The Democratic Republic of Timor-Leste

FY2018 Ex-Post Evaluation of Japanese Grant Aid Project

"The Project for River Training for the Protection of Mola Bridge"

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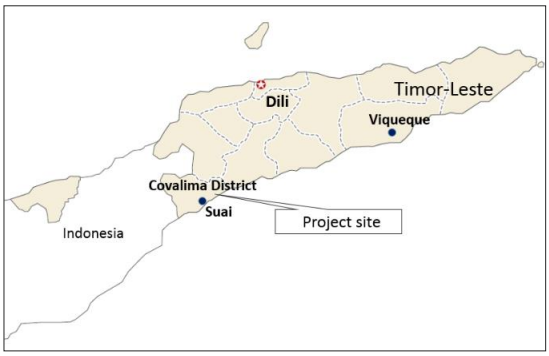
0. Summary

The project was conducted to maintain the function of Mola Bridge[1] and revetments by implementing scouring prevention measures for Mola Bridge located on national road A02 connecting north and south Timor-Leste and installing revetments in the Mola River, thereby contributing to improving the traffic function of the bridge. The purpose of the project is consistent with Timor-Leste's development plans, which emphasize infrastructure development including that for roads and bridges, its development needs for maintaining a smooth transportation network of important routes connecting the capital and the southern region, and Japan's ODA policy and, accordingly, is highly relevant. Both project cost and the project period were within the plan, therefore the efficiency of the project is also high. A new Mola Bridge was constructed prior to the implementation of this project, reducing to zero the number of days in which Mola Bridge is impassable, including during rainy season, the effect of which has been maintained by strengthening the existing Mola Bridge through this project, thus contributing to improving the traffic function of Mola Bridge. As a result, bus companies that operate routes on national road A02 and the scope of transportation services have expanded, and social and economic impacts on the local population have been observed, such as improved access to schools, farmland and markets from the opposite shore and increased income of nearby farmers due to stable farming activities. After installation of the revetment, the flow of water to the opposite bank changed, and erosion damage to some farmland was reported. Although it is necessary to confirm the situation in the future, no other negative impacts have occurred, thus the effectiveness and impact of the project are high. As for sustainability, some minor problems have been observed with regards to institutional/organizational and financial aspects as well as the status of operation and maintenance, such as a shortage of engineer personnel in charge of maintenance, an insufficient budget, and some sections of the road surface of the bridge requiring maintenance. Therefore, the sustainability of the project effects is fair.

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

[1] Mola Bridge, the target of this project, exists in the form that the new Mola Bridge (the right bank side), which was built through grant aid in fiscal 2008, adjoined to the existing (old) Mola Bridge (the left bank side), constructed during the Indonesia era, at the section where the old bridge was seriously damaged and washed away due to flooding.

1. Project Description



Project Location

Mola Bridge and reinforced pier and abutment

1.1 Background

Since Timor-Leste depends entirely on land transportation for commodity distribution and passenger transportation, the most significant issue for its economic development is to develop a transportation network centering on roads. Because of the steep terrain and the fact that the land consists of brittle sedimentary layers, the roads in Timor-Leste are frequently subject to landslides and flooding mainly during rainy season. As a result, the transportation network is often cut off in many places, seriously affecting social and economic development.

Mola Bridge is situated on national road A02 and located approximately 9 km upstream from the mouth of the Mola River. At the time of project planning, there was an existing steel truss bridge on the east (left) bank side of the river. On the west (right) bank side, there was originally a causeway, but it was washed away by annual floods, forcing local people to cross the river by traveling over the river bed. Therefore, the validity of constructing a new bridge in the form that it adjoined to the existing was recognized and the Japanese Government supported the construction of a new Mola Bridge in 2009. However, the banks of the Mola River near the new bridge were seriously damaged by devastating rainfall and repeated flooding in 2010. Approximately 500 m upstream from the Mola Bridge, the embankment on the right bank was eroded over a stretch of around 300 m, and the mortar masonry revetment on the left bank was also destroyed. Other nearby bridges were also destroyed or had their abutments eroded, requiring the Timor-Leste government to implement emergency restoration work. Following this situation, there was concern that the existing Mola Bridge might also be damaged by repeated large-scale flooding in the future, as was the case with other bridges. In response, the government of Timor-Leste requested grant aid from the Japanese Government for reinforcement of the bridge piers and abutments of the existing Mola Bridge and Mola River banks, and support was granted in order to maintain the sustainable traffic function of Mola Bridge.

1.2 Project Outline

The objective of this project is to maintain the function of Mola Bridge and revetments by conducting scouring prevention measures for the existing abutments and piers of Mola Bridge located on national road A02 connecting north and south Timor-Leste and installing revetments in the Mola River, thereby contributing to improving the traffic function of Mola Bridge[2].

Grant Limit / Actual Grant Amount	26 million yen /26 million yen (Detailed Design) 1,108 million yen /1,004 million yen (Civil works)
Exchange of Notes Date /Grant Agreement Date	March 2013 / March 2013
Executing Agency	Ministry of Public Works
Project Completion	October 2015
Target Area	Zumalai, Covalima district, Timor-Leste
Main Contractor	Dai Nippon Construction Inc.
Main Consultant	Eight-Japan Engineering Consultants Inc.
Preparatory Survey	February 2012 – February 2013
Related Projects	【Technical Cooperation】 ・The Project for the Capacity Development of Road Services (2016 –2019) ・The Project for the Capacity Development of Road Works (2010 –2014) ・Project for Capacity Building of Periodic Road Maintenance (2006 –2008) 【Grant Aid】 ・The Project for Construction of Mola Bridge (2008) ・The Project for Improvement of Roads between Dili and Cassa (2004) 【World Bank】 Road Climate Resilience Project (2012– on going) rehabilitation of national road (Dili - Aileu - Ainaro - Same, Dili - Ermera)

[2] According to the ex-ante evaluation report, the project outline was as follows: “it aims to improve the safety of the bridge by implementing measures to prevent scouring of the abutments and piers of Mola Bridge and revetments in the Mola River, thereby contributing to the economic revitalization of the southern region of the country”. However, it was considered excessive that the impact of revetment development of one bridge is described as "social economic development”. Therefore, the outline of this project was adjusted by setting the impact as “contributing to improving the traffic function” in consideration of the effectiveness of the project (maintaining related infrastructure functions).

2. Outline of the Evaluation Study

2.1 External Evaluator

Hisae Takahashi, Japan Economic Research Institute Inc.

2.2 Duration of Evaluation Study

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

Duration of the Study: September, 2018 – September, 2019

Duration of the Field Study: December 1 – December 15, 2018

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

3.1 Relevance (Rating: ③[4])

3.1.1 Consistency with the Development Plan of Timor-Leste

At the time of project planning, the country aimed to become a top middle income country by 2030 under its development policy *Strategic Development Plan (SDP) (2011- 2030)* and accordingly set targets to achieve in the medium to long term. Under the policy, which consists of seven major sectors, including "infrastructure development", the government set the following targets: conducting appropriate maintenance on all roads by 2015, reaching road standards at the international level by 2020, constructing new bridges by 2030, securing year-round traffic on both national and district roads, etc.[5]

SDP (2011-2030), which is a long-term plan, continued to be in effect at the time of the ex-post evaluation, and the importance of road and bridge development is confirmed. In addition, the Directorate of Road, Bridge and Flood Control (DRBFC), which is part of the Ministry of Public Works, formulated a *Five Year Strategy (2019 - 2023)* for road and bridge development taking into account subsequent progress made in the infrastructure sector plan set forth in the SDP. This strategy also includes plans for developing 21 bridges and revetments for 19 rivers, as well as surveys, design and development plans for national roads and district roads.

As described above, Timor-Leste's development plan specifies the importance of road and bridge development as part of the infrastructure sector in contributing to economic development. The project aimed to maintain the transportation function of national road A02 by reinforcing abutment and revetments/piers, therefore demonstrating the consistency between the country's development plan and this project.

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

[4] ③: High, ②: Fair, ①: Low

[5] Source: *Preparatory survey report, Official Development Assistance (ODA) Country data book 2013*

3.1.2 Consistency with the Development Needs of Timor-Leste

Timor-Leste is divided between the northern region centered on the capital city of Dili and the southern region which is a grain-growing region alongside mountain ranges that run from east to west; thus, the need for a transportation network connecting the north and the south has been discussed for many years. Japan has also supported road improvement work for the main road linking Dili and Suai, which is a major city in the south that serves as a hub for agricultural development, and also the project for construction of Mola Bridge located on the main national road. Mola Bridge has made it possible to cross the Mola River by vehicle throughout the year, and has brought about expected economic effects, etc. However, the banks of the Mola River have suffered serious damage such as scouring and the revetment wall was also eroded due to subsequent repeated devastating rainfall and flooding. Though emergency restoration work was implemented by the Timor-Leste Government, there was a concern that large scale flooding would cause serious damage. Furthermore, the development plan for the southern region as a base of industry and the improvement of the transportation network connecting north and south were urgent issues; hence, the government placed importance on enhancing the safety of Mola Bridge[6].

Even at the time of the ex-post evaluation, the transportation network linking the northern region, where Dili is located, and the southern region, which is the main producer of agricultural products, was considered to be an important route in the country. In addition, Timor-Leste has indicated its intention to work on refining gas from the Timor Sea[7], and promoted development of the southern region. Therefore, the expressway starting from the major city of Suai in the southern region is under construction to secure transportation routes, the Suai-Betano section of which was opened in November 2018, and it will be extended further to Viqueque in the future. Though a bridge parallel to Mola Bridge was constructed on the expressway, motorcycles are prohibited on the expressway, and bus passengers cannot freely get on and off. Thus, there will continue to be a significant need for maintaining the transportation function of national road A02 and Mola Bridge even after the expressway opens.

3.1.3 Consistency with Japan's ODA Policy

In *Country Assistance Policy for Timor-Leste (2012)*, "Assistance for building a foundation for economic growth from reconstruction" was set as the main goal, and support for infrastructure development projects was prioritized to revitalize economic activities, which was the biggest challenge. The *JICA Country Specific Analysis Paper (2013)* also positioned as priority issues strengthening industries forming the foundation of the country, and improving its infrastructure. Therefore, it was confirmed that this project was consistent with

[6] Source: Ex-ante evaluation report

[7] Waters located south of Timor-Leste and northwest of Australia. There are oil and natural gas reserves on the sea floor.

Japan's ODA policy.

3.1.4 Appropriateness of the Project Plan and Approach

During the implementation of the grant aid project, the Project for Construction of Mola Bridge (2008), a large-scale flood occurred. Based on this fact, this project was planned and implemented with the understanding that it would be difficult to maintain the transportation function even with construction of the new Mola Bridge if the piers, abutments and revetments of the existing Mola Bridge, which deteriorated, were scoured. Furthermore, prior to the planning for this project, there was minimal awareness of the need for maintenance activities, and skills and knowledge related to maintenance were insufficient in Timor-Leste. Therefore, in order to maintain the traffic function of the existing Mola Bridge and revetment on the national road in the long term, this project employed a design that requires minimal maintenance and management by taking into consideration the adoption of concrete structures, measures to prevent erosion through sufficient embedment, and erosion control through use of foot protecting blocks. As such, the plan and approach of the project are also deemed to be appropriate given that a design was adopted to reduce the maintenance burden while maintaining the strength of the target facilities in full consideration of the background of project implementation, awareness of maintenance in the country, and the executing agency's maintenance capabilities.

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

3.2 Efficiency (Rating: ③)

3.2.1 Project Outputs

[Japanese side]

This project consists of construction work to protect the piers and abutments of the existing Mola Bridge, construction work for the revetment in the Mola River, and consulting services. As shown in the planned and actual outputs in Table 1, the project was mostly implemented as planned. Changes were made in the specifications of steel sheet piles and wire mesh for gabion around the bridge piers, and reinforcement around the abutments was added (as described in detail below). However, the executing agency's engineer and the consultant explained that the function, strength, project cost and project period were not affected by those changes. Therefore, the changes are considered to be appropriate as minor design changes.

Table 1 Planned and actual outputs

Target	Items	Plan	Actual
Existing pier	Erosion protection: Protecting work against pier scouring 1) Place steel sheet pile around pier 2) Place concrete blocks in front of sheet pile	7m (length) × 45.6m (extension) 10m(length) × 60.0m (extension) 314 blocks for 3t	As planned
Existing Abutment	Erosion protection: Protecting work for abutment 1) Place gabion around the abutment 2) Place concrete block on and in front of the gabion	900 gabion, 1.0m × 1.0m × 1.0m 824 blocks for 3t	As planned
Revetment wall	Erosion protection: Protecting work for revetment 1) Place gravity type of retaining wall 2) Place steel sheet pile under the foundation of the retaining wall 3) Place concrete bock in front of the retaining wall	5.0-6.7m (height), 700m (extension) IIw 2m (length) × 700m (extension) 1,211 blocks for 3t	As planned
	Secure water use function 1) Place stairs at revetment 2) Place an intake at the revetment	4 places 1 place	As planned
Consulting Service		Detailed design, procurement management and civil works supervision	As planned

Source: Preparatory survey report, document provided by JICA, responses to a questionnaire by the executing agency and consultant

Revetment constructed in the Mola River

Constructed stairs

[Changes in the plan[8]]

(1) Steel sheet pile around the pier (changes in shape, length and specification)

・Change in shape from IIw type to III type

(Reason) The original plan was to use a wide IIw type (width 600 mm) to reduce the number of inserted sheets, but the difference in bonding angle between the steel sheet piles in the curved part was smaller than the allowable value, and high construction accuracy was required. Therefore, to improve construction accuracy, the shape was changed to the type III with a narrower width per sheet (width 400 mm) thereby expanding the allowable range of the joining angle in construction.

・Change in length from 7 m to 7.5 m

(Reason) The length was changed to ensure overall stability based on the result of a stability calculation factoring in the shape change of the sheet pile.

・Change in specification from SY type to SYW type

(Reason) Since the upper space under the bridge girder was limited, it was assumed to be difficult to install the piles all at once. Therefore, it was necessary to cut the sheet piles and place the shortened sheets while welding them into single sheets to enhance workability. In doing so, it was determined that the SYW type should be utilized since it is superior over the originally designed SY 295 type in weldability of the joint portion.

(2) Wire mesh for gabion (protecting work for abutment)

・Changes in the strength of wire, weight per m^2, size and applicable standard for gabion

(Reason) The strength of the wire, the weight per m^2, and the size of the gabion were changed in accordance with the change of the standard for gabion applied by the Timor-Leste government from the standard for the United States (AASHTO[9]) to the one for Indonesia (SNI[10]).

(3) Reinforcement of the area around abutment

・Addition of suction prevention mats laid at the bottom of concrete blocks

(Reason) The gabion were designed such that, in installing the concrete blocks on top, crusher run[11] would be packed into the spaces in the gabion to compact the rocks. However, it was difficult to compress the rocks because construction space was limited, hence suction preventive mats were laid out to prevent the material from being washed away.

[8] Source: Document provided by JICA, responses to a questionnaire by the executing agency and the consultant
[9] American Association of State Highway and Transportation Officials
[10] Indonesia National Standard
[11] Crushed stone used as a roadbed material for roads, produced by crushing rocks or cobble stones with a crusher

[Timor-Leste side]

The following six items were implemented by Timor-Leste as planned[12].

1) Securing lands (Yard for stockpiling materials/equipment, workplace, building worker's camp and building a facility that supplies daily life water for workers)
2) Smooth custom clearance at the port of disembarkation of materials/equipment transported from Japan and the third country
3) Regarding the procurement of materials/equipment and supply of service by the Japanese people, exempting or bearing customs, domestic tax, and other surcharges imposed within Timor-Leste
4) Accommodating the Japanese people who supplied services for this project, especially when he/she was getting into, leaving and staying Timor-Leste for their work
5) Bearing the costs imposed on Timor-Leste side persons in charge of this project
6) Expenses related to tax exemptions including customs and consumption taxes.

3.2.2 Project Inputs

3.2.2.1 Project Cost

The Japanese side's share of the project was 1,030 million yen compared to the exchange note (E/N) limit of 1,134 million yen; thus, costs on the Japanese side were within the plan (91% of the plan). Although planned project costs including approximately 43 million yen[13] for Timor-Leste's share were 1,246 million yen, it was difficult to compare the total project cost because the record of the amount spent by Timor-Leste site was not available. However, since Timor-Leste's burden was in line with the plan and there were no problems (see "3.2.1 Output"), it is considered that the expenditure was made as planned.

3.2.2.2 Project Period

The project period[14] was planned to be 33 months, however, it was actually the 32 months from March 2013 to October 2015, which was within the plan (97% of the plan). The factors contributing to the project period being within the plan include the fact that weather effects were limited. In the plan, it was assumed that construction would be suspended due to flooding during rainy season; however, the project was ahead of schedule since there wasn't any major rainfall or flooding during the construction period. In addition, there were no effects from international events or disasters, thus materials were available without problem.

[12] Source: Preparatory survey report, responses to a questionnaire by and interviews with the executing agency

[13] The ex-ante evaluation report noted that the amount to be covered by Timor-Leste was 1 million yen. On the other hand, the preparatory survey report stated that the amount paid by Timor-Leste was US$ 534 thousand = 43 million yen (exchange rate of US $1 = 80.52 yen as of June 2016). The amount noted in the preparatory survey report is deemed to be appropriate when considering the matters borne by Timor-Leste. Therefore, in this evaluation, 43 million yen is noted as the amount paid by the government of the Timor-Leste at the time of planning.

[14] The project period is defined as the duration from the month in which the G/A for detailed design was signed to the end of construction.

Customs clearance and tax exemption procedures were also smoothly carried out at Dili Port due to prior coordination between the executing agency and the customs clearance authorities, and changes were approved smoothly. Thus, the fact that there were no suspended period is also considered to be a factor contributing to the project proceeding without delay[15].

As mentioned above, both the project cost and project period were within the plan. Therefore, efficiency of the project is high.

3.3 Effectiveness and Impacts[16] (Rating: ③)

At the site of Mola Bridge, a new Mola Bridge connecting the opposite bank was constructed through grant aid and adjoined with the existing Mola Bridge, which was built during the Indonesia era. Therefore, the effectiveness in terms of transportation function was confirmed through construction of the new Mola Bridge and, accordingly, the effectiveness and impact of the project are analysed from the perspective of whether the traffic function, including as it relates to the new Mola Bridge, the existing Mola Bridge, and the surrounding revetments, has been maintained through reinforcement of the existing bridge and revetments. In addition, through this project, part of Mola Bridge (a bridge pier/abutment and revetment) was reinforced, and, given that it is very difficult to measure the outcome of this project on its own, the criteria for comparing effectiveness and impact were confirmed in consideration of the status of the area even before The Project for Construction of Mola Bridge, completed at August 2018, was conducted.

3.3.1 Effectiveness

3.3.1.1 Quantitative Effects (Operation and Effect Indicators)

(1) Impassable days

Before the new Mola Bridge was constructed, people needed to cross the existing Mola Bridge and part of the actual riverbed in order to cross the river, thus making it impossible to cross when the water level rose during rainy season. After the new Mola Bridge was constructed (the new Mola Bridge was constructed over the section of the riverbed where vehicles previously crossed over directly), it became possible to cross the river regardless of whether it is dry season or rainy season. Subsequently, surrounding revetments and banks have not been damaged by heavy rain or flooding on rainy days as a result of bridge pier protection and abutment scouring as well as revetment development. Accordingly, passable conditions have been maintained even during precipitation and floods. As a result, the number of

[15] Responses to a questionnaire by the consultant

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

impassable days per year was reduced to zero even at the time of the ex-post evaluation, and the transportation function as a bridge has been maintained.

Table 2 Impassable days of Mola Bridge

	Baseline	Target	Actual			
	2007	2018	2015	2016	2017	2018
		2 Years After Completion	Completion Year	1 Year After Completion	2 Years After Completion	3 Years After Completion
Impassable days	60	0	0	0	0	0

Source: Ex-ante evaluation report, responses to questionnaire by the executing agency, interviews with people living around the bridge and drivers

Note: The direct factor reducing the impassable days to zero is the new Mola Bridge constructed in 2011. The same index was adopted for this project considering that the significance of the project lies in maintaining the functions of related infrastructure, including the existing Mola Bridge connected to the new bridge.

(2) Types of vehicles that can cross the bridge

This indicator, which was the operation and effect indicator used for the "The Project for Construction of Mola Bridge," was also confirmed for this project as a reference. Before the new Mola Bridge was constructed, only vehicles of a certain height could reach the other side by crossing the riverbed. As of the ex-post evaluation, all types of vehicles could traverse the river, even during rainy season, and the function as a bridge has been maintained.

Table 3 Types of vehicle that can cross Mola Bridge

	Baseline	Target	Actual	
	2007		2015	2018
			Completion Year	3 Year After Completion
Types of vehicles that can cross Mola bridge	Limited types of vehicles (4WD, trucks)	—	All types of vehicles	All types of vehicles

Source: Document provided by JICA, responses to questionnaire, interviews with the executing agency and drivers.

3.3.1.2 Qualitative Effects (Other Effects)

(1) Improvements in stability and safety of revetment and existing bridge

This project was conducted for the purpose of maintaining the function of the bridge through reinforcement of bridge piers, abutments and the revetment in preparation for subsequent rainfall and flooding since part of the revetment was damaged by flooding during the implementation of the Project for Construction of Mola Bridge. According to the bus drivers who have used Mola Bridge, in order to cross Mola Bridge by bus when it was difficult during rainy season, passengers had to get off in front of the bridge, pay money to get help to cross to the other side, and then switch to another bus. Additionally, truck drivers had to wait on the opposite bank until the water level fell in rainy season, and even after the water level fell, they had to search for a spot where their vehicles could pass, a process that took between dozens of minutes to several hours. Upon ex-post evaluation, not only vehicles but also

pedestrians could cross the bridge, including during rainy season, and the traffic function was maintained. This is because the stability and safety of the existing bridge improved after the construction of the new bridge, and the bridge piers and abutments of the existing bridge were protected and the revetment was improved through this project, making it possible for the bridge to withstand impact and scouring, thus contributing to enhanced safety and stability of the existing bridge and revetment.

In addition, multiple bridges near Mola Bridge were confirmed to be damaged due to flooding or impossible to cross. However, no damage from natural disasters was confirmed at Mola Bridge and its revetment, and, further, bridge function has been maintained throughout the year, confirming that safety and stability have been sustained as a result of the project.

(2) Reduction of maintenance costs

In this project, revetment maintenance costs (repair and restoration) were expected to be reduced as a result of revetment development. In particular, the structures developed as part of this project have incorporated minimum maintenance features to minimize the maintenance burden with an eye to sustainability, thus maintenance related to scouring of the foundation is basically almost not required[17]. Even prior to the implementation of this project, there was no regular maintenance of the bridge, and emergency support was provided in the event of disaster. Therefore, it is not possible to compare costs before and after the project. On the other hand, in the present situation where bridges in the surrounding area need to be repaired, there are no damages, and thus no need to repair, for Mola Bridge or related facilities, even after rainy season, and no repair costs have arisen as a result. Thus, the project is deemed to have also contributed to a reduction in expenses.

3.3.2 Impacts

3.3.2.1 Intended Impacts

(1) Contribution to economic revitalization

As a result of enabling safe passage across Mola Bridge and maintaining such status, the number of bus operators with routes connecting the capital city of Dili to the major city of

[17] In Timor-Leste, protection measures against scouring were taken by simply preparing gabions in front of the retaining walls and bridge piers; thus, the foundations of rivers were often washed away and needed to be restored each time. With this project, on the other hand, maintenance costs related to foundation scouring have not been necessary. This is because the foundation was embedded from the riverbed to the assumed scouring depth, and the steel sheet piles were placed on the foundation so that the sediment runoff of the foundation was prevented by allowing groundwater to enter from the back as a countermeasure against scouring from river flow exceeding the projection in this project. Moreover, revetment retaining walls in Timor-Leste are structured as masonry retaining walls made by bonding stones with mortar, thus resulting in a fragile structure in which, for example, the frame is damaged at every increase in the water level, accordingly requiring damaged areas to be repaired every year. In this project, concrete created with a suitable material and composition based on engineering was manufactured at a plant and used as a frame for the revetment retaining wall, creating a structure strong enough to withstand increases in water, thereby making maintenance costs required for repairing the frame almost unnecessary.

Suai in the south increased from 36 before the project to 44 in 2018. Although the direct factor for the increase is considered to be the construction of the new Mola Bridge and promotion of the development of the southern region, safe passage across Mola Bridge is indispensable for transporting people and materials between the northern and southern regions. Thus the enhancement of transport services indirectly contributes to the development of the southern region's economy.

Table 4 Number of bus operators with routes connecting Dili and Suai

Before construction of new Mola Bridge (2005)	After construction of new Mola Bridge and before project implementation (2014)	At the time of the ex-post evaluation (2018)
8 companies	36 companies	44 companies

Source: Interviews with the Ministry of Transport and Communication and the Department of Land Transportation

(2) Social and economic contribution to local residents

Through interviews with the executing agency and users of the bridge during the site survey, it was confirmed that securing and maintaining safe and smooth transportation across Mola Bridge has contributed to improving transportation and access to nearby schools and markets, etc. and to enhancing transportation services operated by transportation companies, as well as delivering goods for expressway construction implemented as part of the development of the southern region of the country. The details are as follows.

・Improvements in transportation and access to schools and markets, etc.

There is an elementary school and a market in Zumalai on the Suai side of Mola Bridge, and in Fatukaaf, a town on the opposite side, there is a secondary school and mainly farmland. With the construction of the new Mola Bridge and maintenance of the traffic function, students who were often unable to attend school and farmers who had limited access to the market and farmland during rainy season are now able to go to school or to work on the farmland and carry agricultural products to the market regardless of the season. In addition, equipment that could not previously be brought to the farmland can now be brought, resulting in improved work efficiency as of the ex-post evaluation. As a result, although the relevant data could not be obtained, farmers working near the bridge explained that the rice yield and income of farmers in the area have been increasing.

・Improvements in transportation services

In addition to the increase in bus companies operating routes connecting Dili and Suai, it has also become possible to carry goods (loading construction materials on the carrier of the bus) that were previously difficult to carry. In the construction of the expressway opened between Suai and Betano in 2018, all materials needed for the construction were transported

via Mola Bridge; hence, safe passage across the bridge has greatly contributed to the construction of the expressway[18].

3.3.2.2 Other Positive and Negative Impacts

(1) Impacts on the Natural Environment

Although preparation of an environmental impact assessment report to this project was not required under the domestic law of the Timor-Leste, the initial environmental examination and the environmental management plan were implemented and prepared. After that, based on the prepared plan, water quality was monitored in addition to air quality and noise that were required to be monitored by the consultant at the time of project planning. The results were reported through a monthly report, confirming that it was within the standard value defined by the guidelines of the International Finance Corporation. In addition, through questionnaires with the executing agency, interviews and site survey, it was confirmed that there was no negative impact on the natural environment during and after the project.

(2) Resettlement and Land Acquisition

It has been confirmed in the site surveys during scoping that resettlement have not occurred due to the implementation of this project. Since the project reinforced the bridge piers and abutments of an existing bridge, this survey also confirmed that land acquisition and resettlement were not generated for developing the revetment.

(3) Other impact: Flooding of some farmland near rivers

In this project, a revetment on the Zumalai side was mainly developed. This is mainly because of erosion across a wide area on the Zumalai side that occurred at the time of planning, interfering with the lives of neighbouring residents on this side. After revetment construction, though flood damage affecting residents on the Zumalai side was eliminated, a change occurred in the flow of the river hitting the revetment. Therefore, there is a new flow against Fatukaaf, a town on the opposite side. It was reported in interviews with local residents that with increased rainfall, water flows into part of the farmland in the vicinity of Mola Bridge and the crops are damaged, although only a small area is affected. According to an engineer with the executing agency, the flow of the river may change unexpectedly due to annual rainfall, making it a difficult event to assume at the time of planning. Moreover, since no survey has been conducted so far, the causal relationship with this project has not been clarified. However, the recognition of the local residents of the area is as described above, thus, it is necessary to conduct a survey and investigate the cause of the farmland damage on the

[18] Based on the interviews with farmers working near Mola Bridge, local residents and bus drivers operating routes between Dili and Suai.

Fatukaaf side, despite only a limited area being affected. Furthermore, it is desirable to consider measures for flood disaster affected areas as a general response, regardless of the cause and effect relationship with this project.

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

3.4 Sustainability (Rating: ②)

3.4.1 Institutional / Organizational Aspect of Operation and Maintenance

The DRBFC of the Ministry of Public Works is in charge of maintaining National Road A02 and bridges and public facilities along the route. At the time of project planning, the DRBFC headquarters located in the capital implemented budget management, plan preparation, design and ordering, while inspection and construction management were under the jurisdiction of the district offices. Subsequently, the division of roles of the maintenance system was changed in 2014, with DRBFC headquarters supervising national roads and bridges on national roads and outsourcing maintenance work to local contractors. The district offices are mainly in charge of maintenance and management of district roads, while the reporting system, which entails communicating the situation in the case of a disaster or other such emergency, has been maintained.

At the time of the ex-post evaluation, there were 138 staff members at the DRBFC headquarters, which includes 30 engineers. According to the maintenance department, despite a shortage of engineers, the limited number of staff members carry out maintenance activities to the furthest extent possible. The main reasons for the shortage of engineers are the difficulty of hiring appropriate personnel and the lack of budget. In particular, regarding shortages of personnel in positions that require the appropriate skills, it has been reported that there is a mismatch in the hiring process between the personnel that have been recruited and the type of personnel that are actually required. Although coordination between senior management and human resources is necessary, the employment decision is often made by a single individual, thus it is necessary to continue to explain the need for engineers and encourage the organization to increase in number of employees.

Thus, while the maintenance system for roads and bridges is clear, the mismatch in human resources recruiting and a shortage of engineers in the first place are considered to be concerns in terms of the institutional/organizational aspect of operation and maintenance.

3.4.2 Technical Aspect of Operation and Maintenance

There are no concerns about the technical level of the engineers responsible for the operation and maintenance in the DRBFC as long as it relates to the basic maintenance of the

bridges and revetments. In particular, this project was structured to utilize a design that minimizes the required maintenance activities, and there have been no cases of DRBFC being unable to response to the operation and maintenance needs of Mola Bridge and revetments at the time of the ex-post evaluation. The maintenance activities related to the bridge and revetments include checking for cracks; coating for rust prevention; checking for deformation and displacement due to scouring or erosion; etc. These activities can be handled by DRBFC, and the DRBFC has actually taken care of backfilling revetments as well as repacking blocks and soil. Therefore, no concerns related to technical aspects have been identified at present. However, when the bridge structure itself needs to be improved, support from engineers outside of the country may be necessary.

Furthermore, as part of the technical cooperation project, in addition to improving road maintenance and management capabilities, road and bridge databases are also being developed. Therefore, the contribution in terms of maintenance has been confirmed; specifically, it has made it possible for DRBFC to grasp the current status of bridges and revetments on national roads, where they had difficulty in grasping the situation before. Going forward, it is expected that the database will be developed to allow for efficient work, i.e. grasping the situation and allocating the budget based on that information. In addition, technical cooperation project has continued after project implementation, and training opportunities for road maintenance have been provided. Although usage is limited, the executing agency manages the manual, and it was confirmed that the manual can be referred to when necessary.

Although support from overseas would be required in response to structural damage caused by a large-scale disaster, such cases are regarded as disaster countermeasures rather than maintenance activities. Therefore, daily maintenance of the bridge entails general visual inspection, and, accordingly, there are no technical concerns unless serious structural problems were to arise.

3.4.3 Financial Aspect of Operation and Maintenance

Prior to implementation of this project, regular management of facilities was not implemented for the Mola River, and emergency construction was only implemented when the revetment was damaged. However, at the time of planning, it was estimated that a budget of US$ 1,000 per year would be necessary to carry out maintenance work for facilities after implementation of this project. Table 5 shows the maintenance budget of DRBFC. The amount allocated for the operation and maintenance budget widely fluctuates, and according to the maintenance department, the budget necessary for carrying out appropriate operation and maintenance has not been secured. For example, they requested US$ 31 million from fiscal authorities in 2015, but was only allocated US$ 10.6 million.

Table 5 DRBFC's maintenance budget

(Unit: US$ million)

2015	2016	2017	2018
10.6	3.9	2.4	1.0

Source: document provided by the executing agency

At the time of the ex-post evaluation, no large-scale disasters have occurred near Mola Bridge and the revetment, thus there are no damaged parts and no expenses related to maintenance work, as was the case at the time of planning. On the other hand, it has also been reported that maintenance activities specified at the time of planning were partially restricted due to a lack of budget (see "3.4.4 Status of Operation and Maintenance"), which is also clear considering the difference between the amount required for operation and maintenance and the actual allocated amount.

3.4.4 Status of Operation and Maintenance

Through both the questionnaire given to the executing agency and the site survey, it was confirmed that there was no problems in the maintenance status given that there was no deformation of the piers and abutments, movement of blocks, scouring of the revetment or erosion. As stated above, the facilities are made of steel sheet piles and concrete, and basically requires only minimum maintenance. Therefore, maintenance requirements entail periodic inspections through visual checks before and after rainy season, confirmation of the items in Table 6, and repairs as needed.

Table 6 Maintenance and management works for the related facilities

Classification	Frequency	Area to be inspected	Contents of work	Inspection method
Management by periodic inspection	Twice yearly (Before and after rainy season)	Revetment	Scour and erosion in the front portion of revetment Deformation/displacement of the facility, cracks in the facility Movement of concrete blocks Sediment runoff from the backside	Visual check
		Piers/ Abutment	Deformation of the top part of steel sheet pile Movement of concrete blocks	Visual check

Source: preparatory survey report

As noted in Table 6, the bridge piers, abutments and revetments that were reinforced through this project were planned to be checked twice a year (before and after rainy season), but such checks have been limited to once a year due to a shortage of personnel. However, the facilities developed through this project are designed to reduce the level of required maintenance to a minimum, and DRBFC has determined that there have been no problems

through visual checks conducted once a year. Although no major disasters have occurred so far and the need for major rehabilitation has not arisen, it is desirable to conduct visual checks twice a year as planned from the standpoint of preventive maintenance.

During the site survey, no sections of the bridge piers, abutments and revetments were identified as requiring repair; however, this project was implemented with the objective of maintaining the traffic function of Mola Bridge as a bridge on a national road. Therefore, when the maintenance condition of the existing Mola Bridge and the new Mola Bridge, completed the construction on November 2018, was also checked, it was noted that there is unevenness on the surface of the road over which vehicles pass when crossing the existing and new Mola Bridge. Though there are no problems with the actual structure or ability to cross the bridge, it is necessary for vehicles to slow down when crossing the bridge[19]. It is thought that such deterioration is due in part to large vehicles with heavy material loads traveling across the bridge during a short period of time when an expressway was being constructed.


Uneven road surface on Mola Bridge

In the light of above, some minor problems have been observed in terms of the institutional/ organizational aspect, financial aspect and current status. Therefore, sustainability of the project effects is fair.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

The project was conducted to maintain the function of Mola Bridge and revetments by implementing scouring prevention measures for Mola Bridge located on national road A02 connecting north and south Timor-Leste and installing revetments in the Mola River, thereby contributing to improving the traffic function of the bridge. The purpose of the project is consistent with Timor-Leste's development plans, which emphasize infrastructure development including that for roads and bridges, its development needs for maintaining a smooth transportation network of important routes connecting the capital and the southern region, and Japan's ODA policy and, accordingly, is highly relevant. Both project cost and the project period were within the plan, therefore the efficiency of the project is also high. A new Mola Bridge was constructed prior to the implementation of this project, reducing to zero the number

[19] The travel time across Mola Bridge in dry season was 10 minutes before construction of the new Mola Bridge (2007), 25 seconds when Mola Bridge was completed, and approximately 2 minutes at the time of the ex-post evaluation.

of days in which Mola Bridge is impassable, including during rainy season, the effect of which has been maintained by strengthening the existing Mola Bridge through this project, thus contributing to improving the traffic function of Mola Bridge. As a result, bus companies that operate routes on national road A02 and the scope of transportation services have expanded, and social and economic impacts on the local population have been observed, such as improved access to schools, farmland and markets from the opposite shore and increased income of nearby farmers due to stable farming activities. After installation of the revetment, the flow of water to the opposite bank changed, and erosion damage to some farmland was reported. Although it is necessary to confirm the situation in the future, no other negative impacts have occurred, thus the effectiveness and impact of the project are high. As for sustainability, some minor problems have been observed with regards to institutional/organizational and financial aspects as well as the status of operation and maintenance, such as a shortage of engineer personnel in charge of maintenance, an insufficient budget, and some sections of the road surface of the bridge requiring maintenance. Therefore, the sustainability of the project effects is fair.

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

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

(1) Confirmation of damage to farmland and examination of future follow-up

After implementation of the project, the development of the revetment changed the flow of the river when the water level rose, causing flooding of previously unaffected farmland, albeit to a limited extent. There was no need to question the design at the time of planning because it is difficult to completely predict and understand the water volume and the flow of water. However, it is desirable for the executing agency to grasp the status of damage and to consider measures as necessary so as to minimize any damage in the future.

(2) Maintenance and management of Mola Bridge

This project reinforced the existing Mola Bridge piers, abutments and revetments, and its purpose was to maintain the transportation function of Mola Bridge on the national road through the enhancement of surrounding facilities. Although there have been no problems with the facilities that were improved through the project, at the time of the ex-post evaluation, there was unevenness on the surface of the road over which vehicles pass on both the existing and new Mola Bridge. While this does not affect the actual ability of vehicles to cross the bridge at present, if the situation worsens in the future, it is likely to affect the smooth flow of traffic across the bridge. Thus, the executing agency must repair those parts before the situation gets worse.

(3) Elimination of mismatches in the recruitment of staff through information sharing

At the time of the ex-post evaluation, there was a shortage of engineers at DRBFC, who should be in charge of road and bridge maintenance, hindering them from implementing the number of planned visual inspections. According to DRBFC, although they submitted the requests for hiring engineers, the staff hired are often administration staff rather than engineers. It is desirable for DRBFC and the human resources department, and also management of the executing agency, to share more detailed information on the necessary personnel and work to eliminate mismatches in the type of personnel hired during the next round of recruiting.

4.2.2 Recommendations to JICA

None

4.3 Lessons Learned

・Contributing to ensuring sustainability by designing projects based on the technical capacity and financial status of the target country

It was not emphasized in Timor-Leste about road and bridge maintenance, and appropriate maintenance was not being implemented at the time of the project planning. In addition, there have been financial constraints, thus it is not easy to secure the necessary maintenance costs for roads and bridges across the country, even if the need for such maintenance is identified. In light of this situation, the design for the project was adopted to reduce the maintenance burden after the project completion as much as possible. In fact, as of the ex-post evaluation, there has been no particular maintenance work that the country could not address and no expenses have arisen. As was the case with this project, by deliberating the target country's awareness and capabilities of maintenance and management, adopting a design considering the sustainability will reduce the burden on maintenance organizations, and will go a long way in ensuring sustainability.

End