Kingdom of Cambodia

FY2023 Ex-Post Evaluation Report of Grant Aid Project

"The Project for Urgent Replacement of Bridges in Flood-Prone Areas"

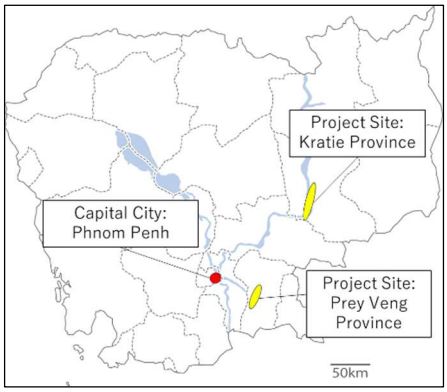
External Evaluator: Nobuyuki Kobayashi, OPMAC Corporation

0. Summary

The objective of this project is to ensure safe, smooth and stable transportation and logistics in flood-affected areas and to reduce vulnerability to natural disasters by the replacement of seven bridges and improvement of approach roads on National Road No. 11 and National Road No. 73 in Prey Veng Province and Kratie Province, Cambodia. The project improved transportation infrastructure and was consistent with the development policy and needs of Cambodia and with the ODA policy of Japan. For both internal coherence and external coherence, the effects of collaboration between the project and other projects were found, and its relevance and coherence are high. The output of the project was in line with the plan, and the project cost and project period were within the plan. Therefore, efficiency of the project is very high. The indicators for the effectiveness of the project achieved their targets, and no traffic disruption on the project bridges has occurred due to flooding since project completion. In some areas, the elimination of waiting times at the bridges has allowed commuters to get to work or school on time, and the convenience of transporting crops to market has improved. As for impact, an increase of employment in the service industry and an increase in the number of middlemen for agricultural products have been suggested. This project has achieved its objectives. Therefore, effectiveness and impacts of the project are high. There were no significant changes in the policy and system aspects after project commencement. For the organizational/institutional aspect, the division of roles among the government agencies involved in the maintenance of the project bridges has been well-defined, and the agencies involved have acquired the skills necessary for maintenance. On the other hand, preventive maintenance (periodic maintenance) accounted for 5% and 11% of the road maintenance budgets in Prey Veng Province and Kratie Province, respectively. These were sizable portions of the maintenance budgets of both provinces. The temporary bridges, which were constructed prior to project implementation, needed to be removed as soon as possible, but this has not yet been done due to a lack of budget in the executing agency. There is a risk that the remaining piers of the temporary bridge may collapse. If this happens, it may affect the traffic on the project bridge. For these reasons, the sustainability of the project effects is moderately low.

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

1. Project Description



Project Locations
(Source: Evaluator's Photo)

Bridge after Replacement (Prek Chhloung Bridge) (Source: Evaluator's Photo)

1.1 Background

Cambodia is located in the downstream area of the Mekong River, and much of its land is low-lying. The geographical characteristics of the country make it prone to flooding caused by a rise in the water level of the Mekong River, and large-scale flooding occurred in 2011 and 2013. In particular, the flooding during the rainy season of 2013 caused enormous damage to the country. Disaster victims were over 1.7 million people, and more than 140,000 people were forced to evacuate.

National Road No. 11 runs along the eastern bank of the Mekong River and functions as a major north-south transport route connecting National Road No. 1, National Road No. 7 and National Road No. 8 (see Figure 1). National Road No. 73 is also a major route for the transport of goods between the capital Phnom Penh and the northeast region, and the road follows a route along the Mekong River in Kratie Province. Both National Road No. 11 and National Road No. 73 go through the flood zones of the Mekong River where many temporary bridges were unusable during the floods. Moreover, the temporary bridges on National Road No. 11 were seriously damaged, and heavy vehicles exceeding the maximum load of 15 tons used National Road No. 73. Therefore, it was an urgent issue to replace the temporary bridges, which were at high risk of collapsing, on both national roads and to secure transport routes during floods.

With this background, this project supported the Road Infrastructure Department (RID) under the Ministry of Public Works and Transport (MPWT) for the replacement of the two temporary bridges on National Road No. 11 in Prey Veng Province and the five temporary bridges on National Road No. 73 in Kratie Province.

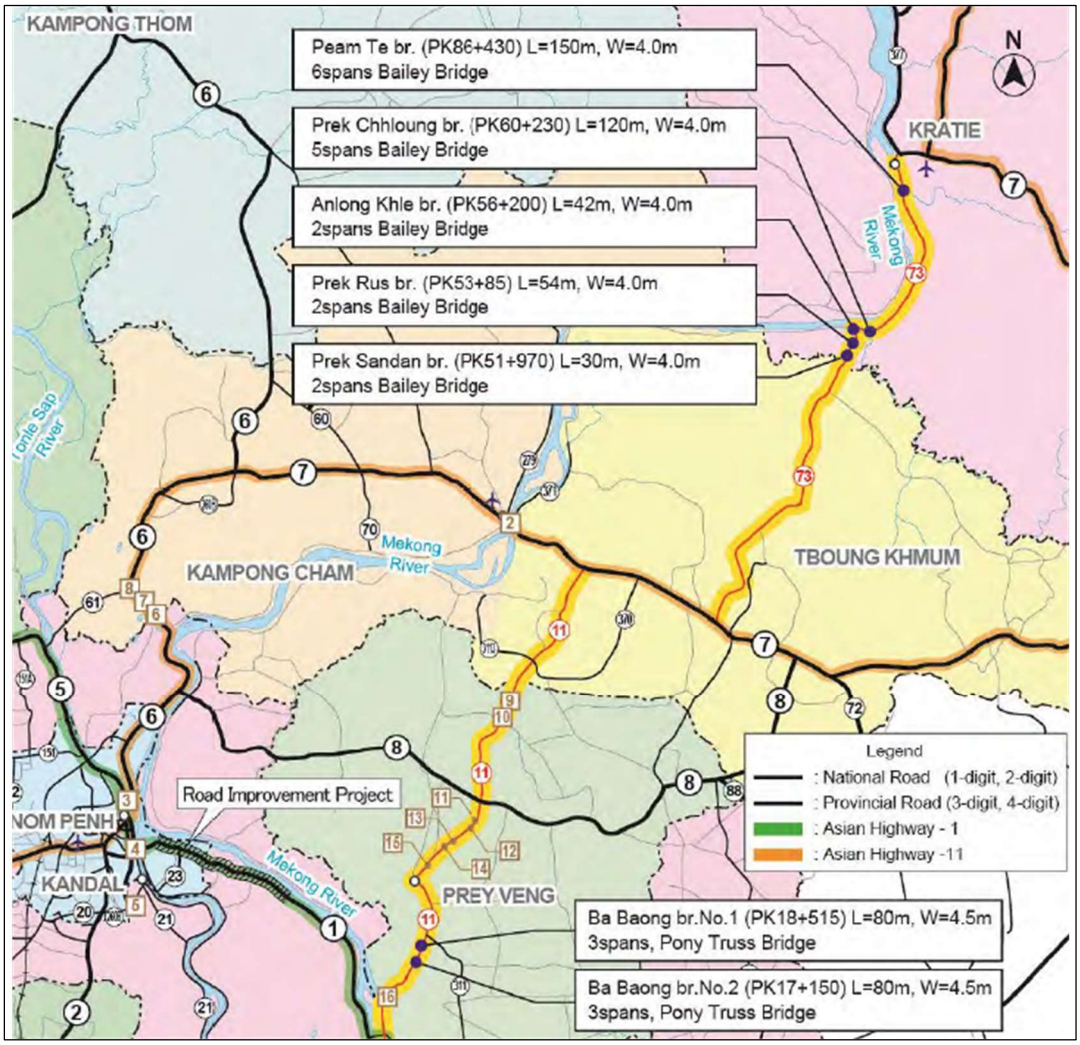


Figure 1 Project Area at the Time of the Planning (2017)

(Source: the preparatory survey report for the Project for Urgent Replacement of Bridges in Flood-prone Areas)

1.2 Project Outline

The objective of the project is to ensure safe, smooth, and stable transportation and logistics and reduce vulnerability to natural disasters in flood-affected areas by replacement of the bridges and improvement of the approach roads on National Roads No. 11 and No. 73 in Prey Veng Province and Kratie Province, thereby contributing to the economic development of the project areas.

Grant Limit / Actual Grant Amount	3,942 million yen / 3,582 million yen
Exchange of Notes Date / Grant Agreement Date	October 2017 / November 2017

Executing Agency	Ministry of Public Works and Transport
Project Completion	November 2020
Target Area	Prey Veng Province and Kratie Province
Main Contractor	HAZAMA ANDO CORPORATION
Main Consultant	CTI Engineering International Co., Ltd.
Preparatory Survey	May 2016 - August 2017
Related Projects	[Technical Corporation] The Project for Strengthening Capacity for Maintenance of Roads and Bridges (2015-2018) [World Bank] Cambodia Road Connectivity Project (2020 - 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: November 2023-Feburary 2025

Duration of the Field Study: March 3, 2024-March 22, 2024, July 28, 2024-August 6, 2024

2.3 Constraints During the Evaluation Study

Among the operation and effect indicators selected in the ex-ante evaluation, the actual values at the time of the ex-post evaluation were not available for the indicators for the impact of the project (Passengers on National Road No. 11 and National Road No. 73 and Cargo Volume on National Road No. 11 and National Road No. 73). The baseline and target values for the above indicators were based on the origin of destination survey for vehicles conducted at the time of planning, but no similar surveys were conducted after the project was completed. Therefore, in consultation with MPWT and DPWT of both provinces, trade data between Cambodia and Vietnam were selected as alternative indicators for analyzing the quantitative effects in the Impact.

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 Cambodia

In *the National Strategic Development Plan 2014-2018*, the national development plan at the time of the planning, the development of physical infrastructure was one of the four key areas. As the important areas to be addressed in infrastructure development included "development of transport and urban infrastructures," a policy was set out to develop 3,500 km of roads during the period of the plan. In the core strategy of "good governance," it was planned that investment in transport infrastructure, including bridges, would be made, and that in particular, attention would be paid to the development of transport systems in rural areas for sustainable growth.

At the time of the ex-post evaluation, the national development plan *National Strategic Development Plan 2019-2023*, had four priority areas, one of which was "economic diversification." This area included the improvement of logistics systems and the strengthening of transport. The plan pointed out that road infrastructure was inadequate to meet the increasing demand for transportation. As part of infrastructure development, the plan was to build or rehabilitate 3,000 km of roads during the period of the plan, and to start using the newly built bridges on National Roads No. 11 and No. 73. Moreover, *the Comprehensive Master Plan on Cambodia Intermodal Transport and Logistics System* (formulated in 2023) mentioned repair works on National Road No. 73 (scheduled from 2023 to 2027) and repair work on National Road No. 11 (scheduled from 2028 to 2033) as priority projects for the improvement of logistics.

At the times of both the planning stage and the ex-post evaluation, the national development plans emphasized the need to strengthen transport infrastructure and promoted road development. Moreover, the national development plan at the time of the ex-post evaluation and *the Comprehensive Master Plan on Cambodia Intermodal Transport and Logistics System* envisioned the replacement of, and repair works on, bridges on National Road No. 11 and National Road No. 73.

3.1.1.2 Consistency with the Development Needs of Cambodia

At the time of planning, the two bridges on National Road No. 11 and the five bridges on National Road No. 73 were all temporary bridges, and there was a risk that they might collapse due to infrastructure damage or the passage of heavy vehicles. National Road No. 11 was connected to National Road No. 8 and functioned as a complementary route to National Road No. 1. National Road No. 73 was connected to National Road No. 7 and became a part of the logistics route connecting the capital city Phnom Penh with the northeastern part of Cambodia.

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

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

National Road No. 7 avoided the flood zone of the Mekong River, and National Road No. 73 served as a short-cut route of National Road No. 7. Furthermore, it was expected that it should be possible to cross the river even during Mekong River floods as the height of the bridges would be raised as part of the project. For this reason, the project was expected to contribute to emergency support and reconstruction in the region at the time of disaster.

At the time of the ex-post evaluation, all of the temporary bridges on National Road No. 11 had been replaced as planned, and they could be used as part of the detour for National Road No. 1. Based on interviews with truck drivers, it was discovered that National Road No. 73 was being used as a shorter route for National Road No. 7[3]. Road construction had been implemented on a 0-50 km section of National Road No. 73 (Tboung Khmum Province), and on both Provincial Road No. 377 and Provincial Road No. 377A (Kratie Province), which were connected to National Road No. 73. National Road No. 71C, which connects to National Road No. 73, was also constructed. As the project raised the height of the bridge girders to accommodate a rise in the water levels of floods caused by climate change, the bridge design can withstand a water level higher than the flood with a 50-year probability, which is common in Japan.

At the times of both the planning and the ex-post evaluation, National Road No. 11 was being used as a complementary route of National Road No. 1, and National Road No. 73 was being used as a complementary route of National Road No. 7. At the time of the ex-post evaluation, the development of National Road No. 73 and the roads connecting to the national road was ongoing, and this showed a strong need for the development of roads in the northeastern part of Cambodia. In addition, the design of the road can withstand a higher water level at the time of floods. Based on the above, it is concluded that the project met development needs both at the time of planning and at the time of the ex-post evaluation.

3.1.1.3 Appropriateness of the Project Plan and Approach

The project brought the intended results, and no errors in the project logic or unforeseen external conditions were found. As a lesson learned from a similar project in the past, the executing agency of this project (MPWT) needed to improve its bridge maintenance capabilities with additional training. As described later (see “3.1.2.2 Internal Coherence”), MPWT has improved road and bridge maintenance capabilities through JICA’s technical cooperation project.

[3] Interviews with four truck drivers were conducted between the Anlong Khle Bridge and the Prek Rus Bridge in Kratie Province.

3.1.2 Coherence (Rating: ③)

3.1.2.1 Consistency with Japan's ODA Policy

At the time of planning, *the Country Assistance Policy for Cambodia* (formulated in 2017) emphasized the strengthening of the logistics network, including roads, and the policy supported both the improvement of regional connectivity and industrial promotion. JICA's *Country Analysis Paper for the Kingdom of Cambodia* (formulated in 2014) emphasized "strengthening the economic foundation" and, thus, concluded that it was necessary to provide support for improving domestic connectivity in terms of "developing economic infrastructure." This project replaced the temporary bridges on National Road No. 11, which complements the main national highway, and National Road No. 73, which is a part of the trunk road connecting the capital Phnom Penh with the northeast part of the country. The project outcome included "ensuring safe, smooth, and stable transportation and logistics." Based on the above, it is concluded that the scope and the outcome of the project were in line with the priorities of the ODA policy at the time of planning.

3.1.2.2 Internal Coherence

At the time of planning, it was assumed that the maintenance capabilities to be strengthened by *the Project for Strengthening Capacity for Maintenance of Roads and Bridges* (2015-2018), a JICA technical cooperation project, would be utilized in maintenance for the project. At the time of the ex-post evaluation, the road and bridge maintenance manuals prepared by the above technical cooperation project were being used by RID, DPWT of Prey Veng Province, and DPWT of Kratie Province. The contents of the maintenance manuals covered routine maintenance[4] and preventive maintenance (periodic maintenance)[5] of roads and bridges. RID was using the bridge inventory established by the above technical cooperation project for maintenance planning. The use of the maintenance manuals and the bridge inventory was contributing to the improvement of maintenance capabilities, and tangible results of the coordination were confirmed.

3.1.2.3 External Coherence

At the time of planning, it was decided that the project would replace two bridges on National Road No. 11 and that road improvement (e.g., road widening) would be conducted with the support of the Chinese government. Based on the responses to the questionnaire and interviews with the executing agency, it was found that the entire section of National

[4] Routine maintenance means works such as repairing potholes and cracks on the pavement, cleaning, weeding.
[5] Preventive maintenance (periodic maintenance) means works such as an overlay of pavement, close visual inspection and repairs to bridges.

Road No. 11 had been improved with the support of the Chinese government by the time of the ex-post evaluation. National Road No. 11 was widened, and all temporary bridges were replaced with permanent bridges, which ensured smooth traffic on the road. For National Road No. 11, the design of the approach roads to the bridges constructed by the project was changed to fit the alignments of the road supported by the Chinese government. Moreover, the World Bank funded the *Cambodia Road Connectivity Project* (2020 - present) and the project has been improving sections of 0 - 50 km on National Road No. 73, Provincial Road 377, and Provincial Road 377A. The project is expected to facilitate regional transportation in the northeastern part of Cambodia.

According to DPWT in both provinces, and the police, bridge replacement under the project and road development by other donors will ensure the running of traffic during Mekong River floods. Therefore, the project is also in line with Goal 9 of SDGs, "Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation."

For Relevance, the project matched the development policy and the development needs of Cambodia. For Coherence, the project was consistent with Japan's ODA policy, and tangible results were confirmed through collaboration between the projects supported by JICA and other donors. Therefore, its relevance and coherence are high.

3.2 Efficiency (Rating: ④)

3.2.1 Project Outputs

The output of this project was as planned, and there were no changes that affected the effectiveness of the project (see Table 1). The design changes were mainly (1) changes in the alignment of the approach roads of the two bridges on National Road No. 11, and (2) changes in the slope protection of the two bridges.

Table 1 Output of the Project (Planned and Actual)

Planned	Actual
1) Civil Works ・ Replacement works for two bridges on National Road No. 11 and five bridges on National Road No. 73 ・ Construction of approach roads attached to the above bridges ・ Total length of construction: 4,094m (including total length of bridges 670m)	1) Civil Works As planned
2) Consulting Services ・ Detailed design, tender assistance, and construction supervision	2) Consulting Services As planned

Source: documents provided by JICA

Table 2 List of Bridges Replaced by the Project

Road	Province	Bridge Name	Construction Length	Bridge Length	Sidewalk
National Road No. 11	Prey Veng Province	Ba Baong No. 1	685 m	105 m	No
		Ba Baong No. 2	720 m	105 m	No
National Road No. 73	Kratie Province	Peam Te	700 m	175 m	Yes
		Prek Chhloung	554 m	140 m	Yes
		Anlong Khle	480 m	48 m	No
		Prek Rus	505 m	62 m	No
		Prek Sandan	450 m	35 m	No

Source: documents provided by JICA

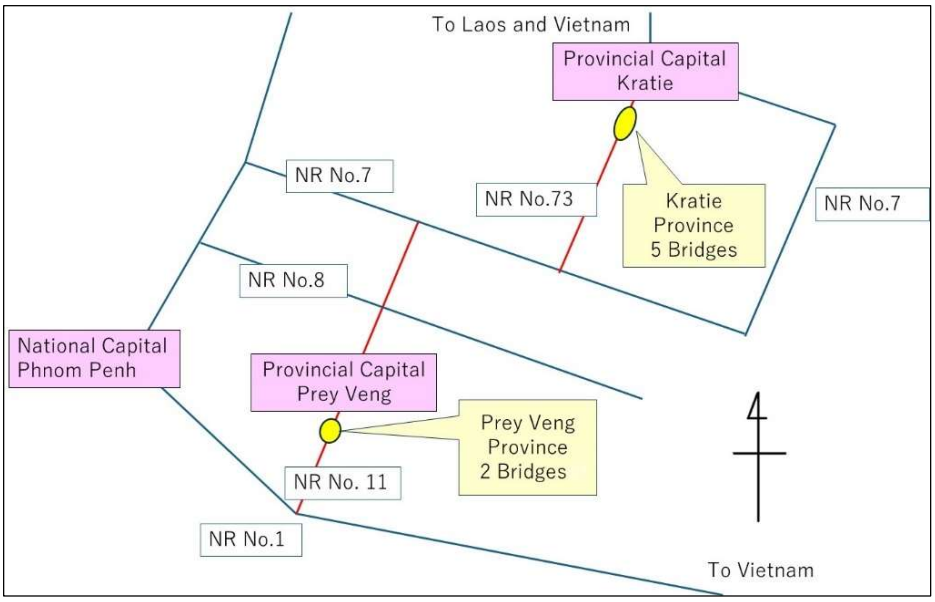

Figure 2 Schematic of the Project (Source: Evaluator's Figure)

Photo 1 Bridge after Replacement (Ba Baong No. 1 Bridge) (Source: Evaluator's Photo)

Photo 2 Bridge after Replacement (Ba Baong No. 2 Bridge) (Source: Evaluator's Photo)

Photo 3 Bridge after Replacement (Peam Te Bridge) (Source: Evaluator's Photo)

Photo 4 Bridge after Replacement (Prek Rus Bridge) (Source: Evaluator's Photo)

3.2.2 Project Inputs

3.2.2.1 Project Cost

The actual project cost was 3,807 million yen (3,582 million yen for the Japanese side and 225 million yen for the Cambodian side), compared to the planned amount of 4,156 million yen (3,942 million yen for the Japanese side and 214 million yen for the Cambodian side), which was within the plan (92% of the plan). The project costs on the Japanese side were 91% of the plan, and those on the Cambodian side were 105% of the plan. Based on the interview with the construction supervision consultant, it was understood that the bidding had been highly competitive as three companies submitted bids for the civil works for the construction of the bridge. The actual cost for civil works borne by the Japanese side was 3,276 million yen, compared to the planned amount of 3,439 million yen. As a result, the cost reduction of civil works led to a decrease in the project cost. In addition, the project cost increased by 19 million yen, mainly due to an increase in personnel expenses resulting from the extension of the project

period, which was caused by the COVID-19 pandemic. However, the project cost was within the plan.

3.2.2.2 Project Period

The project was implemented from November 2017 to November 2020 (37 months). At the time of planning, the project period was expected to be from November 2017 to August 2020 (34 months). However, the project period was changed to November 2017 to November 2020 (37 months) during project implementation due to COVID. Since this change can be confirmed by a formal agreement with the executing agency based on an amended contract dated September 14, 2020, the project period after this revision was used as the planned period in the ex-post evaluation.

The result is 100%[6] by comparing the planned (37 months) and actual (37 months) after this revision.

Therefore, efficiency of the project is very high.

3.3 Effectiveness and Impacts[7] (Rating: ③)

3.3.1 Effectiveness

3.3.1.1 Quantitative Effects (Operation and Effect Indicators)

The outcome envisioned by the project includes "ensuring safe, smooth, and stable transportation and logistics in flood-affected areas." To measure the effectiveness of the project, the six indicators were selected in the ex-ante evaluation (see the following table).

[6] The actual project period (37 months) is 109% of the project period originally planned (34 months).
[7] When providing the sub-rating, Effectiveness and Impacts are to be considered together.

Table 3 Operation and Effect Indicators of the Project

		Baseline Value	Target value	Actual value			
		2016	2023	2020	2021	2022	2023
			3 Years After Completion	Completion Year	1 Year After Completion	2 Years After Completion	3 Years After Completion
Pause time before the bridge (seconds/unit)	NR11	114	0	0	0	0	0
	NR73	42-162	0	0	0	0	0
Shortening transit time (minutes)[1]	NR11	46	40	35	35	35	35
	NR73	60	47	59	59	55	54
Number of freight vehicles of 15 tons or more (vehicles/day)[2]	NR73	0	260	NA	NA	NA	NA
Shortening time by conversion from National Road No. 7 to NR73 for freight vehicles of 15 tons or more (minutes)[3]	NR73	214	140	210	200	180	140

Source: documents provided by JICA, the executing agency, etc.

Note 1: Average travel time (one-way) at morning and evening peak hours and off-peak for the measurement section. According to the construction supervision consultant, the indicator for National Road No. 73 was shown as a round trip (120 minutes) in the ex-ante evaluation sheet. However, the baseline and the target values in the table were revised to be for one-way with the assumption of a reduction of 13-minutes for a one-way trip.
Note 2: A traffic count for heavy vehicles had not been measured in National Road No. 73 following project completion.
Note 3: The baseline value is the travel time on National Road No. 7 (from the junction of National Road No. 73 and National Road No. 7 to the provincial capital Kratie), and the target and the actual values are the travel times on the same section of National Road No. 73.

At the time of the ex-post evaluation, actual data was available for five indicators not including "Number of freight vehicles of 15 tons or more," of which the targets were achieved for four indicators and achieved moderately for one indicator. From the above, it is concluded that the outcome of the project was achieved as planned.

For the indicator "Pause time before the bridge," prior to project implementation (2016), the temporary bridges had one lane, which caused waiting time for oncoming traffic. At the time of the ex-post evaluation, the bridges under the project had two lanes on both National Road No. 11 and National Road No. 73, and the waiting time had been eliminated. For the indicator "Shortening transit time," the target was achieved for National Road No. 11, and for National Road No. 73, the target was reduced by 6 minutes (from 60 to 54 minutes) compared

to the target of 13 minutes (from 60 to 47 minutes), which resulted in approximately 50% of the target. The actual data measured by the external evaluator in March 2024 showed a reduction of 31 minutes for National Road No. 11 and 48 minutes for National Road No. 73, confirming the reduction in travel time. For the indicator "Shortening time by conversion from National Road No. 7 to National Road No. 73 for freight vehicles of 15 tons or more," the target was achieved. Through interviews with truck drivers, it was found that the travel time when using National Road No. 7 was approximately 4 hours, while the travel time when using National Road No. 73 ranged from 1 hour and 30 minutes to 3 hours. The usage of National Road No. 73 resulted in a reduction of the travel time, though the travel time varied depending on the cargo being carried and other factors.

3.3.1.2 Qualitative Effects (Other Effects)

To understand the qualitative effects of the project, interviews with residents[8] were conducted at three locations around the bridges of the project on National Road No. 11 and National Road No. 73. As the two bridges on National Road No. 73 (Peam Te Bridge and Prek Chhloung Bridge) were equipped with sidewalks and were expected to be used for commuting to schools, the above interviews with residents covered children and elderly people and also included teachers[9]. Since the number of large freight vehicles was expected to increase on National Road No. 73, truck drivers were also interviewed. The qualitative effects found in the interviews with the beneficiaries are as follows.

Driving at night and during heavy rain: Residents and truck drivers said that the bridges of the project could be used at night and during heavy rain. Truck drivers using National Road No. 73 commented that the bridge did not flood even during heavy rains and that they could see on the bridge at night using reflectors. Interviews with DPWT officials in both states also confirmed that after the opening of the bridges the bridge had never been inaccessible due to the time of day or to weather conditions.

Prevention of traffic disruption during floods: After the bridge came into use, no floods occurred that made the bridges inaccessible and disrupted traffic. According to DPWT and the police in both states, no major flooding had occurred since project completion, but they were of the opinion that the height of the bridges had been adequately raised and that they could be used even during major flooding. When it came to setting the heights of bridge girders, the project bridges were designed to withstand flood levels higher than the 50-year probability of flooding in consideration

[8] Those living near the Ba Baong No. 2 Bridge in Prey Veng Province (five residents), Peam Te Bridge in Kratie Province (five residents), and Prek Chhloung Bridge (four residents) were interviewed. For the interview sites, the locations where satellite data analysis showed a significant increase in nighttime light were selected.

[9] Four elementary schoolteachers and five high school teachers in Kratie Province were interviewed.

of climate change.

Improvement of transportation: In the vicinity of the Peam Te bridge, farmers saw improvements in travel time and safety when transporting crops to market; in the vicinity of the Prek Chhloung bridge, service providers in the city center commented that the delivery times of products were shorter. At a high school in Kratie Province, where students and teachers used motorcycles or cars to commute to school, they commented that waiting times at the bridges had been eliminated, allowing them to arrive at school on time.

Traffic accidents: According to residents, slip accidents had been frequent because the floor plates of the temporary bridges were steel plates. However, slip accidents decreased with the replacement of the bridges. On the other hand, residents were concerned about an increase in accidents caused by higher speeds on the approach roads. Therefore, DPWT of both provinces were assessing the installation of traffic signs. After project completion, there was one accident without injuries due to the driver of a passenger car being drowsy. Two fatal accidents of a motorcycle and a three-wheeler had occurred on the bridges of the project.[10] The fatal accidents occurred on the Peam Te bridge, when vehicles crashed into the sidewalk step at night or early in the morning. After the above fatal accidents, roadway lights were installed on the Peam Te Bridge as a countermeasure. No traffic accidents involving children were found.

From the above, it was confirmed that the bridge has been usable regardless of weather conditions and that the convenience for traffic has been improved. In addition, countermeasures against traffic accidents were being taken.

3.3.2 Impacts

3.3.2.1 Intended Impacts

1) Quantitative Effects

One of the impacts of the project is the promotion of trade between Cambodia and Vietnam. Based on responses to the executing agency's questionnaire and interviews, it is clear that National Road No. 11 is a part of a trade corridor with Vietnam[11]. Moreover, National Road No. 73 serves as a shortcut route for National Road No. 7, which is part of the Asian Highway connecting Cambodia and Vietnam.

[10] Accident statistics were available after the bridge openings in Kratie Province and after August 2023 in Prey Veng Province.

[11] The route of National Road No. 1 - National Road No. 11 - National Road No. 8 - National Road No. 72 is used as the route from Phnom Penh to the Vietnam border.

Table 4 Vietnam's share in the trade of Cambodia

(Units: USD thousand)

	2016	2023[1]
Export	9,929,297	22,644,989
to Vietnam (value)	220,872	2,972,558
to Vietnam (%)	2.2%	13.1%
Import	12,244,636	24,183,043
from Vietnam (value)	1,420,231	3,612,181
from Vietnam (%)	11.6%	14.9%

Source: Ministry of Economy and Finance (Cambodia)

Note 1: the data for 2023 are provisional (as of July 2024).

As shown in the above table, between the year prior to project commencement (2016) and the time of the ex-post evaluation (2023), exports to, and imports from, Vietnam increased significantly in value[12]. The Vietnamese share of Cambodia's exports and imports also increased significantly[13]. Although factors other than the project have affected the increase in trade between Cambodia and Vietnam (such as the economic growth of both countries and trade through other trade routes), the facilitation of logistics by the project is also considered to have contributed to some extent.

2) Qualitative Effects

The Impact of the project was considered to be "economic development of the project areas." Interviews with residents suggested that both employment in the urban area and visits by middlemen of agricultural products had increased. In the urban area (around the Prek Chhloung bridge) with many service sector businesses, both the number of customers and the employment of shopkeepers increased in stores and eateries after project completion. At the other two sites, where agriculture is the main economic activity, no significant increase in employment was found. However, at all of the sites visited, visits of agricultural products middlemen (dealing in rice, cassava, cashew nuts, etc.) increased after the bridge replacement. As the temporary bridges had had weight restrictions, the replacement of the bridges under the project made it easier to transport agricultural products by truck. As a result, it is concluded that the project contributed to an increase in the number of middlemen visiting from outside the areas.

[12] In Cambodia, the fiscal year is from January to December.

[13] In the trade statistics by country in 2023, the United States was the biggest for exports and China was the biggest for imports.

3.3.2.2 Other Positive and Negative Impacts

1) Impacts on the Environment

As the project did not fall under the large-scale project in the road and bridge sector and the undesirable environmental impacts was insignificant, the project was classified as Category B based on the JICA Guidelines for Environmental and Social Considerations (April 2010). Based on the responses to the questionnaire with MPWT and the construction supervision consultant, environmental monitoring (air quality, water quality, waste, noise and vibration) was conducted as planned during project implementation, and mitigation measures during construction (such as water spraying, idling off of heavy equipment/construction vehicles, use of sediment spill prevention sheets, banning construction works at night) were implemented as planned. The monitoring reports (August 2020, September 2020, and October 2020) showed that noise exceeded environmental standards (60 dB), but that there was no significant difference in noise level between the time of construction and other times of the day. The noise above the environmental standard was due to the noise of vehicles passing by on the temporary bridges that had been constructed prior to the project[14] and, thus, was caused by factors other than the construction activities of the project. According to DPWT in both Prey Veng Province and Kratie Province, the environmental departments of both provinces were responsible for monitoring after the opening of the bridges, and no negative environmental impacts had been reported, although the items monitored during the ex-post evaluation were unclear. No negative impacts on the natural environment were found during the interviews with residents in the ex-post evaluation.

2) Resettlement and Land Acquisition

Since the Ministry of Economy and Finance (MEF) of Cambodia was responsible for the compensation for affected residents, no information was available from the executing agency regarding actual data on the area of land acquisition, the number of affected households, the number of relocated households, and complaints/measures taken. Based on responses to the questionnaire and interviews with the construction supervision consultant, it is clear that resettlement was in line with the plan. A total of 17 households were resettled at Peam Te Bridge, Prek Chhloung Bridge, and Ba Baong No. 2 Bridge, where resettlement had been expected in the feasibility study, and the total number of affected households (who had received compensation for losses of land, structures, and trees) was 31 households. Based on questionnaire answers and interviews with MPWT, it is clear that compensation and assistance for people affected were provided in accordance with domestic regulations and the JICA guidelines.

[14] Based on interviews with local residents. The temporary bridge floor panels were made of metal, which generated a loud noise when vehicles passed by.

3) Gender Equality, Marginalized People, Social Systems and Norms, People's Well-being and Human Rights

Of the bridges under the project, sidewalks were installed on two bridges on National Road No. 73 (Peam Te Bridge and Prek Chhloung Bridge). In interviews with residents, elderly people who use the bridges on foot commented that the sidewalks were wide enough and far enough away from the roadways. In addition, some residents stated that they used the above bridges when they went for walks, suggesting that residents could use the bridge safely and securely.

4) Unintended Positive / Negative Impacts

・Emergency response to ground subsidence

During project implementation, in the flood season of 2019, the water level of the Mekong River was higher than usual in Kratie Province. A sharp increase in the water level occurred between August 29 and September 2, 2019, and the water level rose by 2.5 m during this period. The rise in water level caused ground subsidence (30 - 40 m^3) on the slope along the downstream west bank of the temporary bridge of Prek Chhloung. The ground subsidence occurred in an area outside the project scope, but was close to a residential area and left some houses leaning. The situation required urgent action as there was a concern about the expansion and increase of ground subsidence. Therefore, the project provided emergency work for the ground subsidence, contributing to the safety of residents.

・Safer use of boats at times of higher water level.

The project constructed bridges over tributaries of the Mekong River at two locations in Kratie Province (Peam Te Bridge and Prek Chhloung Bridge). In the areas surrounding both bridges, riverfront residents used boats year-round. In the detailed design of the project, signs indicating the distance between the water surface and the bridge girders were added to ensure the safer use of boats at the times of higher water level.

Photo 5: Height markings to bridge girders
(Peam Te Bridge)
(Source: Evaluator's photo)

Photo 6: Height markings to bridge girders
(Prek Chhloung Bridge)
(Source: Evaluator's photo)

The indicators selected in the ex-ante evaluation were achieved as planned, waiting time at the project bridges was eliminated and travel time decreased. As a qualitative effect, no traffic disruption due to flooding has occurred on the project bridges since their opening. In some areas, the elimination of waiting time at the bridges has enabled commuters to get to work or school on time, and transporting crops to market has become more convenient. The Impact of the project, "economic development of the project areas" was also found, suggesting an increase in employment in the service industry and an increase in the number of middlemen for agricultural products. This project has achieved its objectives. Therefore, effectiveness and impacts of the project are high.

3.4 Sustainability (Rating: ②)

3.4.1 Policy and System

The national development plan of the Cambodian government at both the time of planning and that of the post-evaluation focused on infrastructure development in the transport sector. The Comprehensive Master Plan on Cambodia Intermodal Transport and Logistics System (formulated in 2023) included repair works on National Road No. 73 and National Road No. 11, and both roads were important to ensure smooth logistics. At the time of the ex-post evaluation, there had been no change in policy and system that would negatively affect the realization of the project effects. Thus, it is concluded that there are no issues that would impair the sustainability of the project in the aspect of policy and system.

3.4.2 Institutional/Organizational Aspect

At the time of the ex-post evaluation, RID, one of the departments under MPWT, developed a country-wide maintenance plan for the bridges, overseeing the implementation of maintenance, and providing technical advice. DPWT in Prey Veng Province and Kratie Province were responsible for the maintenance of the project bridges. When formulating maintenance plans, DPWT in both provinces reported each year to RID on the results of inspections which showed bridges requiring maintenance. RID prioritized the bridges for maintenance by using the bridge inventory and formulated maintenance budgets. RID had a 12-member department that managed the bridge inventory and formulated maintenance plans.

Based on the responses to the questionnaire and interviews with the Prey Veng Province DPWT, it was discovered that four teams were formed for road maintenance in the province, with four permanent staff, all of which were engineers, and with about 30 termed employees working on maintenance works. Based on the responses to the questionnaire and interviews with the DPWT in Kratie Province, it is seen that the DPWT has organized eight maintenance teams for road maintenance in the province, with five full-time employees (all engineers) and approximately 30 termed employees engaged in maintenance work.

On the division of roles in maintenance, it was clear which agency is in charge across the entire process of bridge inspection, maintenance planning, budget allocation, and construction implementation. Thus, there are no issues that would impair sustainability in the institutional and organizational aspect.

3.4.3 Technical Aspect

As mentioned above (“3.1.2.2 Internal Coherence”), the Technical Cooperation *Project for Strengthening Capacity for Maintenance of Roads and Bridges* (2015-2018) developed various manuals for routine maintenance and preventive maintenance (periodic maintenance) of roads, and the inspection and repair of bridges. At the time of the ex-post evaluation, RID and DPWT in both provinces were using the above manuals. Moreover, the above project provided training on maintenance methods for small bridges. RID was using the bridge inventory supported by the above project in developing maintenance plans for bridges.

According to the construction supervision consultant, DPWT in both provinces had been engaged in road maintenance (such as inspection, cleaning, repair, and resurfacing) for many years and owned paving equipment. Both Peam Te Bridge and Prek Chhloung Bridge allow close inspections of key structures from catwalks. Other bridges also allow close inspections from scaffolding during low water season. Therefore, no special equipment was required for close inspections.

The permanent staff of both RID and the DPWT in both provinces had had formal education

in the relevant fields (engineering, finance, etc.) and were hired after a written exam and a job interview.

RID conducted periodic training for road maintenance. Two people from every DPWT were able to participate in the training once a year. The training covered entire road assets, including roads and bridges, and each session focused on a specific theme. In addition, DPWTs in both provinces conducted internal training twice a year, with staff members themselves serving as trainers.

Manuals for road and bridge maintenance were available and being used by RID and DPWT in both provinces. RID, and DPWT in both provinces conducted training as a JICA technical cooperation project which suggests that the technical level required for the maintenance of the project was obtained. Based on the above, it is concluded that there are no issues that would impair sustainability in the aspect of technology.

3.4.4 Financial Aspect

MPWT's road maintenance budget increased between 2021 and 2023 (see Table 5). The road maintenance budgets of Prey Veng Province and Kratie Province, where the maintenance of the project bridges was carried out, were stable from 2021 to 2023, with just some fluctuations from year to year (see Table 6).

Table 5 Road Maintenance Budget in MPWT

	2021	2022	2023
Road maintenance budget (Riel million)	249,516	279,990	289,981
Road maintenance budget (USD million)[1]	60.88	68.26	70.54

Source: MPWT
Note 1: Converted at the average exchange rate for the year in the IMF Data Portal

Table 6 Road Maintenance Budgets for Prey Veng Province and Kratie Province

	2021	2022	2023
Road maintenance budget for Prey Veng province (Riel million)	18,969	22,262	17,366
Road maintenance budget for Prey Veng province (USD million)[1]	4.63	5.43	4.22
Road maintenance budget for Kratie Province (Riel million)	22,017	19,098	20,444
Road maintenance budget for Kratie Province (USD million)[1]	5.37	4.66	4.97

Source: Prey Veng Province DPWT and Kratie Province DPWT
Note 1: Converted at the average exchange rate for the year in the IMF Data Portal

To analyze the sufficiency of the maintenance budget, the maintenance costs required for the

bridges of the project[15] were compared with the road maintenance budgets of both provinces (average for 2021-2023). In Prey Veng Province, the amount required for routine maintenance was equivalent to 1% of the total maintenance budget, while the amount required for preventive maintenance (periodic maintenance) was equivalent to 5% of the total maintenance budget. In Kratie Province, the amount required for routine maintenance accounted for 2% of the total maintenance budget, while the amount required for preventive maintenance (periodic maintenance) accounted for 11% of the total maintenance budget. The above analysis showed that the amount of routine maintenance was small compared to the total maintenance budget, and that budgeting for the amount was feasible. On the other hand, preventive maintenance (periodic maintenance) to be required in the future, accounted for 5% and 11% of the road maintenance budgets allocated to Prey Veng Province and Kratie Province, respectively. These amounts required sizable portions of the maintenance budgets of both provinces.

At the time of the ex-post evaluation, the removal of piers was incomplete on the two temporary bridges (for details, see "3.4.7 Status of Operation and Maintenance"). The piers of the temporary bridges should have been removed as soon as possible at the time of the project completion, but this has not been done due to the lack of MPWT budget.

Based on the above, it can be seen that, while expenditure for routine maintenance of the project bridges could be secured, budgeting for preventive maintenance (periodic maintenance) was more difficult. In addition, the budget for removing the temporary bridges has not been provided. Therefore, it was concluded that there were issues in the financial aspect of O&M.

3.4.5 Environmental and Social Aspect

As described in "3.3.2.2 Other Positive and Negative Impacts," there were no significant negative environmental and social impacts, including negative impacts unanticipated at the time of the planning. Therefore, no factors would negatively affect the sustainability of the project from the environmental and social considerations. Based on the above, it is concluded that there are no issues that would impair the sustainability of the project from the environmental and social considerations.

3.4.6 Preventative Measures to Risks

For the project implementation and project achievement, few preconditions were assumed at the time of the planning, namely: (1) that land acquisition and resettlement would be carried out as planned, and (2) that sufficient budget would be provided for maintenance and repair, and that maintenance would be continually implemented. During project implementation, land

[15] The amount required for routine maintenance was based on the information in the preparatory survey report for this project. The amount required for preventive maintenance (periodic maintenance) was estimated with reference to the preparatory survey report for the preceding grant aid project, *the Project for Flood Disaster Rehabilitation and Mitigation*, as the amount was not mentioned in the preparatory survey report for this project.

acquisition and resettlement were carried out as planned, and routine maintenance has been carried out continuously since project completion. Therefore, the risks assumed at the time of planning had not materialized by the time of the ex-post evaluation, and there are no issues that would impair sustainability in the preventive measures to the risks.

3.4.7 Status of Operation and Maintenance

In the survey of project sites during the ex-post evaluation, the bridge superstructures, bridge substructures, approach roads, and revetments were visually inspected. The current conditions of the bridges are shown in the following table.

Table 7 Current Status of the Bridges under the project

Visual Inspection	Current Conditions
Bridge superstructures (roadways, sidewalks, drainage facilities, etc.)	Pavement damage had been repaired and did not impede traffic; however, there were unrepaired cracks on the pavement of the Ba Baong No. 1 Bridge. There were also minor cracks on the concrete structure. No abnormalities were observed in the expansion devices, but many bridges had had repairs to fill gaps and steps. Roadways and sidewalks were cleaned; metal lids of the drainage inlets in Anlong Khle Bridge and Prek Chhloung Bridge had been stolen.
Bridge substructures	By visual inspection, there was no chipping or noticeable cracks in the concrete structures, and no scouring had occurred in the abutments.
Approach roads	Pavement damage had been repaired and did not impede traffic; road markings were faded on Prek Sandan Bridge and Anlong Khle Bridge; there were unrepaired cracks on the Prek Sandan Bridge; there was no damage to the guardrails and the roadside poles, and shoulder collapse and slope collapse had not occurred.
Revetments	By visual inspection, there was no chipping or noticeable cracks in the concrete structures. DPWT in both provinces conducted periodical visual inspections, and no serious damage had occurred by the time of the ex-post evaluation.

At the time of the ex-post evaluation, the removal of the piers was incomplete for two temporary bridges (Peam Te Bridge and Prek Chhloung Bridge), and, thus, there was concern about the sustainable project effects for the new bridges. It was pointed out that in the defect inspection it was found that the temporary bridges would obstruct the flow of the river and possibly raise the water level by the accumulation of impediments at the piers. The piers of the temporary bridge of Peam Te had been leaning since project implementation. At the time of the ex-post evaluation there was a risk that the remaining piers of the temporary bridge would collapse which may affect the traffic on the project bridge.

Photo 7: Piers of Temporary Bridge (Peam Te Bridge)
(Source: Evaluator's photo)

The site survey found no serious damage that would affect the project effects. However, there was concern that the pavement was susceptible to damage due to an increase in heavy freight vehicle traffic and insufficient enforcement of overloading. Moreover, the piers of the temporary bridges remained, and an earlier removal of the piers was desirable. Therefore, it is concluded that the status of operations and maintenance was problematic.

Some issues have been observed in the financial aspects and the current status of operation and maintenance. 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

The objective of this project is to ensure safe, smooth and stable transportation and logistics in flood-affected areas and to reduce vulnerability to natural disasters by the replacement of seven bridges and improvement of approach roads on National Road No. 11 and National Road No. 73 in Prey Veng Province and Kratie Province, Cambodia. The project improved transportation infrastructure and was consistent with the development policy and needs of Cambodia and with the ODA policy of Japan. For both internal coherence and external coherence, the effects of collaboration between the project and other projects were found, and its relevance and coherence are high. The output of the project was in line with the plan, and the project cost and project period were within the plan. Therefore, efficiency of the project is very high. The indicators for the effectiveness of the project achieved their targets, and no traffic disruption on the project bridges has occurred due to flooding since project completion. In some areas, the elimination of waiting

times at the bridges has allowed commuters to get to work or school on time, and the convenience of transporting crops to market has improved. As for impact, an increase of employment in the service industry and an increase in the number of middlemen for agricultural products have been suggested. This project has achieved its objectives. Therefore, effectiveness and impacts of the project are high. There were no significant changes in the policy and system aspects after project commencement. For the organizational/institutional aspect, the division of roles among the government agencies involved in the maintenance of the project bridges has been well-defined, and the agencies involved have acquired the skills necessary for maintenance. On the other hand, preventive maintenance (periodic maintenance) accounted for 5% and 11% of the road maintenance budgets in Prey Veng Province and Kratie Province, respectively. These were sizable portions of the maintenance budgets of both provinces. The temporary bridges, which were constructed prior to project implementation, needed to be removed as soon as possible, but this has not yet been done due to a lack of budget in the executing agency. There is a risk that the remaining piers of the temporary bridge may collapse. If this happens, it may affect the traffic on the project bridge. For these reasons, the 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

In the site survey of the ex-post evaluation, it was found that the piers of two temporary bridges (Peam Te Bridge and Prek Chhloung Bridge) had not been removed. The defect inspection pointed out that the temporary bridges would obstruct the flow of the rivers and possibly raise the water level by the accumulation of impediments at the piers. In addition, the piers of the temporary bridge of Peam Te had been leaning since project implementation, posing a risk of collapse. Due to concern for the sustainable project effects of the new bridges, the executing agency needs to secure a budget and remove the piers at the earliest opportunity.

According to MPWT and DPWT of both provinces, due to maintenance budget constraints, priority was given to repair works of damaged roads and bridges, and budget allocations for preventive maintenance (periodic maintenance) tended to be small. As the traffic of freight vehicles increased in National Roads No. 11 and No. 73, the road surfaces were vulnerable to damage. For this reason, timely preventive maintenance (periodic maintenance) was needed. It is desirable for the executing agency to secure a budget for preventive maintenance (periodic maintenance) and to prioritize maintenance works when formulating maintenance plans in the future.

4.2.2 Recommendations to JICA

None

4.3 Lessons Learned

Estimation of the Cost of Preventive Maintenance

At the time of the planning, the costs required for preventive maintenance (periodic maintenance), which will occur in 5 to 10 years, had not been estimated. Since preventive maintenance is an important task for the extension of the usable period of bridges and for the control of life-cycle costs, it is desirable that the cost of preventive maintenance is properly estimated at the time of project planning. In addition, it is appropriate to consult with the executing agency to ensure a budget for estimated maintenance costs during the project implementation phase.

Selection of Operation and Effect Indicators

As the operation and effect indicators chosen in the ex-ante evaluation included some indicators that were difficult for relevant government organizations to measure regularly, it was difficult to obtain data for these indicators in the ex-post evaluation. The targets for these indicators were set by using data collected in the preparatory survey for the project. When selecting operation and effect indicators in the ex-ante evaluation, it is preferable to set indicators that can be collected and monitored by the relevant government organizations after project completion, rather than indicators that require detailed data collection, such as in the preparatory survey.

5. Non-Score Criteria

5.1 Performance

5.1.1 Objective Perspective

As mentioned above (“3.3.2.2 Other Positive and Negative Impacts”), ground subsidence occurred near the temporary bridge of Prek Chhluong in Kratie Province, a location not within the construction area, during the flood season of 2019. When the executing agency approached the project officials for repair, the information was promptly shared among the relevant officers in JICA, and emergency measures were taken under the project. Urgent action was needed as the ground slide was close to the residential area, and some houses were had begun to lean due to this incident. In light of the contribution to the safety of residents, JICA project officials’ prompt action was appropriate.

5.2 Additionality

None

(End)