Democratic Socialist Republic of Sri Lanka

Ex-Post Evaluation of Japanese Grant Aid Project
"The Project for Construction of New Mannar Bridge and Improvement of Causeway"

External Evaluator:
Tomoko Tamura, Kaihatsu Management Consulting Inc.

0. Summary

This project was implemented with the objective of achieving stable traffic flow and contributing to sustainable regional development in Mannar District in Sri Lanka, by replacing the old Mannar Bridge and improving the causeway.

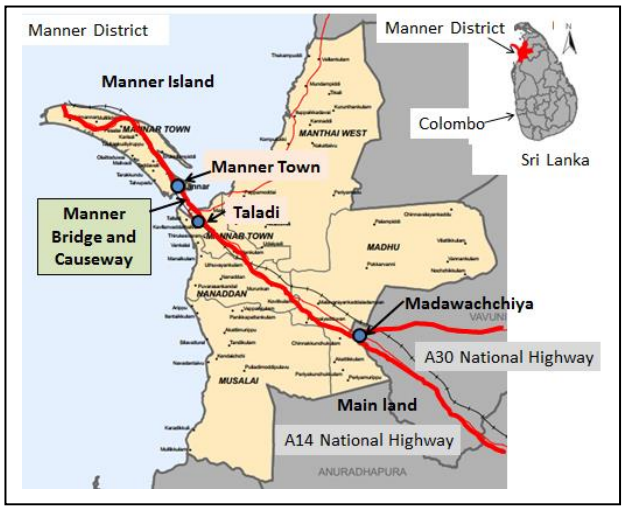
Both at the time of planning and ex-post evaluation of the project, the objective of the project was in line with the medium- and long-term development plan of the country and the road development plan, which were aiming at regional economic development. The need for and urgency of replacing Mannar Bridge and improving the causeway were high at the time of planning of the project. The need for safety and convenience of travel on the bridge and the causeway remained high at the time of the ex-post evaluation of the project. The project has relevance with Japanese assistance policy, as assistance for rehabilitation of the conflict-effected area and regional economic development were some of the priority areas in Japanese assistance policy to Sri Lanka at that time. Therefore relevance of the project is high.

The weight limit for vehicles traveling on the bridge was increased as planned from 10 tons to 30 tons after the project. The traffic volume during daytime increased significantly from 3,000 to 4,000 vehicles per day. There has been no flooding of the causeway after the project. A lot of the beneficiaries mentioned the improvement in traffic safety, and convenience and transport of agriculture and fishery products, as effects of the project. They also mentioned that transportation of heavy machinery and material became possible after the project. Therefore, effectiveness and impact of the project are also high.

Efficiency of the project is high, as the project cost and period were shorter than planned. There were some problems with sustainability, including maintenance of the lighting facility on the bridge and cleaning the surface of the bridge. It is expected that the operational system of maintenance will also be improved. Therefore, sustainability of the project is fair.

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

1. Project Description



Project Location

New Mannar Bridge

1.1 Background

Mannar District is located in the north-west of Sri Lanka. It has a population of 990,000, and an area of around 2,000 km^2. The district consists of five divisional secretariat divisions, one on Mannar Island and four on the mainland. Mannar Bridge and the causeway, which were improved by this project, connect Mannar Island and the mainland.

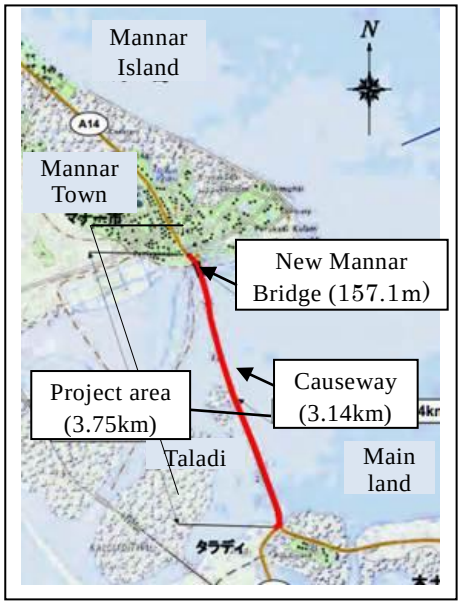


Figure 1 Map of the Project

The District Secretary's office is located in Mannar Town on Mannar Island. Important facilities of the district, such as the district general hospital, district offices of the various government institutions and banks, are also in Mannar Town. Therefore, people living on the mainland of Mannar District have to travel over Mannar Bridge and the causeway when they visit these facilities and offices. It is same when people from other districts of the country visit Mannar Town. Residents of Mannar Island have to travel over Mannar Bridge and the causeway when they visit the mainland. In this way, Mannar Bridge and the causeway form a single travel route connecting Mannar Island and the mainland that residents of, and visitors to, the district cannot travel without it.

Mannar Bridge was constructed in 1930 during the British colonial period. At the time of planning the project it was in a dilapidated condition, and had also been damaged as the result of a blast conducted by the LTTE[1]. There was a risk of vehicles falling off the

[1] The Liberation Tigers of Tamil Eelam.

causeway, which is connecting the mainland and the bridge, as the width of the roadway of the causeway was too narrow and the shoulders of the causeway had almost collapsed. As a result of these problems there was no guarantee of road safety, and large vehicles could not pass each other.

This project was implemented by Japanese Grant Aid, with the aim of solving the above-mentioned problems by constructing a new Mannar Bridge and improving the causeway.

1.2 Project Outline

The objective of this project is to realize stable traffic flow and sustainable regional development in Mannar district of Sri Lanka by replacing the existing Mannar Bridge and improving the causeway.

Grant Limit/Actual Grant Amount	1,836 million yen/1,833 million yen
Exchange of Notes Date	May 2007
Implementing Agency	Road Development Authority
Project Completion Date	March 2010
Main Contractor	Wakachiku Co. Ltd.
Main Consultant	Joint venture of Nippon Koei Co., Ltd. and Oriental Consultants
Basic Design	June 2006
Related Projects	None

2. Outline of the Evaluation Study

2.1 External Evaluator

Tomoko Tamura, Kaihatsu Management Consulting Inc.

2.2 Duration of the Study

Duration of the Study：November 2012 - September 2013

Duration of the Field Study：February 13 - March 9, 2013; June 2 - June 4, 2013

2.3 Constraints during the Evaluation Study

One of the qualitative effects of the project was expected to be a reduction in the number of traffic accidents as a result of improved traffic safety. However, this effect was not analyzed with quantitative information because there was insufficient data on the number of traffic accidents before and after the project.

One of the expected impacts of the project was a reduction in the maintenance cost of the causeway. However, it was difficult to evaluate this impact, as the cost of maintenance of the causeway before and after the project was not available.

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

3.1 Relevance (Rating: ③[3])

3.1.1 Relevance with the Development Plan of Sri Lanka

The national development plan of the government of Sri Lanka at the time of planning of the project, *Mahinda Chintana* (2006-2017), stated that economic development and poverty reduction of rural area of the country was a priority issue because economic activities were intensively conducted in the Western Province,[4] which includes Colombo; 23 per cent of the population were below the poverty line, and most of them were living in rural areas (2004).

The Comprehensive Road Plan (2005), which was developed at the time of planning of the project and based on the above-mentioned national development plan, planned to establish eight economic development centers outside Colombo District, and to develop a road network to connect these centers. The roads to and from Mannar Town were planned to be developed as a priority to facilitate development of the rural economy, as Mannar Town was included as one of the economic development centers in the plan.

Achievement of economic development in a balanced manner was still a priority issue at the time of both implementation and the ex-post evaluation of the project, as *Mahinda Chintana* was still the national development plan of the country. It was a policy of the National Road Master Plan (2007-2017), issued in December 2007, to maintain, improve and expand the road network of the country in order to promote ethnic integration and economic growth. It was also planned to facilitate balanced growth of the rural economy and income equality through the development of roads.

The project aimed at sustainable development of the rural area by constructing a new Mannar Bridge and improving the causeway. The objective of the project was highly in line with the national development plan and road development plan of the country.

3.1.2 Relevance with the Development Needs of Sri Lanka

According to the detailed design report of the project, Mannar Bridge and the causeway had the following problems at the time of planning the project (see pictures on next page):

[2] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory
[3] ③: High, ② Fair, ① Low
[4] GDP contribution of the Western Province was as high as 51 per cent of total GDP of the nine provinces in the country at the time of development of the plan (2004). The percentage of the contribution was reducing and it was 45.1 per cent in 2011. However, it is still true that the economic activity of the country is concentrated in the Western Province.

Mannar Bridge

- A temporary bridge was constructed and used after the bridge collapsed as a result of its dilapidated condition and damage caused by the blast. The temporary bridge was unstable because it was constructed on piers that were broken and cracked due to the blast.
- The width of the roadway was four meters in some parts of the bridge; therefore large vehicles could not pass each other.
- The maximum weight of vehicles was limited to ten tons, because the bridge did not have adequate load bearing capacity as a result of deterioration of the piers and concrete beams due to salt erosion and dilapidation.

Causeway

- There was a risk that vehicles could fall down from the causeway, as the width of the roadway became narrower where the wall of the causeway was declined and had collapsed and the surface of the roadway had deteriorated and become exposed.
- In terms of safety of travel, it was a problem for pedestrians and vehicles when the causeway was inundated at full tide during the rainy seasons. This happened because the body of the causeway has settled.

According to the questionnaire survey carried out at the time of the ex-post evaluation,[5] 98 per cent of the respondents mentioned that the construction of a new bridge and improvement of the causeway had been "very urgent", and two per cent said "urgent". All the respondents agreed that they had had problems earlier. They stated, for example: "We were worried that the bridge might fall down"; "It took a long time to travel over the bridge and therefore, it was not possible to reach destinations on time"; "Vehicles could not pass by each other"; "We could not bring in heavy vehicles"; and "The bridge and the causeway caused a problem for transport of agriculture and fishery products". From these facts, it was confirmed that there was a strong need and urgency for construction of a new bridge and improvement of the causeway at the time of project planning.

After the end of the civil war in 2009, the internally displaced people who had been in welfare camps returned to various places in Mannar District. Work has started on reconstruction and development of basic infrastructure, such as roads, bridges and facilities for water and electricity supply.[6]

[5] The questionnaire survey was conducted for a randomly selected sample of 100. Fifty were selected from people on the mainland and 50 from the island. The sample included general households (67 per cent), government staff (17 per cent), people working/owning shops and market (15 per cent) and staff of schools and hospitals (1 per cent).

[6] The A14 national highway (Madawachchiya – Talaimannar), which is the main road in Mannar was improved in 2010-11. A bridge was constructed at the end of the A32 national highway (Pooneryn－Karative), which opened access from Mannar District to Jaffna District.

Under these circumstances, it was found that the traffic volume over Mannar Bridge and the causeway at the time of the ex-post evaluation had increased substantially compared to that at the time of project planning, as is mentioned in the section of this report on Effectiveness. The need to transport heavy machinery, such as road rollers and shovel cars, construction materials, electricity poles and fishing boats, had also increased with the implementation of projects for rehabilitation and development of the area. Therefore, the need to maintain the safety and convenience of travel over Mannar Bridge and the causeway remained high at the time of the ex-post evaluation.

		
Available width of the roadway of the bridge was four meters	The pier at the center of the bridge, which was cracked following a bomb blast	The causeway

The old Mannar Bridge and the causeway

		
Width of the roadway of the bridge is 10.4 meters	Mannar Bridge	The causeway

The new Mannar Bridge and the improved causeway

3.1.3 Relevance with Japan's ODA Policy

The country assistance policy of the Ministry of Foreign Affairs of Japan, which was developed in 2004 during the implementation of the ceasefire agreement, stated that the assistance for economic development of the country should aim at sustaining the peace and assisting the process of rehabilitation and balanced development of the regions. This project aimed to assist the process of rehabilitation in the area affected by the civil war,

and facilitate economic development of the rural areas, as mentioned earlier. Therefore, the project has a high relevance with the overseas assistance policy of Japan.

This project has been highly relevant with the country's development plan, development needs, as well as Japan's ODA policy; therefore its relevance is high.

3.2 Effectiveness[7] (Rating: ③)

3.2.1 Quantitative Effects (Operation and Effect Indicators)

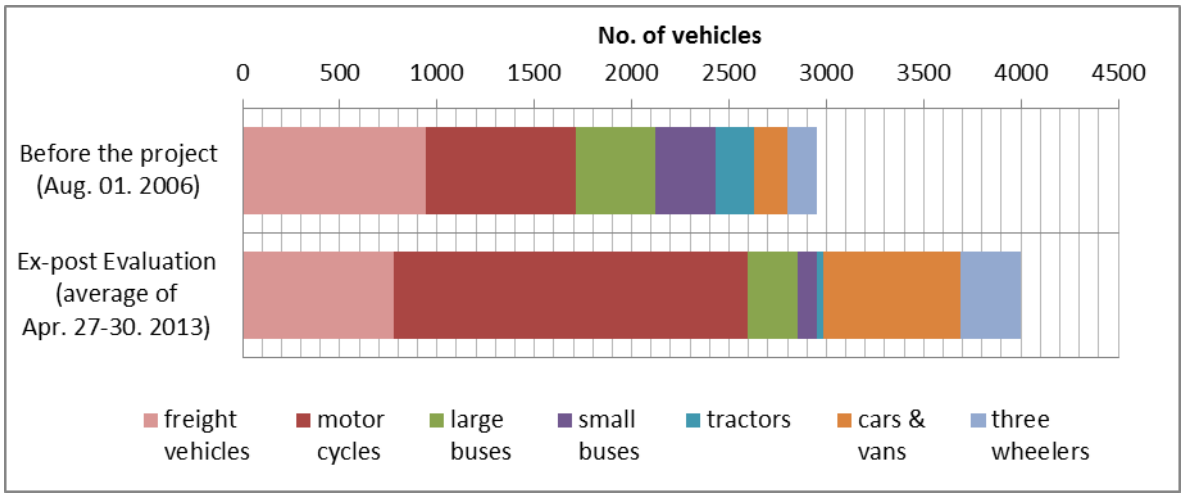
The operation and effect indicators of the project were planned as an increase in the weight limit of vehicles traveling across the bridge, and an increase in traffic volume. The weight limit of vehicles traveling on the bridge was ten tons at the time of the project planning. It was planned to increase this to thirty tons after the completion of the project. The Road Development Authority (RDA) confirmed at the time of the ex-post evaluation that the weight limit of the bridge had been designed as thirty tons, and the present weight limit was also thirty tons as planned.[8] According to the stakeholders of Mannar District, the heaviest vehicle likely to travel over the bridge would be a heavy duty lorry of the Ceylon Electricity Board loaded with electricity poles for high-tension transmission lines. The Mannar office of the Ceylon Electricity Board commented that they do not have any problem with the present weight limit, as the weight of the above-mentioned lorry would not be more than thirty tons.

As Figure 2 shows, when the daytime traffic volume for twelve hours at the time of planning and the ex-post evaluation were studied,[9] it was found to have increased substantially, from around 3,000 to around 4,000.

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

[8] The bridges of the national highways were recently designed to have a weight limit of 30 tons, according to the RDA. The RDA was of the opinion that the weight limit of Mannar Bridge should be regarded as 30 tons, as it was designed in the above-mentioned manner. However, a facility to weigh vehicles traveling on the national highways has only recently been introduced in the country, and Mannar Bridge does not have such a facility yet. Therefore, a signboard for the weight limit has not been arranged, and the weight of vehicles traveling the bridge has not been checked, and, therefore, people using the bridge do not know the weight limit. The RDA had specified the weight limit, arranged signboards and made necessary arrangements to limit the vehicles for the dilapidated bridges.

[9] The result of a traffic volume survey conducted during the detailed design on August 1, 2006 (a weekday) was used as traffic volume at the time of project planning. The average of the results of a traffic survey conducted for four days, from April 27 (Sat) to 30 (Tue), 2013, was used as a traffic volume at the time of the ex-post evaluation. The RDA conducted both surveys at Mannar Bridge for twelve hours, from six o'clock in the morning to six o'clock in the evening. The latter survey was conducted for four days consecutively to have more accuracy. There was no multi-day survey conducted at the time of project planning; therefore, the results of the one-day survey were used.



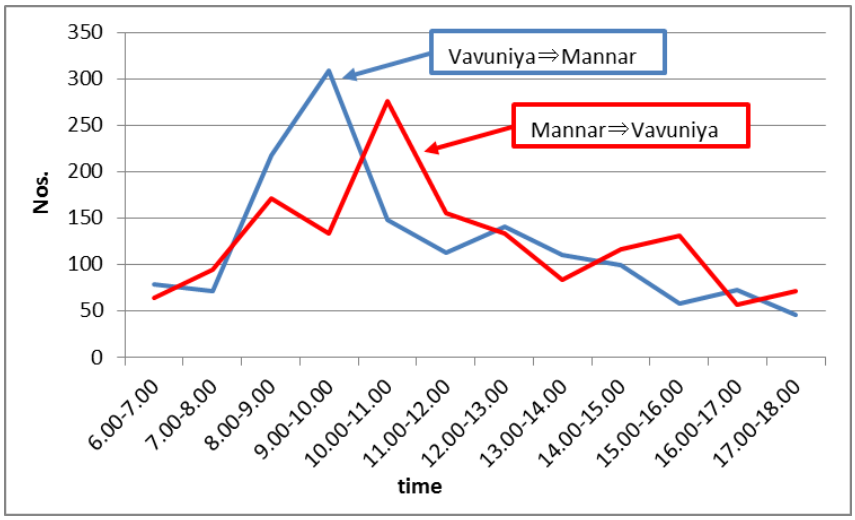
Source：RDA

Figure 2　Traffic volume at the time of planning and ex-post evaluation of the project

Figure 2 also shows that it is particularly the number of motorcycles, cars and vans that have increased. The stakeholders in Mannar District explained that the number of these vehicles had increased as more people in Mannar District purchased motorcycles, cars and vans for personal use as a result of the increased freedom of movement after the end of the conflict, and the area for commuting and schooling expanding accordingly. There are several other reasons that helped the people of Mannar District to purchase the above-mentioned vehicles. For example, they are now able to purchase vehicles with installment payments, as several leasing companies recently opened branch offices in Mannar Town. Senior government officers in the area have been given the opportunity to purchase vehicles with reduced import tax, just like officers in other parts of the country.

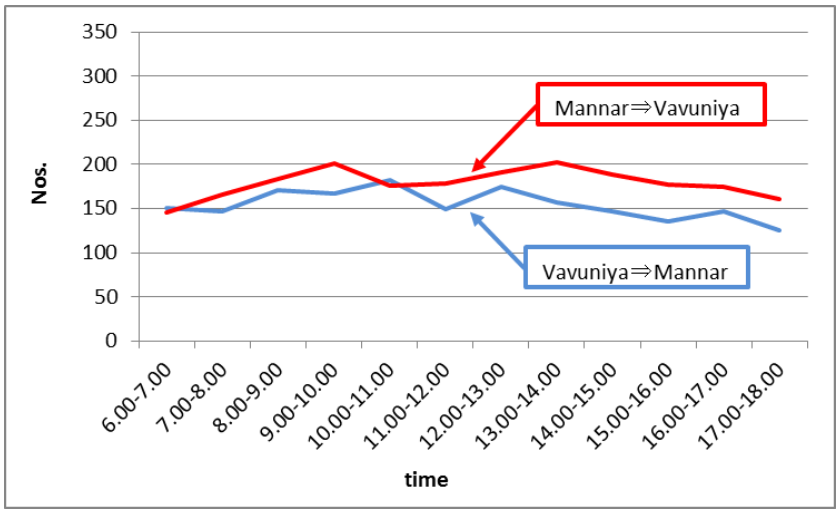
Figures 3 and 4 show the number of vehicles every hour. It was found from these figures that the number of vehicles in the morning and in the evening was very low at the time of planning the project; however, the number of vehicles was almost the same every hour of the day at the time of the ex-post evaluation. The number of vehicles in the morning and in the evening was low at the time of planning the project because people tended to avoid traveling on the bridge and the causeway during these times, because it was difficult for large vehicles to pass each other and the bridge was very old and could collapse. It was also because public security had deteriorated in those days.

After the project the traffic volume became stable during the course of the day, because safety and convenience of travel over the bridge and causeway had improved as a result of the project, and also because the people felt it was safe to travel throughout the day as a result of improvement in public security after the end of the conflict.



Source: RDA

Figure 3 Hourly traffic volume before the project (August 1, 2006)



Source : RDA

Figure 4 Hourly traffic volume after the project (Average from April 27- 30, 2013)

The external evaluator studied the number of buses traveling in the area, although this had not been particularly expected to be an operation and effect indicator of the project at the time of planning. Buses are the main public transport facility in the area.[10]

Table 1 shows data submitted by the Mannar Depot of the Sri Lanka Transport Board on the number of services, buses and passengers on the public buses departing from

[10] There had earlier been a train service from the mainland to Talaimanner, at the end of Mannar Island. The service was suspended in 1990 due to the conflict. Currently, buses are the only public transport. Sri Lanka Railways were carrying out repair work on the railway as at July 2013.

Mannar Town before and after the project. It is clear from the table that all the above-mentioned figures increased substantially.

Table 1 Information about public buses departing from Mannar Town

Year	Number of services per day	Number of buses operated per day	Average number of passengers per day
2008	90	16	3,140
2009	96	18	3,336
2010	108	20	3,769
2011	147	28	4,100
2012	188	32	4,730

Source：Mannar Depot of the Sri Lanka Transport Board

Table 2 shows information on the long-distance buses before and after the project, submitted by the chairman of the Mannar Private Bus Owners' Association. The number of services per day was increasing rapidly, just like the services of public buses. It was also found that a bus service from Mannar to Jaffna had commenced recently.

Table 2 Number of services per day of private long-distance buses departing from Mannar Town

Route/Year	2009	2013
Mannar Town – Vavuniya Town	10	24
Mannar Town - Colombo City	3	18
Mannar Town – Jaffna City	0	14

Source：Mannar Private Bus Owners' Association

Before the project, when public and private buses were fully loaded they were stopped by the police and several passengers had to disembark before the bridge. The passengers who got off the buses had to walk across the bridge and get on the bus again at the other side.

Earlier, the road was closed when a bus broke down on the bridge or the causeway, until either the bus was repaired in situ or towed away. This is no longer a problem, as there are two lanes on the bridge and the causeway.

3.2.2 Qualitative Effects

Expected qualitative effects of the project included that the causeway would not be

inundated, and the number of traffic accidents on the bridge and the causeway would be reduced.

Before the project, the causeway was usually inundated twice a year, and this caused a problem for traveling. The salt water that covered the surface of the road when it was flooded was one of the causes of damage to the road. As expected, the causeway has not been inundated after the project.

According to Mannar District Traffic Police, there were no traffic accidents on Mannar Bridge either before or after the project. Table 3 shows the number of traffic accidents on the causeway. It is difficult to make a conclusion about the change in the number of traffic accidents before and after the project by analyzing the table, because the number of injuries before the project is not available, and the duration of the records before and after the project is different.

Table 3 Number of traffic accidents on the causeway before and after the project

Item/Year	2006-2009 (4 years)	2010-2012 (3 years)
Deaths	03	01
Injuries	Not available	11
Damaged vehicles	09	06
Vehicles falling off the causeway	02	06

Source：Mannar District Traffic Police

However, stakeholders of the project in the RDA Mannar office and District Secretary's Office were of the opinion that the number of traffic accidents might have increased after the project. This was mainly because traffic volume had increased, and vehicles were able to increase speed when traveling on the causeway after the project. Before the project the maximum speed of vehicles was around 30 km per hour. Currently, the speed limit of the causeway is 50 km - 70 km per hour. According to the RDA, the number of traffic accidents often increases after road improvements, such as road widening or resurfacing, as vehicles can comfortably go faster. Therefore, it is often necessary to do something to prevent traffic accidents after road improvements.

The causeway is very dark at night as there are no streetlights and no houses or shops along the causeway at the moment. Most of the traffic accidents happen at night when the vehicles try to avoid donkeys and cows crossing the causeway, according to the RDA and the Mannar District Police. To prevent traffic accidents, the RDA and other stakeholders in the area pointed out the need for streetlights along the causeway, and for nets and

fences to stop animals coming onto the causeway.[11]

3.3 Impact

3.3.1 Intended Impacts

(1) Improvement of safety and convenience of travel, development and activation of regional socio-economic status

In the questionnaire survey for 100 beneficiaries, the external evaluator asked how the new Mannar Bridge and improvement of the causeway contributed to the socio-economic situation of the citizens of the Mannar District. All the respondents selected that "the project had contributed" to all the items in the questionnaire, including improving safety and convenience of travel, transportation of agriculture and fishery products, heavy machinery and material could now be transported, and increased employment and job opportunities.

Key informant interviews,[12] were also conducted in the ex-post evaluation. In the interviews, the respondents stressed impacts of the project were improved safety and convenience of travel, facilitation of resettlement of internally-displaced people, and activation of economic activities.

It was very impressive that respondents to the questionnaire survey talked a lot about the difficulties they had earlier faced when traveling and transporting goods, and the tremendous benefits they enjoy after the project. This shows that the project had a great impact on the socio-economic life of people in Mannar District.

Box 1: Opinion of Mr. A. A. Edward, former Deputy Land Commissioner of Mannar

Mannar Bridge is the only access to Mannar Island and is a lifeline for citizens of Mannar District. Our life and work were disturbed for five years after the bridge was blasted by the LTTE in 1990. We had to travel from the mainland to Mannar Island by boat, as we did not have a bridge.

We used a Bailey bridge after 1995. We did not feel at all safe as the bridge was old and badly damaged. We had to wait for a long time before getting on the bridge when there was

[11] Local authorities are in charge of construction and operation and maintenance of streetlights on national highways in Sri Lanka. Mannar Urban Council agreed it was necessary to put streetlights along the causeway and had looked into this possibility on several occasions. However, the council had not yet implemented it as it would be very expensive - around LKR 4 million (around JPY 3.8 million).

[12] The key informant interviews were conducted in selected public and private sector organizations in Mannar Town, especially those relating to travel and transport businesses. For example, public sector organizations, such as Urban Council, Divisional Secretary's Office, Agriculture Department, Sri Lanka Transport Board, *Pradeshya Sabhawa* (divisional council); and private sector organizations, such as guest house owners and traders of fisheries products. In addition to that, information was collected from citizens of Mannar who had been employed in the project under the contractor for administration, accounting, supervising, etc.

a lot of traffic because large vehicles could not go past each other as the width of the bridge was narrow. We could not bring things needed for infrastructure and economic development, such as large lorries, shovel cars, electricity poles for high tension lines, and manhole covers, due to the limitation on weight.

Since the conflict was ended in 2009, development assistance and infrastructure construction have commenced in Mannar District in an active way after thirty years. If the new Mannar Bridge had not been constructed, there would have been various problems in transporting materials and heavy vehicles, speedy transport and travel, in rehabilitation programmes for internally-displaced people returning to Mannar District, and for housing and basic infrastructure development. The construction of the new Mannar Bridge and improvement of the causeway by JICA was indeed a timely assistance.

Box 2: Opinion of Mr. Devathas Croos, who is engaged in wholesale of fishery products in Pesalai on Mannar Island

I currently sell fishery products wholesale to supermarkets and trading companies in Colombo. I have 14 lorries. I started an ice factory and a crab meat processing factory two years ago.

Earlier it took around 45 minutes from Mannar town to Taladi. It was difficult for us, as we have to keep the fishery products as fresh as possible. Now, I'm glad that I can travel in around 10 minutes. Earlier, large cooler trucks and container trucks could not travel over the bridge. Now, fish traders from outside the district come here in these vehicles to purchase fishery products. I'm expanding the business by taking this opportunity. More than anything, the old bridge was shaking, and too narrow for two vehicles to pass by each other. It was also dangerous.

(2) Reduction of the maintenance cost of the causeway

It was expected that the maintenance cost of the causeway would be reduced as a result of the causeway being more stable, and there being less damage to the protection wall and road surface.

However, it is not known whether the cost was reduced or not, because the amount of expenditure for maintenance of the causeway before and after the project is not available. The RDA Mannar office paid for the cost of maintenance of Mannar Bridge and the causeway out of the total budget for maintenance work allocated to the office as and when necessary.

3.3.2 Other Impacts

(1) Impacts on the natural environment

Negative impacts on the natural environment as a result of the project were not observed or pointed out during or after the project.[13]

(2) Land Acquisition and Resettlement

The two households who had illegally occupied the public land were resettled as a result of the project. The resettlement was conducted in a legal way. One of the households, which had a shop, was provided with an alternative land for building as otherwise they would have lost their livelihood. In addition, Mannar District Secretariat carried out the relocation of a petrol station run by a cooperative society in a legal way. An alternative land and cost for reconstruction were provided to the cooperative society. The RDA acquired a land with a security guardroom of the army. The necessary compensation was paid to the Ministry of Defense. The Ceylon Electricity Board and the Sri Lanka Telecom respectively relocated electricity and telephone poles. The RDA paid necessary costs for the relocation. There have been no complaints or issues about the above-mentioned resettlement, land acquisition and relocation of public facilities, and therefore there is no particular problem in this regard.

(3) Other Indirect Impact

The beneficiaries expressed deep gratitude in the questionnaire survey and the key informant interviews to the Japanese government and the contractor for implementing the project during the conflict when public security was unstable and there were a lot of restrictions on transport and traveling. Many of them were of the opinion that the bridge is designed beautifully, and it contributes to enhancing the image of Mannar District.

In total, 296 citizens of Mannar District were employed by the project, according to the resident of Mannar who worked as a coordinator under the contractor of the project.[14] The results of the questionnaire survey showed that more than 80 per cent of the respondents recognized the impact of employment generated by the project, and expressed gratitude for that.

This project has largely achieved its objectives; therefore its effectiveness and impact is high.

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[13] After the completion of the project, on July 12, 2010, the area south-east from Mannar Bridge was registered as a wetland under the Ramsar International Convention, and came under the management of the Department of Wildlife Conservation.

[14] The population of Mannar District and Mannar Town Divisional Secretariat Division were 990,000 and 510,000 respectively according to the national census of 2012.

3.4 Efficiency (Rating: ③)

3.4.1 Project Outputs

All the expected outputs of the project were produced as planned, except for the minor adjustments and changes mentioned below. These minor changes did not influence the quality or length of the period of construction.

Table 4 Planned and Actual Outputs of the Project

Plan	Actual
(1) Construction of a new bridge - Length: 157.1 m - Width : 10.4 m (two lanes) - Walking paths : 3.0 m in both sides (1.5 m in one side) - Pavement : Asphalt concrete - Piers : Pile-bent system - Abutment : Direct filling slope - Foundation : Cast-in-place reinforced concrete piles	As planned except the following minor changes: - Diameter of the mantle of the piers was changed from 1.2 meters to 1.4 meters to suit the type of cast-in-place piles of the piers. - Size of the cradle of the water supply pipeline changed from 1700x550x528 mm to 700x700x528 mm due to change of the diameter of the pipeline.
(2) Improvement of the causeway - Width : 11.0 m (Two lanes with walking paths in both sides) - Length: 3.14 km - Pavement : Double bituminous surface treatment (DBST) (around 37,000 m^2 including the approach roads)	As planned except the following minor changes: - The size of the chips for DBST was changed from 9.5 mm to 19 mm due to change of the types of vehicles and increase of traffic volume in future. - Height of the causeway in every section was made higher than the existing road to avoid inundation.
(3) Approach roads - Width : 11.0 m (Two lanes with walking paths on both sides) - Length : 0.453 km	As planned.

Source : JICA and the Project Completion Repot

3.4.2 Project Input

3.4.2.1 Project Cost

The cost of the project was planned as JPY 1,897 million and was actually JPY 1,833 million in total, including the contract amount for the consultant of JPY 103 million and the same for the contractor of JPY 1,730 million. The cost of the project was lower than

planned (96% of planned cost).

The government of Sri Lanka contributed LKR 176 million in total, including payment of custom duty for import materials and machinery, taxes, cost of land acquisition and resettlement and other administration expanses. It was JPY 154 million using the exchange rate at the time of project planning.[15] Therefore, the total cost of the project was JPY 1,987 million.

3.4.2.2 Project Period

The project period was planned as 37 months from May 2007 to June 2010. It was actually 34 months: from 23 May 2007 to 1 March 2010. The project period was shorter than planned (92% of the planned period). The project was completed before the planned date as a result of the stakeholders of the project making a determined effort, even though the civil works were suspended from the middle of January to middle of April 2008 due to deterioration of public security of the area.

Both project cost and project period were within the plan, therefore efficiency of the project is high.

Box 3: Opinion of Mr. S.S. Rajasingam, a supervisor of the civil works of the project

The people in Mannar did not have many employment opportunities at the time construction of the new Mannar Bridge started, as we had unstable public security during the conflict. The contractor of the project, which was a Japanese company, understood this situation and actively employed local companies and persons as subcontractors and direct employees.

I was employed as a supervisor for the civil works of the project, as I had worked as a chairman of farmers' organizations, and my leadership in the area was appreciated. I supervised around thirty laborers. There was strict discipline at the workplace. Everybody in the workplace had to punch timecards and participate in the radio gymnastics every morning. The time for the radio gymnastics was important for group leaders to count the number of group members attending the work. We felt strange at first, as we did not have these customs in Sri Lanka. However, we got used to the system within two or three days. One of the good points of working for the project was that we learnt Japanese management systems and discipline in the workplace from the Japanese staff.

Every working group was given clear responsibilities and targets, so that we could

[15] LKR 1 = JPY 1.1443

complete the given work on time. We worked hard from seven o'clock in the morning to five o'clock in the evening. We sometimes worked overtime and on Sundays. We were very proud of being a part of the "Construction of a new Mannar Bridge". This pride created a sense of unity among the stakeholders and encouraged everyone to make every effort to complete the work as soon as possible.

Construction under the environment of conflict was very difficult. We had to obtain permission from the army for every shipment of construction material and machinery. The army and police both provided us with the fullest cooperation, as they understood the need for the project. The project was completed earlier than planned because of the Japanese management, motivation of the workers and cooperation of the stakeholders.

3.5 Sustainability（Rating：②）

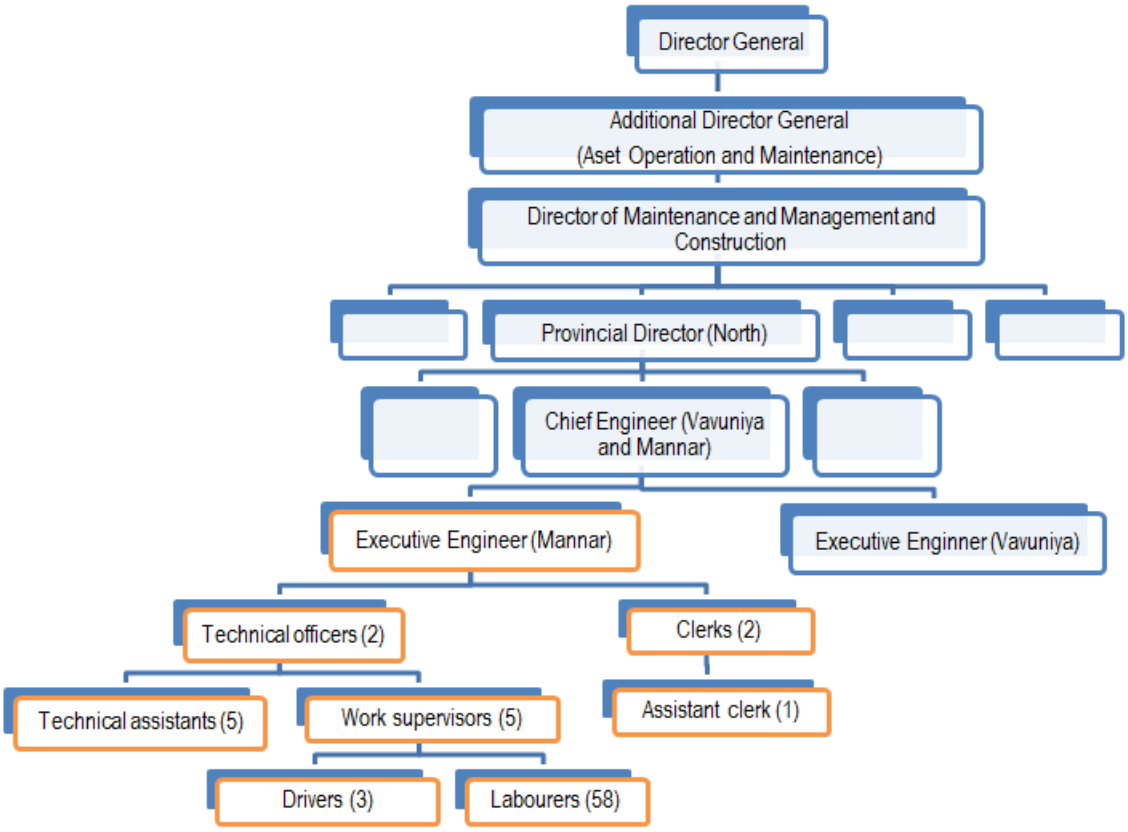
3.5.1 Institutional Aspects of Operation and Maintenance

The Mannar office of the RDA is in charge of maintenance of roads in the district, including Mannar Bridge and the causeway improved under the project. The head of the office is the executive engineer. The chief engineer of the Vavuniya and Mannar office of the RDA is supervising the Mannar office. Figure 5 shows the institutional set-up of the office in the organizational structure of the RDA.

The RDA Mannar office assigns the necessary staff for maintenance of the facility under their responsibility, and there is no vacancy or double duty at the moment. In recent years, the RDA has had a policy of not increasing the cadre of laborers in order to increase management efficiency. Therefore, sometimes when someone retires the vacancy has not been filled. The Mannar office is trying to increase the efficiency of work; available staff carries out work assigned to the office after shifts of the laborers are allocated in the best possible way.

In this way, there is a clear responsibility for maintenance assigned to the organization. However, there is no work plan, checklist or record of inspection with regard to the maintenance of Mannar Bridge and the causeway at the moment.[16] They conduct maintenance work as necessary. The staff members have a general understanding about the necessary intervals for the work, such as whether it should be carried out once a week or once a month.

[16] They used the checklist provided by the contractor once; however they did not use it after that as the format was not convenient for them.



Source：Reply of the RDA to the evaluation questions

Figure 5　Organizational Structure of the RDA for Maintenance Work

3.5.2　Technical Aspects of Operation and Maintenance

According to the RDA Mannar office, there is no problem with the technical level of the technical officers and technical assistants, and they do not have technical issues with regard to the maintenance of the Mannar Bridge and the causeway at the moment except for replacement of bulbs of the lights on the bridge as mentioned later. Training of staff of the Mannar office was not planned or implemented under the project, as the technical level of the staff was considered to be adequate to implement maintenance of Mannar Bridge and the causeway.

3.5.3　Financial Aspects of Operation and Maintenance

As mentioned in the section on Impact in this report, there is no particular budget allocation for maintenance of Mannar Bridge and the causeway. The cost of maintenance of the facility came from the maintenance budget allocated to the RDA Mannar Office when necessary. There are two items in the maintenance budget of the office: routine maintenance and periodic maintenance. Table 5 shows the budget allocation and actual

expenditure on these items in recent years. In addition to these budget allocations, the RDA head office provides an emergency maintenance budget according to necessity, for example, when roads need urgent repairs due to floods.

Table 5 Annual budget of RDA Mannar office for maintenance work

(Unit：Million Rupees)

Item/ Year	2010		2011		2012	
	Budget allocation	Actual expenditure	Budget allocation	Actual expenditure	Budget allocation	Actual expenditure
Routine maintenance	20.0	10.8	14.0	14.0	17.3	17.3
Periodic maintenance	36.0	35.6	42.0	40.4	80.0	48.5
Total	56.0	46.4	56.0	54.4	97.3	65.8

Source：RDA

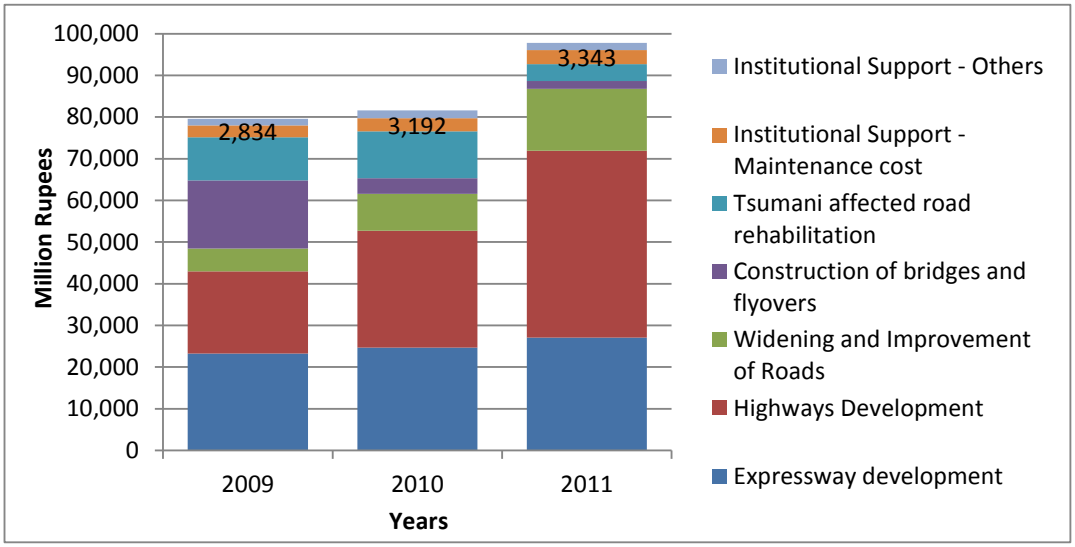
When a road is expanded or improved, responsibility for maintenance of the road under construction will be transferred to the contractors. Then, the cost of maintenance of that particular road will be removed from the annual budget for the RDA offices. Therefore, the annual budget of the RDA offices varies from year to year. The budget for maintenance of the RDA offices was allocated from the Road Maintenance Trust Fund (RMTF). The central government allocates the necessary budget to the fund.

The external evaluator discussed with the staff of the RDA Mannar office whether the budget allocated to the office was sufficient. They stated that it is not excessive but not too low; it is adequate if they manage it properly. As the above table shows, there are some balances remaining some years. In most cases this is because a payment to a contractor was not completed, as the work entrusted to them did not show the expected progress.[17] The RDA Mannar office had estimated the maintenance cost of Mannar Bridge and the causeway as around LKR 910,000 per year based on the cost of the necessary staff and materials; this is within the budget of the office. There seems to be no particular problem with regard to the financial situation of the Mannar office as the annual budget, including the cost of personnel and material, has been revised each year taking account of increasing prices.

Figure 6 and 7 show budget allocation and expenditure of the RDA. Cost of maintenance for the last three years were LKR 2,834 million, LKR 3,192 million and

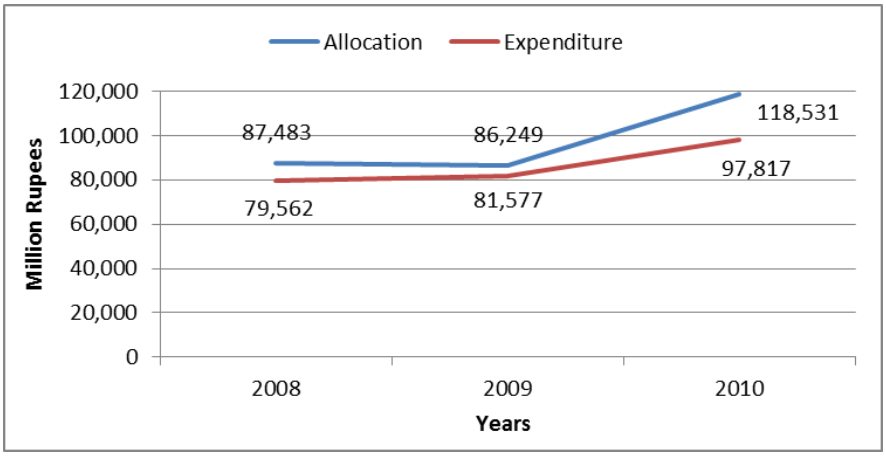
[17]For example, there was a surplus in the budget for 2012, as the office had planned to implement periodic maintenance of small-scale bridges during 2012; however they could not do so within the year because the procurement process for the work took longer than expected.

LKR 3,343 million. There seems to be no particular problem with the budget allocation and expenditure as the RDA increased the amount of the total budget, including the budget for maintenance, year by year considering the price hike and increase of employment cost; and the total amount of expenditure was within the budget.



Source：Annual report of the RDA

Figure 6　Annual Budget Allocation of the RDA



Source：Annual Report of the RDA

Figure 7　Annual Budget Allocation and Actual Expenditure of the RDA

3.5.4　Current Status of Operation and Maintenance

Table 6 shows the main items of maintenance and frequency of the work for Mannar Bridge and the causeway, which were stated in the detailed design report of the project.

Table 6 Maintenance Items (plan)

Category	Frequency	Inspection items	Work items
Maintenance work needing to be carried out every year			
Maintenance of drains	Twice a year	Drains on the bridge surface	Removal of sand
		Drains under the walking path	Removal of sand
Maintenance of the facility for traffic safety	Once a year	Indications of road surface	Repainting and replacement of bulbs in the streetlights
Maintenance of the road	Twice a year	Shoulder and cut slope	Removal of weeds
Maintenance work needing to be carried out once every few years			
Inspection and repairs of the walls and bottom protection work	At the time of cyclone (estimated as once in 2 years)	Protection wall	Repair of damaged parts
Maintenance and repair of the pavement	Once in 5 years	Surface of the pavement	Repair of overlay, cracks, potholes and others
Repainting of iron poles for lights	Once in 10 years	Surface of the metal parts	Painting at site
Replacement of the expansion joints	Once in 10 years		

Source：Detailed design report

At the time of the first field survey of the ex-post evaluation in February 2013, the following problems on the status of maintenance of Mannar Bridge and the causeway required improvement. Following discussions with the RDA Mannar office and the head office, as of June 2013 some of these problems have already been attended to, and it is planned to address some others.

(1) Maintenance and cleaning of the drains was inadequate

It was found at the time of the field survey of the ex-post evaluation that drain holes on both sides of the bridge and drain (service duct) were not cleaned properly. Because of this, drainage pipes under the bridge seemed to be blocked and were not functioning properly. As a result, the rainwater had run into the side of the approach roads and had eroded the cut slopes. The erosion may cause sedimentation on the approach roads in future. The RDA Mannar office mentioned that they had carried out cleaning once a week; however, there was no cleaning schedule, nor any checklist for the inspection or any record that could prove the cleaning had been done. It seemed that the service duct

was not cleaned periodically.

As a result of discussions with the Chief Engineer, who is in charge of Vavuniya and Mannar, and the staff of the RDA head office, RDA Mannar office conducted a cleaning campaign at the end of February 2013, including the following work:

- Removal of sand on the bridge surface
- Removal of sand in the drain holes of the bridge
- Removal of sand and garbage in the drains by opening the concrete lid of the drains.
- Re-planting of grass on the turf of the approach roads to prevent erosion.

Cleaning of drains on the bridge

The Mannar office conducted removal of sand periodically after the campaign, too. There has been no erosion observed on the approach roads so far.

(2) Maintenance of the facility for traffic safety: streetlights on the bridge are not functioning

The streetlights on Mannar Bridge were constructed by the project in order to secure safety of traffic on the road and ships traveling under the bridge. However, all seven bulbs of the lights had burnt out and had not been replaced for more than one year. The Chief Engineer of the RDA Vavuniya and Mannar explained that they had not replaced the bulbs recently due to the following reasons, although they had replaced them several times after completion of the project.[18]

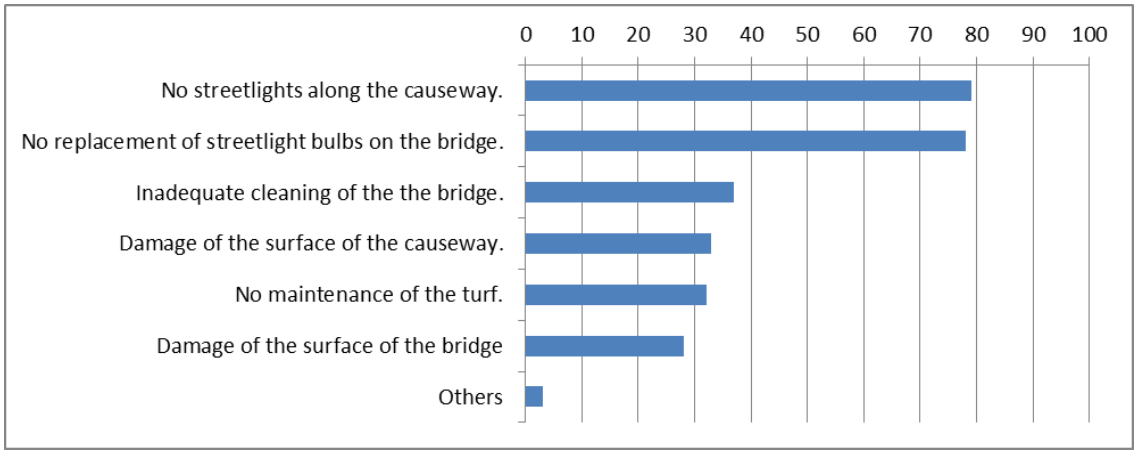
- The bulbs are 12 m up, and they have to use scaffolding to replace them. However, they found it was dangerous for staff as the scaffolding was trembling. It is especially dangerous from April to September, when strong winds blow in the area. They had rented a crane, but found it not realistic to do so often as the rental charge was LKR 10,000 per time.
- The streetlights are not durable against vibration and the bulbs do not last long. The two in the middle of the bridge last only around six months as they vibrate more.

With regard to this problem, the RDA head office instructed the Chief Engineer to replace the bulbs with LED bulbs, which last for 10–15 years. The Chief Engineer was in the process of discussing the details of the technical specifications with a supplier.[19]

[18]Local authorities are in charge of maintenance of the streetlights of the national highways and bridges in general. However, the RDA is undertaking maintenance of the streetlights on the Mannar Bridge as they are high and technically difficult for Mannar Urban Council to maintain.

[19]LED bulbs were hardly available or used in Sri Lanka at the time of planning of the project. Therefore,

Figure 8 shows the results of the questionnaire survey about the current status of maintenance. The beneficiaries expressed concern that there are no streetlights along the causeway, and that the bulbs of the streetlights on the bridge do not function. It is expected that the organizations in charge will provide solutions to these issues urgently.



Source: Questionnaire survey

Figure 8 Are there any problems on maintenance of Mannar Bridge and the causeway?

(3) Maintenance and repair of the pavement: damage to the road surface

Some chips of the asphalt pavement on the bridge had worn off. The pavement of the approach roads had started to be badly damaged, especially on their downward slopes.[20] This was because more friction occurred there, as vehicles had to brake. Maintenance of the pavement was supposed to be conducted once in five years according to the maintenance plan developed at the time of project planning. The RDA should examine the need to repave from a technical viewpoint, so that they can carry out it at an appropriate time.

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there seems to be no problem with the selection of the kind of bulb at that time. The height of the streetlights was in accordance with the standards of the RDA. Also, the lights needed to be high enough to ensure adequate coverage. It was planned to use scaffolding for replacement of bulbs. The impact of vibration and strong winds might not have been studied adequately.

[20] According to the detailed design report and explanation of the RDA, there had been a discussion whether the pavement should be asphalt concrete or DBST (double bituminous surface treatment). DBST was adopted even though asphalt concrete was more durable, because asphalt was not available near the construction site at that time. Asphalt is now readily available - after the project a manufacturing workshop of asphalt concrete has been constructed in Madawachchiya, and this is owned by the RDA.

(4) Insufficient maintenance of the turf on the approach roads

The RDA Mannar office started replanting the grass after the external evaluator pointed out that there was no grass. The office needs to continue the replanting and to water and weed the replanted grass periodically.

There was no problem on the weeding of the shoulder and the cut slopes.

There were several issues with regard to maintenance as mentioned above. These were not because of shortage of budget or laborers, but because there was not sufficient management or incentive for the maintenance work as there was no cleaning schedule, record of inspection or adequate monitoring by senior management.

In this way, some problems have been observed in terms of the institutional aspects and the current status of the maintenance of the bridge and the causeway, therefore sustainability of the project effect is fair.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

This project was implemented with the objective of achieving stable traffic flow and contributing to sustainable regional development in Mannar District in Sri Lanka, by replacing the old Mannar Bridge and improving the causeway.

Both at the time of planning and ex-post evaluation of the project, the objective of the project was in line with the medium- and long-term development plan of the country and the road development plan, which were aiming at regional economic development. The need for and urgency of replacing Mannar Bridge and improving the causeway were high at the time of planning of the project. The need for safety and convenience of travel on the bridge and the causeway remained high at the time of the ex-post evaluation of the project. The project has relevance with Japanese assistance policy, as assistance for rehabilitation of the conflict-effected area and regional economic development were some of the priority areas in Japanese assistance policy to Sri Lanka at that time. Therefore relevance of the project is high.

The weight limit for vehicles traveling on the bridge was increased as planned from 10 tons to 30 tons after the project. The traffic volume during daytime increased significantly from 3,000 to 4,000 vehicles per day. There has been no flooding of the causeway after the project. A lot of the beneficiaries mentioned the improvement in traffic safety, and convenience and transport of agriculture and fishery products, as effects of the project. They also mentioned that transportation of heavy machinery and material became possible after the project. Therefore, effectiveness and impact of the project are also high.

Efficiency of the project is high, as the project cost and period were shorter than planned. There were some problems with sustainability, including maintenance of the lighting facility on the bridge and cleaning the surface of the bridge. It is expected that the operational system of maintenance will also be improved. Therefore, sustainability of the project is fair.

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

4.2 Recommendations

4.2.1 Recommendations to the Executive Agency

(1) The RDA is advised to establish a more effective system for maintenance of Mannar Bridge and the causeway by developing and implementing a maintenance schedule, utilizing a checklist for inspection, record keeping and monitoring implementation.

(2) The Urban Council of Mannar and other stakeholders of the project are expected to construct streetlights along the causeway by fundraising and coordinating the relevant institutions.

4.2.2 Recommendations to JICA

It is recommended that improvements in the system of maintenance of Mannar Bridge and the causeway should be monitored in future.

4.3 Lessons Learned

The project was highly appreciated by the local community as it had employed them in the civil works as much as possible, and this contributed to increasing employment opportunities and improving their skills and experience. The sense of ownership of the project was enhanced among the local community as a result of the contractor doing this, and provided maximum benefit and consideration to them. This experience should be shared with other projects.