

Ex-Post Project Evaluation 2020: Package I-1 (Cambodia)

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Kingdom of Cambodia

FY2020 Ex-Post Evaluation Report of Grant Aid Project

“The Project for Improvement of Svay Rieng Provincial Referral Hospital”

External Evaluator: Nobuyuki Kobayashi / Koichi Sato, OPMAC Corporation

0. Summary

With the aim of improving the functions of Svay Rieng Provincial Referral Hospital, including their obstetrics / gynecology department and emergency outpatient services, and thereby contributing to the improvement of the quality of health care services in Svay Rieng Province, the project implemented the construction of hospital facilities and procurement and installation of medical equipment. Building facilities and supplying equipment in this way is fully consistent with Cambodia’s development needs and policies, which aimed to improve the quality of health services through the development of health infrastructure, including health facilities. It was also in line with Japan’s ODA policies. Therefore, its relevance is high. On project cost and project period, the project cost was within the plan, but the project period exceeded the plan. Therefore, efficiency of the project is fair. Regarding the effectiveness of the project, Svay Rieng Provincial Hospital has been able to meet the growing needs of health care services in the province by utilizing the new facilities and equipment procured in the project, and its functionality as a top referral hospital has been improved. This also led to the improvement of the quality of health care services provided by Svay Rieng Provincial Hospital and the strengthening of the referral system in Svay Rieng Province. Furthermore, the project contributed to universal health coverage¹ by providing health care services to the poor and made a positive impact on the hospital’s response to novel coronavirus infections (COVID-19). As described above, this project has mostly achieved its objectives. Therefore, effectiveness and impacts of the project are high. The hospital has secured most of the necessary medical personnel, and they have the skills to provide health care services, as well as operate and maintain the facilities and equipment. Although repairs of low-priority equipment tend to be slow, hospital revenue and expenditures are stable, and the facilities and provided equipment are in a usable state. Therefore, sustainability of the project effects is high.

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

¹ When all people have access to appropriate health care services including preventative, curative, and rehabilitative care, at an affordable cost.

1. Project Description



Project Location



Hospital Built by the Project

1.1 Background

As a result of civil conflicts in Cambodia since the 1970s, the country's health care system was devastated; the number of medical personnel was drastically reduced and medical equipment and facilities were destroyed. Since the end of these civil conflicts, health indicators such as the maternal mortality rate was improved through support provided by a number of development partners in the health sector. However, the system for providing health care services remained weak, especially in rural hospitals, where even basic medical equipment was not available.

At the time of planning the project, Svay Rieng Province's health indicators (number of hospital beds per 10,000 people, under-five mortality rate, and maternal mortality rate) were lower than the Cambodian average, and there was much room for improvement, especially in maternal and child health indicators. In addition, since the province had 11 special economic zones, further economic development and population growth was expected, as was a corresponding increase in health needs. In addition, with the construction of the Southern Economic Corridor, which runs from the Thai border in northwestern Cambodia to Vietnam via National Highways 5 and 1, and the opening of the Neak Loeung Bridge, both traffic and traffic accident victims were expected to increase. However, the hospital was not functioning well as a top referral hospital due to insufficient facilities and equipment, and had suffered age-related deterioration. Therefore, making these improvements was an urgent issue.

1.2 Project Outline

The objective of this project is to improve the functions of Svay Rieng Provincial Referral Hospital, including their obstetrics / gynecology department and emergency outpatient services, by construction of hospital facilities and procurement and installation of medical equipment, thereby contributing to the improvement of the quality of health care services across Svay Rieng Province.

Grant Limit / Actual Grant Amount	1,077 million yen / 1,009 million yen
Exchange of Notes Date / Grant Agreement Date	March 2015 / March 2015
Executing Agency(ies)	Ministry of Health Svay Rieng Provincial Health Department Svay Rieng Provincial Hospital
Project Completion	June 2017
Target Area	Svay Rieng Province
Main Contractor(s)	Building: Tobishima Corporation Equipment: Nissei Trading Co., Ltd.
Main Consultant(s)	Azusa Sekkei Co., Ltd. / INTEM Consulting, Inc. (JV)
Preparatory Survey	July 2014 - March 2015
Related Projects	[Technical Cooperation] <ul style="list-style-type: none"> - “Project on Strengthening of Medical Equipment Management in Referral Hospitals” (2009 - 2014) - “Project for Strengthening Human Resources Development System of Co-medicals” (2010 - 2015) - “Project for Improving Maternal and Newborn Care through Midwifery Capacity Development” (2010 - 2015) - “Project for improving continuum of care with focus on intrapartum and neonatal” (2016 - 2022)

2. Outline of the Evaluation Study

2.1 External Evaluator

Nobuyuki Kobayashi / Koichi Sato, OPMAC Corporation

2.2 Duration of Evaluation Study

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

Duration of the Study: October 2020 – January 2022

Duration of the Field Study: Not implemented

2.3 Constraints during the Evaluation Study

2.3.1 Information Collected and Quality of the Data

For this ex-post evaluation, due to the global pandemic caused by COVID-19 the external evaluators were not able to conduct a field survey. Due to the spread of infections in Cambodia and taking safety issues into consideration, the field survey assistant was also unable to conduct an on-site inspection of the hospital. As a result, information and data collection methods were limited to questionnaires and interviews via online conferencing systems. Therefore, there were no opportunities to hear directly from the beneficiaries, and the information and data in the evaluation may thus not fully reflect the actual on-site situation.

3. Results of the Evaluation (Overall Rating: A²)

3.1 Relevance (Rating: ③³)

3.1.1 Consistency with the Development Plan of Cambodia

At the time of the planning the Government of Cambodia designated “improving equitable access to quality health services” as one of the priority themes in the health sector in its *National Strategic Development Plan* (2014 - 2018). It aimed to improve health infrastructure by building hospitals and health centers, improve asset management of medical equipment and facilities, and promote investment in advanced medical equipment and technology. In addition, *the Second Health Sector Strategic Plan* (2008 - 2015), which was formulated in conjunction with the above plan and Millennium Development Goals, set maternal and child health (i.e., health of pregnant women, infants, and young children) as one of three priorities and defined five strategic areas for implementation (i.e., health service delivery, health care financing, human resources for health, health information system, and health system governance).

At the time of the ex-post evaluation, *the National Strategic Development Plan* (2019 - 2023) identified “human resources development” as one of its priorities, and addressed the promotion of public health and nutrition. Specifically, it refers to the further implementation and revision of *the Third Health Sector Strategic Plan* (2016 - 2020), increased investment in health facilities and emergency medical services, and improved management capacity for the periodic inspection of public and private health facilities. With the goal of providing “high-quality, effective, and equitable health services,” *the Third Health Sector Strategic Plan* (2016 - 2020) identifies one of its two priorities as improving the quality of health services (by maintaining or further improving access and coverage). It outlines a strategy for implementation in seven areas: health service delivery, health system financing, health workforce development, essential support systems, health infrastructure development, health information system, and health system governance.

Based on the above, the project was consistent with the development policies of the Government of Cambodia at the time of both planning and ex-post evaluation.

3.1.2 Consistency with the Development Needs of Cambodia

At the time of the planning of the project, Svay Rieng Province’s health indicators were lower than the Cambodian average. The under-five mortality rate in Svay Rieng Province was 93 per 1,000 live births (Cambodian average: 54, from the Cambodia Demographic and Health Survey 2010); the maternal mortality rate was 559 per 100,000 live births (Cambodian average: 461, from the General Population Census of Cambodia 2008); and the number of hospital beds per

² A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

³ ③: High, ②: Fair, ①: Low

10,000 people was 3.5 (Cambodian average 6.7, from the National Health Statistic Report 2011). Therefore, it was necessary to improve the system for providing health care services.

At the time of the ex-post evaluation, the average annual population growth rate from 2008 to 2019 in Svay Rieng Province was 0.8% (General Population Census of Cambodia 2019), which shows a moderate growth trend. Furthermore, according to Svay Rieng Provincial Hospital, the number of outpatients in the four basic departments (surgery, internal medicine, pediatrics, and obstetrics and gynecology) at the hospital increased from 14,941 in 2014 to 30,771 in 2020, more than doubling during this period. In addition, a level of 700 or more annual referrals from lower-tier hospitals to Svay Rieng Provincial Hospital has been maintained since 2018, the year after the completion of the project, compared to 670 in 2014, the year before the project started. At the time of the ex-post evaluation, the hospital is functioning as a top referral hospital and there is a strong need for the health care services it provides.

Based on the above, the project was consistent with the development needs of Cambodia at the time of both planning and ex-post evaluation.

3.1.3 Consistency with Japan's ODA Policy

In *the Country Assistance Policy for Cambodia* (April 2012), the health sector falls under the priority area of the “promotion of social development,” with a policy to support the strengthening of the health system as a whole under the development issue of “enhancing health and medical care.” The JICA Country Analysis Paper for Cambodia also pointed out that “the improvement of services at hospitals and health facilities in rural areas” is an important issue.

By the provision of the facilities and equipment of Svay Rieng Provincial Hospital as a top referral hospital, this project aimed to enhance its functionality and, then, to improve health care services in the province. Thus, this project was in line with Japan's ODA policies.

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

3.2 Efficiency (Rating: ②)

3.2.1 Project Outputs

(1) Facilities and Equipment

The project aimed to improve the quality of health care services in Svay Rieng Province by upgrading the facilities and equipment of Svay Rieng Provincial Hospital, and the output was produced as planned. The planned and actual output was shown in the following table.

Table 1: Planned and Actual Outputs

Item	Planned	Actual
Facilities	Newly constructed slope and three-story building, which houses general outpatient, emergency room, medical imagery, surgery, obstetrics and gynecology, and administrative departments (total area: 3,147.95 m ²)	As planned
Equipment	94 items, including obstetrics and gynecology examination beds, ultrasound diagnostic apparatus, and operating tables	As planned

Source: Preparatory Survey Report and questionnaire responses from the Consultant

When equipment was purchased for the project, the contract between the Ministry of Health and the contractor who procured the equipment included maintenance services for three years after project completion. In addition, consulting services were provided for project implementation, which included the detailed design, supervision of construction and procurement, and technical guidance. The Consultant also monitored the maintenance status of major equipment (18 items) for three years after completion of the project. Due to fluctuations in the exchange rate and local materials costs, it was necessary to lower the construction cost and this resulted in some changes from the basic design for the facilities (see table below).

Table 2: Changes from the Basic Design

No.	Changes
1	Parking area cancelled
2	Balconies on the side of the main building cancelled
3	Shape of slope changed and volume of building frame reduced
4	Changes to the specifications of the balcony handrail in the main building, from perforated brick blocks to aluminum
5	Addition of concrete paving for parking area

Source: Questionnaire responses from the Consultant

According to interviews with the Consultant, the impact of the above-mentioned specification changes to the hospital building was minor, and there were no problems in terms of building safety. Therefore, the changes to the specifications noted above are considered appropriate.



Operating Room



Labor and Delivery Room

(2) Technical Guidance

As a soft component of the project, technical guidance was provided for equipment that had not been used before and that was necessary for hospital operations (see table below). According to the Consultant and Svay Rieng Provincial Hospital, each of the technical guidance tasks was implemented as planned.

Table 3: Implemented Soft Components

Implemented content	<ol style="list-style-type: none"> 1. Development of an operational system and provision of guidance on digital processing techniques and maintenance of the CR System (system that digitally processes transmitted x-ray images), which is a component of the general-purpose x-ray equipment. 2. Development of an operational system and provision of technical guidance on the maintenance and management of central sterilization equipment. 3. Clinical skills guidance for emergency surgery in obstetrics and gynecology, surgery, and co-medical fields.
Implementation period	April – December 2017

Source: JICA-provided materials, Preparatory Survey Report, and questionnaire responses from Svay Rieng Provincial Hospital and the Consultant

(3) Responsibilities of the Cambodian Side

At the time of planning the project, the following responsibilities were to be borne by the Government of Cambodia (see table below). Based on questionnaire responses from the Consultant and executing agency, as well as interviews, the responsibilities of the Cambodian side were as planned.

Table4: Responsibilities of the Government of Cambodia

Procedural matters	Tax exemptions, facilitation for materials and equipment imported from Japan or third countries, acquisition of land use permits, banking arrangements, and issuance of payment authorizations
Undertakings of the Cambodian side	Removal of obstructions and clearing of the planned construction site, arrangements for facilities related to electricity, water supply, drainage, and medical gas for the new facility, renovation and change of usage of existing buildings, exterior work (tree clearing), and relocation of existing equipment and furniture

Source: Preparatory Survey Report and questionnaire responses from Svay Rieng Provincial Hospital and the Consultant

3.2.2 Project Inputs

3.2.2.1 Project Cost

The planned project cost was 1,086 million yen (1,077 million yen for the Japanese side and 9 million yen⁴ for Cambodian side) and the actual cost was 1,014 million yen (1,009 million yen for Japanese side and 5 million yen for Cambodian side). As a result, the actual project cost was within the plan (93% of the plan).

⁴ The planned figures included bank charges, but the actual bank charges were not available for comparison. For a proper comparison, this cost was excluded when comparing the planned and actual figures.

The planned and actual project costs for the Japanese side are shown in the following table. The actual cost was about 68 million yen below the planned cost. According to the Consultant, during the detailed design stage, the project cost was kept within the plan by changing the specifications of the facilities, in order to cope with fluctuations in the exchange rate and the cost of local materials.

Table 5: Breakdown of Project Costs on the Japanese Side

Unit: million yen

Item	Planned	Actual
Construction	720	655
Equipment	196	190
Design and supervision	151	151
Maintenance contract (3 years)	10	13
Total	1,077	1,009

Source: Project Completion Report, JICA-provided materials, and questionnaire responses from the Consultant

The actual project cost on the Cambodian side was 55% of the plan. Svay Rieng Provincial Hospital cited the following as the reasons for the lower project costs: 1) lower labor costs for the removal of existing facilities⁵, 2) smaller scale of infrastructure lead-in and connection work, and 3) amount of equipment and furniture relocation and procurement was reduced to an amount that could be covered by the hospital budget. According to interviews with the hospital, the above changes had no impact on hospital operations.

Table 6: Breakdown of Project Costs on the Cambodian Side

Unit: thousand yen

Item	Planned	Actual
Removal of existing facilities	3,121	1,521
Backfilling and leveling	577	517
Infrastructure lead-in and connection work	869	340
Existing facility renovations	1,535	1,497
Relocation and procurement of equipment, furniture, etc.	2,880	905
Tree clearing	391	334
Total	9,373	5,114

Source: Ex-ante Evaluation, Preparatory Survey Report, and questionnaire responses from Svay Rieng Provincial Hospital

3.2.2.2 Project Period

The project period was planned from March 2015 to January 2017 (23 months) and the actual period was from March 2015 to June 2017 (28 months); therefore, the actual project period exceeded the plan (122% of the plan). The reasons for the extended period were 1) delay in the

⁵ According to interviews with Svay Rieng Provincial Hospital, the contracted amount for removal work was sufficient to pay the minimum wage.

starting month of the detailed design⁶, 2) prolonged detailed design work and extension of the construction period due to specification changes, and 3) extension of the construction period caused by the replacement of contractor.

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

3.3 Effectiveness and Impacts⁷ (Rating: ③)

3.3.1 Effectiveness

3.3.1.1 Quantitative Effects

Of the five indicators set to measure the quantitative effects of the project at the time of planning, data that would enable a determination of the degree of target achievement was collected for four indicators (total number of hospitalized days for obstetrics and gynecology, the number of emergency patients, number of deliveries, and number of outpatients in the four basic departments). The number of surgical operations was not reflected in this evaluation result because the data obtained was not limited to the fields affected by the project, making it difficult to determine the degree of target achievement. For three of the indicators, not including the number of emergency patients, the actual results for the target year (2020) exceeded the targets (see table below). However, the actual number of emergency patients in 2020 was only 92% of the target. Svay Rieng Provincial Hospital indicated that the reason for this was that at the time of the ex-post evaluation, all district hospitals in Svay Rieng Province had established emergency departments, which meant there were more places for emergency patients to be seen. This reason was also confirmed by the responses to the questionnaire given to the provincial health department. Based on the above, of the four indicators that can be used to determine the degree of target achievement, three indicators were 100% achieved and one indicator was 92% achieved, resulting in an average achievement of 98%.

⁶ According to the Consultant, the plan assumed a transfer of ownership contract and a consultant contract to be signed in the same month, but the transfer of ownership contract was delayed to the end of the month, causing a delay in the start of detailed design.

⁷ Sub-rating for Effectiveness is to be put with consideration of Impacts.

Table 7: Quantitative Effects of the Project

	Baseline	Target values	Actual values			
	2013	2020	2017	2018	2019	2020
		3 years after project completion	Year of project completion	1 year after project completion	2 years after project completion	3 years after project completion
Total number of OB / GYN hospitalization days (person-days / year)	8,899	14,281	10,355	15,000	15,681	16,060
No. of emergency patients (persons / year)*	1,138	1,374	1,438	1,544	1,734	1,270
No. of deliveries (births / year)**	2,304	3,037	3,241	3,679	3,878	4,115
No. of outpatients in 4 basic departments (persons / year)	9,736	15,994	23,020	30,702	30,897	30,771

Source: Ex-ante Evaluation, Preparatory Survey Report, and questionnaire responses from Svay Rieng Provincial Hospital

Note 1: * The baseline figure for the number of emergency patients is the actual number of patients in 2014. Since comparable data was not available, the target was reset by applying the growth rate at the time of planning to the hospital data.

Note 2: ** The number of deliveries excludes cesarean sections.

In order to further scrutinize the functional improvement of Svay Rieng Provincial Hospital, in addition to the above indicators, data for the indicators shown in the following table were also collected, and the results from FY 2014 and FY 2020 were compared. Results found increasing trends in the number of ultrasound examinations, radiographs, and high-risk deliveries in recent years. This demonstrates the improved functionality of the hospital as a top referral hospital and suggests that it is playing an important role in satisfying the growing need for health care services. However, the high level of bed occupancy in the four basic departments also suggests that the use of additional beds outside of regulations and the use of beds by multiple patients are common. In order to meet the increasing needs of health care services in the province, it seems desirable to expand the capacity of hospital facilities.

Table 8: Supplementary Indicators for the Project

	Actual values				
	2014	2017	2018	2019	2020
	Year before project start	Year of project completion	1 year after project completion	2 years after project completion	3 years after project completion
Average length of stay (days / person)	3.89	3.46	3.85	3.71	3.58
Bed occupancy rate of 4 basic departments (%)	122.75	129.61	173.60	188.75	168.14
No. of gynecological surgeries (cases / year)	579	1,154	665	766	709
No. of prenatal and postnatal checkups (persons / year)	895	1,521	966	1,448	1,784
No. of ultrasound examinations (cases / year)	4,908	6,502	8,154	9,079	10,353
No. of X-rays taken (cases / year)	1,512	4,603	4,820	5,227	5,459
No. of cesarean sections (cases / year)	358	526	439	555	571
No. of high-risk deliveries* (cases / year)	575	624	948	974	974

Source: Preparatory Survey Report and questionnaire responses from Svay Rieng Provincial Hospital

Note: * High-risk delivery refers to the use of suction or forceps, etc.

3.3.1.2 Qualitative Effects (Other Effects)

When the project was being planned, the qualitative effects were assumed to be providing quality medical services and strengthening the referral system in the province. With regard to quality medical services, specific individual improvements at the hospital are noted in this section, and the resulting changes in treatment outcomes are described in section 3.3.2.1 Intended Impacts. In addition, the strengthening of the referral system within the province is also analyzed in section 3.3.2.1 Intended Impacts, as the project effects will be realized across a broader area.

According to questionnaire responses from Svay Rieng Provincial Hospital, the project has provided clean, safe, and well-equipped facilities and equipment, which has made it possible to 1) reduce surgery times, 2) reduce the unnecessary use of antibiotics due to the shortened surgery times, and 3) provide joint medical services (examination, consultation, and treatment) between obstetricians and pediatricians for pregnant women. Based on the above, it is believed that after the project completion, the hospital became able to provide comprehensive medical services focusing on growth, as well as surgeries with less burden on the body, suggesting the realization of the project's qualitative effects.

3.3.2 Impacts

3.3.2.1 Intended Impacts

The impact of the project was set as improving the quality of health care services in Svay Rieng Province. Based on the scope of the project, the following two effects were expected: (1) provision of high-quality health care services in obstetrics and gynecology, emergency medicine, and surgery, etc. at Svay Rieng Provincial Hospital, and (2) strengthening of the

referral system in the province. The intended impacts of the project at the time of the ex-post evaluation are as follows.

- (1) Provision of high-quality health care services in obstetrics and gynecology, emergency medicine, and surgery, etc.

To quantitatively verify the impacts, the following table shows the health indicators for Svay Rieng Provincial Hospital, which are: 1) maternal deaths, 2) neonatal deaths, 3) under-five deaths, 4) deaths from non-communicable diseases among young people, 5) deaths within 48 hours of emergency transport, and 6) deaths due to sepsis.

Table 9: Health Indicators for Svay Rieng Provincial Hospital

Indicator	2014	2015	2016	2017	2018	2019	2020
Number of maternal deaths (persons / year)	2	2	5	0	0	1	1
- Percentage of total deliveries (%)	0.07	0.06	0.15	0	0	0.02	0.02
Number of neonatal deaths (persons / year)	40	63	47	45	49	39	52
- Percentage of total deliveries (%)	1.33	1.82	1.41	1.19	1.19	0.88	1.11
Number of deaths of children under 5 (persons / year)	4	27	13	14	16	8	11
Number of deaths among young people from non-communicable diseases (persons / year)	0	0	0	2	0	0	0
Number of deaths within 48 hours of emergency transport (persons / year)	134	106	128	152	101	101	81
Number of deaths due to sepsis (persons / year)	0	0	0	0	0	0	0

Source: Questionnaire responses from Svay Rieng Provincial Hospital

Of the six indicators, three indicators (maternal deaths, neonatal deaths, and under-five deaths) have repeatedly increased or decreased between 2014 and 2020. Since the number of deliveries increased significantly during the above period, the number of maternal and neonatal deaths as a percentage of the number of deliveries decreased slightly in comparison of before and after the project. For two indicators (number of deaths of young people due to non-communicable diseases and number of deaths due to sepsis), the number of cases was close to zero from 2014 to 2020. As for the number of deaths within 48 hours of emergency transport, there was an upward trend from 2015 to 2017, but this has been declining since the year after the project was completed (2018). However, the improvement of the emergency medical system in Svay Rieng Province may have contributed to the lowered number for this indicator by reducing the number of critical patients transported. From the above, it can be concluded that the project has contributed to an improvement in the quality of health care services at the top referral hospital in Svay Rieng Province.

(2) Strengthening of the referral system within the province

The percentage of outpatients who are referral patients from lower-tier hospitals has decreased compared to 2014, the year before the commencement of the project (see the following table). However, analyzing the details, it can be concluded that the main reason for this is the rapid increase in the number of outpatients received by Svay Rieng Provincial Hospital. One factor in this increase is the heightened demand for medical services in the province due to the progress of universal health coverage, which will be discussed later (3.3.2.2 Other Positive and Negative Impacts). The number of referral patients from lower-tier hospitals to Svay Rieng Provincial Hospital has remained high, at over 700 since 2018. The number of referrals for high-risk deliveries has also been at a higher level since 2017 than it was before. One reason for the increase in the number of referrals to a higher-tier hospital is that patients who would have previously been diagnosed at other higher-tier hospitals in the country or in Vietnam tended to visit Svay Rieng Provincial Hospital first and receive their first diagnosis there. Although other factors may have contributed to the increase, the project seems to have, to a certain extent, contributed to the strengthening of the referral system in the province.

Table 10: Referrals within the Province

Indicator	2014	2015	2016	2017	2018	2019	2020
Number of referral patients (persons / year) from other facilities (lower-tier hospitals)	670	352	945	420	700	731	704
Percentage of outpatients who are referrals (%)*	4.62	2.49	5.73	1.81	2.28	2.37	2.29
Number of referrals for high-risk deliveries (persons / year)	37	48	07	118	60	73	84
Number of referrals to top hospitals (persons / year)	669	813	62	1,070	1,169	1,297	1,330

Source: Questionnaire responses from Svay Rieng Provincial Hospital

Note: * Calculated by dividing the number of outpatients (persons / year) by the number of referral patients (persons / year) from other facilities (lower-tier hospitals).

3.3.2.2 Other Positive and Negative Impacts

(1) Impacts on the Natural Environment

The project was judged to have minimal adverse impacts on the environment and was classified as Category C under the Japan International Cooperation Agency Guidelines for Environmental and Social Considerations (issued in April 2010). According to questionnaire responses received from the Consultant and Svay Rieng Provincial Hospital, the project did not have any negative impact on the natural environment. Svay Rieng Provincial Hospital remained in operation while the project was underway, and construction work was not carried out at night, in consideration of the impact on hospitalized patients. No particular problems were found in the disposal of waste materials and surplus soil during the construction. According to an

interview with Svay Rieng Provincial Hospital, at the time of the ex-post evaluation, medical waste was being disposed of in accordance with the regulations in Cambodia.

(2) Resettlement and Land Acquisition

According to interviews with Svay Rieng Provincial Hospital and the Consultant, no resettlement or land acquisition was taken place under the project.

(3) Unintended Positive / Negative Impacts

● Contribution to SDG Target 3.8: universal health coverage

Even before the commencement of the project, Svay Rieng Provincial Hospital was accepting patients who were struggling financially. In Cambodia, the Health Equity Fund and Community-based Health Insurance have been established to enable such patients to receive health care services. The number of patients receiving health care services at Svay Rieng Provincial Hospital using these systems has been on the rise since 2017, the year the project was completed (see table below). This indicates that the project is contributing to the SDG Target 3.8: universal health coverage.

Table 11: Number of Patients Using the Health Equity Fund and Community-Based Health Insurance

Item	Year	2015	2016	2017	2018	2019	2020
No. of patients using the Health Equity Fund (persons)		7,713	4,973	6,970	9,399	7,663	8,576
No. of patients using Community-based Health Insurance (persons)		0	0	2,772	7,697	16,989	19,274

Source: Preparatory Survey Report and questionnaire responses from Svay Rieng Provincial Hospital

● Contribution to novel coronavirus (COVID-19) response

As the top referral hospital in the province, Svay Rieng Provincial Hospital is engaged in the isolation, diagnosis, and treatment of novel coronavirus (COVID-19) patients. The hospital isolates and tests suspected COVID-19 patients who also have diseases that cannot be treated by district hospitals. These patients are then transferred to other hospitals once their condition is stabilized. According to interviews with the hospital, from the beginning of 2021 to early July of the same year, 209 patients suspected of having coronavirus were isolated, and 53 of them tested positive for the virus. Of the 53 patients who tested positive, 26 were pregnant women who had undergone C-sections, eight had undergone other surgeries, and 19 had other serious diseases. In addition, according to interviews with Svay Rieng Provincial Hospital, if the new hospital building had not been constructed by this project, it would have been difficult to isolate the patients on the scale described above. It is thus thought that the project contributed

to the treatment of novel coronavirus disease in Svay Rieng through the construction of the hospital building.

- Cooperation and synergy with other projects of donor agencies including JICA

At Svay Rieng Provincial Hospital, various organizations have provided support in the health care sector. Based on the responses to questionnaires and interviews with Svay Rieng Provincial Hospital, the areas of synergy with the project and for which equipment procured in the project is used include obstetrics, gynecology, and pediatrics (JICA Technical Cooperation Project: Project for Improving Continuum of Care with Focus on Intrapartum and Neonatal Care), ophthalmology (Eye Care Foundation supported by the Government of The Netherlands), diabetes and hypertension treatment (German Agency for International Cooperation and Novo Nordisk), and the treatment of HIV / AIDS and tuberculosis (Cambodia Health Committee, a local NGO). In addition, training on 5S guidelines⁸ and general hygiene guidance (e.g., hospital-acquired infection control, etc.) was provided by Japan Overseas Cooperation Volunteers (JOCV) at Svay Rieng Provincial Hospital (see section 3.4.2 Technical Aspects of Operation and Maintenance for details).

As described above, Svay Rieng Provincial Hospital has appropriately responded to the growing needs of health care services in the province by utilizing the facilities and equipment provided under the project, and its functionality as a top referral hospital has been improved. This has led to improvement in the quality of health care services provided by Svay Rieng Provincial Hospital and the strengthening of the referral system in Svay Rieng Province. In addition, the project has contributed to universal health coverage by providing health care services to the poor, and an impact in the treatment of novel coronavirus has been confirmed. Thus, this project has mostly achieved its objectives. Therefore, effectiveness and impacts of the project are high.

3.4 Sustainability (Rating: ③)

3.4.1 Institutional / Organizational Aspects of Operation and Maintenance

(1) Institutions and organization for the operation of health care services

At the time of the ex-post evaluation, the number of medical personnel involved in the operation and maintenance of Svay Rieng Provincial Hospital is as shown in the following table. In order to quantitatively verify the degree of over- and under-staffing, the number of staff at the time of the ex-post evaluation was compared with the number of staff that should be assigned to CPA3 hospitals, as stipulated in the CPA Guidelines.⁹

⁸ 5S is a method of workplace environment improvement and quality control developed by Japanese industry. 5S is named after the first letters of the five steps: Sort, Set in order, Shine, Standardize, and Sustain.

⁹ CPA stands for Complementary Package of Activities, and the CPA Guidelines are issued by the Cambodian government to classify provincial hospitals into three levels (CPA1 to CPA3) according to their size, and to specify the

Table 12: Number of Staff that Should be Assigned to CPA3 Hospitals vs. Number of Staff at the Time of the Ex-post Evaluation

Item	Number of staff that should be assigned to CPA3 hospitals	Number of staff at the time of ex-post evaluation
Doctor	23 - 40	27
Dentist	2 - 3	1
Pharmacist	6 - 8	2
Secondary Doctor (Medical Assistant)	2 - 3	3
Secondary Dentist (Dentist Assistant)	2 - 3	0
Nurses	50 - 80	50
Midwives	12 - 14	19
Assistant Nurse	14 - 20	21
Assistant Midwife	2 - 4	5
Physiotherapist	3 - 4	2
Accounting staff	2 - 4	2
Others	79 - 166	110
Total	179 - 276	242

Source: Preparatory Survey Report and questionnaire responses from Svay Rieng Provincial Hospital

First, regarding the overall number of staff, Svay Rieng Provincial Hospital had 242 medical personnel at the time of the ex-post evaluation, which is within the level required by CPA Guidelines (i.e., 179 - 276 people). However, the numbers of dentists and co-medical staff (pharmacists, dental assistants, and physiotherapists) were lower than the numbers of staff required by those guidelines. According to the hospital, the reason for the low number of dentists is that dental patients tend to visit private dental clinics, and one dentist is able to handle the number of patients who come to the hospital. In Cambodia, there are few licensed co-medical personnel in general, and it is difficult to hire new ones. The hospital employs six contract nurses to provide support the pharmacists and the dentist, mainly doing administrative work. In addition, since the hospital does not have a clinical laboratory technician, doctors, nurses, and other medical personnel are handling these tasks.

(2) Institutions and organizations for operation and maintenance of facilities and equipment

Based on the responses to questionnaires and interviews with the Consultant and Svay Rieng Provincial Hospital, a medical equipment management team led by the anesthesiologist has been established to maintain and manage the medical equipment. If there is any equipment failure or malfunction, each department reports to the anesthesiologist, who then, together with the team, prioritizes the equipment and deals with the failure or malfunction, if it is within the hospital budget. If the hospital budget cannot cover the equipment problem, the hospital will apply for

necessary health care services and equipment for each level. CPA3 refers to the largest hospitals with specialized departments such as ophthalmology and otolaryngology, and Svay Rieng Provincial Hospital is classified as CPA3.

budget from the provincial health department. For maintenance of the building, a building manager has been appointed in the administrative unit. The responsibilities of operation and maintenance for the project's facilities and equipment are thus clearly defined.

From the above, it is concluded that there are no particular problems with the institutional and organizational aspects of operation and maintenance.

3.4.2 Technical Aspects of Operation and Maintenance

According to Svay Rieng Provincial Hospital, medical personnel are able to participate regularly in internal and external training programs. For example, within the hospital, clinical case studies are presented every two weeks, and technical training based on the specialties of each department is provided. Outside the hospital, they participate in training and conferences held on a national and provincial level. In addition, Svay Rieng Provincial Hospital commented that the Japan Overseas Cooperation Volunteers (JOCV) contributed to the promotion of 5S. Specifically, in addition to the training on the 5S guidelines, general hygiene guidance such as hospital-acquired infection control was conducted and information on 5S was provided to patients and their families. JICA volunteers prepared activity plans together with the head nurse, and were in charge of training hospital staff and monitoring the activities.

According to Svay Rieng Provincial Hospital, medical personnel have the opportunity to regularly participate in internal and external training programs to acquire relevant skills and knowledge in the operation and maintenance of the facilities and equipment. At the time of the ex-post evaluation, it was difficult for local suppliers to visit the hospital directly due to the coronavirus pandemic. However, the hospital has been able to consult with these local suppliers by phone or e-mail about repairing equipment and purchasing spare parts or reagents.

From the above, it is concluded that there are no particular problems with the technical aspects of operation and maintenance.

3.4.3 Financial Aspects of Operation and Maintenance

The income and expenditure of Svay Rieng Provincial Hospital shows an increase in revenue from 2018 to 2020, with a surplus every year (see table below). The hospital is expected to continue to post a surplus in 2021, indicating that the hospital's operations are financially stable. However, the hospital pointed out that renovation and maintenance of the facility and equipment repairs tend to be delayed due to the time needed for payment from the Health Equity Fund and Community-based Health Insurance. In cases where medical equipment problems hinder diagnosis and treatment, they work with private clinics to address the issue. The Consultant also commented that due to budget constraints in the hospital, the repair of equipment that is used less frequently and has a lower priority is sometimes delayed. However, as described in section 3.3.1 Effectiveness, the hospital is responding to the increasing needs of health care services,

and it is presumed that the aforementioned issues do not have a serious impact on hospital operations.

From the above, it is concluded that there are no particular problems with the financial aspects of operation and maintenance.

Table 13: Financial Status of Svay Rieng Provincial Hospital

Unit: Riel

Item	Year	2018	2019	2020	2021 (planned)
Revenue:					
Budget from MOH		6,115,859,159	6,576,429,982	6,360,487,625	6,678,512,060
Budget from Province		4,023,349,489	4,368,838,736	4,762,530,110	5,143,532,518
User fee		3,289,487,900	3,789,688,100	3,714,546,500	4,086,001,200
Total		13,428,696,548	14,734,956,818	14,837,564,235	15,908,045,778
Expenses:					
Salary		2,542,329,100	2,717,756,600	3,301,890,960	3,466,985,508
Bonus		1,973,692,740	2,273,812,860	2,228,727,900	2,451,600,720
Medical supply		3,471,100,313	3,761,656,950	3,654,915,564	3,947,308,808
Materials		1,577,772,870	1,709,844,068	1,661,325,256	1,794,231,277
Medical equipment		1,294,760,596	1,367,875,254	1,329,060,205	1,435,385,021
O&M for equipment		23,960,845	32,037,300	41,147,000	50,376,400
O&M for facility		270,495,624	400,272,700	146,015,800	160,617,380
Electricity / Water supply		407,910,400	415,643,936	456,003,050	501,603,355
Gas		246,865,200	467,078,100	413,675,700	455,043,270
Administration		119,302,450	143,397,425	155,418,950	177,960,845
Others		1,144,914,158	1,133,369,012	1,197,592,401	1,233,520,173
Payment to government		16,049,979	17,434,741	16,975,195	18,801,205
Travel		111,784,000	110,378,000	110,099,000	121,108,900
Total		13,200,938,275	14,550,556,946	14,712,846,981	15,814,542,862
Balance		227,758,273	184,399,872	124,717,254	93,502,916

Source: Preparatory Survey Report and questionnaire responses from Svay Rieng Provincial Hospital

3.4.4 Status of Operation and Maintenance

As described in section 2.3 Constraints during the Evaluation Study, it was not possible to visit Svay Rieng Provincial Hospital to inspect the facilities and equipment (94 items) procured in the project. According to the Consultant, who visited the hospital in December 2020, at that time, there were no problems with the equipment for which maintenance contracts have been signed (18 items) under the project. According to questionnaire responses received from the hospital, of the equipment procured in the project, the oxygen system had malfunctioned at the time of the ex-post evaluation. Due to the COVID-19 pandemic, it is delayed to obtain spare parts for this equipment for the time being. However, the hospital continues to provide treatment to patients using oxygen cylinders.

From the above, it is concluded that there are no particular problems with the status of operation and maintenance.

No major problems have been observed in the institutional / organizational, technical, financial aspects, and the current status of the operation and maintenance system. Therefore, sustainability of the project effects is high.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

With the aim of improving the functions of Svay Rieng Provincial Referral Hospital, including their obstetrics / gynecology department and emergency outpatient services, and thereby contributing to the improvement of the quality of health care services in Svay Rieng Province, the project implemented the construction of hospital facilities and procurement and installation of medical equipment. Building facilities and supplying equipment in this way is fully consistent with Cambodia's development needs and policies, which aimed to improve the quality of health services through the development of health infrastructure, including health facilities. It was also in line with Japan's ODA policies. Therefore, its relevance is high. On project cost and project period, the project cost was within the plan, but the project period exceeded the plan. Therefore, efficiency of the project is fair. Regarding the effectiveness of the project, Svay Rieng Provincial Hospital has been able to meet the growing needs of health care services in the province by utilizing the new facilities and equipment procured in the project, and its functionality as a top referral hospital has been improved. This also led to the improvement of the quality of health care services provided by Svay Rieng Provincial Hospital and the strengthening of the referral system in Svay Rieng Province. Furthermore, the project contributed to universal health coverage by providing health care services to the poor and made a positive impact on the hospital's response to novel coronavirus infections (COVID-19). As described above, this project has mostly achieved its objectives. Therefore, effectiveness and impacts of the project are high. The hospital has secured most of the necessary medical personnel, and they have the skills to provide health care services, as well as operate and maintain the facilities and equipment. Although repairs of low-priority equipment tend to be slow, hospital revenue and expenditures are stable, and the facilities and provided equipment are in a usable state. Therefore, sustainability of the project effects is high.

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

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

Furthering the effective usage of the project

At the time of the ex-post evaluation, there were emergency departments established at all of the district hospitals in Svay Rieng Province. Svay Rieng Provincial Hospital has been providing emergency medical services since before implementation of the project and has accumulated

knowledge in this field, so it is possible for them to transfer medical technology to the newly established emergency departments in the district hospitals. Svay Rieng Provincial Hospital provides technical guidance to district hospitals in all medical fields, so it is desirable that they continue to provide this guidance with more emphasis on emergency medicine, in order to improve the emergency medical care provided at the district hospitals.

4.2.2 Recommendations to JICA

None

4.3 Lessons Learned

Equipment maintenance after project completion

When equipment was purchased for the project, the contract between the Ministry of Health and the contractor who procured the equipment included maintenance services for three years after project completion. Based on this clause, the local suppliers of the equipment visited the hospitals to conduct periodic inspections and provided on-call support. In addition, a system was established so that the Consultant would monitor the maintenance status of major equipment after project completion. According to the Consultant, this maintenance work led to the proper maintenance of the equipment for three years after completion of the project. Additionally, through the monitoring of maintenance conditions, advice was given on how to identify reasons for equipment failure and how to prevent it. Based on this, it is recommended that a clause for maintenance work, including periodic inspections, be added to contracts for equipment procured by the Japanese side, and that a system for monitoring its maintenance status be established so that the equipment can be properly maintained after the completion of future projects in the health sector.

Collecting outcome indicators

At the time of planning, outcome indicators were set to recognize the quantitative effects of this project. These indicators to be measured were set in a stringent manner so that the effects of the project could be properly assessed. However, they were different from the indicators that were regularly compiled by Svay Rieng Provincial Hospital. For example, the number of surgical operations covers only the fields affected by the project, measuring the sum of limb and abdominal surgeries. In contrast, the hospital collected data on all surgical procedures, but did not collect separate data covering only the aforementioned types of surgeries. Therefore, it was difficult to determine the achievement level of this indicator. When setting precise outcome indicators in order to properly assess the effects of a project, staff of the executing agency should be given a deeper understanding of the definition of the indicators at the time of project planning.

The data collection system should also be checked on a regular basis while the project is underway to ensure that the system has been properly established.

Kingdom of Cambodia

FY2020 Ex-Post Evaluation Report of Japanese Grant Aid Project
“The Project for the Improvement of the National Road No.1 (Phases 1-4)
/ The Project for Improvement of the National Road No.1 Urban Section
/ The Project for Construction of Neak Loeung Bridge”

External Evaluator: Nobuyuki Kobayashi, OPMAC Corporation

0. Summary

This project conducted the improvement of a road and repairing/construction of bridges in the Phnom Penh - Neak Loeung section of National Road No. 1 and its objective was to expand transportation capacity, improve efficiency, and enhance flood control in the above section, thereby contributing to a strengthening of international logistics and a revitalization of the society and economy of the project area. With Cambodia’s policy goal of enhancing international corridor development, the amount of trade between Cambodia and Vietnam was on rise. This project has been highly relevant to the country’s development plan and development needs, as well as Japan’s ODA policy. Therefore, its relevance is high. Both the project cost and the project period exceeded the plan. Therefore, the efficiency of the project is fair. The effects (an improvement in traffic efficiency, flood protection, etc.) were found in the improved section of National Road No.1, and the opening of the Neak Loeung Bridge brought about smoother crossing of the Mekong River. Cargo volume between Cambodia and Vietnam was increasing, and the economy in the project affected area was also expanding. This project has achieved its objectives. Therefore, the effectiveness and impacts of the project are high. Given the responsibilities and personnel assignment of the executing agencies, it is feasible to carry out routine and periodic maintenance of the infrastructure constructed by the project. The maintenance of the improved section of National Road No.1 is within the technical level of the Department of Public Works and Transport (DPWT), but the maintenance of Neak Loeung Bridge requires the Ministry of Public Works and Transport (MPWT) to obtain higher technical skills to cope with the special features of the cable-stayed bridge. In terms of budget, it was expected that the maintenance budget would be allocated for the improved section of National Road No.1, but budget allocation for the periodic maintenance of Neak Loeung Bridge needed to be reassessed. Nevertheless, no severe damage occurred affecting transport in the infrastructure constructed by the project. From the above, some minor problems have been observed in terms of the technical aspect and financial aspect on the operation and maintenance of this project. Therefore, the sustainability of the project effects is fair.

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

1. Project Description



Project Location



Neak Loeung Bridge

1.1 Background

Cambodia is located between Thailand and Vietnam, and National Road No.1 in Cambodia is part of the international corridor connecting Ho Chi Minh and Bangkok. National Road No.1 is also a major trunk road for domestic logistics connecting the capital city, Phnom Penh, and the southeast area of Cambodia.

As the section of National Road No.1 from Phnom Penh to Neak Loeung is along the Mekong River and lies on its flood plain, design and construction of the road were difficult. In the early 2000s, with Asian Development Bank (hereinafter called ADB) support, National Road No.1 at the section from Neak Loeung to Bavet (the border with Vietnam) was improved, but improvement of the section from Phnom Penh to Neak Loeung was not started due to the technical concerns stated above. After a flood in 2000, the above section was damaged significantly, which resulted in extremely low travel speed. In the flood in 2000, two locations of National Road No. 1 were intentionally cut to block inflow from the river and prevent flood damage in the city of Phnom Penh. After the flood, one-lane Bailey bridges¹ was built for passage. However, these bridges needed to be replaced immediately as the locations became bottlenecks of traffic. The National Road improvement part of the project, whose contents are the Grant Aid “the Project for Improvement of National Road No.1 (Phase 1 through 4) / the Project for Improvement of National Road No.1 Urban Section”, was to support the improvement of the above unrepaired section of National Road No.1.

National Road No.1 crossed the Mekong River at Neak Loeung in Cambodia without a bridge in the 2000s, with a ferry service being the only way to cross the river. In 2008, the traffic volume crossing the river in Neak Loeung was expected to soon reach the limit of the ferry service capacity. For the efficient logistics of National Road No.1, a new transport measure to replace ferries for river crossing was required. The bridge construction part of the project, the Grant Aid

¹ A type of temporary bridge

“the Project for the Construction of Neak Loeung Bridge”, was to support the construction of a cable-stayed bridge on National Road No.1, thus eliminating the need for ferry transportation.

1.2 Project Outline

The objective of this project is to expand transportation capacity, improve efficiency, and enhance flood control in the Phnom Penh- Neak Loeung section of National Road No. 1 by the improvement of the road and the repairing/construction of bridges in the aforementioned section, thereby contributing to a strengthening of international logistics and a revitalization of the society and economy of the project area.

[The Project for Improvement of National Road No.1 (Phases 1-4)/The Project for Improvement of the National Road No.1 Urban Section]

Grant Limit / Actual Grant Amount	(Phase 1) JPY 786 million / JPY 777 million (Phase 2) JPY 4,746 million / JPY 4,571 million (Phase 3) JPY 2,005million / JPY 1,138 million (Phase 4) JPY 1,585 million / JPY 1,543 million ² (Urban section) JPY 251 million
Exchange of Notes Date /Grant Agreement Date	(Phase 1) June 2005 ³ (Phase 2) June 2006 (Phase 3) July 2009 / July 2009 (Phase 4) December 2013 / January 2014 (Urban section) November 2014 / December 2014
Executing Agency	MPWT
Project Completion	July 2017 ⁴
Target Area	Phnom Penh capital city, Kandal province
Main Contractor(s)	(Phases 1 and 2) Obayashi Corp., (Phase 3) Daiho Corp., (Phase 4 and Urban section) Hazama Ando Corp.
Main Consultant	Katahira & Engineers International
Basic Design	March 2004 – March 2005
Related Projects	[Technical Cooperation] “Project on Capacity Enhancement of Environmental and Social Considerations for Resettlement” (2010 - 2012) [Grant Aid] “Project for Flood Disaster Rehabilitation and Mitigation” (2012) [Others] “Study on the Road Network Development in the Kingdom of Cambodia” (2005 - 2006) [Other Aid Agencies] ADB “Greater Mekong Subregion: Phnom Penh to Ho Chi Minh City Highway Project” (1999)

² The actual grant amount includes that of the Project for the Improvement of the National Road No.1 Urban Section.

³ As Phases 1 and 2 were agreed before October 2008, the grant agreements were not signed. For this reason, only the Exchange of Notes Date is shown.

⁴ At the time of the construction completion in the target section for the Urban Section

[The Project for Construction of Neak Loeung Bridge]

Grant Limit / Actual Grant Amount	(Detailed Design) JPY 239 million / 218 million (Construction) JPY 11,940 million / JPY 9,777 million
Exchange of Notes Date /Grant Agreement Date	(Detailed Design) March 2010 / March 2010 (Construction) June 2010 / June 2010
Executing Agency	MPWT
Project Completion	April 2015
Target Area	Kandal province, Prey Veng province
Main Contractor	Sumitomo Mitsui Construction
Main Consultant	Chodai • Oriental Consultants (JV)
Preparatory Survey	February 2009 – March 2010
Related Projects	[Technical Cooperation] “Project on Capacity Enhancement of Environmental and Social Considerations for Resettlement” (2010 - 2012) [Grant Aid] “Project for Flood Disaster Rehabilitation and Mitigation” (2012) [Others] “Study on the Road Network Development in the Kingdom of Cambodia” (2005 - 2006) [Other Aid Agencies] ADB “Greater Mekong Subregion: Phnom Penh to Ho Chi Minh City Highway Project” (1999)

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: October 2020 – January 2022

Duration of the Field Study: July 2021 (conducted by field assistants in Cambodia)

2.3 Constraints during the Evaluation Study

In the ex-post evaluation, survey assistants in Cambodia conducted a field survey as it was difficult for the external evaluator to travel due to the COVID-19 pandemic. Due to safety considerations across Cambodia, the survey assistants conducted the survey on the resettlement of residents at only two relocation sites⁵ where the locations had been identified in advance and support for the survey was obtained. Moreover, as the number of respondents was small and selection was not conducted using systematic sampling, their answers could be biased. There were

⁵ Six relocation sites were built for resident resettlement in the Project for the Improvement of National Road No.1.

the same issues in the sample size and sampling method for the beneficiary survey and, therefore, the survey results may not represent the overall project benefits appropriately. The analysis of the negative impacts on the environment is based on the information from MPWT and the Consultant, as environment impact assessment reports, monitoring reports, and monitoring data were not available.

3. Results of the Evaluation (Overall Rating: B⁶)

3.1 Relevance (Rating: ③⁷)

3.1.1 Consistency with the Development Plan of Cambodia⁸

At the time of the planning of the Project for Improvement of National Road No.1, the national development strategy, the *Rectangular Strategy* (2004), had the further rehabilitation and construction of the transportation network at Rectangle 2 “Continued Rehabilitation and Construction of Physical Infrastructure” among its four basic strategies. The transportation network was emphasized in particular, with the roads and bridges connecting Cambodia with neighboring countries, seen as important in integrating the Cambodian economy into the regional and global economies. Similarly, in the *Socio-Economic Development Plans Phase II* (2001 - 2005), the development goals of the transport sector were the rehabilitation, maintenance, and enhancement of the transportation infrastructure to promote market integration and trade, and thus the improvement of National Road No.1 had a higher priority, as it was a part of the international corridor connecting Bangkok and Ho Chi Minh.

At the planning time of the Project for Construction of Neak Loeung Bridge, the national development strategy, the *Rectangular Strategy Phase II* (2008) aimed at the further rehabilitation and construction of the transport network, stated at Rectangle 2 “Further Rehabilitation and Construction of the Physical Infrastructure”. The transport sector was prioritized for the integration of the domestic economy itself as well as integration into the regional and global economies. In addition, the *National Strategic Development Plan Update 2009-2013* had the policy of continuing the construction of important national roads to integrate the country domestically and with neighboring countries, as mentioned in the above-mentioned *Rectangular Strategy Phase II*.

At the time of the ex-post evaluation, the national development strategy, the *Rectangular Strategy Phase 4* (2018), had improvement of the logistics network at Rectangle 2 “Economic Diversifications” among its four basic strategies. A major policy goal was to establish a logistics

⁶ A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

⁷ ③: High, ②: Fair, ①: Low

⁸ This project is consisted of the Project for Improvement of the National Road No.1 and the Project for Construction of Neak Loeung Bridge, but the subjects to be assessed in development policy and development needs are mostly common between the two phases. Therefore, the relevance was evaluated at three timings: the planning time of the Project for Improvement of the National Road No.1, the planning time of the Project for Construction of Neak Loeung Bridge, and the time of ex-post evaluation.

network linking the country with key global economic centres. The *National Strategic Development Plan 2019-2023* had the policy of road rehabilitation and construction of more than 3,000 km, and roads between major provincial cities and the Special Economic Zones were to be improved to a higher standard (expansion to 4-lane roads, etc.). The same plan also promoted studies to improve roads and bridges in the section of National Road No.1 between Phnom Penh and Bavet. The development plan for the road sector, the *National Road Network Master Plan (2006)*⁹, was still a basic strategy at the time of the ex-post evaluation, and the development of National Road No.1 had a higher priority in terms of the enhancement of the international corridor, economic development in provincial cities and linkages between main domestic cities (multipolar development).

At both the times of the ex-ante and the ex-post evaluation, improvement of the transport network had been prioritized in the national development plans and the sector plans, especially the development of the international corridor linking Cambodia and neighboring countries. As the target section of the project is a part of the main national road connecting the capital city Phnom Penh to the border with Vietnam, the objective of the project, especially its impact, was therefore consistent with the continuing policy goals of the national development plans.

3.1.2 Consistency with the Development Needs of Cambodia

The Greater Mekong Subregion Ministerial Conference (1998) adopted the economic corridor approach (east-west, north-south and southern) proposed by ADB. The Southern Economic Corridor was an international corridor from Ho Chi Minh to Bangkok via Phnom Penh, and National Road No.1 in Cambodia was a part of this Southern Economic Corridor. National Road No.1 in Cambodia was also part of Asian Highway AH1 and had an important role in the country's international and domestic logistics. However, the flooding in 2000 caused severe damage to that national road and only temporary repairs were conducted. Taking into consideration future transport demand, large-scale rehabilitation was inevitable. At the time of planning of the Project for the Improvement of National Road No.1, although the section east of Neak Loeung was to be improved by ADB, details of the improvement of the section between Phnom Penh and Neak Loeung had not yet been decided.

In Neak Loeung, National Road No.1 crosses the Mekong River. At the planning time of the Project for Construction of Neak Loeung Bridge, ferry crossings at this location were a bottleneck on the Southern Economic Corridor, with a waiting time of up to 7 hours. With the traffic capacity of the ferry service expected to reach its limit in 2012, the construction of a bridge was an urgent issue for smooth transport.

At the time of the ex-post evaluation, National Road No.1 was still a part of the Southern Economic Corridor and Asian Highway AH1 and was used for land trade between Cambodia

⁹ JICA "The Study on the Road Network Development" (2006) supported the formulation of the above master plan.

and Vietnam. From the year before the commencement of the Project for Improvement of National Road No.1, the share of Vietnam in both Cambodian exports and imports increased (see the following table). Exports from Cambodia to Vietnam have shown an increasing trend on a monetary basis. Vietnam has become the third most important country as the import from Vietnam have also increased on a monetary basis.

Table 1: Trade between Cambodia and Vietnam

Unit: USD million

	2004*	2017*	2018	2019	2020
Exports	2,795.14	11,313.38	12,739.26	14,866.3	14,436.5
to Vietnam (amount)	42.4	325.8	361.8	359.2	318.1
for Vietnam (%)	1.5%	2.9%	2.8%	2.4%	2.2%
Imports	2,032.8	14,800.9	18,130.6	21,058.4	20,858.9
from Vietnam (amount)	168.7	1,682.3	2,221.0	2,724.9	2,687.2
from Vietnam (%)	8.3%	11.4%	12.3%	12.9%	12.9%

Source: IMF - Direction of Trade Statistics

Note: * the year before the project commencement, for 2004, the project completion year, for 2017.

National Road No.1 is the shortest route from Phnom Penh to Ho Chi Minh, and there is no bridge on the Mekong River south of the Neak Loeung Bridge in Cambodia. Consequently, that bridge is an important part of the road infrastructure from the point of view of smooth transport between Phnom Penh and the south-eastern part of Cambodia (Prey Veng Province and Svay Rieng Province). JICA's "Basic Information Survey on National Road Network Development Plan" (2013) forecasted the traffic volume of major national roads in Cambodia by 2030 and proposed four prioritized projects for road improvement. In terms of the promotion of investment and the response to transportation demand, the above priority projects included the construction of the second Neak Loeung Bridge, and the importance of bridging at Neak Loeung was proved again.

At the times of both the ex-ante and the ex-post evaluation, National Road No.1 was a part of the international corridor and an important route for international and domestic logistics. The amount of trade between Cambodia and Vietnam has shown an increasing trend, and the share of Vietnam in imports to Cambodia has been especially high. Moreover, Neak Loeung Bridge has an important role for smooth transport in the south-eastern part of the country. The scope of this project is the improvement of National Road No.1 and the construction of Neak Loeung Bridge, the project has therefore been consistent with the development needs of Cambodia.

3.1.3 Consistency with Japan's ODA Policy

At the time of planning for the Project for Improvement of National Road No.1 and the Project for Construction of Neak Loeung Bridge, Japan's Country Assistance Program for Cambodia

(2002) referred to “sustainable economic growth and the realization of a stable society” as priority areas of assistance, and its policy was “promotion to improve socio-economic infrastructure and to enhance the environment for economic growth”. In addition, the program also mentioned road damage caused by flooding of the Mekong River and aimed to improve the infrastructure with consideration of protection from natural disasters. Furthermore, the program referred to the development of “the second East-West Economic Corridor” (the international corridor from Ho Chi Minh to Bangkok via Phnom Penh) with the policy of the development of the Greater Mekong Sub-region for the reduction of disparity among ASEAN¹⁰ countries.

The goal of the project was the enhancement of smooth transport and logistics through road improvement and the construction of bridges on National Road No.1, a trunk road in the country as well as an international corridor. The impacts of the project were expected “to stimulate socio-economic activities in the area along the road” and “to enhance international logistics.” In addition, National Road No.1 was elevated as an embankment road of the Mekong River in the project, and this contributed to infrastructure improvement for disaster protection. Thus, the objective of the project was consistent with ODA policy at the time of planning.

This project has been highly relevant to the country’s development plan and development needs, as well as Japan’s ODA policy. Therefore, its relevance is high.

3.2 Efficiency (Rating: ②)

3.2.1 Project Outputs

(1) The Project for Improvement of National Road No.1

The road improvement of National Road No.1 (the section between Phnom Penh and Neak Loeung) and the construction and replacement of bridges were implemented in the Project for Improvement of National Road No.1 (see the following table). For improvement of the road, the road surface was elevated (elevation by approximately 70 cm on average) to prevent overflow at the same water level as the flooding of 2000. At the project implementation, consulting services such as detailed design, tender assistance, and construction supervision were carried out. The survey on compensation and replacement costs for the resettlement of residents was added to the consulting services during the project implementation. The plan and actual outputs of the project are shown in the following table.

¹⁰ Association of South-East Asian Nations

Table 2: Outputs for The Project for Improvement of National Road No.1 (Plan and Actual)

Plan	Actual
<ul style="list-style-type: none"> Road Improvement (widening, raising, pavement): Total length 55.98 km (4-lane section 1.8 km, 2-lane section 54.18 km) Bridge construction: Total length 240.6 m (replacement of two bridges, construction of one bridge) 	<ul style="list-style-type: none"> Road Improvement (widening, raising, pavement): Total length 55.98 km (4-lane section 4.0 km, 2-lane section 51.98 km) Bridge construction: Total length 239.8 m (replacement of two bridges, construction of one bridge)

Source: Basic design study report, documents provided by JICA

A notable modification of the project scope was the extension of the 4-lane section (before the scope change 1.8km, after the scope change 4.0km). The above modification was appropriate as this change was caused by the significant increase of traffic volume during project implementation. Assuming the same number of lanes as the initial plan, the traffic volume (at a 3.5 km point) would be more than 80 percent of road capacity in 2014 and cause serious traffic congestion.

At the time of planning of the Project for Improvement of National Road No.1, the Government of Cambodia was expected to provide compensation payments to the affected residents and relocate existing infrastructure as their responsibilities. The compensation for the affected residents was changed significantly, as described later (“3.3.2.2 Other Positive and Negative Impacts”).

(2) The Project for Construction of Neak Loeung Bridge

New bridges and approach roads were constructed at the crossing points of the Mekong River of National Road No.1 by the Project for Construction of Neak Loeung Bridge. The main bridge is a prestressed concrete cable-stayed bridge with a 640 m of bridge length and a 330 m of maximum span length. In the project implementation, consulting services such as detailed design, tender assistance, and construction supervision were carried out. Due to the existence of unexploded ordnances, the clearance of unexploded ordnances was also added to the consulting services during project implementation. The plan and actual outputs of the project are shown in the following table.

Table 3: Outputs for The Project for Construction of Neak Loeung Bridge (Plan and Actual)

Plan	Actual
<ul style="list-style-type: none"> Main bridge: PC cable-stayed bridge (640 m) Approach bridges: PC composite bridges (1,575 m) Approach road: 3.1 km, 2-lane 	<ul style="list-style-type: none"> Main bridge: as planned Approach bridges: as planned Approach road: 3.25 km, 2-lane

Source: Preparatory survey report, documents provided by JICA

A major change in the technical specifications was modification of the pavement structure. This change is considered appropriate from the viewpoint of sustainability because it responds

to future increases in traffic and reduces the risk of pavement damage. As Neak Loeung Bridge was one of the longest bridges in Cambodia, supplemental construction was added to the project scope, such as for monuments (at two locations), during the project implementation.

At the planning time of the Project for Construction of Neak Loeung Bridge, the Government of Cambodia was expected to undertake the costs for land acquisition, for the resettlement of residents (including surveys and compensation for the affected residents), the clearance of unexploded ordnances and the installation of various kinds of infrastructure. The Cambodia side kept their obligations. However, there was an issue in the disposal of unexploded ordnances, which caused a delay in the project implementation, as described later.



National Road No.1
(at the completion of Phase 3)



Approach road of Neak Loeung Bridge

3.2.2 Project Inputs

3.2.2.1 Project Cost

(1) The Project for Improvement of National Road No.1

The planned project cost was JPY 8,219 million in total (Japan side: JPY 7,984 million¹¹, Cambodia side: JPY 235 million), and the actual was JPY 9,632 million in total (Japan side: JPY 8,030 million, Cambodia side: JPY 1,602 million). Consequently, the actual project cost exceeded the plan (117% against the plan).

The planned project cost of the Japan side was JPY 7,562 million in the basic design study report. However, there was a significant modification of the project scope (extension of 4-lane sections) of the Project for the Improvement of National Road No.1. For a proper comparison, the planned project cost of the Japan side is adjusted to JPY 7,984 million¹² including the additional cost of the above modification, reflecting the advice from the Consultant. The actual project cost of the Japan side was JPY 8,030 million.

¹¹ The amount is based on the plan of the basic design study report.

¹² Based on the proposal of the Consultant, the increased project cost (plan) for extension of 4-lane sections was estimated by using a comparison between the remainder of the project cost of Phase 3 and the estimated project cost at the planning of Phase 4, which was then added to the project cost of the Japan side (plan).

For the project cost of the Cambodia side, only the amount of the costs for land acquisition and resettlement of resident was obtained. Comparing the plan and the actual of that portion, the actual project cost was JPY 1,602 million against the plan of JPY 235 million. The significant difference between the plan and the actual was due to a significant revision of the policy on the compensation to the affected residents. The increase of the project cost on the Cambodia side was necessary to mitigate the negative impact on the affected residents, especially for compensation for the involuntary resettlement of residents. For this reason, it is concluded that this expenditure was appropriate.

(2) The Project for Construction of Neak Loeung Bridge

The planned project cost was JPY 12,115 million in total (Japan side: JPY 12,005 million¹³, Cambodia side: JPY 110 million), and the actual was JPY 10,141 million in total (Japan side: JPY 9,996 million, Cambodia side: JPY 145 million). Consequently, the actual project cost was within the plan (84% of the plan). While the planned project cost of the Japan side was JPY 12,005 million, the actual project cost was JPY 9,996 million, which was 83% of the plan. The actual project cost was within the plan. The reason for the reduction in project cost was that the construction cost was lower than the estimation due to competitive bidding. Regarding the project cost of the Cambodia side, only the cost for land acquisition and resettlement was obtained. Comparing the plan and the actual of that portion, the actual project cost was JPY 145 million against the planned project cost of JPY 110 million, which was 132% of the plan.

The actual project cost for the Project for Improvement of National Road No.1 and the Project for Construction of Neak Loeung Bridge was 101% of the plan on average, which was higher than the plan.

3.2.2.2 Project Period

As described above, a significant modification (extension of 4-lane sections) of the project scope was made for the Project for Improvement of National Road No.1 at the time of planning for Phase 4 (2013). For a proper comparison, adopting the planned project period at the time of project scope modification as the planned target, the project period (plan) was 10 years and 9 months (June 2005 to February 2016). The project period (actual) was 12 years and 2 months (June 2005 to July 2017, 113% against the plan) and exceeded the plan¹⁴.

At the time of appraisal, it was initially planned that the Project for the Improvement of National Road No.1 would be divided to 3 phases. However, it was actually implemented in 5

¹³ The amount is based on the plan of the preparatory survey report and does not match the amount of grant limit.

¹⁴ The Project for the Improvement of National Road No.1 was completed at the completion of the entire target section. In addition, the interval period was 2 years and 3 months between the completion of Phase 3 to the E/N of Phase 4 in consideration of the progress of resident resettlement and the timing of the Cambodian government election.

phases. The section from the starting point to the 4 km point was separated from Phase 3 to Phase 4, due to a design modification for the construction of the second Monivong Bridge and the laying of water supply pipes for the ODA Loan Project Niroth Water Supply Project. In addition, Phase 4 and the Urban Section were separated as the project cost was anticipated to exceed the budget due to the depreciation of the yen and the change of pavement structure during the implementation of Phase 4.

The project period of the Project for Construction of Neak Loeung Bridge was planned to be 4 years and 9 months (March 2010 to November 2014). The project period (actual) was 5 years and 2 months (March 2010 to April 2015, 109% of the plan) and exceeded the plan¹⁵. The reasons for the delay were mainly 1) a longer bidding period (Actual: 4 months versus Plan: 2 months), and 2) the suspension of construction due to the unexploded ordnances (approximately four months).

Taking an average of both figures above, the project period was 111% of the plan, which was longer than the plan.

Both the project cost and project period exceeded the plan. Therefore, efficiency of the project is fair.

3.3 Effectiveness and Impacts¹⁶ (Rating: ③)

3.3.1 Effectiveness

The Project for Improvement of National Road No.1 and the Project for Construction of Neak Loeung Bridge each had their own outputs, and different effect indicators were separately selected to measure the quantitative effects at the time of planning. For this reason, the effectiveness of each project is to be analysed separately.

3.3.1.1 Quantitative Effects

(1) The Project for the Improvement of National Road No.1

For the five indicators selected at the time of the planning, the achievement level was 93% on average (see the following table). Targets on heavy cargo traffic, flood countermeasures, and the submerged section in National Road No.1 were fully achieved (achievement level 100%), the reduction of travel time was mostly achieved (achievement level 88%), and the average travel speed was fairly achieved (achievement level 75%). It can be presumed that the actual figures for travel time and average travel speed show that the smooth flow of traffic has

¹⁵ In the plan, the completion of construction works and bridge opening were to be at the same time, but the completion of construction works was at 1 year later from the opening of the bridge due to supplemental construction works. For a proper comparison, the project period was defined from the project commencement to bridge opening at the above judgment.

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

been accomplished mostly in line with the targets. The development of a detour route to avoid the congested section of National Road No.1 and the enhancement of traffic enforcement also contributed to the above project effects. Through interviews with MPWT, it was learned that traffic jams occurred at some sections because intersections with low traffic capacity and on-street parking in the vicinity of markets are considered to have prevented smooth traffic flow¹⁷. As the project also was planned to replace deteriorated bridges, maximum vehicle weights were expected to increase. In a part of the improved section, the pavement structure was modified to a higher standard during project implementation and the increase in the maximum vehicle weight was also achieved. As the improved section is an embankment road of the Mekong River, the elevation of the road contributes to protection from flooding in Phnom Penh, as well as flooding on the road. The project effects through the road elevation were as planned.

Table 4: Quantitative Indicators for the Project for the Improvement of National Road No.1

	Baseline	Target	Actual			
	2000	2020	2017	2018	2019	2020
		3 Years After Completion	Completion Year	1 Year After Completion	2 Years After Completion	3 Years After Completion
Reduction of Travel Time (minutes)*	-	62.5	40	45	50	55
Average Travel Speed (km/h)	30	80	45	50	55	60
Heavy Cargo Traffic (max weight)	15	20	25	25	25	25
Flood countermeasures	Overflowed the banks of Phnom Penh City	Did not overflow the banks of Phnom Penh City	Did not overflow the banks of Phnom Penh City	Did not overflow the banks of Phnom Penh City	Did not overflow the banks of Phnom Penh City	Did not overflow the banks of Phnom Penh City
Submerged section of National Road No.1(m)	1,100	0	0	0	0	0

Source: Ex-ante evaluation sheet of Phase 4, questionnaire answers from MPWT

Note: * In the ex-ante evaluation sheet of Phase 4, “Reduction of travel time” mentioned travel time and, therefore, this table modifies the figures to show a reduction of travel time. For travel time, the baseline (2000) was 110 minutes, the target (2020) 45-50 minutes, and actual (2020) 55 minutes.

In addition to the above indicators, to examine the utilization of the improved section, traffic volume was also analyzed by comparing the target and baseline with actual figures (see Table 5 and Table 6). According to the traffic volume survey at the improved section after project completion (2018, 2019), the actual data for six locations where the traffic volume survey was conducted exceeded the planned targets significantly. Furthermore, the traffic volume was

¹⁷ JICA “Data collection survey on development of roads and related facilities in National Road No.1 and around border of Cambodia and Vietnam” Final Report for National Road No.1 (2019)

measured in 2004 before project implementation. In a comparison of the baseline and the actual data, substantial increases in traffic volume over the entire improved section were found. In 2013, Phnom Penh New Port was constructed at the 25 km point on the improved section of National Road No. 1 with the support of the Chinese government and started handling containers. The improvement of National Road No. 1 and the development of the port progressed at the same time and this contributed to the stabilization of cargo transportation to the capital city, Phnom Penh. From the above, it can be concluded that the improved section has been sufficiently utilized.

Table 5: Traffic Volume of the Improved Section of the Project for the Improvement of National Road No.1 (March 2004)

Location*	Actual (Number of Vehicles) **			Actual (PCU)		
	Light Vehicles	Heavy Vehicles	Total	Light Vehicles	Heavy Vehicles	Total
0.1 km point	9,205	562	9,767	11,507	2,106	13,613
1.5 km point	7,112	618	7,730	8,890	2,316	11,206
3.5 km point	6,607	468	7,075	8,258	1,755	10,013
5.0 km point	6,055	361	6,417	7,569	1,355	8,925
7.0 km point	4,156	358	4,514	5,195	1,341	6,536
12.5 km point	3,303	247	3,550	4,129	926	5,055
14.5 km point	2,876	316	3,192	3,595	1,185	4,779
34.5 km point	2,239	398	2,636	2,798	1,492	4,290

Source: Base design study report

Note 1: * km point started from the Phnom Penh side of the section improved by this project

Note 2: ** The data were converted into 24-hour traffic volume with the day/night ratio of 1.30. The target of the basic design study report was daytime 12-hour traffic volume. Types of vehicles were light vehicles (passenger cars, etc.) and heavy vehicles (buses, heavy trucks, trailer trucks, etc.).

Table 6: Traffic Volume of the Improved Section of the Project for the Improvement of National Road No.1 (September 2018)

Location*	Actual (Number of Vehicles)**			Actual (PCU)***			Target (PCU)****
	Light Vehicles	Heavy Vehicles	Total	Light Vehicles	Heavy Vehicles	Total	
0.1 km point	40,314	3,131	43,445	50,393	9,393	59,786	23,864
1.5 km point	31,370	3,253	34,623	39,213	9,759	48,972	19,601
2.5 km point	23,449	3,233	26,682	29,311	9,699	39,010	18,569
3.5 km point	19,764	2,524	22,288	24,705	7,572	32,277	17,537

Source: Documents provided by JICA, basic design study report

Note 1: * km point started from the Phnom Penh side of the section improved by this project

Note 2: ** Actual data is 24 hour traffic (average of 2 week days and one weekend day). Types of vehicles are light vehicles (passenger cars and light trucks) and heavy vehicles (buses heavy trucks, trailer trucks, etc.).

Note 3: *** Conversion factors of PCU are 1.25 for light vehicles and 3 for heavy vehicles (JICA "Data collection survey on development of roads and related facilities in National Road No.1 and around the border of Cambodia and Vietnam").

Note 4: **** The data were converted into 24-hour traffic volume with the day/night ratio of 1.30. The target of the basic design study report was daytime 12-hour traffic volume.

Table 7: Traffic Volume of the Improved Section of the Project for the Improvement of National Road No.1 (January 2019)

Location*	Measurement Date**	Actual (PCU)***				Target (PCU)****
		Motorcycles	Small Vehicles	Large Vehicles	Total	
Kokir Market (13.5 km point)	Weekday	7,737	12,667	10,803	31,207	
	Weekend	9,360	13,506	10,236	33,102	
	Average	8,549	13,087	10,520	32,155	14,029
Phnom Penh New Port (24.5 km point)	Weekday	3,897	9,282	12,048	25,227	
	Weekend	4,376	9,332	12,510	26,218	
	Average	4,137	9,307	12,279	25,723	11,780

Source: JICA “Data collection survey on development of roads and related facilities in National Road No.1 and around border of Cambodia and Vietnam” Final Report for National Road No.1, basic design study report

Note 1: * km point started from the Phnom Penh side of the section improved by this project

Note 2: ** Traffic volume is for 24 hours (average of one week day and one weekend day). Motorcycles includes motor cycles, three wheelers, and motor cycles with carts. Small vehicles includes passenger cars and light trucks. Large vehicles includes buses, heavy trucks, and trailer trucks.

Note 3: *** Conversion factors of PCU are 0.3 for motor cycles, 1.25 for small vehicles, and 3.00 for large vehicles.

Note 4: **** The data were converted into 24-hour traffic volume with the day/night ratio of 1.30. The target of the basic design study report was daytime 12-hour traffic volume.

(2) The Project for Construction of Neak Loeung Bridge

For two indicators selected at the time of planning, the achievement level was 100% on average (see the following table). The target for the time for suspension of river crossing was achieved (achievement level 100%), and the target on travel time for river crossing was mostly achieved (achievement level 99%). By the elimination of ferry crossing, the travel time for river crossing was significantly reduced in line with the plan, smooth transport was still being maintained at the time of the ex-post evaluation. As, before the project, the ferry service was not operated during the night, night river crossing was not possible. For this reason, the target was river crossing at all hours. After project completion, river crossing became possible anytime regardless of traffic volume, weather conditions, or time of day.

Table 8: Quantitative Indicators for the Project for the Construction of Neak Loeung Bridge

	Baseline	Target	Actual			
	2009	2015	2015	2018	2019	2020
		Completion Year	Completion Year	3 Years After Completion	4 Years After Completion	5 Years After Completion*
Travel time for river crossing (minutes)*	Maximum 420 (Peak time)	5	NA	15	15	10
Time for suspension of river crossing (minutes)	300 (0 - 5 AM)	0	0	0	0	0

Source: Preparatory survey report, questionnaire answers from MPWT

Note: * The data for the completion year (2015) could not be obtained. As the change of the target is considered small over time, the judgment was made by a comparison of the target and the actual figure at the time of ex-post evaluation. The achievement of travel time for river crossing is based on the reduction of travel time (target: 415 minutes, actual 420 minutes).

In addition to the above indicators, to examine the utilization of Neak Loeung Bridge, traffic volume was also analyzed by comparing the target and baseline with the actual data (see the following table). Based on the traffic volume survey immediately after the project completion (2015), the actual figures at two locations where traffic volume surveys were conducted exceeded the planned targets significantly. At the planning of this project, the traffic demand for 2009 was estimated at 3,549 vehicles per day (PCU equivalent), and the comparison of the baseline and the actual data suggests that the traffic volume increased significantly from before and after the project. From the above, it can be concluded that Neak Loeung Bridge is being fully utilized to cross the river.

Table 9: Traffic Volume of Neak Loeung Bridge (2015)

Measurement Location	Actual (Number of Vehicles)*					Actual (PCU)**	Target (PCU)
	Motor cycles	Small Vehicles	Medium Vehicles	Large Vehicles	Total		
In Neak Loeung (58.1 km)	13,626	4,046	855	1,066	19,593	14,908	7,118
Out Neak Loeung (64.2 km)	12,969	4,633	865	1,887	20,354	17,938	

Source: The survey team for JICA Technical Cooperation “The Project for Strengthening Capacity for Maintenance of Roads and Bridges,” preparatory survey report (2010)

Note 1: * Traffic count was for 24 hours. Motorcycles includes motorcycles and motorcycles with carts. Small vehicles includes passenger cars and 4WD. Medium vehicles includes mini-buses and buses. Large vehicles includes heavy trucks, and trailer trucks.

Note 2: ** Conversion factors of PCU are 0.30 for motorcycles, 1.25 for small vehicles, and 3.00 for medium and large vehicles.

3.3.1.2 Qualitative Effects (Other Effects)

(1) The Project for Improvement of National Road No.1

As a qualitative effect of road improvement projects, road improvement is expected to bring driving comfort in general. In the beneficiary survey¹⁸ at the time of ex-post evaluation, drivers and proprietors along the road stated that driving comfort had been increased in the improved section compared to the time before project implementation (2004) (see Table 10). The reasons were reductions in vibration, easy-to-read traffic signs and the expansion of road width. According to the answers of drivers and proprietors, sections submerged in heavy rain had been reduced (see Table 11). Based on the answers of drivers and proprietors, it can be concluded that driving comfort was significantly improved, even in the rain.

¹⁸ For the beneficiary survey, a questionnaire survey was conducted with drivers and proprietors along the road and 12 persons responded (7 drivers, 5 proprietors) at four locations from Phnom Penh (east bank of the Bassac River) to Neak Loeung (east bank of the Mekong River).

Table 10: The Result of the Survey on Drivers and Proprietors along the Road
(Driving Comfort)

Q. Compared with 2004 (before project), is driving in the national road No.1 more comfortable?

	Yes	Yes, to Some Extent	Same	No, to Some Extent	No	Total
Responses	9	3	0	0	0	12
%	75%	25%	0%	0%	0%	100%

Table 11: The Result of the Survey on Drivers and Proprietors along the Road
(Submerged Section)

Q. Compared with 2004 (before project), is the submerged section reduced when it is heavy rain?

	Yes	Yes, to Some Extent	Same	No, to Some Extent	No	Total
Responses	10	2	0	0	0	12
%	83%	17%	0%	0%	0%	100%

(2) The Project for Construction of Neak Loeung Bridge

One of the qualitative effects of the Project for Construction of Neak Loeung Bridge is convenience of logistics through the elimination of hours of river crossing suspension. According to MPWT, large cargo vehicles were banned from entering Phnom Penh during daytime¹⁹ at the time of the ex-post evaluation and, therefore, cargo delivery was allowed only from night-time to early morning. Had Neak Loeung Bridge not been opened, and 24-hour river crossing not been available, logistics in Phnom Penh City would have been interrupted. It was also suggested that the opening of Neak Loeung Bridge had made the shipping of fresh food products to Phnom Penh more convenient for the grocery producers on the east bank of the Mekong River. According to Svay Rieng Agro-Products Cooperative, the elimination of the long waiting time for the ferry service had led to an improvement in customer satisfaction as vegetables need to maintain their freshness²⁰.

3.3.2 Impacts

3.3.2.1 Intended Impacts

Both the project areas of the Project for Improvement of National Road No.1 and the Project for Construction of Neak Loeung Bridge were in the same vicinity, and separating the impacts was difficult. For this reason, the impacts are to be set in common for both projects. The enhancement of international logistics and the stimulation of socio-economic activities in the

¹⁹ MPWT stated that large cargo vehicles were banned from entering from 5 to 21 o'clock at the time of the ex-post evaluation.

²⁰ <https://www.jica.go.jp/cambodia/office/information/event/20170405.html> (accessed on August 27th, 2021)

project area are analysed, integrating the impacts of the Project for Improvement of National Road No.1 and the Project for Construction of Neak Loeung Bridge together.

(1) Cross-border Logistics Vehicles between Cambodia and Vietnam

Bavet is located along National Road No.1 at the border of Cambodia and Vietnam. The number of cargo vehicles (cargo trucks and container trucks) passing through Bavet almost doubled from 2014 (the year before the completion of Neak Loeung Bridge) to 2018 (see the following table). For the same period, the number of container trucks increased, which meant a qualitative change of logistics. The Gross Domestic Product (GDP) of Cambodia increased about 1.5 times from 2014 to 2018 in USD terms, while the GDP of Vietnam increased about 1.3 times in USD terms over the same period²¹. The elimination of ferry transport at Neak Loeung was essential for the realization of smooth land trade between Cambodia and Vietnam. Although the economic growth of both Cambodia and Vietnam have also contributed to the increase, the completion of the bridge has presumably been one of the factors contributing to the increase in the number of cargo vehicles passing through Bavet, promoting trade between both countries. Furthermore, container transport requires roads with a higher standard (extension of road width and increase of maximum weight). Thus, the higher standard of road achieved by the project presumably became one of the factors allowing the increase of container trucks.

Table 12: Number of Cargo Vehicles Crossing the border at Bavet

Unit: Number of vehicles per year

Type / Year	2014	2015	2016	2017	2018
From Vietnam to Cambodia					
Cargo trucks	14,270	21,532	24,683	12,420	15,737
Container trucks	37,309	40,115	44,784	60,494	78,672
Subtotal	51,579	61,647	69,467	72,914	94,409
From Cambodia to Vietnam					
Cargo trucks	2,590	2,693	3,335	4,268	4,451
Container trucks	11,947	12,800	15,276	17,641	20,198
Subtotal	14,537	15,493	18,611	21,909	24,649
Total	66,116	77,140	88,078	94,823	119,058

Source: JICA “Data collection survey on development of roads and related facilities in National Road No.1 and around border of Cambodia and Vietnam” Final Report for National Road No.1

(2) Stimulation of Socio-Economic Activities in the Project Area

With the stimulation of socio-economic activities in the project area, cargo volume was expected to increase in the same area. In the beneficiary survey at the time of the ex-post

²¹ The World Bank: <https://data.worldbank.org/country/Cambodia>, <https://data.worldbank.org/country/VN> (accessed on August 27th, 2021)

evaluation, more than 80% of drivers and proprietors along the road said that cargo volume had increased compared to the time before project implementation (2004) (see the following table). In particular, all the proprietors along the road (five persons) were of the opinion that it had increased. Agricultural products and construction materials were quoted as the items with more volume. As mentioned above (“3.3.1.2 Qualitative Effects (Other Effects)”), vibration was reduced on the improved section of National Road No. 1 and the opening of Neak Loeung Bridge shortened shipping time, and, thus, the project is contributing to the shipment of agricultural products. Moreover, the increase in construction materials reflects the progress of development in the project area.

Table 13: The Survey Result of the Survey with Drivers and Proprietors along the Road
(Increase of Cargo)

Q. Compared with 2004 (before project), has the cargo volume increased?

	Yes	Yes, to Some Extent	Same	No, to Some Extent	No	Total
Responses	7	3	1	1	0	12
%	58%	25%	8%	8%	0%	100%

As mentioned above (“3.3.1 Effectiveness”), travel time on the improved section of National Road No.1 was shortened and driving comfort was improved by the project. On the other hand, the beneficiary survey²² at the time of the ex-post evaluation found that frequency of visits to the downtown area of Phnom Penh (west of the Bassac River) decreased. Specifically, about 50% (8 persons) answered that opportunities to visit the downtown area of Phnom Penh by themselves or with intimates (family, neighbors, etc.) had decreased compared to 2004, the year before the project. Shopping was the main reason for going out at the time of the ex-post evaluation. Based on the interviews with the residents along the road, it was discovered that they tended to shop in their neighborhoods, as commercial areas were expanding around the residential areas. The progress of development and the promotion of consumption in the vicinity were observed in the project area, though factors other than the project (such as urbanization in the suburb of Phnom Penh) have also contributed to this change.

3.3.2.2 Other Positive and Negative Impacts

(1) Impacts on the Natural Environment

As the Project for Improvement of National Road No.1 was requested prior to the *JICA Guidelines for Environmental and Social Considerations* (2004) coming into effect, no

²² For the beneficiary survey, a questionnaire survey was conducted with residents along the road and answered by 15 persons (6 male, 9 female) at 4 locations from Phnom Penh (east bank of the Bassac River) to Neak Loeung (east bank of the Mekong River).

category was selected, but an environmental baseline survey was conducted at the time of planning. Based on the questionnaire survey with the Consultant, it was found that countermeasures and mitigation measures against environmental impacts had been taken, such as the utilization of low-noise and low emission equipment, the suspension of construction works during night, and water sprinkling. However, periodic collection of environmental data was not conducted as monitoring items were not specified. Based on the questionnaire survey with MPWT, it was concluded that (1) no negative impact on the natural environment occurred either during project implementation or after completion, (2) after project completion, no concerns such as serious air pollution were confirmed in the project area by air quality monitoring of the Ministry of Environment in Cambodia.

Based on the *JICA Guidelines for Environmental and Social Considerations* (2004), the Project for Construction of Neak Loeung Bridge was classified as Category A (likely to have significant adverse impacts on the environment and society). MPWT implemented an environment impact assessment, and its report was approved by the Ministry of Environment in Cambodia. Based on the questionnaire survey with the Consultant, it was found that during project implementation, the contractor operated cleaning works and water sprinkling and periodically monitored the noise and water quality of the river. Based on answers to the questionnaire from MPWT, it was concluded that no negative impacts on the natural environment had occurred either during, or after, project implementation.

(2) Resettlement and Land Acquisition

In the Project for the Improvement of National Road No.1, resettlement along with land acquisition had been anticipated at the time of planning. In 2006, during project implementation, issues regarding compensation for affected residents were pointed out by NGO. Taking those issues into account, the resettlement action plan (hereinafter called “RAP”) was revised based



A House after Resettlement

on the *JICA Guidelines for Environmental and Social Considerations* (2004) or the *Japan International Cooperation Agency Guidelines for Environmental and Social Considerations* (2010). In response to the results of JICA’s Review Board for Environmental and Social Consideration, this project took numerous actions such as strengthening public relations for advance explanations to affected residents, the agreement of project implementation with residents, securing nearby and convenient relocation sites, prevention of unclear price reductions in asset assessments, the participation of local residents in grievance committees,

and impact mitigation of changes in road alignment. Many of the above measures went beyond the usual considerations given to affected residents previously taken by the Cambodian government. For this reason, a regular meeting was held once every two weeks between the Government of Japan/JICA and the Government of Cambodia (Inter-ministerial Resettlement Committee) for promoting better understanding and an appropriate response on the Cambodian side. Additionally, the JICA technical cooperation project “Project on Capacity Enhancement of Environmental and Social Considerations for Resettlement” (2010 to 2012) was implemented for the enhancement of administrative capacity for resettlement by the Government of Cambodia. As well as the project by ADB, which supported a neighboring road section, compensation for affected residents was based on replacement costs, and additional compensation was implemented for affected residents during Phase 1 and 2. At the completion of the Project for Improvement of National Road No.1, the number of affected residents was 4,474 households (including resettled residents of 364 households).

In the Project for Improvement of National Road No.1 (Phase 3), a study to verify compensation for resettlement and replacement costs was conducted. Based on the study results, compensation during Phase 1 to 3 was based on replacement costs, which were calculated using the appropriate measuring method, and external monitoring confirmed that resettlement had been appropriately implemented. Moreover, claims were handled with the grievance window²³. Based on the questionnaire survey with the expert in the JICA technical cooperation project “Project on Capacity Enhancement of Environmental and Social Considerations for Resettlement,” a grievance redress system was established for the resettled residents at all phases. Information was given at stakeholder meetings, and claims were resolved through this system.

In this ex-post evaluation, a survey was implemented regarding resettlement in the Project for the Improvement of National Road No.1²⁴. The questionnaire survey showed that infrastructure in the relocation sites was adequately developed, and no negative impact was found on the quality of living (see Table 14 and Table 15). Compensation was paid to all affected residents. Some residents insisted the compensation rates were not sufficient (see Table 16 and Table 17). The calculation of replacement costs was based on the average prices of market costs for materials and assets. A shortage in the compensation amount occurred at some households presumably due to the above calculation method. However, none of the above residents filed a claim as the amount of shortage was presumably not significant enough to harm their quality of living. No issues on compensation payment based on replacement costs, the public relations

²³ Katahira & Engineers International (2012) “Follow-up Study on the 2007 Replacement Cost Study of the Project for the Improvement of National Road No.1”

²⁴ Data was collected in July 2021 for this survey from 2 sites out of 6 relocation sites built for the Project for the Improvement of National Road No.1. A questionnaire survey was conducted with 12 resettled residents (6 males, 6 females), and interviews were held with 2 leaders of communes and 1 government official in charge of resettlement.

of RAP, or the grievance redress system were pointed out at the interviews with the commune chiefs of the relocation sites and a government official in charge of resettlement.

Table 14: The Result of the Survey with Resettled Residents (Infrastructure in New Locations)

Q. Was the infrastructure of the new location sufficiently developed (water supply, electricity, access to public transportation, etc.)?

	Yes	Yes, to Some Extent	Neither Yes nor No	No, to Some Extent	No	Total
Responses	11	1	0	0	0	12
%	92%	8%	0%	0%	0%	100%

Table 15: The Result of the Survey with Resettled Residents (Living Standard and Convenience)

Q. Compared with the pre-relocation, has the standard of living and convenience improved?

	Yes	Yes, to Some Extent	Neither Yes nor No	No, to Some Extent	No	Total
Responses	8	2	2	0	0	12
%	67%	17%	17%	0%	0%	100%

Table 16: The Result of the Survey with Resettled Residents (Uncompensated Affected Residents)

Q. Was there any resident in the previous commune who was negatively affected by this project but was not compensated?

	Many residents were not compensated	Some residents were not compensated	All residents were compensated.	Total
Reponses	0	0	12	12
%	0%	0%	100%	100%

Table 17: The Result of the Survey with Resettled Residents (Compensation Amount)

Q. Was the compensation amount enough to replace lost assets?

	Yes	Yes, to Some Extent	Neither Yes nor No	No, to Some Extent	No	Total
Reponses	4	3	1	4	0	12
%	33%	25%	8%	33%	0%	100%

At the time of planning, land acquisition was expected to cause resettlement for the Project for Construction of Neak Loeng Bridge, as well. RAP was formulated for proper resettlement and the avoidance and reduction of resettlement was implemented. At the time of completion of the Project for Construction of Neak Loeng Bridge, the number of the affected residents was 197 households (including resettled residents of 7 households). Based on the questionnaire

answers from the expert of JICA technical cooperation project, “Project on Capacity Enhancement of Environmental and Social Considerations for Resettlement”, no particular issue was observed on resettlement as RAP was formulated in accordance with the guidelines of 2010 and compensation was implemented accordingly.

(3) Advanced Design and Construction and a symbol of Japan-Cambodia Friendship

Neak Loeung Bridge won the Japan Construction International Award and the Japan Society of Civil Engineers Tanaka Award for both its advanced design and construction and its contribution to friendship between Japan and Cambodia. The reasons for the winning were that the management of construction had been undertaken under severe field conditions, the reduction of the construction period and cost by adopting new technology, and the contribution to the friendship between Japan and Cambodia. The bridge has become a sight-seeing spot for the aesthetic appearance of the cable-stayed bridge, and it is also depicted on the 500 riel bill of Cambodia.

In the improved section of National Road No. 1, project effects such as improvement of road efficiency and flood protection were found, and by the opening of Neak Loeung Bridge, transport crossing the Mekong River became smooth. The volume of logistics between Cambodia and Vietnam was increasing, and stimulation of economic activities was also seen in the project area. For the above reasons, this project has achieved its objectives. Therefore, the effectiveness and impacts of the project are high.

3.4 Sustainability (Rating: ②)

3.4.1 Institutional/Organizational Aspect of Operation and Maintenance

At the time of ex-post evaluation, DPWT had been established in 25 cities/provinces as local offices of MPWT. DPWT is in charge of 3 types of road maintenance (routine, periodic, and emergency),²⁵ and MPWT is responsible only for maintenance which requires advanced technical skills. The Phnom Penh City DPWT and the Kandal Province DPWT are in charge of maintenance for the improved section of the Project for Improvement of National Road No.1. In MPWT, the Department of Expressway, Bridges and Investment (hereinafter called “DEBI”) is responsible for the bridges under the Project for Construction of Neak Loeung Bridge, and Kandal Province DPWT and Prey Veng Province DPWT are in charge of the approach roads. In general, the maintenance of national roads is implemented mainly by internal personnel, and outsourcing is also utilized when required. Based on the interviews with MPWT, it was

²⁵ Routine maintenance covers inspection, cleaning, and minor repair works, regular maintenance covers repair works (overlay, etc.), and emergency maintenance covers disaster relief works.

discovered that maintenance of Neak Loeung Bridge is not outsourced, but external engineers are hired occasionally for technical support.

The number of personnel assigned for the maintenance of the project is as in the following table. The assigned personnel can implement routine maintenance on the sections for which they are in charge, and the periodic maintenance is also expected to be managed by utilizing internal and external resources.

Table 18: Staff Assignment for Operation and Maintenance

Types of Infrastructure	Sections in Charge	Number of Staff	Number of Engineers in the Staff
Improved Section of National Road No.1	Phnom Penh DPWT	10	2
	Kandal Province DPWT	10	2
	Total	20	4
Neak Loeung Bridge	DEBI	12	4
	Kandal Province DPWT	8	2
	Prey Veng DPWT	8	2
	Total	28	8

Source: Questionnaire answers and interview from MPWT

The responsibility for each type of maintenance work is clear, and there was no uncertainty regarding the departments responsible for infrastructure or maintenance activities. MPWT and DPWT related to the project are considered capable of maintenance of the infrastructure constructed by the project. From the above, it is considered that there is no notable issue in the institutional and organization aspects for operation and maintenance.

3.4.2 Technical Aspect of Operation and Maintenance

MPWT and DPWT related to the project were performing the maintenance of paved roads prior to project implementation. Considering the types of improvement works, maintenance for the improved section of National Road No.1 is expected to be managed at the same technical level as for other national roads. Through the JICA technical cooperation project “the Project for Strengthening Capacity for Maintenance of Roads and Bridges” (2015-2018), capacities such as those for road inspection (measurement and evaluation of road surface), preventive maintenance, and bridge maintenance cycles (inspection, assessment, planning, repair works, and maintenance of asset ledgers) were enhanced. By the questionnaire answers from MPWT, it was confirmed that MPWT possessed the manuals for road maintenance (routine and periodic) and bridge maintenance at the time of ex-post evaluation.

The Consultant prepared maintenance manuals for the equipment of Neak Loeung Bridge (stay cables, electrical equipment, expansion joints, and bearings), which required maintenance works with advanced technical skills. Based on the interviews with MPWT, it was confirmed that bridge inspection vehicles had been obtained and stay cable inspection utilizing robots was also

being planned at the time of the ex-post evaluation. Furthermore, JICA's technical cooperation project, mentioned above, implemented a pilot project for the control of overloaded vehicles on Neak Loeung Bridge (measurement of trucks, reporting, and analysis). However, JICA's technical cooperation project did not support the formulation of an inspection plan reflecting the structural properties of a cable-stayed bridge, the implementation of inspection works, nor the preparation of maintenance plans based on inspection results, which are the foundation for periodic maintenance. Capacity enhancement for these is required in future. As described below ("3.4.3 Financial Aspect of Operation and Maintenance"), the MPWT budget for periodic maintenance is limited. Thus, it is preferable to reassess the maintenance system including the introduction of cost-saving technology (the utilization of drones, robots, etc.).

MPWT holds annual workshops for the maintenance of roads and bridges, and 84 persons attended from MPWT and DPWT in 2019. Based on the interviews with MPWT, it was confirmed that the contents of the workshops covered wide topics on the maintenance of roads and bridges.

The maintenance of National Road No.1 is managed with the technical level of DPWT, and maintenance manuals and workshops were also provided. On the other hand, the maintenance of Neak Loeung Bridge requires more advanced technical skills to handle the special features of a cable-stayed bridge (formulation of inspection plans reflecting the structural properties of a cable-stayed bridge, inspection works, the preparation of maintenance plans based on inspection results, cost-saving technology). Thus, some issues are found in terms of the technical aspect of operation and maintenance.

3.4.3 Financial Aspect of Operation and Maintenance

In accordance with the responsibility for maintenance described above ("3.4.1 Institutional / Organizational Aspect of Operation and Maintenance"), Phnom Penh City DPWT and Kandal Province DPWT provided the maintenance costs for the improved section of the Project for Improvement of National Road No.1. The maintenance costs for the bridge section of the Project for Construction of Neak Loeung Bridge were provided by MPWT, and the maintenance costs for the approach roads were provided by Kandal Province DPWT and Prey Veng Province DPWT.

The maintenance budget of MPWT at the time of the ex-post evaluation is shown on Table 19, and the maintenance budget provided from MPWT to DPWT is shown on Table 20. As the budget of DPWT is also provided from each province, the actual amounts of the budget available for the maintenance of DPWT exceed the amounts shown in the following table. The maintenance budget (the sum of routine maintenance, periodic maintenance, and emergency maintenance) of MPWT has stayed at around USD 70 million for the past 3 years. Based on the

interviews with MPWT, it was discovered that the allocation of the maintenance budget for National Road No.1 is highly prioritized as the national road is a major trunk road.

Table 19: Maintenance Budget in MPWT

Unit: USD million

	2017	2018	2019
Maintenance Budget	70.00	70.00	67.13
for Routine Maintenance	41.75	40.00	41.03
for Periodic Maintenance	18.25	20.00	18.60
for Emergency Maintenance	10.00	10.00	7.50

Source: Questionnaire answers from MPWT

Table 20: Maintenance Budget Provided from MPWT to DPWT

Unit: USD million

	2017	2018	2019
Phnom Penh DPWT	0.19	0.17	0.18
for Routine Maintenance	0.19	0.17	0.18
for Periodic Maintenance	0.00	0.00	0.00
for Emergency Maintenance	0.00	0.00	0.00
Kandal Province DPWT	2.23	2.05	2.21
for Routine Maintenance	1.25	1.18	1.50
for Periodic Maintenance	0.98	0.87	0.71
for Emergency Maintenance	0.00	0.00	0.00
Prey Veng State DPWT	1.25	1.57	1.73
for Routine Maintenance	1.25	0.86	1.20
for Periodic Maintenance	0.00	0.71	0.53
for Emergency Maintenance	0.00	0.00	0.00

Source: Questionnaire answers from MPWT

At the time of planning for the Project for Improvement of National Road No.1, the maintenance costs for the improved section were estimated at USD 21,970 per year in 2005. The maintenance budget of Phnom Penh City and Kandal Province DPWT is considered sufficient to finance the maintenance cost of the improved section.

At the time of planning of the Project for Construction of Neak Loeung Bridge, it was assumed that the maintenance works of Neak Loeung Bridge would mainly be visual inspections for the first 10 years after completion, and that large expenditure would not be required. However, the periodic maintenance cost of USD 3.7 million was estimated to be required every 10 years after completion. If scaffolding is built on the entire bridge for visual inspection and repair works, the above-mentioned cost for periodic maintenance is expected to be incurred at the time of the ex-post evaluation. Neak Loeung Bridge was completed in 2015, and periodic maintenance will be required within a few years. At the time of the ex-post evaluation, the planning of the periodic maintenance for Neak Loeung Bridge had not yet started, but the cost for the periodic maintenance of Neak Loeung Bridge was approximately 20% of the annual budget for periodic

maintenance of MPWT, which is a significant amount of expenditure to be financed in a single year. For this reason, the allocation of additional budget will be required.

It is concluded that it is possible to secure the budget for the maintenance of the improved section of the Project for Improvement of National Road No.1. It is necessary to reassess how the budget for the periodic maintenance for Neak Loeung Bridge will be obtained. Therefore, there are some issues in the financial aspect of operation and maintenance.

3.4.4 Status of Operation and Maintenance

According to the questionnaire to MPWT, among the follow-up items pointed out by the defect inspections of the Project for Improvement of National Road No.1, repairing cracks in the bridge had not been performed at the time of the ex-post evaluation. However, the interviews with MPWT indicated that the inspection of the bridge was continuing and there was no serious issue affecting transport. At the on-site inspection of the ex-post evaluation, the expansion joints of the bridge needed to be repaired, and the pavement of the road shoulder was stripped in the section with heavy traffic. Based on the questionnaire answers from MPWT, it was clear that the follow-up items pointed out by the defect inspection of the Project for Construction of Neak Loeung Bridge had mostly been managed at the time of the ex-post evaluation. At the defect inspection, friction noise was heard from the attachment section of the vibration dampers, but at the time of the ex-post evaluation, there was no serious damage observed at the same component. At the on-site inspection of the ex-post evaluation, the drainage outlets of Neak Loeung Bridge were clogged with sand and garbage.

The JICA “Data Collection Survey on Development of Roads and Related Facilities in National Road No.1 and around Border of Cambodia and Vietnam” in 2019 pointed out that the above-mentioned bridge repairs had not yet been conducted and that, in addition, the road markings on National Road No.1 were not clear. According to the consultant of the JICA technical cooperation project “the Project for Strengthening Capacity for Maintenance of Roads and Bridges,” clogging by sand was observed at the drainage outlets of Neak Loeung Bridge during an on-site visit in January 2020. However, no severe damage affecting transport was found at the improved section of National Road No.1 and Neak Loeung Bridge.

While the routine maintenance needs to be improved for some activities, the infrastructure constructed by the project is considered to have no serious damage affecting transport. From the above, it is considered that there is no notable issue regarding the status of operation and maintenance.

Some minor problems have been observed in terms of the technical aspect and financial aspect. Therefore, the sustainability of the project effects is fair.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

This project conducted the improvement of a road and repairing/construction of bridges in the Phnom Penh- Neak Loeung section of National Road No. 1 and its objective was to expand transportation capacity, improve efficiency, and enhance flood control in the above section, thereby contributing to a strengthening of international logistics and a revitalization of the society and economy of the project area. With Cambodia's policy goal of enhancing international corridor development, the amount of trade between Cambodia and Vietnam was on rise. This project has been highly relevant to the country's development plan and development needs, as well as Japan's ODA policy. Therefore, its relevance is high. Both the project cost and the project period exceeded the plan. Therefore, the efficiency of the project is fair. The effects (an improvement in traffic efficiency, flood protection, etc.) were found in the improved section of National Road No.1, and the opening of the Neak Loeung Bridge brought about smoother crossing of the Mekong River. Cargo volume between Cambodia and Vietnam was increasing, and the economy in the project affected area was also expanding. This project has achieved its objectives. Therefore, the effectiveness and impacts of the project are high. Given the responsibilities and personnel assignment of the executing agencies, it is feasible to carry out routine and periodic maintenance of the infrastructure constructed by the project. The maintenance of the improved section of National Road No.1 is within the technical level of DPWT, but the maintenance of Neak Loeung Bridge requires MPWT to obtain higher technical skills to cope with the special features of the cable-stayed bridge. In terms of budget, it was expected that the maintenance budget would be allocated for the improved section of National Road No.1, but budget allocation for the periodic maintenance of Neak Loeung Bridge needed to be reassessed. Nevertheless, no severe damage occurred affecting transport in the infrastructure constructed by the project. From the above, some minor problems have been observed in terms of the technical aspect and financial aspect on the operation and maintenance of this project. Therefore, the sustainability of the project effects is fair.

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

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

Enhancement of Maintenance Technical Skills of Long Bridge

Neak Loeung Bridge is one of the longest bridges in Cambodia and its maintenance requires maintenance plans and works that handle the special features of long bridges. Moreover, new maintenance methods for long bridges using drones and robots have been developed in recent years and the introduction of new technology is in greatly necessary for the reduction of maintenance costs. At the time of ex-post evaluation, periodic maintenance of Neak Loeung

Bridge is to be conducted within a few years and a significant amount of expenditure is expected accordingly for the maintenance cost. It is desirable for MPWT to improve the technical level of the department in charge of bridge maintenance, and to enhance the maintenance equipment by the time of the implementation of periodic maintenance.

Formulation of a Plan for Periodic Maintenance

Neak Loeung Bridge requires periodic maintenance every 10 years after completion, and at the time of ex-post evaluation the periodic maintenance was to be performed in a few years. Considering the amount of the annual budget for periodic maintenance at MPWT, it is presumably difficult to finance the estimated cost for periodic maintenance in a single year. In order that the delay of budget allocation does not cause a delay in maintenance, it is desirable that MPWT specifies the activities required for periodic maintenance immediately and formulates a maintenance program for multiple years.

4.2.2 Recommendations to JICA

Monitoring of Periodic Maintenance

Neak Loeung Bridge was opened in 2015 and the first periodic maintenance is to occur within a few years. By that time, MPWT needs to have improved technical skills for maintenance further and to have obtained the budget required for the maintenance works. Therefore, it is desirable to routinely monitor the periodic maintenance of MPWT and, if required, provide technical advice.

4.3 Lessons Learned

Flexible Modification of RAP for Fairness

The resettlement action plan (RAP) was formulated for the project in accordance with the *JICA Guidelines for Environmental and Social Considerations* (2004) or the *JICA Guidelines for Environmental and Social Considerations* (2010), which were not applied at the time of the request from the Government of Cambodia. This project compensated affected residents on the same basis of replacement costs as the ADB-funded project, which supported the neighboring section, and provided additional compensation to the affected residents of Phases 1 and 2. At the time of the request for this project, no guidelines for social consideration were established, and RAP did not rely on certain guidelines. Moreover, the contents of the guidelines were revised with more consideration for the livelihoods and living environment of the affected residents during project implementation. It was also necessary to consider the compensation level of ADB for fair treatment of the affected residents. Thus, it is concluded that this flexible management of this project was appropriate. When there is a lack of fairness among the affected residents under the existing RAP due to major change in JICA's policy on social consideration and differences

from the policy on social consideration of adjacent sections supported by other donors, it is desirable that the contents of RAP are reassessed in accordance with more recent guidelines.

Kingdom of Cambodia

FY2020 Ex-Post Evaluation Report of Technical Cooperation Project

“The Project on the Capacity Building for Water Supply System
in Cambodia (Phase 2)/(Phase 3)”

External Evaluator: Nobuyuki Kobayashi, OPMAC Corporation

0. Summary

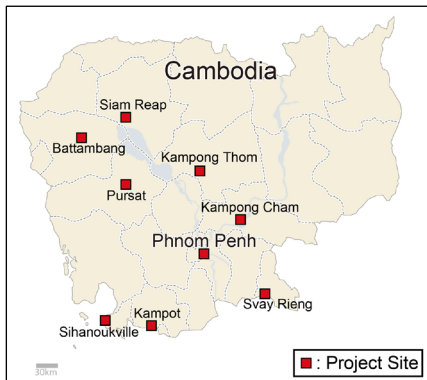
Through two phases of technical cooperation, this project aimed to improve the operation and maintenance (O&M) capacity of water supply facilities and the management capacity of water supply services of the public waterworks in eight cities¹ of Cambodia (Target Provincial Waterworks: TPWs). The aim was also to contribute to the dissemination of the project effect across the cities participating in the “National Conference on Public Water Utilities” and to the improvement of the water supply services in the project area.

In Cambodia, access to safe water in urban areas other than Phnom Penh was an issue, for which the country had a policy solution. The objective of the project was consistent with the above development policy and development needs and was also consistent with Japan’s policy at the time of planning. Therefore, the relevance of this project is high. Through the implementation of this project, the capacity development of all TPWs (O&M capacity of water facilities, management capacity of water supply services) was mostly achieved. An improvement of the water supply services, and a higher level of satisfaction of costumers were also found in seven TPWs (excluding Sihanoukville where the water business was leased to a private company for 20 years). Therefore, effectiveness and impact of this project is high, as the project effects were shown as planned. Taking an average of the two phases, efficiency of this project is fair as both the project cost and the project period exceeded the plan. The development policy aimed at the autonomous operation of public waterworks. In line with the policy, the water supply law was drafted and several Prakas (ministerial ordinances) were approved. The Ministry of Industry, Science, Technology, & Innovation (MISTI), which was the supervisory authority of public waterworks, established the monitoring scheme for seven TPWs, and the seven TPWs assigned sufficient personnel for the O&M of water supply facilities. The counterparts of this project were given training opportunities, and the seven TPWs were able to maintain their technical level through their daily operations. The water supply operations in the seven TPWs were financially stable. Therefore, sustainability of the project effects is high.

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

¹ Siem Reap, Battambang, Kampot, Kampong Cham, Kampong Thom, Pursat, Svay Rieng, Sihanoukville. In this report, all TPWs refer to the public waterworks of the above eight cities, while the seven TPWs means the public waterworks offices of the above cities other than Sihanoukville, where the water supply operation was transferred to a private company.

1. Project Description



Project Locations



Leakage Detector Provided by this Project

1.1 Background

After the end of the Cambodian Civil War, the construction of water supply facilities and the capacity improvement of the O&M for the facilities progressed in Phnom Penh with the support of Japan and other aid agencies. The Japan International Cooperation Agency (JICA) supported the O&M capacity of water supply facilities in the Phnom Penh Water Supply Authority (PPWSA) from 2003 to 2006, through the Project on the Capacity Building for the Water Supply System in Cambodia (Phase 1) and endeavored to establish a human resources development system for the water supply sector in Cambodia. In the early 2000s, however, water services were still inadequate in cities other than Phnom Penh. The Department of Potable Water Supply (DPWS of the Ministry of Industry, Mines, and Energy (MIME)), which was in charge of the water supply sector at that time, supervised 14 cities where the public waterworks had an urgent need for both a development of facilities and an improvement of operational capacity. With the Asian Development Bank (ADB), the World Bank (WB), and Japan's ODA loans and grant aids, the facilities of the public waterworks were developed. However, on the other hand, the operational capacity of the water supply operation had substantial room for improvement.

With this background, this project supported the capacity building of water supply operation at TPWs in eight cities from 2007 to 2018. This project consists of the Project on the Capacity Building for the Water Supply System in Cambodia (Phase 2) and (Phase 3) and it aimed to develop human resources in a wide variety of fields at all TPWs and the regulatory authority. Specifically, Phase 2 aimed to improve the technical capacity for the O&M of water supply facilities, and Phase 3 aimed to strengthen the management capacity of the water supply business. In addition, Phase 3 also strengthened the capacity of the supervisory authority in monitoring and consultation on the performance of public waterworks.

1.2 Project Outline

		Phase 2	Phase 3
Overall Goal		Capacity to operate and maintain water supply facilities is improved in the urban areas of 14 cities which participate in “National Conference on Public Water Utilities” in the Kingdom of Cambodia.	Water services provided by TPWs are enhanced.
Project Purpose		Capacity to operate and maintain water supply facilities is improved in the targeted provincial waterworks (TPWs) utilizing the experiences accumulated during the Phase 1 Project.	All TPWs are able to manage water supply more stable and sustainably.
Outputs	Output 1	Capacity to analyze the water quality is improved in the TPWs.	Capacity of managing the data necessary for Business Plan is enhanced at TPWs.
	Output 2	Capacity to treat water quality is improved in the TPWs.	Capacity of formulating Business Plans is improved at TPWs.
	Output 3	Capacity for operation and routine maintenance of electrical facilities is improved in the TPWs.	Capacity of monitoring Business Plans is enhanced at TPWs.
	Output 4	Capacity for operation and routine maintenance of mechanical facilities is improved in the TPWs.	Capacity of monitoring, evaluating Business Plan, formulation policies and supporting TPWs for funding is strengthened at MIH ² .
	Output 5	Capacity to maintain water distribution facilities is improved in the TPWs.	Capacity of analyzing human resources development and improvement measures at TPWs is enhanced.
	Output 0	The Project is managed appropriately by the Project Support Team (PST).	
Total cost (Japanese Side)		687 million yen	504 million yen
Period of Cooperation		May 2007 – March 2012 (Extended period: May 2011 – March 2013)	November 2012 – June 2018 (Extended period: December 2017 – June 2018)

² At the beginning of Phase 3, the implementing agency was MIME. During project implementation, it was reorganized into the Ministry of Industry and Handicraft (MIH). At the time of the ex-post evaluation, the name of the ministry was changed to MISTI.

Target Area	Phnom Penh, Siem Reap, Battambang, Kampot, Kampong Cham, Sihanoukville, Kampong Thom, Pursat, Svay Rieng	Same as left
Implementing Agency	DPWS/MIME, 8 TPWs	MIH ³ , 8 TPWs
Other Relevant Agencies/ Organizations	PPWSA	PPWSA
Organization in Japan	Ministry of Health, Labour and Welfare, Kitakyushu City Waterworks Bureau, Nagoya City Waterworks Bureau	Kitakyushu City Water and Sewer Bureau
Related Projects	<p>[Technical Cooperation]</p> <ul style="list-style-type: none"> • Project on the Capacity Building for Water Supply System in Cambodia (Phase 1) (2003 - 2006) • Project for Strengthening Administrative Capacity of Urban Water Supply in Cambodia (2018 - 2022) <p>[ODA Loan]</p> <ul style="list-style-type: none"> • Siem Reap Water Supply Expansion Project (2012) <p>[Grant Aid]</p> <ul style="list-style-type: none"> • Project for Improvement of Water Supply System in Siem Reap Town (2004) • Project for Replacement and Expansion of Water Distribution Systems in Provincial Capitals (2011) • Project for Expansion of Water Supply Systems in Kampong Cham and Battambang (2013) • Project for Expansion of Water Supply System in Kampot (2015) • Project for the Expansion of Water Supply System in Pursat (2019) <p>[Other aid agencies]</p> <ul style="list-style-type: none"> • WB “Urban Water Supply Project” (1996 - 2004) • WB “Provincial and Peri-Urban Water Supply and Sanitation Project” (2003 - 2008) • ADB “Provincial Towns Improvement Project” (2000 - 2006) • ADB “Urban Water Supply Project” (2015-) • ADB and Agence Française de Développement (AFD) “Provincial Water Supply and Sanitation Project” (2017-) 	

1.3 Outline of the Terminal Evaluation

1.3.1 Achievement Status of Project Purpose at the Terminal Evaluation

The following table shows the prospective achievement of the Project Purpose at the time of the terminal evaluation of the Project.

³ At the completion of Phase 3

Table 1: Prospective Achievement of the Project Purpose (at the Terminal Evaluation)

Phase 2	In consideration of the achievement of the four indicators for the Project Purpose, it is assessed that the Project Purpose is expected to be mostly achieved. However, the extent of capacity improvement differs among TPWs, especially between the leading TPWs (Siem Reap, Battambang, Kampot, and Sihanoukville) and other TPWs.
Phase 3	The Project Purpose has been partially achieved at the time of the terminal evaluation, but there are differences among TPWs. An extension of the project period increases the likelihood that all TPWs will achieve the Project Purpose.

1.3.2 Achievement Status of Overall Goal at the Terminal Evaluation (including other impacts)

The following table shows the prospective achievement of the Overall Goal at the time of the terminal evaluation on this Project.

Table 2: Prospective Achievement of the Overall Goal (at the Terminal Evaluation)

Phase 2	At the time of the terminal evaluation, it is difficult to foresee the possibility and scale of impact expected from this Project. The achievement of the Overall Goal depends mainly on how effectively and efficiently the human resource development system functions internally.
Phase 3	It is very likely that the Overall Goal will be achieved. Based on the customer satisfaction survey conducted by the project, it can be seen that customer satisfaction has increased in almost all TPWs. In Kampot, the improvement of customer satisfaction is slightly lower, but customer satisfaction is expected to be improved with the operation of the new facility.

1.3.3 Recommendations from the Terminal Evaluation

The following table shows the recommendations at the terminal evaluation of the Project.

Table 3: Recommendations (at the Terminal Evaluation)

Phase 2	<ol style="list-style-type: none"> (1) Promotion of appropriate water treatment based on accurate understanding and judgment of water quality analysis in all TPWs (2) Continuation of leak detection in the water distribution in all TPWs (3) Joint training by local experts from PPWSA and local trainers of the leading TPWs (4) Formulation of a plan for PPWSA's involvement in capacity building (5) Supporting the establishment of an association for waterworks by Japanese experts (6) Preparation of a roster for all technical staff of PPWSA, DPWS/MIME, and TPWs (7) Integration and sharing of the information on suppliers and procurement methods for materials and supplies (8) Activities to establish an association for waterworks based on DPWS/MIME's Action Plan (9) Preparation of short- and medium-term action plans for each office of DPWS/MIME (10) Preparation of annual human resource development plans for all TPWs (11) Development of an organizational mechanism to secure funds for further capacity building of all TPWs (12) Continuation of on-the-job training to effectively apply Standard Operation Procedures (SOP) to operation and routine maintenance of electrical and mechanical equipment (13) Preparation of an SOP for routine inspections of chlorine injection facilities and continuation of OJT
Phase 3	<ol style="list-style-type: none"> (1) Review of the implementation schedule until the project completion (2) Completing the installation and effective use of the synergic utility management system (3) Utilization of local human resources in the leading group (4) MIH's independent and continuous monitoring (5) Review of indicators and activities (6) Support for the formulation of the water supply law (7) Appropriate accounting for the depreciation of facilities (8) Setting of water tariff

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: October 2020 – January 2022

Duration of the Field Study: Not conducted

2.3 Constraints during the Evaluation Study

In this ex-post evaluation, the external evaluator was unable to conduct a field survey due to the coronavirus pandemic. Neither were the field survey assistants able to visit TPWs as the disease was spread across Cambodia. Therefore, the collection method of information and data was limited to questionnaires and interviews using the web conferencing system. As a result, of the 14 cities participating in the “National Conference on Public Water Utilities”, it was impossible to obtain sufficient information for six cities unassisted by this project. For this reason, the dissemination of the project effect on these cities was not taken into consideration in the judgement. At the ex-post evaluation, water supply operation in Sihanoukville was leased to a private company for 20 years and the public waterworks assisted by this project ceased to exist. Since sufficient information was not available for six cities outside the project area and Sihanoukville, the analysis on Impact and Sustainability was based on the current status of the seven cities assisted by this project.

3. Results of the Evaluation (Overall Rating: A⁴)

3.1 Relevance (Rating: ③⁵)

3.1.1 Consistency with the Development Plan of Cambodia⁶

At the planning of Phase 2, Cambodia’s national development strategy, *the Rectangular Strategy* (2004), had four strategies. Strategy 2 “Further Rehabilitation and Construction of Physical Infrastructure” had the policy goals: (1) providing clean and safe water to all citizens and (2) protecting all citizens from water-related diseases. In addition, *the National Strategic Development Plan 2006 – 2010* selected the percentage of the population with access to safe water sources in urban areas as a monitoring indicator, aiming to improve this indicator. Moreover, the sector plan *Implementation Strategy for Urban Water Supply* (2006) was also

⁴ A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

⁵ ③: High, ②: Fair, ①: Low

⁶ There is continuity in the project objectives and activities of Phase 2 and Phase 3, and the two phases mostly share the subjects to be assessed in development policy and development needs. Therefore, the analysis focused on three points: at the planning of Phase 2, at the completion of Phase/the planning of Phase 3, and the completion of Phase 3.

formulated, with the policy to strengthen small- and medium-sized water supply services in urban areas. The short-term goals included enhancement of staff capacity, improvement in the efficiency of public water supply services, maintenance of infrastructure and the development of maintenance skills.

At the completion of Phase 2 and the planning of Phase 3, in the country's national development strategy *the Second Rectangular Strategy* (2008), Strategy 2 "Further Rehabilitation and Construction of Physical Infrastructure" had the policy of focusing more on access to clean water, in line with *the Cambodia Millennium Development Goals*. *The National Strategic Development Plan Update 2009 – 2013* stated that the access to safe water in urban areas had been improved. However, the plan also pointed out that (1) access was still low at about 50% of the urban population, (2) access to safe water was limited among poor people, and (3) funds for further improvement were insufficient. Based on this understanding, the plan included the policy to enhance the capacity of public waterworks in the water supply sector of urban areas.

At the completion of Phase 3, the country's national development strategy *Fourth Rectangular Strategy* (2018) had four strategies. Strategy 4 "Inclusive and Sustainable Development" promoted a good and clean living environment. As a part of this strategy, the policy was to support urban development, including the water supply sector, and to prioritize the formulation of master plans in urban areas. In addition, *the National Strategic Development Plan 2014 – 2018* mentioned that the coverage of water supply services was approximately 50% in urban areas, excluding Phnom Penh. The plan also pointed out issues such as (1) weak autonomy except in the water supply authorities in Phnom Penh and Siem Reap, (2) lackluster operational performance and inadequate human resources, and (3) tariff setting that did not allow full cost recovery. Measures such as decentralization of the water supply in urban areas, autonomous management of public waterworks modeled on PPWSA, the formulation of business plans for public waterworks, and human resource development in the water supply sector in urban areas were proposed as solutions for the above problems. At the completion of Phase 3, the sector plan *Implementation Strategy for Urban Water Supply* (2006) was an active plan in use.

At the planning of Phase 2, and at the completion of Phase 2/the planning of Phase 3, and at the completion of Phase 3, the development policy aimed to improve the access to safe water in urban areas. Since the achievement of the project objectives for this project contributes to the policy goals of the development policy (access to safe water in urban areas), this project is consistent with the development policy.

3.1.2 Consistency with the Development Needs of Cambodia

At the planning of Phase 2, households using water piped to dwellings accounted for only about 30% of the population in urban areas other than Phnom Penh⁷. Aid agencies provided support in major cities, but the O&M capacity of public waterworks, which was under the supervision of MIME, was insufficient. As a result, it was difficult to provide a stable supply of safe water. One of the causes of this issue was an insufficient system for human resources development for the water supply sector of MIME.

At the completion of Phase 2 and the planning of Phase 3, the MIME survey found that the population with access to safe water accounted for only about 60% of the urban population in 2010. It was pointed out that the management of public waterworks was inefficient and that this had become an issue in the improvement of access to safe water. In order to make public waterworks operate efficiently as a public corporation, it was necessary to solve several problems: (1) tariff revenues and operating costs were not well recognized, (2) financial statements in accordance with standard accounting standards were not prepared, and (3) development and replacement plans for facilities and equipment in the medium- and long-term were not formulated.

At the completion of Phase 3, access to “improved water⁸” had reached about 80% in the urban areas other than Phnom Penh, but the access to tap water accounted for less than 60%. The above-mentioned “improved water” included water from wells and rainwater and these water sources did not necessarily ensure appropriate water quality. The terminal evaluation of Phase 3 pointed out that the weak capacity of operation and limited human resources was a challenge in the water supply sector in urban areas.

Table 4: Access to the Improved Water (2017)

	Cambodia	Phnom Penh	Other urban areas	Rural areas
Access to the improved water	64.8%	97.6%	78.5%	58.3%
Piped to dwellings or on premises	29.2%	96.1%	56.6%	16.0%
Unimproved water	35.2%	2.4%	21.5%	41.7%

Source: Cambodia Socio-Economic Survey 2017

In a comparison of the three points (at the planning of Phase 2, at the completion of Phase 2/the planning of Phase 3, and at the completion of Phase 3), the population who could use safe water in urban areas increased, but even at the completion of Phase 3, there was still room for improvement in the cities other than Phnom Penh. During this period, the further use of water

⁷ Based on National Institute of Statistics of Cambodia “Housing Condition 2007”. Water piped to dwellings means water supply directly from waterworks to each house and does not include public taps.

⁸ Improved water includes water piped to dwellings, public taps, tubes/piped wells, protected dug wells, rainwater collection systems.

supply required the improvement of the O&M of public waterworks and of business management. Since both phases focused on the improvement of the capacity of local public waterworks, this project is consistent with development needs.

3.1.3 Consistency with Japan's ODA Policy

At the planning of Phase 2, Japan's *Country Assistance Program for Cambodia* (2002) included "support for vulnerable people" in its priority areas and there was the policy to continue cooperation for basic human needs, including the water supply sector. The program regarded basic human needs as an important assistance area for ODA to the country due to (1) direct benefits to the Cambodian people and (2) coping with the disparities caused by economic growth.

At the planning of Phase 3, *Japan's Country Assistance Policy for Cambodia* (2012) included the "promotion of social development" in its priority areas and, as a part of the strategy, had the policy to promote the development of the water supply and sewage infrastructure. It was emphasized that the knowledge of PPWSA, where technical capabilities had been obtained with the support of Japan, would be utilized to promote the development of waterworks in large regional cities.

Both Phase 2 and Phase 3 had the Project Purpose to strengthen the O&M of water supply facilities and the business management of the waterworks of large regional cities and this is consistent with Japan's ODA policy that emphasized assistance in the water supply sector.

This project was highly relevant to the country's development plan and development needs, as well as Japan's ODA policy. Therefore, its relevance is high.

3.2 Effectiveness and Impacts⁹ (Rating: ③)

3.2.1 Effectiveness

3.2.1.1 Project Output

(1) Phase 2

The table below shows the achievement level of the Outputs at the completion of Phase 2. Of the six Outputs, five were achieved or mostly achieved. The Output 2 (improvement of capacity for water treatment) was difficult to achieve in some TPWs due to malfunction of the water treatment facilities.

⁹ Sub-rating for Effectiveness is to be put with consideration of Impacts.

Table 5: Achievement Level of the Outputs (Phase 2)

Output	Achievement*
Output 1: Capacity to analyze the water quality is improved in the TPWs.	<p>Achieved:</p> <ul style="list-style-type: none"> a. All TPWs could regularly analyze water quality in accordance with the SOP. b. All TPWs started the preparation of annual reports on the analysis of water quality from 2010. c. All laboratory staff in TPWs could analyze water quality.
Output 2: Capacity to treat water quality is improved in the TPWs.	<p>Partially achieved:</p> <ul style="list-style-type: none"> a. All TPWs prepared a daily report on water treatment facilities. b. Turbidity of the unfiltered settled water mostly satisfied the target value. c. 3 TPWs could not achieve the target for monthly average residual chlorine due to equipment problems. d. 2 TPWs could not control the cleaning process of filter sand due to equipment problems. e. The SOP for water treatment was prepared. f. At least one person for each of all TPWs could conduct activities related to water treatment.
Output 3: Capacity for operation and routine maintenance of electrical facilities is improved in the TPWs.	<p>Mostly achieved:</p> <ul style="list-style-type: none"> a. The SOP for electrical facilities was prepared. b. All TPWs started the operation of electrical facilities based on the SOP. c. All TPWs started routine and periodic inspections in accordance with the SOP and designated formats. d. All TPWs could assess the condition of the equipment from the inspection results and identify causes of malfunction to some extent. e. At each of all TPWs, there was at least one employee who acquired the ability for the operation and daily maintenance based on the SOP, but it is difficult to assess the achievement level of the target.
Output 4: Capacity for operation and routine maintenance of mechanical facilities is improved in the TPWs.	<p>Mostly achieved:</p> <ul style="list-style-type: none"> a. The SOP for mechanical facilities was prepared. b. All TPWs started the operation of mechanical facilities based on the SOP. c. All TPWs started routine and periodic inspections in accordance with the SOP and designated formats. d. All TPWs could assess the condition of the equipment from the inspection results and identify causes of malfunction to some extent. e. At each of all TPWs, there was at least one employee who acquired the ability for the operation and daily maintenance based on the SOP, but it is difficult to assess the achievement level of the target.
Output 5: Capacity to maintain water distribution facilities is improved in the TPWs.	<p>Mostly achieved:</p> <ul style="list-style-type: none"> a. All TPWs prepared plans to replace old pipes. b. All TPWs completed the construction of approximately 1 km of pipelines. c. All TPWs constructed pipelines in accordance with the design, achieving the target for water-resistant pressure (7.5 kgf/cm²). d. All TPWs inspected water leaks until project completion. e. No water theft inspection was conducted, but related training was conducted. f. At each of all TPWs, there was at least one employee who acquired the ability for the maintenance of distribution facilities, but it is difficult to assess the achievement level of the target.
Output 0: The Project is managed appropriately by the Project Support Team (PST).	<p>Achieved:</p> <ul style="list-style-type: none"> a. PST was established at the beginning of the project and members were appointed. b. A baseline survey report on the capabilities of all TPWs technical staff was prepared. c. Various planning documents for the project were approved in 2007. d. Monitoring was conducted by using a checking format for project activities. e. Project progress was regularly monitored at meetings such as Joint Coordination Meetings. f. A manual on the planning, administration, and evaluation of training programs was prepared in 2009.

Source: Documents provided by JICA, answers of questionnaires for experts

Note: * Achievement level of indicators set for each output

(2) Phase 3

The table below shows the achievement level of the Outputs at the completion of Phase 3. Of the five Outputs, four were achieved. Output 5 (improvement of the capacity for management of human resources development) is judged to have been partially achieved because human resources development plans with longer perspective were not formulated.

Table 6: Achievement Level of the Outputs (Phase 3)

Output	Achievement*
Output 1: Capacity of managing the data necessary for Business Plan is enhanced at TPWs.	<p>Achieved:</p> <p>1-1. All TPWs introduced the Synergistic Utility Management System (SUMS) and used the system for the management of customer information.</p> <p>1-2. The control of asset ledgers based on SUMS was introduced in all TPWs.</p> <p>1-3. Financial statements were prepared every year.</p>
Output 2: Capacity of formulating Business Plans is improved at TPWs.	<p>Achieved:</p> <p>2-1. All TPWs formulated five-year business plans. The contents of the plans were comprehensive and covered the expansion/replacement of facilities, O&M, production, finance, and action plans.</p> <p>2-2. The seminars on the five-year business plans had been conducted by the terminal evaluation.</p>
Output 3: Capacity of monitoring Business Plans is enhanced at TPWs.	<p>Achieved:</p> <p>3-1. All TPWs submitted annual reports on management performance and business plans to MIH. Monitoring of the business plan had commenced by the project completion.</p>
Output 4: Capacity of monitoring, evaluating Business Plan, formulation policies and supporting TPWs for funding is strengthened at MIH.	<p>Achieved:</p> <p>4-1. All TPWs started reporting of Performance Indicators (PI) to MIH as a part of their annual reports.</p> <p>4-2. MIH reviewed PI during the project period and started monitoring based on PI.</p> <p>4-3. MIH compared the annual plans and actual results of TPWs and discussed with TPWs future plans and targets for the next year.</p> <p>4-4. MIH conducted performance evaluations and regularly proposed business improvements for public waterworks.</p>
Output 5: Capacity of analyzing human resources development and improvement measures at TPWs is enhanced.	<p>Partially achieved:</p> <p>5-1. A personnel evaluation scheme was established in all TPWs, and the performance evaluations of their staff were carried out. However, a medium- to long-term human resources development plan had not yet been formulated.</p>

Source: Documents provided by JICA, answers to questionnaires for experts

Note: *Achievement level of indicators set for each output

3.2.1.2 Achievement of Project Purpose

(1) Achievement level of the Project Purpose for Phase 2

Phase 2 aimed at the development of capacities in several fields related to water supply and the Project Purpose was that TPWs improve the “capacity to operate and maintain water supply facilities”. Four indicators were set for the above objective of which two indicators had been achieved and two indicators were mostly achieved by the completion of Phase 2 (see the following table). Therefore, it is judged that the Project Purpose of Phase 2 was mostly achieved.

Table 7: Achievement Level of the Project Purpose (Phase 2)

Project Purpose	Indicator	Achievement
Capacity to operate and maintain water supply facilities is improved in the targeted provincial waterworks (TPWs) utilizing the experiences accumulated during the Phase 1 Project.	(a) Technical staff of 8 TPWs (88 persons in total at the beginning of the Project) are able to operate and maintain their respective water supply facilities based on the SOPs prepared and/or improved by the Project by the end of the Project.	Achieved: The SOPs for five fields (water quality testing, water treatment, electrical facilities, mechanical facilities, distribution facilities) were prepared and adequately covered the water supply operation. All TPWs could operate and conduct maintenance based on the SOPs.
	(b) The essential analytical items, namely pH, conductivity, turbidity, color and alkalinity, of the treated water distributed by 8 TPWs always satisfy the Cambodian National Drinking Water Quality Standard (CNDWQS); and iron of the treated water distributed by 3 TPWs (i.e. Siem Reap, Sihanoukville, Svay Rieng) always satisfies the Standard by the end of the Project.	Mostly achieved: All TPWs mostly satisfied the essential parameters. Due to equipment problems, Kampong Thom often did not meet the standards for pH, turbidity, color, and Svay Rieng for color. Siem Reap and Sihanoukville satisfied the iron concentration of the water quality standards, but Svay Rieng could not meet the standard due to inadequate facilities. Since the water quality standard did not include alkalinity, the parameter was not assessed in this evaluation.
	(c) Treated water is produced in accordance with the production plan at each TPW daily by the end of the Project.	Achieved: At the time of the terminal evaluation, all TPWs produced treated water based on demand forecasts every day.
	(d) Optimum distributed pressure is kept at each TPW by the end of Project while the water treatment plants are operated.	Mostly achieved: In Siem Reap, water pressure was temporarily low in the morning and evening due to lack of water supply. In other TPWs, water was supplied in line with demand at the time when water could be supplied, and water pressure was maintained properly. Based on the Project Completion Report, in Kampot and Battambang, however, water was not supplied for 24 hours a day.

Source: Documents provided by JICA, questionnaire answers from experts

TPWs acquired a wide variety of capabilities for the O&M of water supply facilities, but there were a few TPWs (Kampong Thom, Svay Rieng, Siem Reap) which could not satisfy some parameters on water quality and water pressure at the completion of Phase 2 due to equipment problems. After the completion of Phase 2, the above three TPWs replaced and expanded water supply facilities with the support of JICA and ADB. In addition, at the completion of Phase 2, no organization for waterworks, which would play an important role in the dissemination of the project effect to other areas, had been established. At the time of the ex-post evaluation, the Cambodian Water Supply Association (CWA) was established.

(2) Achievement level of the Project Purpose for Phase 3

Phase 3 aimed at working out business performance, formulating business plans, and improving monitoring, and the Project Purpose was that all TPWs improve their ability to sustainably manage the water supply business. Three indicators were set for the above objective, and all three indicators were achieved at the completion of Phase 3 (see the table below). Therefore, it is judged that the Project Purpose of Phase 3 was achieved.

All TPWs enabled themselves to operate businesses by using SUMS, and MIH established a monitoring scheme. At the completion of Phase 3, the water supply cost was lower than the water tariff in all TPWs. This project introduced accounting procedures in accordance with international accounting standards. As a result, water supply costs were recognized accurately and cost management could be carried out properly. In Kampong Cham and Battambang, the amount of water treatment increased with the expansion of water treatment facilities and this resulted in cost reduction due to economies of scale. Phase 3 also supported the revision of water tariffs in Kampong Cham. Specifically, this project estimated the profit and loss of the public waterworks in Kampong Cham in the future and explained to residents the appropriate level of water tariff.

Table 8: Achievement Level of the Project Purpose (Phase 3)

Project Purpose	Indicator	Achievement
All TPWs are able to manage water supply more stable and sustainably.	(1) All TPWs are able to utilize the knowledge given by the Project activities.	Achieved: All TPWs formulated business plans and continuously prepared financial statements and PI by using SUMS. The ability for business planning and monitoring, which was essential for the management of water supply operation, was acquired.
	(2) The performance indicators (PIs) are clarified and monitored.	Achieved: A monitoring system for public waterworks was established. All TPWs regularly prepare PIs and report them to MIH. MIH monitored the performance (including PI) of the public waterworks, and provided management advice.
	(3) Performance at all TPWs is improved as compared to 2013, using the PIs as a tool.	Achieved: In all TPWs, the water supply cost fell in 2014 and 2015, dropping below the water tariff. TPWs became profitable. For all TPWs, the non-revenue water at the completion of Phase 3 (2017) was lower than that at the beginning of the phase (2012) (see the following table).

Source: Documents provided by JICA, questionnaire answers from experts

Table 9: Non-revenue Water in TPWs (2012 and 2017)

Year	Siem Reap	Battambang	Kampot	Kampong Cham	Sihanouk ville	Kampong Thom	Pursat	Svay Rieng
2012	9.7%	20.5%	18.7%	11.8%	15.6%	17.0%	17.0%	14.8%
2017	6.1%	10.6%	9.3%	7.2%	14.7%	10.0%	9.6%	9.6%

Source: Documents provided by JICA

Phase 2 mostly achieved its purpose and Phase 3 achieved its purpose. From the above, it can be seen that the project mostly achieved its purpose.

3.2.2 Impacts

The impact of Phase 2 was the improvement of the “capacity to operate and maintain water supply facilities” in 14 cities, and included the dissemination of the project effect to six cities outside the project area. At the ex-post evaluation, however, information on the current situation was only available in the seven cities supported by this project. For this reason, the judgment is based on the realization of project effect in those cities. Moreover, the achievement level was based on the current situation at the time of the ex-post evaluation as there was no target timing set for the achievement of the Overall Goal in either Phase 2 or Phase 3.

3.2.2.1 Achievement of Overall Goal

(1) Achievement Level of the Overall Goal for Phase 2

The goal of Phase 2 was that all TPWs continued to improve water supply services after project completion. Two indicators were set for the above objective. At the time of the ex-post evaluation, one indicator (Indicator a) had been achieved and another indicator (Indicator b) was mostly achieved (see the following table). Therefore, it is judged that the Overall Goal of Phase 2 was mostly achieved.

After the completion of Phase 2, seven TPWs developed water treatment plants, and the treated water generally satisfied the water quality standards of Cambodia. At the time of the ex-post evaluation, seven TPWs were supplying water 24 hours a day. In the beneficiary survey¹⁰ at the time of the ex-post evaluation, most of the beneficiaries had the opinion that water pressure was sufficient. However, the beneficiaries of Kampot and Battambang stated that water pressure dropped after 2018 (at the completion of Phase 3). According to the public waterworks in Kampot and Battambang, the demand increase in recent years has been affecting water pressure.

¹⁰ For the beneficiary survey, a questionnaire survey was carried out and 47 beneficiaries (23 men and 24 women) in the project area excluding Sihanoukville replied. The responses to the questionnaire were collected via TPWs (6-8 people per TPW). TPWs divided their water supply areas into three zones (near / medium / far) along the distance from the water treatment plants and selected an almost equal number of respondents from each zone.

Table 10: Achievement Level of the Overall Goal (Phase 2)

Overall Goal	Indicator	Achievement
Capacity to operate and maintain water supply facilities is improved in the urban areas of 14 cities which participate in “National Conference on Public Water Utilities” in the Kingdom of Cambodia.	(a) Important analytical items, namely Fe, Mn, Al, Cu, Zn, hardness, Cl, SO ₄ ²⁻ , NH ₃ , H ₂ S, of the treated water distributed by 8 provincial waterworks always satisfy the Cambodian National Drinking Water Quality Standard.	Achieved: Based on questionnaire answers from seven TPWs, all met most of the water quality standards in 2020. TPWs in Svay Rieng, and Prusat reported that they could not satisfy some parameters which were not included in the indicator on the left.
	(b) Optimum distributed pressure is always kept at each water treatment plant.	Mostly achieved: Based on questionnaire answers from seven TPWs, all achieved 24-hour water supply in 2020. In the beneficiary survey at the time of the ex-post evaluation, 90% of the respondents answered that water pressure was “sufficient” and “mostly sufficient” (see Table 11). However, there was an opinion that water pressure decreased from 2018 (the completion of Phase 3), mainly from the residents of Kampot and Battambang (see Table 12).

Source: Documents provided by JICA, questionnaire answers from seven TPWs, beneficiary survey at the time of ex-post evaluation

Table 11: Water Pressure at the Time of the Ex-post Evaluation (2021)

	Sufficient	Mostly Sufficient	Mostly Insufficient	Insufficient	Total
Respondents	34	9	2	2	47
%	72%	19%	4%	4%	100%

Table 12: Water Pressure at the Ex-post Evaluation (2021)

in Comparison of the Completion of Phase 3 (2018)

	Much Higher	Higher	No Change	Lower	Much Lower	Total
Respondents	6	15	15	10	1	47
%	13%	32%	32%	21%	2%	100%

(2) Achievement Level of Overall Goal for Phase 3

The goal of Phase 3 was the improvement of water supply services even after project completion. One index was set for the above objective. At the time of the ex-post evaluation, the indicator had been achieved (see the following table). Therefore, it is judged that the Overall Goal of Phase 3 was achieved.

In the beneficiary survey at the time of the ex-post evaluation, all the respondents were satisfied with the water supply services, and approximately 80% of them answered that their satisfaction had increased from 2018 (at the completion of Phase 3). It is concluded that customer satisfaction is improving because seven TPWs are proceeding with the development of water supply facilities such as the new construction and renewal of water supply pipes since the completion of Phase 3, and as the customer information management by SUMS is ongoing.

Table 13: Achievement Level of the Overall Goal (Phase 3)

Overall Goal	Indicator	Achievement
Water services provided by TPWs are enhanced.	Level of Customer Satisfaction in TPWs is improved.	Achieved: Based on the customer survey conducted by the project, almost 70% (average of 8 TPWs) of the respondents answered that the service improved from 2013 to 2017. In the beneficiary survey at the time of ex-post evaluation, all respondents answered that they were “very satisfied” or “satisfied” (Table 14). Approximately 80% of the respondents replied that their satisfaction level was improved, compared with 2018 (the completion of Phase 3) (see Table 15).

Source: Documents provided by JICA, beneficiary survey at the time of ex-post evaluation

Table 14: Customer Satisfaction at the Time of Ex-post Evaluation (2021)

	Very Satisfied	Satisfied	Neither of Satisfied nor Unsatisfied	Unsatisfied	Very Unsatisfied	Total
Respondents	22	25	0	0	0	47
%	47%	53%	0%	0%	0%	100%

Table 15: Customer Satisfaction at and the Ex-post Evaluation (2021) in Comparison of the Completion of Phase 3 (2018)

	Much Higher	Higher	No Change	Lower	Much Lower	Total
Respondents	14	23	8	2	0	47
%	30%	49%	17%	4%	0%	100%

(3) Current Status of the Project Purposes

- Number of households served by water supply services in 7 TPWs

As seven TPWs enhanced their abilities for the O&M of water supply facilities, the number of households served by the water supply in the project areas was on the rise (see the table below). The renewal and expansion of water supply facilities by other projects also affects the quality of water supply services. Nevertheless, water quality and water pressure are maintained appropriately in the project areas while the beneficiary population is increasing.

Table 16: Number of Households Served by Water Supply Services at Project Commencement and after Project Completion

	At Project Commencement (2007)	At Project Completion (2018)	One Year after Project Completion (2019)	Two Years after Project Completion (2020)
Siem Reap	3,578	8,797	11,033	13,087
Battambang	7,897	23,920	27,398	30,616
Kampot	NA	13,135	13,304	13,764
Kampong Cham	3,338	10,464	12,001	13,345
Kampong Thom	1,683	5,555	6,087	6,672
Pursat	2,503	7,657	8,002	8,615
Svay Rieng	NA	4,432	4,812	5,069

Source: Questionnaire answers from MISTI

- Submission of annual reports by TPWs

In Phase 3, all TPWs established a performance monitoring system based on PI. Based on the responses of the questionnaires to seven TPWs, it can be confirmed that they periodically submitted annual reports (including PI and financial statements) to MISTI in 2020. MISTI kept track of the performance of seven TPWs through its annual report and provided management advice to them.

Phase 2 mostly achieved its overall goal and Phase 3 achieved its overall goal. From the above, it can be confirmed that the project mostly achieved its purpose.

3.2.2.2 Other Positive and Negative Impacts

(1) Impacts on the natural environment, resettlement and land acquisition

This project provided materials and equipment for water supply operation, constructed water supply pipes, and renewed old equipment at the water treatment plants. Based on the answers of the questionnaires to seven TPWs and the expert questionnaires, it can be seen that the project did not have a significant negative impact on the natural environment, and neither land acquisition nor resettlement of residents occurred.

(2) Dissemination of the project effect to water supply operators other than TPWs

In Phase 3, CWA, public waterworks other than TPWs, and private water suppliers also participated in training on non-revenue water and Cambodia International Financial Reporting Standards (CIFRS). According to experts, some private water suppliers took action on non-revenue water after the training. Moreover, the waterworks in Kampong Cham provided guidance on water leakage countermeasures in Stung Treng, outside their supply area. Since the solution of non-revenue water and water leakage problems leads to an increase in income and the efficient management of the water supply business, it is considered that this project contributed to the improvement of water supply services in the areas unassisted by the project.

(3) Support for capital investment of TPWs

Out of the five-year business plans assisted by Phase 3, the expansion plans were utilized for the preparation of Japanese grant aid projects in Pursat and Svay Rieng. The grant aid project “Project for the Expansion of Water Supply System in Pursat” commenced in 2019.

(4) Overseas expansion of local governments

Kitakyushu City commenced the dispatch of experts in 1999, and dispatched many long-term experts and short-term experts through this project. In tandem with the dispatch of experts, Kitakyushu City has organized the Cambodia-Japan Water Supply and Sewage Seminar

annually since 2008, and established the Kitakyushu City Overseas Water Business Promotion Council in 2010. The city has the role of a bridge between the water supply sector in Cambodia and Japanese companies, including indigenous ones. As a result, Prime Minister Hun Sen visited Kitakyushu City in 2015, and Phnom Penh and Kitakyushu City signed a friendship town agreement in 2016. This project helped Kitakyushu City build a cooperative relationship with the Cambodian government, and led to the overseas operations of local governments.

Through the implementation of this project, the Project Purpose, the capacity improvement of all TPWs (O&M capacity of water supply facilities and the capacity to sustainably manage water supply services), was mostly achieved. Regarding the Overall Goal, it is confirmed that seven TPWs improved water supply services and that customer satisfaction has increased. Since the project effects are as planned, effectiveness and impacts of the project are high.

3.3 Efficiency (Rating: ②)

3.3.1 Inputs

The Inputs of each phase of this project are shown in the following table.

Table 17: Inputs of Phase 2 (Plan and Actual)

Inputs	Plan	Actual (at the Time of Project Completion)
(1) Experts	Long-term: 3 fields (chief advisor/ distribution facility/electrical facility, water treatment, coordination/training) Short-term: 5 fields (water quality testing, water treatment, electrical facility, mechanical facility, distribution facility) Total 200.5 PM*	Long-term: 4 persons (chief advisor, water treatment process, chief advisor/distribution network, human resource development/coordination) Short-term: 20 persons (water quality testing, water treatment, electrical facility, mechanical facility, distribution facility, human resource development) Total 208.9 PM*
(2) Trainees received	Training in Japan, group training	Training in Japan 22 persons, group training 452 persons
(3) Equipment	Equipment for water quality testing, pipeline equipment, water distribution management equipment, leakage detectors, equipment for electrical and mechanical facilities	Vehicles, equipment for water quality testing, water treatment equipment, equipment for electrical and mechanical facilities, equipment for a distribution facility (including pipeline equipment and leakage detector) Total: JPY 185 million
(4) Overseas Activities Cost	The target is not shown.	69 million yen
Japanese Side Total Project Cost	487 million yen	687 million yen
Cambodia Side Total Project Cost	Local cost	11 million yen**

Source: the ex-ante evaluation sheet of Phase 2, the terminal evaluation report for Phase 2, documents provided by JICA

Note 1: * PM stands for person month.

Note 2: ** At the terminal evaluation

Table 18: Inputs of Phase 3 (Plan and Actual)

Inputs	Plan	Actual (at the Time of Project Completion)
(1) Experts	Long-term: 2 fields (chief advisor/ customer information management, coordination/ monitoring) Short-term: 8 fields (accounting standards, asset data management, replacement/O&M planning, expansion planning, financial planning, technical examination of plan, financial examination of plan, human resource development management)	Long-term: 3 persons (chief advisor, coordination/monitoring) Short-term: 24 persons (accounting standards, asset data management, replacement/O&M planning, expansion planning, financial planning, human resource development management)
(2) Trainees received	Training in Japan, training in a third country	Training in Japan 26 persons, training in a third country 22 persons
(3) Equipment	Equipment for replacement and others (JPY 8 million)	Same as the left (JPY 35 million)
(4) Overseas Activities Cost	58 million yen	108 million yen
Japanese Side Total Project Cost	432 million yen	504 million yen
Cambodia Side Total Project Cost	Costs required for project activities	-

Source: the ex-ante evaluation sheet of Phase 3, documents provided by JICA



Source: Battambang Waterworks

Equipment for Waterworks (drill)



Source: Siem Reap Water Supply Authority

SUMS
(Synergistic Utility Management System)

3.3.1.1 Elements of Inputs

In both Phase 2 and Phase 3, the scope of technical advice was as planned. Based on answers to the questionnaires to the implementing agencies, it can be seen that the equipment provided, the abilities of experts, and the contents of training were appropriate or appropriate to some extent. For Phase 2, it was assumed that equipment would be provided for training purposes at the planning. As the facilities in the water treatment plants of TPWs had many problems which hindered training during project implementation, measures to expand the provision of equipment were taken.

In both Phase 2 and Phase 3, the Cambodian side assigned counterparts, provided facilities and information/data necessary for the project, and bore local costs. This project utilized the human resources of PPWSA, with which Phase 1 assisted, and disseminated the technical capabilities and knowledge of the water supply authority over a wide area in Cambodia. Based on the answers of the questionnaires to the experts, it is clear that the facilities in the water treatment plants had problems as mentioned above. On the other hand, the experts also replied that (1) the appropriate facilities were finally provided for offices, and (2) the Cambodian side provided the required amount of the local cost.

3.3.1.2 Project Cost

For Phase 2, the actual project cost (amount of cooperation) on the Japanese side was JPY 687 million, compared with the planned amount of JPY 487 million. The actual project cost was higher than the plan (141% of the plan). As mentioned above, an increase in the provision of equipment was required during project implementation and this was the main reason for the increase of the project cost.

For Phase 3, the actual project cost (amount of cooperation) on the Japanese side was 504 million yen, compared with the planned amount of JPY 432 million. The actual project cost was higher than the plan (117% of the plan).

On average for the two phases, the actual project cost (amount of cooperation) on the Japanese side was 129% of the plan and exceeded the plan.

3.3.1.3 Project Period

For Phase 2, the actual project period was 4 years and 11 months (from May 2007 to March 2012), compared with the planned project period of 4 years (from April 2007 to March 2011). The actual project period exceeded the plan (123% of the plan). Malfunctions in the water treatment plants of TPWs led to a delay in training and, eventually, a delay in the project implementation.

For Phase 3, the actual project period was 5 years and 8 months (November 2012 - June 2018), compared with the planned project period of 5 years (November 2012 - October 2017). The actual project period exceeded the plan (113% of the plan). It was pointed out that the delay in project implementation was caused by the extension of the procurement period of SUMS.

On average for two phases, the actual project period was 118% of the plan and exceeded the plan.

Both the project cost and project period exceeded the plan. Therefore, efficiency of the project is fair.

3.4 Sustainability (Rating: ③)

This project aimed to improve water supply services by strengthening the O&M capacity of water supply facilities and business management in TPWs. Therefore, the analysis focused mainly on the provision of stable water services by seven TPWs, but also assessed the maintenance of the capacity of the regulatory authority for monitoring public waterworks.

3.4.1 Policy and Political Commitment for the Sustainability of Project Effects

At the time of the ex-post evaluation, the national development strategy, the *National Strategic Development Plan 2019 - 2023*, had the goal of raising the percentage of the urban population with access to clean water from 86% in 2018 to 100% by 2025. Furthermore, the plan included measures to improve technical and financial management: (1) formulation of five-year business plans in all public enterprises by 2023, (2) expansion of the water supply capacity, and sufficient autonomy in public enterprises, and (3) ensuring full-cost recovery and efforts to provide services with quality at a payable price.

Based on the interviews with MISTI, it was understood that the water supply law was in the approval process of the national congress at the ex-post evaluation. The contents of the law included major issues of water supply operation (business licenses, tariff setting, water quality standards, supervision/audits, etc.). Prior to the water supply law, From 2014 to 2017, 15 Prakas (ministerial ordinances) on water supply operation were approved. For example, four Prakas had been approved in 2016, such as performance evaluation of water supply business, water tariff setting, and depreciation of facilities, which were directly related to the sustainability of this project. These ministerial ordinances provided the legal basis for the efficient and stable operation of waterworks.

The policy to expand the access to safe water in urban areas has continued, and development policy had aimed at the autonomous operation of public waterworks. The water supply law was drafted and four important ministerial ordinances were approved in 2016 in line with these policies. Thus, it is concluded that there are no particular problems affecting sustainability in terms of policy and political commitment.

3.4.2 Institutional/Organizational Aspect for the Sustainability of Project Effects

At the completion of Phase 3, the Department of Potable Water Supply in the implementing agency MIH was promoted to the General Department of Potable Water (GD/WAT). MIH renamed itself MISTI in 2020, but GD/WAT continued to supervise water supply services. At the time of the ex-post evaluation, GD/WAT was composed of the Department of Wrap-up & Information (administrative function), the Department of Planning and Data Management, the Department of Potable Water Policies, the Department of Technics & Project Management, and the Department of Potable Water Regulations. The Department of Planning and Data

Management directly supervised public waterworks. The number of personnel in GD/WAT increased from 50 at the terminal evaluation (2017) to 74 at the ex-post evaluation (2021).

Of eight TPWs assisted by this project, the public waterworks in Sihanoukville no longer existed. According to MISTI, the redevelopment of the urban area required capital investment. As the public waterworks did not have a sufficient budget for re-investment and at the same time the waterworks facing the lack of water source for the water production, so the water supply system of Sihanoukville waterworks was leased to a private company. The staff of the public waterworks in Sihanoukville were transferred to the private company which operates water supply services, or transferred to Preah Sihanouk DISTI, or other choice.

Seven TPWs which existed at the ex-post evaluation kept the same institutional position after the completion of Phase 3, and they are public waterworks, except the Siem Reap Water Supply Authority. According to answers to the questionnaires to seven TPWs, the number of technical staff increased after the completion of Phase 3 (2018) in five cities (Kampong Cham, Pursat, Battambang, Siem Reap, and Svay Rieng), with no increase in two cities (Kampong Thom, and Kampot). At the ex-post evaluation, the technical staff had generally achieved the desirable level estimated at the planning of Phase 2. According to the answers in the questionnaires to the experts, the staff of the water treatment plants (water treatment process, electrical facilities, machinery facilities) were engaged in operation regardless of their actual fields of responsibility. Therefore, it is concluded that even TPWs (Kampong Cham, Kampong Thom, Pursat) with very few staff in specific fields can smoothly manage their operations by the complementary staffing of the above three fields.

Table 19: Appropriate Number of Technical Staff in Seven TPWs at the Planning of Phase 2

Unit: persons

Field	Siem Reap	Battambang	Kampot	Kampong Cham	Kampong Thom	Pursat	Svay Rieng	Total
Water quality testing	2	3	2	2	2	2	2	15
Water treatment	2	5	4	3	2	3	2	21
Electrical Facilities	2	3	2	2	2	2	2	15
Mechanical Facilities	2	3	2	2	2	2	2	15
Distribution Facilities	6	6	4	7	3	3	2	31
Total	14	20	14	16	11	12	10	97

Source: The ex-ante evaluation survey report for the Project on the Capacity Building for Water Supply System in Cambodia (Phase 2)

Table 20: Number of Technical Staff in Seven TPWs
at the Time of the Ex-post Evaluation (2021)

Unit: persons

Field	Siem Reap	Battambang	Kampot	Kampong Cham	Kampong Thom	Pursat	Svay Rieng	Total
Water quality testing	3	4	2	2	1	2	2	16
Water treatment	14	8	7	11	4	2	6	52
Electrical Facilities	2	3	4	1	1	2	3	16
Mechanical Facilities	3	3	3	4	1	2	3	19
Distribution Facilities	20	8	10	7	5	7	2	59
Total	42	26	26	25	12	15	16	162

Source: Questionnaire answers from seven TPWs

MISTI established a system for monitoring the seven TPWs and the seven TPWs had the personnel sufficient for the O&M of water supply facilities. Thus, it is concluded that there are no particular problems affecting sustainability in terms of the institutional and organizational aspects.

3.4.3 Technical Aspect for the Sustainability of Project Effects

At the ex-post evaluation, GD/WAT, MISTI formulated an annual training plan and continued training for its staff and the staff of public waterworks. The training covered subjects on O&M and the management of water supply business (see the following table). Moreover, JICA's subsequent project "Project for Strengthening the Administrative Capacity for Urban Water Supply in Cambodia" continuously supported the monitoring capacity of GD/WAT, MISTI, which was enhanced by Phase 3.

Table 21: Training Activities Conducted by MISTI

Training Field	Frequency per Year	Participants per Year
Water treatment	5 times	Approximately 160 persons
Electrical and mechanical facilities	10 times	Approximately 250 persons
Distribution facilities	1 time	Approximately 60 persons
Water testing	No information	No information
Finance and accounting	6 times	Approximately 90 persons
Business planning	No information	No information

Source: Questionnaire answers from MISTI

Based on the answers of the questionnaires to seven TPWs, it was seen that they used the SOPs for the five fields (water quality testing, water treatment, electrical facilities, mechanical facilities, distribution facilities) provided by Phase 2 and continued to collect information for

updating customer ledgers, asset ledgers, and financial statements. Moreover, five of the seven TPWs prepared annual training programs and planned to offer internal training courses on four to seven subjects in 2021 (see the table below). Although the contents of training differ across TPWs, training on electrical and mechanical facilities, measures on non-revenue water, and business planning were mainly provided. In addition, staff could participate in MISTI training even in TPWs without training programs (Battambang and Kampot). From the use of the SOPs and SUMS, it is concluded that the staff in seven TPWs had the opportunity to maintain the technical level through their work, and many TPWs tried to improve the technical level through internal training.

Table 22: Training Activities Conducted by Seven TPWs

	Annual Plan	Frequency*	Training Field
Siem Reap	Yes	4	Water resource management, hygiene, countermeasures on non-revenue water, business management, internal audit, water meter reading
Battambang	No	None	No training
Kampot	No	None	No training
Kampong Cham	Yes	7	Mechanical and electrical facility, planning, countermeasures on non-revenue water
Kampong Thom	Yes	7	Countermeasures on non-revenue water, construction of distribution network, machinery, taxation
Pursat	Yes	4	No information
Svay Rieng	Yes	5	Mechanical and electrical facility, accounting, distribution network management system

Source: Questionnaire answers from seven TPWs

Note: * The number of training courses which TPWs will conduct in 2021

Training opportunities were provided to the staff of seven TPWs who were the counterparts of this project. The technical level could be maintained through daily work in the seven TPWs. Thus, it is concluded that there are no particular problems affecting sustainability in terms of technical aspect.

3.4.4 Financial Aspect for the Sustainability of Project Effects

The expense for training in the water supply sector in MISTI was 72 million riel in 2018 and 2019, but the amount decreased to 36 million riel in 2020. The reduction of the training expense was caused by the difficulty in conducting training due to the coronavirus pandemic. However, as mentioned above, JICA’s “Project for Strengthening the Administrative Capacity of Urban Water Supply in Cambodia” was continuing to assist the monitoring capacity of public waterworks in MISTI at the ex-post evaluation. Therefore, MISTI should be able to maintain the monitoring capacity of public waterworks.

Based on a comparison of the water tariff and the water supply cost among seven TPWs in 2020, it can be seen that the balances were positive or in equilibrium among TPWs other than

Siem Reap and Kampot. The deficits in Siem Reap and Kampot were due to the increases of depreciation caused by the large amount of capital investment in recent years. Therefore, the balance of Siem Reap would be in equilibrium and that of Kampot would be positive if the depreciation were adjusted. Moreover, the cash flow from the operation of seven TPWs was positive on the average of the past three years, and the water supply operations were considered to be financially healthy. Based on the answers in the questionnaires to seven TPWs, for TPWs other than Siem Reap, it can be confirmed that the general budget items (total of maintenance, salary, training) relevant to the project effect of this project increased for the past 3 years (2018 - 2020).

Table 23: Water Tariff and Supply Cost in Seven TPWs (2020)

	Siem Reap	Battambang	Kampot	Kampong Cham	Kampong Thom	Pursat	Svay Rieng
(A) Water tariff	1,960	1,498	1,438	1,389	1,214	1,599	1,200
(B) Supply cost	2,451	1,452	1,813	1,434	1,214	1,534	870
Difference	-491	46	-375	-45	0	65	330
(C) Depreciation	545	428	790	458	204	262	232
Difference excluding depreciation	54	474	415	413	204	327	562

Unit: Riel/m³

Source: Questionnaire answers from seven TPWs

Table 24: Cash Flow from Operation in Seven TPWs

	2018	2019	2020	Average
Siem Reap	-1,580,727	5,114,749	-2,067,772	488,750
Battambang	968,830	2,378,525	2,696,037	2,014,464
Kampot	341,261	941,637	1,947,319	1,076,739
Kampong Cham	3,362,425	2,735,516	4,200,103	3,432,681
Kampong Thom	1,127,210	923,080	1,168,598	1,072,962
Pursat	2,274,274	2,851,292	2,748,612	2,624,726
Svay Rieng	461,167	609,635	531,481	534,094

Unit: thousand Riel

Source: Questionnaire answers from seven TPWs

In parallel with this project, grant aid was provided for the development of water supply facilities in Siem Reap, Battambang, Kampong Cham, and Kampot, contributing to an increase in the population served by water supply and water supply revenue. Human resource development through this project brought about the effective O&M of water supply facilities constructed by grant aid projects and also improved managerial efficiency. Therefore, it is concluded that the synergistic effects of this project and grant aid projects also contributed to the improvement of financial stability.

The water supply operations were financially stable in Seven TPWs. Thus, it is concluded that there are no particular problems affecting sustainability in terms of financial aspect.

No major problems have been observed in the policy background and the institutional/organizational, technical, financial aspects. Therefore, sustainability of the project effects is high.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

Through two phases of technical cooperation, this project aimed to improve the operation and maintenance (O&M) capacity of water supply facilities and the management capacity of water supply services of the public waterworks in eight cities of Cambodia. The aim was also to contribute to the dissemination of the project effect across the cities participating in the “National Conference on Public Water Utilities” and to the improvement of the water supply services in the project area.

In Cambodia, access to safe water in urban areas other than Phnom Penh was an issue, for which the country had a policy solution. The objective of the project was consistent with the above development policy and development needs and was also consistent with Japan’s policy at the time of planning. Therefore, the relevance of this project is high. Through the implementation of this project, the capacity development of all TPWs (O&M capacity of water facilities, management capacity of water supply services) was mostly achieved. An improvement of the water supply services, and a higher level of satisfaction of costumers were also found in seven TPWs (excluding Sihanoukville where the water business was leased to a private company for 20 years). Therefore, effectiveness and impacts of this project is high, as the project effects were as planned. Taking an average of the two phases, efficiency of this project is fair as both the project cost and the project period exceeded the plan. The development policy aimed at the autonomous operation of public waterworks. In line with the policy, the water supply law was drafted and several Prakas (ministerial ordinances) were approved. MISTI, which was the supervisory authority of public waterworks, established the monitoring scheme for seven TPWs, and the seven TPWs assigned sufficient personnel for the O&M of water supply facilities. The counterparts of this project were given training opportunities, and the seven TPWs were able to maintain their technical level through their daily operations. The water supply operations in the seven TPWs were financially stable. Therefore, sustainability of the project effects is high.

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

4.2 Recommendations

4.2.1 Recommendations to the Implementing Agency

It was expected that the project effects of Phase 2 would be disseminated to cities outside the project area, but an organization for public waterworks had not been established by the completion of Phase 2. This became a constraint on the dissemination of project effects, and made it difficult to recognize the project effects after the completion of Phase 2. As CWA was established at the time of ex-post evaluation, it is possible to utilize the organization for the dissemination of project effects. It is desirable that MISTI promptly formulates a plan to utilize CWA for the dissemination of the project effects of this project.

4.2.2 Recommendations to JICA

None

4.3 Lessons Learned

Grouping of project target staff

Phase 3 used the approach of dividing all TPWs into two groups for smoother project implementation. Specifically, the preceding group implemented and used SUMS to some extent, allowing counterpart staff of the following group to participate in the process, and utilizing the experience for smoother implementation in the following group. In addition, the staff of the preceding group supported the following group for efficient project implementation. In this process, motivated and skilled staff were actively assigned to work with other TPWs for the development of key personnel in all TPWs. When it is appropriate to divide a cross-jurisdictional project into multiple target groups, it is desirable to use experience gained in support of a preceding group and to actively utilize the staff of a preceding group.

Utilization of human resources from the preceding phase

In this project, the staff of PPWSA, which was supported in Phase 1, were assigned to teach TPWs. As a result of the implementation of Phase 1, the water supply operation of PPWSA became a good practice in Cambodia, and it was meaningful that the technical capabilities and know-how of PPWSA were widely disseminated. If there are human resources that have been developed in the preceding phase, it is desirable to utilize them in a subsequent cross-jurisdictional project for disseminating the impacts of the preceding phase.

Enhancement of development effect by synergy of technical and financial cooperation

In the regional cities supported by this project, water supply facilities were constructed with financial cooperation. This project contributed to the proper O&M of the water supply facilities. The expansion of the facilities brought an increase in the population served by water supply and

in tariff revenue, and led to the sound management of TPWs in tandem with the strengthening of financial and management capacity through the project. As shown above, the synergistic effect of this project and several instances of financial cooperation resulted in development effects such as improvement of water supply services and sound management of water supply business. In a sector where both facility development (hardware) and capacity development (software) are important (such as water supply), it is desirable that, when facility development is needed, technical cooperation is planned with the effective collaboration of financial cooperation.