stage, any other impacts were not foreseen. However, as the old rough roads were improved to paved roads, black spots, where traffic accidents

[36] Category B: Applied to the project, in which unfavorable impacts to be made to the environment and community are considered smaller compared with Category A (applied to the project, in which seriously unfavorable impacts to be made to the environment and community).

frequently occur due to higher speed are noted after the pavement was completed. One of black spots is the location with a sharp curve, which is located at about 5km north of Akkaraipattu. Particularly, during the three-month period between May and July 2014, 10 accidents (including 7 fatal accidents) occurred. Hence, the District Office immediately painted surface markings and installed guard rails, delineators, and traffic signs (speed limit with 40km/hour), and did whatever technically is applicable. As a result, for the four-month period from August to November 2014, no traffic accident has occurred.

Upon completion of the project, the travel time in the subject road section has been reduced by half and thus the project contributes to enhancement of logistic efficiency. Moreover, the traffic volume on the road section has increased highly, by 8% per annum, and the project has contributed to reconstruction of the regional economy. From the beneficiary survey, it was confirmed that the travel time of the road users and residents along the roads was reduced by about 17 minutes in average. With respect to contribution to alleviation of traffic congestion, about 90% of respondents recognize that it was “substantially” or “fairly” improved. Regarding the contribution (impact) by the project to economic reconstruction in the Eastern Province, 95% of interviewed people acknowledge that the business chances have been “substantially” or “fairly” increased. With respect to alleviation of economic disparity between regions, people note that it was fairly improved. However, since the average annual growth rate of Sri Lanka for the past four years (2010-2013) was 7.5% and the growth rates in other regions were also high, contribution has not reached rectification of the economic gaps between regions.

The project has largely achieved its objectives, and thus the effectiveness and impact is high.

3.5 Sustainability (Rating: ③)

3.5.1 Institutional Aspects of Operation and Maintenance

After the project was completed, Road Development Authority (RDA) is responsible for operation and maintenance of the project roads. RDA is in charge of development, operation and maintenance of national roads consisting of trunk roads (A class) and major roads (B class) among all the road network. The total road length under their management as of August 2010 is about 12,000 km. In the RDA Headquarters, Maintenance Management and Construction Department is responsible for maintenance of national roads, and RDA has Provincial Offices in 9 provinces and

District Offices in 21 locations under the Provincial Offices. Maintenance of the project road (98 km) is undertaken by both Batticaloa and Akkaraipattu District Offices under the Eastern Provincial Office. Batticaloa District Office is responsible for the section between Trikkandimadu and Kalmunai with a total length of about 73km and Akkaraipattu District Office is responsible for the remaining 25 km section between Kalmunai and Akkaraipattu. Number of staffs assigned to both District Offices is as shown in Table 9.

Table 9 Number of Staffs of District Offices

(Unit: persons)

Position	Batticaloa	Akkaraipattu
Chief Engineer	1	1
Executive Engineer	1	2
Technical Officer	3	4
Work Supervisor	9	11
Labor Supervisor & Laborers	about 60	about 110
Total	about 75	about 130

Source: District offices

Regarding the number of staff assigned, Batticaloa District Office considers that the number of staff is not necessarily sufficient since the current regular skilled staffs would be gradually replaced by contract staffs according to the government policy, and vacant positions would not be filled. However, since vacant positions will be filled by contract staffs in sequence, the number of staffs will soon reach the fixed number. On the other hand, Akkaraipattu District Office considers that the number of staffs assigned is appropriate to the current work load for maintenance.

The current organizational setup for maintenance work is the standard one of the RDA District Offices, and appropriately established. The number of staffs assigned is also appropriate.

3.5.2 Technical Aspects of Operation and Maintenance

In order to be an “Engineer” who is an above the management level engineer, he/she must have educational qualification above university graduate level, and needs to acquire the qualification as an “engineer[37]” accredited by Institute of Engineers. Engineers (Chief Engineers and Executive Engineers) at both Batticaloa and Akkaraipattu District Offices have the “Engineer” qualification. It is reported that the technical skill and knowledge of technical staffs such as Technical Officers and Work Supervisors is sufficient to undertake the general maintenance work without any

[37] Equivalent to the “Professional Engineer” in the US and also to an equivalent qualification such as a certified public accountant.

difficulties.

Maintenance work has been implemented according to the RDA's standard regulations, "Standard Specifications for Construction and Maintenance for Roads and Bridges – November 2008". Staffs take training on other manuals and guidelines such as "Code of Conducts" and "Guidelines for Safety" about once a year. Some of technician level staffs were sent to the training on "Improvement of Operational Skills for Construction Equipment", undertaken at ICTAD under the project (vocational training).

Since engineers and technicians with qualified technical skills are assigned for the maintenance work, and undertakings of training and development of manuals are properly done, no particular problem is noted. Thus, there is no technical issues to sustain the effectiveness of the project.

3.5.3 Financial Aspects of Operation and Maintenance

The annual budget and actual expenditure of the whole RDA, and the budget and actual expenditures for maintenance of roads and bridges are shown in Table 10.

Table 10 Annual Budget and Actual Expenditure of the Whole RDA, and the Budget and Actual Expenditures for Maintenance

(Unit: million Rupee)

	2012		2013		2014	
	Budget	Actual	Budget	Actual	Budget	Actual
Whole RDA	132,795	131,970	126,623	125,319	136,205	114,870
Maintenance	5,961 (4.5%)	5,961 (4.5%)	5,150 (4.1%)	5,150 (4.1%)	8,000 (5.9%)	4,180 (3.6%)

Source: RDA Planning Department
Note 1: Actual numbers for 2014 are as of end of August
Note 2: Numbers in ( ) are the ratio of the maintenance budget and actual expenditures against the whole RDA budget and actual expenditures, respectively.
Note 3: Maintenance budget includes that for routine maintenance, periodic maintenance, structural improvement, and safety facilities maintenance, but not for major repairs and reconstruction.

In order to secure financial resources for road maintenance, the Sri Lankan government established "Road Maintenance Trust Fund" in December 2005, and it has collected 1 Rupee per liter from sales of gasoline and 0.5 Rupee per liter from sales of diesel. However, the sale price of gasoline as of November 2014 was about 160 Rupee per liter, and the collection ratio is low. (the gasoline tax in Japan is about 40% of the sale price.) The collected amount from the Road Maintenance Trust Fund reaches about 1.5 billion Rupees every year, and its share among the maintenance budget (about 8 billion Rupees) for 2014 is about 19%. The maintenance budget for 2014 is

about 155% of that of previous year.

It is reported that the required amount for maintenance of national roads under the RDA management is in average 380,000 Rupees/km/year (180,000 Rupees/km/year for routine maintenance, 200,000 Rupees/km/year for periodic maintenance). The maintenance budget allocated to both Batticaloa and Akkaraipattu District Offices and actual expenditures spent for road sections including the subject project road sections are shown in Tables 11 and 12.

Table 11 Expenditures for Maintenance Work of Batticaloa District Office

(Unit: million Rupees)

	2013		2014	
	Budget	Actual Expenditure	Budget	Actual Expenditure
Routine maintenance	85.0	117.38	90.0	53.36
Periodic maintenance	105.0	18.77	100.9	82.00
Structural improvement	29.0	47.71	45.1	57.01
Safety facility maintenance	32.0	7.32	20.0	13.11
Total	251.0	191.18	256.0	205.57 (246.68)

Source: RDA Maintenance & Management Department
Note 1: The total road length managed by Batticaloa District Office is 266 km.
Note 2: Actual expenditures of 2014 is the sum covered up to end of October.
Note 3: Numbers in ( ) are converted to 12-month basis.

Table 12 Expenditures for Maintenance Work of Akkaraipattu District Office

(Unit: million Rupees)

	2013		2014	
	Budget	Actual Expenditure	Budget	Actual Expenditure
Routine maintenance	81.0	53.30	90.0	43.51
Periodic maintenance	105.0	46.44	180.0	109.91
Structural improvement	18.0	4.01	130.0	63.50
Safety facility maintenance	32.0	13.67	20.0	9.26
Total	236.0	117.42	420.0	226.18 (271.42)

Source: RDA Maintenance & Management Department
Note 1: The total road length managed by Akkaraipattu District Office is 380 km.
Note 2: Actual expenditures of 2014 cover up to end October.
Note 3: Numbers in ( ) are converted to 12-month basis.

For the past two years (2013 and 2014), both District Offices could not spend all

the budget allocated to the offices. Since widening and/or reconstruction of roads under the project has been recently completed, maintenance work required is mainly simple general routine and periodic work. It is considered that the budget for the maintenance work has been properly allocated. Regarding the ancillary and additional works mentioned under the next “Current Status of Operation and Maintenance”, the budget for these works is separately allocated from the other budget item (for improvement work).

It is considered that the budget for the maintenance work has been properly allocated. No major problems are observed in the financial aspects of the operation and maintenance system.

3.5.4 Current Status of Operation and Maintenance

Four years have passed since roads were widened and/or paved under the project. From the field ocular inspection, it was noted that there were no particular sections where the road surface was deteriorated, and thus the pavement condition seemed to be generally satisfactory. It is likely that the routine and periodic maintenance work aimed at maintaining the current condition including the following work items has been appropriately implemented.

Routine maintenance: mowing glass on shoulders, patching clacks, repair of pot holes, cleaning drainage ditches, repainting surface markings, repair of traffic signs, etc.

Periodic maintenance: patching/repair pavement surface, maintenance of shoulders, painting of guardrails, repair of traffic signs, improvement of drainage, etc.

Since the major project scope was widening and pavement of the existing roads, ancillary and additional work due to increase of the pavement height was required after the project was completed, and the following work has been continued by using the maintenance budgets of local government and RDA. (Note: At the planning stage, improvement such as putting base course was not considered).

- Reconstruction of curves, which fits with the elevated pavement height was required. (in some sections), because existing curves did not serve its original function (stopping vehicles, and serving as drainage facility) after the project was completed,
- Drainage ditches installed in the urban area were not originally covered.

Installation of covers, additionally needed due to safety reasons (to prevent dropping of pedestrians)

- Expansion of drain ditches/channels to the appropriate locations, needed in some locations. (in order to drain rain water to appropriate locations), because the drain system from installed ditches was not fully planned,

In addition, since some road sections are flooded during rainstorm, rehabilitation work to raise the pavement height by embankment, is needed.

Regarding the infrastructure constructed under the project, from the field ocular inspection during the field investigation, no major clack nor damage on pavement surface were observed. Yet, improvement and additional work, which could not be sufficiently addressed during the rehabilitation work under the project has been undertaken by own funds.

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 sustainability of the projects effect is considered high.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

The objective of the project was to enhance logistic efficiency in the Eastern Province and improve accessibility to neighboring provinces by widening and paving sections under National Roads A4 and A15 in the eastern coastal regions in Sri Lanka, thereby contributing to reconstruction of the regional economy and alleviate the economic gaps between provinces in the country. The project has been highly relevant to the development plans and needs of Sri Lanka, as well as Japan’s ODA policies. Thus, its relevance is high. Regarding the efficiency, the originally planned project (civil work) has been implemented as planned. Since the project cost was higher than planned and the project period was significantly longer than planned, therefore, efficiency of the project is low. Upon completion of the project, the travel time in the subject road section has been reduced by half and thus the project contributes to enhancement of logistic efficiency. Moreover, the traffic volume on the road sections has increased highly, by 8% per annum, and the project has contributed to reconstruction of the regional economy. Regarding the contribution (impact) by the project to economic reconstruction in the Eastern Province, 95% of interviewed people acknowledge that the business chances have been substantially or fairly increased. With respect to alleviation of economic disparity

between regions, 88% of interviewed people note that the household income has been increased either substantially or fairly. Thus, the project has largely achieved its objectives, and the effectiveness and impact is high. No major problems have been observed in the institutional, technical and financial aspects of the operation and maintenance system, therefore sustainability of the project effect is considered high.

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

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

It is frequently observed that the number of serious traffic accidents (fatal and injured) increases after a road was improved. Prevention of traffic accidents cannot be resolved solely by a road management authority and it should be addressed comprehensively from 3E aspects (Engineering, Enforcement, and Education). Regarding the Engineering aspect, a road management authority needs to improve the black spot from technical and engineering viewpoints. With respect to the Enforcement aspect, the traffic police needs to strengthen enforcement. On the Education aspect (education and enlightenment), education and enlightenment to drivers and pedestrians by traffic police and school management are essential. It is recommended to establish an organization to tackle prevention of traffic accidents and prepare a strategy for prevention of traffic accidents by working cooperatively among relevant parties including road administrators, police, school authorities, health administration authorities, and insurance companies.

4.2.2 Recommendations to JICA

None.

4.3 Lessons Learned

(1) Review of Needs for Implementation of Additional Work due to appropriate Design Changes during the project implementation

Since the project was also intended to assist urgently in rehabilitating the damage caused by Tsunami occurred in December 2004, the scope of improvement work was in principle widening, and laying base course on top of the existing roads. However, since the existing surface height was raised, as mentioned above, under Current Status of Operation and Maintenance, ancillary/additional work (raising curves, installation of covers on drainage channels, expansion of drainage ditches) was required in some sections. Even though these problems were not foreseen at the planning stage, these problems were apparently observed during the implementation stage.

Since work needed to resolve the problems is related to the safety, and it is not

practical to undertake these work under the normal maintenance budget, which is not necessarily sufficient after the project was completed, JICA needed to advice to the executing agency that appropriate additional work should be implemented by making design changes during the implementation.

Comparison of the Original and Actual Scope of the Project

Item	Original	Actual
3. Output 1) Civil Work	・Reconstruction of roads and widening (Akkaraipattu – Trikkandimadu section with a total length of about 98km)	As planned Among the whole sections, about 10km sections have 4 lanes and the remaining 88km has 2 lanes. The pavement structure consists of 50 mm asphalt pavement on top of 20 cm base course on the existing surface, which adjusts the existing uneven surface. Repair/reconstruction of 136 culverts or small bridges.
	・Bridge construction in parallel to Kallady Bridge (291m), which is located in the central area of Batticaloa	As planned New construction of a 2-lane bridge in parallel to the existing 1-lane bridge. The type of superstructure is box-girder and that of substructure is reinforced concrete pier. The type of foundation is pile.
2) Consulting Services	・Review of bidding documents and designs ・Construction supervision ・Recommendation and assistance in maintenance and road safety aspects ・Monitoring of safeguard issues ・Monitoring of assistance activities for employment of graduates from vocational training ・Baseline survey Foreign experts: 70.0M/M Local experts: 449 M/M Local assistants: 1,062 M/M	Almost as planned Review of bidding documents and designs was deleted from the scope of work. Since construction of Kallady Bridge was dropped from the original contract and rebidded during the project implementation, assistance in tendering activities was added to the scope of work. The baseline survey was not undertaken. Foreign experts: 100.35M/M Local experts: 482.92M/M Local assistants: 1,173.68M/M
3)Vocational Training	・Planning of training program on operation of construction equipment and maintenance skills ・Selection of trainees ・Coordination of local governments and regional communities ・Undertaking of training (668 participants) ・Assistance for employment	As planned In 2007 and 2008, 668 staff took vocational training to 16 training modules (increased by 2 modules from the original plan)
4. Project Period	March 2006 - September 2009 (43 months)	March 2003 - September 2013 (91 months)
3.Project Cost Amount paid in Foreign currency Amount paid in Local currency Total Japanese ODA loan portion Exchange rate	 4,460 million yen 1,231 million yen 5,691 million yen 4,460 million yen 1 Rupee ＝ 1.11 yen (as of October 2005)	 2,021 million yen 3,849 million yen 5,870 million yen 4,460 million yen 1 Rupee ＝ 1.26 yen (average between 2007 and 2013)