Lao People's Democratic Republic

FY2022 Ex-Post Evaluation Report of

Japanese Grant Aid Project

"Project for Construction of Sekong Bridge on NR16B in the Southern Region of Laos"

External Evaluator: Nobuyuki Kobayashi, OPMAC Corporation

0. Summary

This project is to resolve the missing link of National Road 16B which is an international trunk road, by building Sekong Bridge in the Southern region of Laos. This project, which strengthened connectivity with neighboring countries, was in line with the development policy and development needs of Laos. The project was also in line with Japan's ODA policy. The project was coordinated with other JICA projects and other organizations, and tangible results were found. Therefore, its relevance and consistence are high. The output of the project was in line with the plan. While the project cost was within the plan, the project period exceeded the plan due to the delay in the construction period. From the above, it can be concluded that the efficiency of the project is high. The indicators for effectiveness almost achieved their targets, and the qualitative effects (such as an increase of visits to Sekong town, improvement of the access to social infrastructure) were also evident. Impacts included improvement in the access to Da Nang port, the transportation of agricultural and processed products, and an improvement in the lives and livelihoods of residents on the east bank of the Sekong River. This project has mostly achieved its objectives. Therefore, effectiveness and impacts of this project are high. Some technical and financial issues remain in the operation and maintenance of the project. The Sekong bridge is an extra-dosed bridge, but the government units in charge of maintenance do not have sufficient technology to conduct maintenance on bridges of this type. In addition, it has been difficult to secure the amount of the maintenance budget which was assumed at the time of planning. Therefore, sustainability of the project effects is moderately low.

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

1. Project Description

Project Location

Sekong Bridge

1.1 Background

Road transportation is the main means of travel and cargo transport in Laos, accounting for the majority of passenger and cargo traffic. However, only 60% of the country's national roads were paved, and road maintenance was inadequate in 2013. The southern region of Laos has borders with Thailand and Vietnam, and therefore, there has been a substantial need for road development in this region from the perspective of international connectivity. The region, however, is mountainous and road infrastructure has been undeveloped. The road network has easily been disrupted during the rainy seasons. National Road 16B, a part of the international corridor that crosses the region and connects Thailand and Vietnam, was in a similar condition and had many unimproved sections. In particular, the crossing point of the Sekong River on National Road 16B was not bridged, and the service of river crossing boats was irregular and frequently suspended during the rainy seasons. As a result, this crossing point became a major obstacle to accessing social infrastructure for residents on the east side of the Sekong River. To revitalize international logistics and promote the development of the region, it was highly necessary to build a bridge over the Sekong River on National Road 16B.

1.2 Project Outline

The objective of this project is to resolve the missing link of National Road 16B which is an international trunk road, by building Sekong Bridge in the Southern region of Laos, thereby contributing to economic and social development of the region.

Grant Limit / Actual Grant Amount	(Detailed Design) 84 million yen / 83 million yen (Construction) 2,197 million yen / 1,772 million yen
Exchange of Notes Date / Grant Agreement Date	(Detailed Design) December 2013 / January 2014 (Construction) May 2014 / May 2014
Executing Agency(ies)	Department of Roads (DOR), Sekong Province Department of Public Works and Transport (Sekong DPWT)
Project Completion	February 2018
Target Area	Sekong Province
Main Contractor	Taisei Corporation

Main Consultant	Central Consultant Inc.
Preparatory Survey	March 2013 - January 2014
Related Projects	[Technical Cooperation] ・ Project for Improvement of the Road Management Capability (2011-2018) ・ The Project for Capacity Development on Bridge Maintenance and Management (2020-Present) [Asian Development Bank (ADB)] ・ Road Sector Governance and Maintenance Project (2016 - Present)

2. Outline of the Evaluation Study

2.1 External Evaluator

Nobuyuki Kobayashi, OPMAC Corporation

2.2 Duration of Evaluation Study

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

Duration of the Study: September 2022 - December 2023

Duration of the Field Study: January 11 - January 27, 2023, May 15 - May 25, 2023

2.3 Constraints During the Evaluation Study

In parallel with the construction of the Sekong Bridge by this project, the Lao government constructed the section before and after the Sekong Bridge of National Road 16B, which strongly influenced the effectiveness of this project. This fact requires careful attention in the analysis of the effectiveness and impact of the project.

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

3.1 Relevance/Coherence (Rating: ③[2])

3.1.1. Relevance (Rating: ③)

3.1.1.1 Consistency with the Development Plan of Laos

At the time of planning, *the Seventh Five-year National Socio-Economic Development Plan (2011-2015)* aimed for road development, focusing on the improvement of connectivity with neighboring countries and the development of networks along major corridors. The

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

[2] ④: Very High, ③: High, ②: Moderately Low, ①: Low

construction of the road for Sekong - Dak Cheung - Vietnam border was mentioned in the plan as a priority for Sekong Province. The road sector plan, *the Seventh Road and Bridge Development Plan (2011-2015)*, regarded National Road 16B as the main route in the southern region.

At the time of the ex-post evaluation, Outcome 5 of *the Ninth Five-Year National Socio-Economic Development Plan (2021-2025)* aimed for regional and international cooperation and integration through several measures, including infrastructure development. In particular, in order to build a network connecting ASEAN[3] countries, it was intended that the plan promote road development including that of ordinary roads, bridges, and highways. *The Five-Year Plan (2021-2025)*, which developed by the Ministry of Public Works and Transport (MPWT), included a plan for the road sector, and aimed to turn Laos from a landlocked country to a logistics hub with neighboring countries.

Both at the time of planning and during the ex-post evaluation, the National Socio-Economic Development Plan and the plans for the road sector aimed at the strengthening of connectivity with neighboring countries, and road development relevant to the policy goal was also emphasized. Therefore, this project was consistent with the development policy of Laos.

3.1.1.2 Consistency with the Development Needs of Laos

At the time of planning, the crossing point of the Sekong River on National Road 16B was an undeveloped section of the international corridor connecting Bangkok in Thailand, Pakse in Laos, and Da Nang in Vietnam. At the time of this project, due to the lack of road access, agricultural products and mineral resources produced in the southern region of Laos were shipped from Bangkok Port or from Laem Chabang Port, which is located near Bangkok Port. With the progress of road development east of the crossing point of the Sekong River (National Road 16B in Laos and National Highway 14D in Vietnam), it was expected that the transport of the products from Da Nang Port in Vietnam would be facilitated, and that the distance and time for overland transport would be substantially reduced. Meanwhile, the access to social infrastructure (schools, markets, hospitals, etc.) in Sekong town was difficult on the east side of the Sekong River during the rainy season when river crossing boats were out of service (see Figure 1).

[3] Abbreviation for Association of South - East Asian Nations

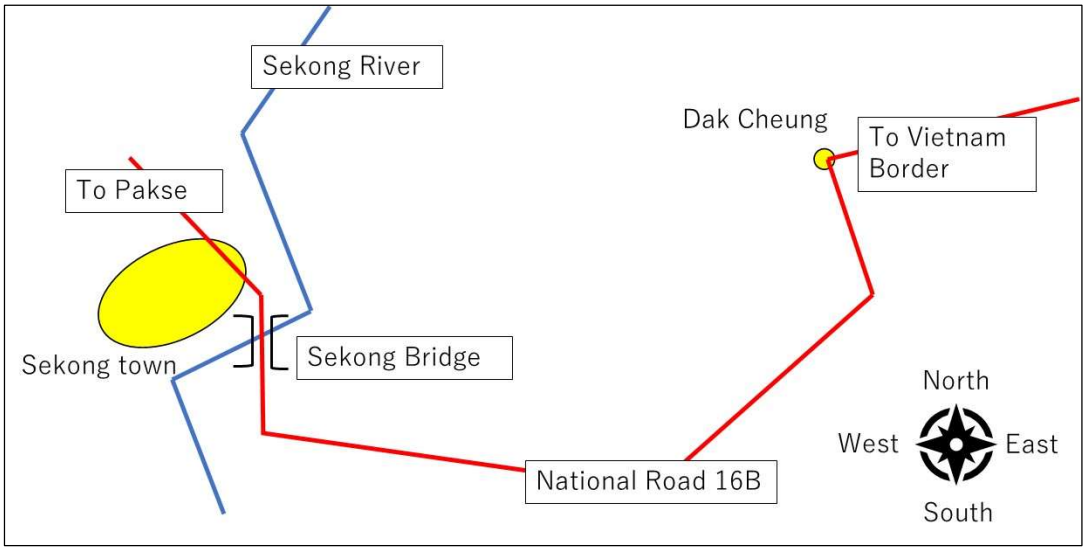


Figure 1 Project Area (Schematic)

Exports to Vietnam accounted for 13.0% of Laos's exports (U.S. dollar basis) before this project (2012) and for 16.5% at the time of the ex-post evaluation (2021), showing a growing trend. Vietnam's share in Lao imports (U.S. dollar basis) decreased from 15.9% before this project (2012) to 7.9% at the time of the ex-post evaluation (2021), but the value of imports increased.[4] As a result, Vietnam ranked third in both imports and exports (U.S. dollar basis) in terms of trade by country in 2021. In the number of visitors to Laos, Vietnamese nationals accounted for 21.2% before this project (2012) and 21.0% at the time of the ex-post evaluation (2020), and Vietnamese nationals ranked second in the number of visitors by country in 2020.[5] At the time of the ex-post evaluation, the closest river-crossing point to the Sekong Bridge was more than 70 km to the south, which means that the Sekong Bridge is a valuable part of the transportation infrastructure for residents east of the Sekong River.

Vietnam's vital role in Laos in both trade and human exchange did not change from the time of planning to the time of ex-post evaluation, and the Sekong Bridge played an important role in logistics and the access to social infrastructure east of the Sekong River at the time of the ex-post evaluation. Therefore, this project was consistent with the development needs of Laos.

3.1.1.3 Appropriateness of the Project Plan and Approach

As the project effects of the Sekong Bridge had been realized to a certain extent by the time of the ex-post evaluation, it can be concluded that there was no notable problem in the project plan or the project logic. At the time of planning, the lessons learned from a similar project suggested that project delays could be prevented by a survey for unexploded ordnance before

[4] Lao Statistical Bureau https://laosis.lsb.gov.la/tblInfo/TblInfoList.do
[5] Ministry of Information, Culture and Tourism "Statistical Report on Tourism in Laos 2016" and "Statistical Report on Tourism in Laos 2021".

project implementation. In this project, the survey for unexploded ordnance was conducted prior to project implementation, and no project delays occurred due to unexploded ordnance. In addition, the lessons learned prior to the project also suggested that a long-term maintenance budget be secured. At the time of the ex-post evaluation, issues remained on securing a budget for periodic maintenance (which should occur every five years after construction completion), which has the nature of preventive maintenance (see "3.4.4 Financial Aspect" for details). However, no serious damage affecting the effectiveness of the Sekong bridge had occurred since project completion.

3.1.2 Coherence (Rating: ③)

3.1.2.1 Consistency with Japan's ODA Policy

The scope of this project was the construction of a new bridge in an undeveloped section of the international corridor linking Thailand, Laos, and Vietnam. At the time of planning, the Ministry of Foreign Affairs' country assistance policy (2012) focused on "economic and social infrastructure development," and the development of transportation infrastructure to strengthen the links with ASEAN countries was a specific focus of the assistance. Thus, the scope of this project was consistent with the ODA policy. Moreover, through the *"Project for Construction of Pakse Bridge"* and the "*Project for Improvement of National Road Route 9,"* JICA had continued to provide assistance to the road sector in the southern region of Laos from the viewpoint of strengthening links with neighboring countries (Thailand and Vietnam). Based on the above, it can be seen that this project was consistent with Japan's ODA policy.

3.1.2.2 Internal Coherence

Although collaboration with other JICA projects was not planned at the time of planning, collaboration for technical cooperation in the maintenance of roads was carried out during the implementation of the project. Under the technical cooperation *"Project for Improvement of the Road Management Capability"* (2011-2018), a bridge maintenance manual, which mainly covered inspection, assessment, and repair, was prepared, and provided to DOR, the implementing agency of this project. The manual is also used by Sekong DPWT, which is the main government organization in charge of maintenance of the Sekong Bridge. In addition, Sekong DPWT participated in a seminar organized by the technical cooperation *"The Project for Capacity Development on Bridge Maintenance and Management"* (2020-2023) and training took place on the use of the above manual for the maintenance of bridges. The acquisition of techniques for maintenance through this cooperation will ensure smooth traffic in the future and contribute to maintaining the effectiveness of this project at an appropriate level.

3.1.2.3 External Coherence

At the time of planning, there were no plans for coordination with projects supported by other donors, but the coordination with an ADB-supported road development project[6] was carried out during the implementation of the project. The above project was for the construction of a part of the section near to that of this project (National Highway 16, Thateng - Lam Mam District), the section from Pakse, a major city in the southern region of Laos, to Sekong town. Therefore, the above project will contribute to an increase in the traffic volume of the Sekong Bridge and promote the effectiveness of this project.

For coherence with global frameworks, the Ministry of Public Works and Transportation aimed to align its planning and implementation with the Sustainable Development Goals (SDGs).[7] This project is also considered to be consistent with SDG Goal 9, "To build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation," as the project will eliminate transportation disruptions during the rainy season and contribute to regional development and the revitalization of trade with neighboring countries.

This project was in line with development policy and development needs of Laos in terms of relevance, and in terms of coherence. It was consistent with Japan's ODA policy, and in collaboration/coordination with JICA and other donors' projects. Tangible results of collaboration/coordination were found. Therefore, its relevance and coherence are high.

3.2 Efficiency (Rating: ③)

3.2.1 Project Outputs

The output of this project is shown in the following table.

Table 1 Comparison of Planned and Actual Results of the Main Outputs

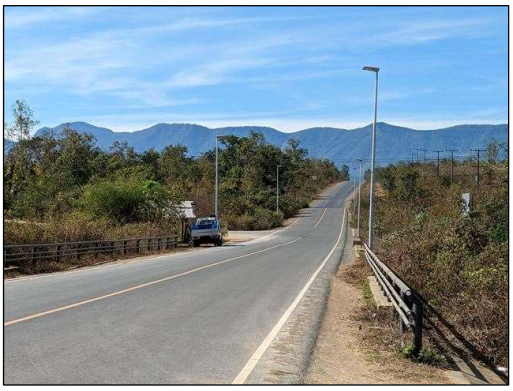
Plan	Actual
[Civil Works] (1) Main bridge (extra-dosed bridge/PC box girder bridge, 300 m long, 2 lanes (7.0 m x 2), sidewalks (0.5 m x 2), sidewalks (1.5 m x 2)) (2) Approach road (527.0 m, 2 lanes (7.0 m x 2), shoulders (3.0 m x 2))	[Civil Works] As planned.
[Consulting Services] Detailed design work, construction supervision	[Consulting Services] As planned.

Source: documents provided by JICA, questionnaire answers from Sekong DPWT

[6] ADB *"Road Sector Governance and Maintenance Project"* (2016-2023 (planned))
[7] MPWT(2022) "Five Year Development Plan 2021-2025"

The output of this project was achieved as planned. For the civil works, there were minor changes from the original plan (e.g., design changes to piers/abutments, changes to intersection geometry at the connection points, additional revetment works, additional space for water pipelines and telephone lines, additional road lighting). According to the construction supervision consultant, the above changes did not affect the project effectiveness. Based on interviews with Sekong DPWT and the construction management consultant, it can be concluded that the obligations to be borne by the Lao side (provision of land, payment of bank charges, etc.) were implemented as planned.

Main Bridge



Approach Road

3.2.2 Project Inputs

3.2.2.1 Project Cost

In this project, the actual project cost for the Japan side was 1,855 million yen, compared to the planned project cost of 2,281 million yen. This was within the plan (81% of the plan). Five companies submitted bids for civil works, and the cost of civil works decreased due to strong competition in the bidding. In the comparison of the planned and the actual costs, only the project cost on the Japanese side was assessed. This is because (1) the available data for the actual project cost for the Lao side included the costs prior to project commencement and a precise comparison was difficult, and (2) the project cost for the Lao side was small (0.2% of the planned project cost) and thus considered very minor.

3.2.2.2 Project Period

The planned project period was 39 months, from January 2014 (grant agreement for detailed design) to March 2017 (start of the use of Sekong Bridge). The actual project period was 50 months, from January 2014 (grant agreement for detailed design) to February 2018 (start of use of the Sekong Bridge), which exceeded the plan (128% of the plan). The extension of the project period was mainly due to delays in construction (planned: 29 months, actual: 40

months). Reasons for the delays included prolonged import procedures for materials and equipment and re-construction to ensure construction quality. The reconstruction was caused by a defect in subcontractor's construction work. The reason for the re-construction was a construction problem that insufficient preparation of the subcontractor caused the interruption of cement placement during the concrete placement. In the re-construction, a part of the bridge body was demolished, and concrete was placed again. As minor incidental works, such as the installation of traffic signs, were conducted after the opening ceremony, the construction of this project was not completed until March 2018, after the bridge had come into use.

The output of the project was as planned. While the project cost was within the plan, the project period exceeded the plan due to the delay in the construction period. Therefore, efficiency of the project is high.

3.3 Effectiveness and Impacts[8] (Rating: ③)

3.3.1 Effectiveness

3.3.1.1 Quantitative Effects (Operation and Effect Indicators)

The outcome assumed for this project was "to resolve the missing link of National Road 16B," and five indicators were set to measure the effectiveness of this project (see next table). Three indicators related to convenience (Travel Time for Crossing the River, Hours Available for River Crossing, Days Available for River Crossing) were achieved (100% achievement). It was difficult to calculate the achievement level for the indicators of traffic volume (Daily Traffic of Vehicles, Daily Traffic of Pedestrians) because the data were not collected for 2021, the year for which the targets was set. However, a traffic count was conducted one year after the bridge opening (2019). Although it is necessary to consider the influence of the COVID-19 pandemic that occurred after the traffic count, the traffic volume (12-hour daytime) in 2019 exceeded the forecasted traffic volume at the time of planning (24 hours) in the total number of vehicles, and the pedestrian count met the target at the time of planning. The survey of the project site at the time of the ex-post evaluation confirmed both internal traffic (pedestrians, motorcycles, and tractors) and transit traffic (pickup trucks, heavy freight vehicles, and construction vehicles) at the bridge. Based on the results of the traffic count in 2019 and a certain level of bridge use at the time of the ex-post evaluation, the two indicators of traffic volume were seen to have been almost achieved. Thus, it is concluded that this project mostly achieved the expected outcomes as planned.

[8] When providing the sub-rating, Effectiveness and Impacts are to be considered together.

Table 2 Quantitative Effects for the Effectiveness of the Project

	Baseline value	Target value	Actual value	
	2013	2020	2018	2021
		3 Years After Completion	Completion Year	3 Years After Completion
1) Travel Time for Crossing the River (minutes)	15	0.3	0.3	0.3
2) Hours Available for River Crossing (hours/day)	14	24	24	24
3) Days Available for River Crossing (days/year)	305	365	365	365
4) Daily Traffic of Vehicles (units/day)	235	461 (wet season) to 516 (dry season)	NA	NA
5) Daily Traffic of Pedestrians (persons/day)	290	330	NA	NA

Source: documents provided by JICA, Sekong DPWT

Note: The baselines for daily traffic of vehicles and daily traffic of pedestrians were based on traffic using river crossing boats. After the completion of the project, the ferry service was discontinued and only road traffic was used. However, traffic volumes were not collected in 2021.

Table 3 Traffic Volume (Total Number of Vehicle) after the Opening of Sekong Bridge

	Forecast	Actual (2019)[3]
	Traffic for 24 hours	Traffic for 12 hours
	1 year after opening	1 year after opening
Passenger Cars	127	343
Trucks 2 axles	33	30
Trucks 3 axles or more	33	7
Trailer trucks	7	5
Developed traffic[1]	32	NA
Total	232	385
Pedestrians (persons)[2]	(reference) 330	672

Source: documents provided by JICA

Note 1: Forecast includes developed traffic generated by the Sekong Bridge.

Note 2: The forecast for pedestrians was not calculated; therefore, The target for the operation and effectiveness indicator is shown for reference.

Note 3: Actual data are based on traffic count on February 13, 2019 (weekday) from 6am to 6pm.

Regarding the travel time for crossing the river, based on the survey of the project site and interviews with nearby residents, it was confirmed that no traffic congestion occurred at the Sekong Bridge. As no delays caused by traffic congestion occurred, smooth passage was possible. On the hours available for river crossing, the Sekong Bridge had remained open to traffic 24 hours a day (including at night) after project completion. The site survey also confirmed that safe passage was possible at night due to adequate lighting. On the days available for river crossing, the Sekong Bridge had never been closed to traffic after project

completion, even during stormy weather, and had remained open for use all year round. For the traffic volume in 2019, heavy cargo vehicles accounted for a small percentage of the total traffic volume due to the underdevelopment of customs clearance facilities at the Vietnamese border and the lack of the regional development around Dak Cheung. On the other hand, the number of pedestrians suggested the vitalization of regional traffic.

3.3.1.2 Qualitative Effects (Other Effects)

To find the qualitative changes in traffic associated with the outcome of this project "to resolve the missing link of National Road 16B."[9], structured interviews with residents (11 males and 10 females, total: 21) were conducted at six locations on the east bank of the Sekong River. The survey sites consisted of five villages along National Road 16B and one village (26 km away from National Road 16B) where satellite data (night light) showed significant changes.

Compared to the situation before the implementation of the project (2013), more than 70% of the residents replied that the frequency of their visits to both Sekong town and the market in the town had increased. Furthermore, all residents replied that the travel time from their houses to Sekong town had decreased due to the elimination of waiting time for river crossing boats at the Sekong River. The opening of the Sekong Bridge brought several benefits through the new possibility of travelling at night, including the ability to receive medical treatment at the provincial hospital in Sekong town, visits to friends and relatives, and the ability to bring farm products to the market at night and sell them early in the morning. On the east bank of the Sekong River, there are no hospitals where surgical operations can be performed. The Sekong Bridge therefore had a crucial role in allowing the treatment of emergency cases requiring surgery (such as caesarean sections, trauma, and appendicitis).

Table 4 Frequency of Outings Compared to 2013 (before Project Implementation)

Destination	More Frequent	Same	Less Frequent	Total
Sekong town	15 persons	5 persons	1 person	21 persons
	71%	24%	5%	100%.
Market	14 persons	5 persons	1 person	20 persons
	70%	25%	5%	100%.

Note: One respondent replied that a comparison was difficult for market visits.

[9] Interviews with residents were conducted in accordance with the questionnaire prepared in advance. The survey sites were Piamay (2 km from Sekong Bridge), Kasang Kang (29 km), Dack Triem (52 km), Xien Lnang (62 km), Turngbrong (80 km), and Dack Doh (81 km). The survey period was mid- to late-January 2023 and mid-May 2023.

Table 5 Reduction of Travel Time to Sekong town Compared to 2013 (before Project Implementation)

Yes	Yes to some extent	Same	No to some extent	No	Total
20 persons	1 person	0 persons	0 persons	0 persons	21 persons
95%	5%	0%	0%	0%	100%.

3.3.2 Impacts

3.3.2.1 Intended Impacts

The impact of this project was “economic and social development in the southern region of Laos." To show the current situation of impact, improvements in international and intra-regional logistics and changes in the lives and livelihoods of residents were assessed.

1) Quantitative Effects

Among the quantitative effectiveness indicators for this project, two indicators shown in the following table are relevant to the impact. The distance for international logistics achieved its target, and the time for international logistics mostly achieved its target. Compared to the situation before project commencement, the access from Sekong Province to Da Nang Port in central Vietnam had improved.

Table 6 Quantitative Effects for the Impact of the Project

	Baseline value	Target value	Actual value	
	2013	Year 2020	2018	2021
		3 years After Completion	Completion Year	3 years After Completion
1) Distance for International Logistics[1] (km)	Approx. 900	Approx. 280	NA	279
2) Time for International Logistics[2] (days)	7	2	NA	2-3

Source: documents provided by JICA, Sekong DPWT, interviews with private companies
Note 1: The baseline value for the distance for international logistics is between Sekong Province and Bangkok. The target and actual values are between Sekong Province and Da Nang.
Note 2: The baseline value for the time for international logistics is for Da Nang - Bangkok. The target and actual values are for Da Nang - Sekong Province - Bangkok.

Regarding the distance for international logistics, in addition to the implementation of this project, the improvement of roads, the customs facilities at the Vietnam border, and the simplification of custom clearance also facilitated exports from Da Nang Port via Dak Cheung (Laos/Vietnam border) in Sekong Province. Customs clearance data showed that a total of

4,697 vehicles (including 3,047 heavy freight vehicles with 6 wheels or more) passed through Dak Cheung in the two-year period from 2021 to 2022. Regarding the time for international logistics, according to private companies in Pakse and Sekong Province[10], no cargo was transported directly from Da Nang Port to Bangkok Port. Therefore, the total times required for Pakse - Da Nang Port, and Pakse - Bangkok Port/Laem Chabang Port were rounded up. The responses from private companies suggest that the time from Pakse to Da Nang Port is approximately 1 day and from Pakse to Bangkok Port/Laem Chabang Port 0.6 to 1.5 days. Thus, the total time was approximately 2 to 3 days from Da Nang Port to Bangkok Port/Laem Chabang Port.

2) Qualitative effects

The impact of the Sekong Bridge on logistics was also assessed through the aforementioned interviews with private companies in Pakse and Sekong Province. At the time of the ex-post evaluation, local companies processing cassava were utilizing National Road 16B to export their products from Da Nang port via the Dak Cheung border. Moreover, it was found that the Sekong Bridge was used for transporting agricultural products (cassava and coffee) from the east side of the Sekong River to processing plants. Local companies had made decisions to: (1) export goods that cannot be transported within Thailand (e.g., combustibles) from Da Nang port via the Dak Cheung border and (2) procure raw materials in Vietnam and import them via the Dak Cheung border. Japanese companies did not use the route over the Sekong Bridge because they exported from Bangkok and Laem Chabang ports using containers. Reasons given not to choose the route over the Sekong Bridge were: (1) National Road 16B is a mountainous road with steep gradients, which poses the risk of accidents and makes it difficult for container trucks to pass; and (2) the road had several sections damaged by landslides. Both local and Japanese firms had an intention to use the route through the Sekong Bridge on condition that the road from the Sekong Bridge to the Vietnamese border is improved as the route would reduce transportation time to an international trading port by the use of the Da Nang port.

To ascertain the changes in lives and livelihoods caused by the construction of the Sekong Bridge, interviews were conducted with residents in Sekong town (market, urban center, and north of the Sekong Bridge)[11]. While the revitalization of businesses relevant to trade with Vietnam could be confirmed, a broader impact on the economy was not clear due to the

[10] Five local companies and four Japanese companies were interviewed regarding changes in logistics after the completion of the Sekong Bridge.

[11] A total of 15 locations were surveyed (including 6 locations where satellite data showed changes in houses), with a total of 15 subjects (7 males and 8 females). The breakdown was 4 market locations (stores), 4 city center locations (stores and residences near the market), and 7 locations north of the bridge (village hall, gas station, school, residences, and an auto repair shop).

COVID-19 pandemic and inflation[12]. The results of the interviews are shown in the following table.

Table 7 Interview Results in Sekong Town

Location	Residents' Opinions
Market	Immediately after the Sekong Bridge was completed, the number of visitors to the market increased. Sales increased for the products that did not compete with those sold by merchants east of the Sekong River (clothing, sundries, herbal medicines). On the other hand, competition became more intense for products (such as vegetables) for which the number of sellers increased. Some respondents said that sales were sluggish due to inflation.
Central Area in the Town	After the completion of the Sekong Bridge, trade of agricultural products (cassava, and coffee) with Vietnam increased. Visitors from Vietnam frequently came to the town before the COVID-19 pandemic. Due to inflation, sales of some products (such as building materials) were sluggish. There were a few vacant lots in the area, and the respondents had the opinion that the number of residents had not increased.
North Side of the Sekong Bridge	After the opening of the Sekong Bridge, auto repair shops experienced an increase of revenue due to more tire changes for long-haul trucks bound for Vietnam. Middle school teachers commented that the use of river crossing boats was no longer needed. As a result, commuting time to school decreased and student absenteeism rates declined.

The improvement of the lives and livelihoods of the residents east of the Sekong River is shown in "3.3.2.2 Other Positive and Negative Impacts 3) Human Well-being".

3.3.2.2 Other Positive and Negative Impacts

1) Impacts on the Environment

This project was classified as Category B based on the JICA Guidelines for the Environmental and Social Consideration (April 2010) for sensitive sectors. Based on the guidelines, this project did not fall under a large-scale project in road, rail, and bridge sectors, and did not have sensitive characteristics or areas. Moreover, the Lao government approved the initial environmental assessment of this project prior to the start of the civil works (January 2014).

According to the construction supervision consultant, the protection measures (oil fences and anti-pollution nets, use of low-noise/low-vibration heavy equipment, and prohibition of night work) were implemented during construction in accordance with the plan. Moreover,

[12] The increase of consumer prices was 3.75% in 2021 and 22.96% in 2022 (Lao Statistics Bureau "Statistical Yearbook 2022"). Thus, the impact of inflationary found in this ex-post evaluation was mainly influenced by events after 2022.

monitoring of water quality, waste, noise/vibration, and accidents was also carried out during the construction in accordance with the plan. No problems were found, nor were their complaints from residents. On the other hand, no environmental monitoring had been conducted after project completion. Based on answers to the questionnaire and interviews with Sekong DPWT, no negative impacts on the natural environment were found and there were no complaints from residents after project completion. Not find negative impacts on the natural environment clearly attributable to this project were found through the inspection of the project site or interviews with residents.

2) Resettlement and Land Acquisition

In the project plan, land acquisition was expected to be completed prior to the start of the project. Based on the responses to the questionnaire to Sekong DPWT and interviews with the construction supervision consultant, it was confirmed that this project did not cause land acquisition and resettlement. The changes in the technical specifications in the completion notification did not involve land acquisition and resettlement.

3) Human Well-being

The interviews with residents in the six locations on the east bank of the Sekong River[13] covered opinions on (1) changes in life satisfaction compared to the time that the Sekong Bridge was opened, and (2) changes in factors related to life satisfaction (23 factors[14]) and the most important factors among these (up to 3 factors).

Regarding change in life satisfaction compared to the time that the Sekong Bridge was opened, 90% (19 persons) of all respondents (21persons) replied that they were "More satisfied" or "Much more satisfied," showing an increase in life satisfaction (see next table). The increase in life satisfaction was also consistent with the realization of the outcomes (reduction of travel time, year-round use of the bridge, nighttime travel, and more frequent visits to Sekong town), and no decrease in satisfaction due to unexpected reasons was found.

Table 8 Life Satisfaction Compared to 5 years ago (Opening of the Sekong Bridge)

Much less satisfied	Less satisfied	More satisfied	Much more satisfied	I don't know.	Total
0 persons	0 persons	13 persons	6 persons	2 persons	21 persons
0%	0%	62%	29%	10%	100%.

[13] The interviewees are the same persons in the interviews in "3.3.1.2 Qualitative Effects (Other Effects)."

[14] Household income/assets, income inequality, availability of housing, quality of housing, health, education, negative impacts on the natural environment, access to the natural environment, connection with community, connection with family, helping other people, safety, violence, level of trust in the government, participation in political decision-making, free choice of what to do in life, discrimination and exclusion, availability of employment, job satisfaction, work-life balance, enough rest, proficiency in the mother language, respect for cultural norms of behavior

On the most important factors related to life satisfaction, 14 of the 19 respondents who replied that they were “More satisfied” or "Much more satisfied" with their lives mentioned factors relevant to the Sekong Bridge. The factors most frequently mentioned by respondents was household income/assets (8 respondents), followed by availability of employment (3 respondents), and level of trust in the government (3 respondents). All factors relevant to the Sekong Bridge are summarized in the following table.

Table 9 Most Important Factors in the Change of Life Satisfaction

Factors	Number of Respondents	Relevancy with the Sekong Bridge
Household Income/Assets	Eight persons	Road improvements of National Road 16B, including the Sekong Bridge resulted in (1) an increase in visits by middlemen who purchase crops, (2) easier transportation of crops to the market in Sekong town, and (3) selling meals and general merchandise to drivers.
Availability of Employment	Three persons	After the road construction of National Road 16B, including the Sekong Bridge, (1) sales of coffee and cassava increased. New plantations were started, or the area of plantations increased, and (2) stores were opened to sell products to drivers. As a result, employment was created.
Level of Trust in the Government	Three persons	Because of the road improvements on National Road 16B, including the Sekong Bridge, the respondents felt that the government was interested in the development of the region.
Quality of Housing	Two persons	After the road construction of National Road 16B, including the Sekong Bridge, (1) an increase of income enabled the replacement of roofs and (2) construction materials became more readily available.
Health	Two persons	There are no clinics available in their neighborhood at night. With the road improvement of National Road 16B, including the Sekong Bridge, people could receive medical care at the hospital in Sekong town when it was needed (including at night).
Education	Two persons	A nearby high school was located in Sekong town. Due to the road construction of National Road 16B, including the Sekong Bridge, students could commute to the school without payment for river crossing boats or boarding.

The survey revealed two impacts not normally expected from bridge projects: (1) the creation of trust in the government through the construction of the bridge contributing to life satisfaction, and (2) improvement of housing quality due to easier access to building materials.

4) Gender Equality, Marginalized People, Social Systems and Norms, and Human Rights

Ethnic minorities comprise a high percentage of the population east of the Sekong River, and the Sekong Bridge has improved access to social infrastructure (schools, hospitals, and markets) for the residents in the region. Regarding gender equality, social systems/norms, and human rights, no negative impacts on the residents were found.

As shown in "3.3.1.1 Quantitative Effects (Operation and Effect Indicators)," the expected outcomes were achieved mostly as planned. Additionally, qualitative effects such as an increase in visits to Sekong town and improved access to social infrastructure were evident. There were several impacts including improved access to Da Nang port, the transportation of agricultural and processed products, and the improvement of the lives and livelihoods of the residents on the east bank of the Sekong River. This project has mostly achieved its objectives. Therefore, effectiveness and impacts of the project are high.

3.4 Sustainability (Rating: ②)

3.4.1 Policy and System

At both the time of planning and that of the ex-post evaluation, the Lao government's *Five-Year National Socio-Economic Development Plan* emphasized the enhancement of connectivity with neighboring countries and the development of the relevant roads for the implementation of this policy. Following this policy, the Lao government completed the construction of a road from Sekong town to the Vietnam border after the commencement of this project. At the time of the ex-post evaluation, no policy or institutional changes had occurred that would impair the realization of the project effects.

3.4.2 Institutional/Organizational Aspect

At the time of the ex-post evaluation, Sekong DPWT was responsible for the maintenance of the Sekong Bridge with the maintenance support of DOR as originally planned. Laos introduced a Bridge Management System (BMS), which stored and updated records of periodic inspections, diagnoses, repairs, and reconstruction. Sekong DPWT having reported the results of periodic inspections of bridges, including this bridge, to DOR, DOR prioritized maintenance activities based on BMS. In the cases that Sekong DPWT could not manage, DOR directly conducted inspections and ordered repair works. As Sekong DPWT was not directly engaged in cleaning and repair works, the maintenance works were outsourced to private companies. Sekong DPWT was responsible for supervision of maintenance works and quality control of repair works. In addition to Sekong DPWT, Offices of Public Works and Transport (OPWT) in each district participated in the quality control of bridge inspections and repair works.

At the time of the ex-post evaluation, Sekong DPWT had assigned three officials, all of which

were engineers, to the maintenance of national roads (including bridges). According to Sekong DPWT, the number of staff was sufficient, as Sekong DPWT was not directly engaged in cleaning and repair works.

From the above, it can be confirmed that a system and structure for operation and maintenance has been established.

3.4.3 Technical Aspect

At the time of the ex-post evaluation, DOR was regularly conducting training on bridge maintenance, and the officers of Sekong DPWT participated in the training in 2019 and 2023. The main contents of the training included bridge inspection/diagnosis, selection procedures for repair works, and the operation of BMS. JICA technical cooperation *"The Project for Capacity Development on Bridge Maintenance and Management"* was supporting DOR for training for bridge maintenance.

JICA technical cooperation *"Project for Improvement of the Road Management Capability"* prepared a bridge maintenance manual, and the manual was being used by Sekong DPWT. However, the manual was intended to be used for conventional girder bridges and did not cover the maintenance works required for an extra-dosed bridge like the Sekong Bridge. The contractor developed a maintenance manual for the Sekong Bridge of this project which included works that are not performed on conventional girder bridges (e.g., inspection of elevated areas, inspection and replacement of cables, etc.). However, the project did not conduct training on the maintenance of extra-dosed bridges as it was not assessed whether the Sekong DPWT could technically implement the maintenance of the Sekong Bridge at the time of planning. At the time of ex-post evaluation, JICA's technical cooperation project "*The Project for Capacity Development on Bridge Maintenance and Management*" supported the relevant authorities in acquiring bridge maintenance capability. However, Sekong DPWT had no experience in the maintenance of extra-dosed bridges and needed further capacity building in this field as they faced difficulties in maintenance works that were not usually performed for conventional girder bridges. Moreover, DOR pointed out that the lack of equipment necessary for the maintenance of extra-dosed bridges (such as aerial ladder trucks and drones) had become a technical constraint.

Based on the interviews with the construction supervision consultant, it was found that expansion joints and cables were available in neighboring countries (Thailand and Vietnam). Companies in Laos had experience in the replacement of expansion joints, but they had limited experience in the replacement of cables.

The above indicates that there are some problems with the operation and maintenance techniques.

3.4.4 Financial Aspect

While the DPWT of each province is responsible for maintenance works on national roads, the MPWT, a central government ministry, is in charge of maintenance and budget allocation for national roads overall. The maintenance budget for national roads is provided from the Road Fund administered by MPWT. The DPWT of each province provides its budget rationale and submits a budget request. After MPWT approves the request, the budget is allocated to the DPWT of each province in the year following the request.

The Sekong Bridge is a part of National Road 16B, for which the warranty period has not yet ended. Therefore, at the time of the ex-post evaluation, no maintenance budget had been allocated for the Sekong Bridge, as a part of National Road 16B. According to Sekong DPWT and DOR, it was expected that the Sekong Bridge will make a budgetary request based on the inspection in 2023 and that a maintenance budget will be allocated in 2024 and thereafter.

As shown in the following table, the road maintenance budget (for all grades of roads except private roads) in Sekong Province decreased over the past three fiscal years.

Table 10 Road Maintenance Budget for Sekong DPWT (Allocated Amount)

Unit: thousand Lao kip

FY 2021	FY 2022	FY 2023
6,888,888	4,997,000	3,199,000

Source: Sekong DPWT

Applying the inflation rate (GDP deflator) for 2014 - 2022 to the maintenance budget requirement which had been estimated at the time of planning, the routine maintenance of the Sekong Bridge would require (1) 438 million kip annually, (2) 162 million kip for periodic maintenance (every 5 years), and (3) 71 million kip for emergency maintenance (every 2 years). The sum of (1), (2), and (3) results in an average annual expenditure requirement of 506 million kip. Sekong Province allocated 3,199 million kip for the maintenance budget in 2023 and the annual expenditure requirement was equivalent to 16% of the total maintenance budget in Sekong Province. Sekong DPWT and DOR placed high importance on the Sekong Bridge and made efforts to obtain maintenance budget. However, it would be difficult to allocate almost 20% of the total maintenance budget in the province only to the maintenance of the Sekong Bridge. While both the Sekong DPWT and DOR recognized the need for preventive maintenance in line with advance planning, they needed to give priority to severe damage in the road network requiring immediate treatment. As the Sekong Bridge was completed in 2018 and therefore the timing for periodic maintenance was drawing near, it would be difficult to secure a budget for periodic maintenance of a strong preventive nature.

The above indicates that there are some problems with the operation and maintenance finances.

3.4.5 Environmental and Social Aspect

As discussed in "3.3.2.2 Other Positive and Negative Impacts", it was concluded that no significant negative impacts had occurred in either the environmental or social aspects at the time of the ex-post evaluation. Based on answers to the questionnaire by Sekong DPWT, to interviews with them, and the survey of the project site, no negative impacts on the natural environment directly attributable to the project were found, as protection measures had been taken during construction in accordance with the plan. Moreover, no land acquisition or resettlement occurred during project implementation.

3.4.6 Preventative Measures to Risks

At the time of planning, it was pointed out that (1) environmental changes and natural disasters, such as flooding exceeding forecasts in the project area, would affect the achievement of the project goals, and (2) the prevention of overloading and its control would affect the service life of the bridge.

Between project completion to the time of the ex-post evaluation, the revetment was inspected when the water level of the Sekong River rose significantly. Flooding has not caused damage to the revetment and there has been no major flooding disrupting traffic since project completion. Overloading had not caused significant damage to the Sekong Bridge at the time of the ex-post evaluation. However, the vehicle weigh station closest to the Sekong Bridge is located near the Vietnamese border, and therefore, there was not sufficient enforcement on traffic from the Pakse side.

No serious problems had arisen regarding the above risks (natural disasters, overloading) assumed at the time of planning. Nevertheless, overloading would lead to damage of the pavement of the bridge, and the deterioration of the pavement of the sections near the bridge might be the result of traffic volume. For this reason, it is desirable to enhance the enforcement in the long run.

3.4.7 Status of Operation and Maintenance

The following table summarizes the current condition of the Sekong Bridge based on visual inspection during the survey of the site visit.

Table 11 Present Condition of the Sekong Bridge

Visually Inspected Parts	Present Condition
Bridge Superstructure	There were no cracks or delamination on the pavement and no chips in the concrete structure. There were no abnormalities in the cables or expansion joints. Driveways and sidewalks had been swept and weeded, and drainage inlets had been cleaned. Many of the metal lids for drainage inlets were missing due to theft, and the concrete cover in the sidewalk drainage ditch was damaged at one location. No defects were found in the roadway lighting.
Bridge Substructure	There was no concrete chipping, and no scouring had occurred on the abutments placed on the embankment.
Approach Road	There were no cracks or delamination on the pavement. The markings on the road surface were identifiable. The guardrails were not damaged, and no collapse had occurred on the road slopes. However, there were some areas that had not been adequately weeded or cleaned. No defects were found in the roadway lighting.
Bank Protection	There were no cracks and no concrete chipping. Sekong DPWT had inspected this structure after floods and no serious damage had occurred to date.

Drainage Hole in the Main Bridge
(Lid is missing)

Drainage Ditch in the Approach Road
(Filled with weeds and trash)

Based on Sekong DPWT's answers to the questionnaire, interviews with them, and the inspection of the project site, it was found that the Sekong Bridge and the approach road had minor damages, but no serious damages that would affect the effectiveness of the project were found. Although no maintenance budget had been allocated to the Sekong Bridge at the time of the ex-post evaluation, the bridge was cleaned several times a year by residents and government officials.

Based on the above, no serious problems in the status of operation and maintenance are considered to have occurred.

Some minor issues have been observed in the technical and financial aspects. They are not expected to be improved/resolved. Therefore, sustainability of the project effects is moderately low.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

This project is to resolve the missing link of National Road 16B which is an international trunk road, by building Sekong Bridge in the Southern region of Laos. This project, which strengthened connectivity with neighboring countries, was in line with the development policy and development needs of Laos. The project was also in line with Japan's ODA policy. The project was coordinated with other JICA projects and other organizations, and tangible results were found. Therefore, its relevance and consistence are high. The output of the project was in line with the plan. While the project cost was within the plan, the project period exceeded the plan due to the delay in the construction period. From the above, it can be concluded that the efficiency of the project is high. The indicators for effectiveness almost achieved their targets, and the qualitative effects (such as an increase of visits to Sekong town, improvement of the access to social infrastructure) were also evident. Impacts included improvement in the access to Da Nang port, the transportation of agricultural and processed products, and an improvement in the lives and livelihoods of residents on the east bank of the Sekong River. This project has mostly achieved its objectives. Therefore, effectiveness and impacts of this project are high. Some technical and financial issues remain in the operation and maintenance of the project. The Sekong bridge is an extra-dosed bridge, but the government units in charge of maintenance do not have sufficient technology to conduct maintenance on bridges of this type. In addition, it has been difficult to secure the amount of the maintenance budget which was assumed at the time of planning. Therefore, sustainability of the project effects is moderately low.

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

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

The Sekong Bridge, which was constructed by this project, is an extra-dosed bridge. Securing the necessary equipment and revising the maintenance manual for the maintenance of this type of bridge in Laos have been an issue. Sekong DPWT had no experience in the maintenance of this type of bridge and needed to improve its maintenance capacity. Moreover, at the time of the ex-post evaluation, no maintenance budget had been allocated for the Sekong bridge. In consideration of the above situation, it is recommended that Sekong DPWT conduct an inspection of the Sekong Bridge within its current technical capacity and immediately request a

maintenance budget for the bridge. In addition, DOR is expected to provide maintenance budget for the bridge and conduct prompt assessment on measures to strengthen the maintenance of extra-dosed bridges (such as revision of the manual) by ongoing projects.

4.2.2 Recommendations to JICA

None

4.3 Lessons Learned

Utilization of Soft Components to Improve Maintenance Capacity

The bridge constructed by this project is an extra-dosed bridge, and at the time of the ex-post evaluation, there were very few bridges of this type in Laos. Therefore, the relevant government units do not have the sufficient knowledge and experience in the maintenance of extra-dosed bridges. In cases where the type of bridge is rare in the recipient country at the time of project planning, JICA and the implementing agency should assess the maintenance capacity of the relevant government units and, if necessary, incorporate a soft component to the project.

5. Non-Score Criteria

5.1 Performance

5.1.1 Objective Perspective

In this project, construction work was delayed due to reasons such as longer procedures for the import of materials and equipment and re-construction to ensure construction quality. The reconstruction was caused by a defect in subcontractor's construction work. The reason for the re-construction was a construction problem that insufficient preparation of the subcontractor caused the interruption of cement placement during the concrete placement. The contractor promptly reported the above-mentioned delays. Information about the causes of the delays was shared in a timely manner between the contractor, the construction supervision consultant, JICA, and DOR and responses to resolve the problems were made. Although the project was delayed, it is considered that there were no serious problems in the supervision of this project.

5.2 Additionality

None

(End)