

Lao People's Democratic Republic

FY2018 Ex-Post Evaluation of Japanese Grant Aid Project

“Thakhek Water Supply Development Project”

External Evaluator: Miho Kawahatsu, OPMAC Corporation

0. Summary

The project aimed to solve problems such as water shortage in the dry season, unstable water supply conditions, unsanitary water, and the water supply coverage rate by improving water supply facilities in the urban area of Thakhek in Laos, thereby contributing to the expansion of the safe supply of water for the urban population in the district. The project was consistent with the development policy and development needs of Laos both at the time of planning and the ex-post evaluation. Furthermore, it was confirmed that it was consistent with the Japanese ODA policy at the time of planning. Thus, the relevance of the project is high. In the course of implementation, some part of the installation of the water distribution mains were shifted to the Laotian portion. If the cost of the part was excluded from the Japanese portion, the project cost was within the plan, and the project period was as planned. Therefore, efficiency is high. As for the project effects, after project implementation, not only overloaded operation of the water treatment plant was resolved, but the water supply volume and the facility utilization rate have also improved. Furthermore, a stable supply of safe and hygienic water for 24 hours has been mostly realized. Despite this, increases in the number of new customers have been sluggish in the water supply area where the water distribution mains were newly installed by the project (the extension area). Regarding impact, although the service population was increased by the project, it was difficult to achieve the target water supply coverage rate due to the total population increase in urban areas. However, improvements in the quality of public service attained through the project have been recognized by customers. Therefore, effectiveness and impact are fair. Regarding operation and maintenance, no major problems have been observed in terms of the institutional, technical aspects and status of operation and maintenance. However, there have been challenging problems in the financial status. Therefore, the sustainability is fair.

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

1. Project Description



Project Location



Newly Established Water Treatment Plant

1.1 Background

With the progress of urbanization in Laos in recent years, meeting an ever-increasing water demand for the urban population has become an issue. Thakhek, the capital of Khammouane Province, had a population of 86,000 in 2010, before the project implementation, and the water supply coverage rate in the entire urban area was below 50%. In addition, the existing water distribution network in Thakhek remained undeveloped, and the water supply area was limited to the city center. Furthermore, with a worsening water quality of the wells and water shortages in the dry season in the district, the overloaded operation of the existing water treatment plant was inevitable. Design capacity of the water treatment plant having been exceeded, water supply facilities became more decrepit, exacerbating the water quality. In the context of regional economic integration, as Thakhek has a border with Thailand, was likely to become a key location of international trade. It is linked with Nakhon Phanom in Thailand by the Third Mekong Friendship Bridge and is led to Vietnam by the National Route 12. Therefore, future economic revitalization was expected in the district in the future. There was also a concern that the expansion of the supply-demand gap accompanying increases in water use would be inevitable, which might become a bottleneck for the regional economic development.

1.2 Project Outline

The objective of this project was to respond to water shortages in the dry season, unstable water supply conditions, unsanitary water quality, and the water supply coverage rate by improving water supply facilities in the urban area of Thakhek, Laos, thereby contributing to the expansion of the supply of safe water to the urban population in the district.

<Grant Aid Project>

Grant Limit / Actual Grant Amount	Detailed Design: 41 million yen / 40.8 million yen Main Construction: 1,643 million yen / 1,641 million yen
Exchange of Notes Date /Grant Agreement Date	Detailed Design: February 2013 / February 2013 Main Construction: May 2013 / June 2013
Executing Agencies	<ul style="list-style-type: none"> • Ministry of Public Works and Transport (MPWT) • Department of Public Works and Transport (DPWT), Khammouane province • Khammouane Water Supply State Enterprise (NPKM)
Project Completion	March 2016
Target Area	Thakhek District, Khammouane Province
Main Contractor(s)	Hazama Ando Corporation
Main Consultant(s)	Nihon Suido Consultants
Preparatory Survey	December 2011 to January 2013
Related Projects	<p>[Technical Cooperation]</p> <ul style="list-style-type: none"> - Project for the Development of Human resources for Water Supply systems (2003-2006) - The Capacity Development Project for Improvement of Management Ability of Water Supply Authorities (MaWaSU) (2012-2017) - The Project for Improvement of Management Capacity of Water Supply Sector (MaWaSU2) (2018-2023) <p>[Grant Aid]</p> <ul style="list-style-type: none"> - Project for the Vientiane Water Supply Development (2006) <p>[JICA Partnership Program]</p> <ul style="list-style-type: none"> - Saitama Prefectural Government, Public Enterprise Bureau (2016-2019)

2. Outline of the Evaluation Study

2.1 External Evaluator

Miho Kawahatsu, OPMAC Corporation

2.2 Duration of Evaluation Study

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

Duration of the Study: August 2018 – October 2019

Duration of the Field Study: November 25, 2018 – December 18, 2018

2.3 Constraints during the Evaluation Study

During project implementation, a part of the installation of the water distribution main, which had originally been within the project scope of the Japanese portion, was transferred to the Laotian portion due to a substantial reduction of the project cost due to fluctuations in the exchange rate.

As a result, the burden of Laos was increased. At the time of the ex-post evaluation, this part has not been implemented by using the Laotian governmental budget. Therefore, the planned scope of the project had not yet been completed. However, the cooperation scope of Japan was completed in 2016 and in part, planned water distribution mains were installed in the extension area. In addition to this, the water supply facilities were already in full operation. In consideration of the above points, the evaluation of efficiency should be based on the project cost and the project period of the Japanese portion.

3. 3. Results of the Evaluation (Overall Rating: B¹)

3.1 Relevance (Rating: ③²)

3.1.1 Consistency with the Development Plan of Laos

At the time of project planning, since the Prime Minister's Decree No. 37 "Management and Development of the Water Supply Sector" issued in 1999, Laos had upheld the target of 80% water supply coverage rate in urban areas by 2020. In addition, in the "Seventh National Socio-Economic Development Plan (2011-2015)" formulated by the Ministry of Planning and Investment, it was stated that water supply coverage rate in urban areas must be raised to 75% by 2015 (whereas that of the whole country was 80%³). Regarding the development policy at the time of the ex-post evaluation, "90% of the population having access to clean water by 2020" was one of the targets related to the improvement of universal access to health services in the "Eighth National Socio-Economic Development (2016-2020)" formulated in 2016. Furthermore, according to "Water Supply and Sanitation Sector Development" formulated by the Ministry of Public Works and Transport (hereinafter referred to as the 'MPWT') in 2016, the target for water supply coverage rate in urban areas was to be incrementally raised to 80% by 2020, 85% by 2025, and 90% by 2030.

From the above, it can be judged that the project was consistent with the national development policy at both times of project planning and the ex-post evaluation from the viewpoint of improvement of the sanitary water supply, mainly in urban areas.

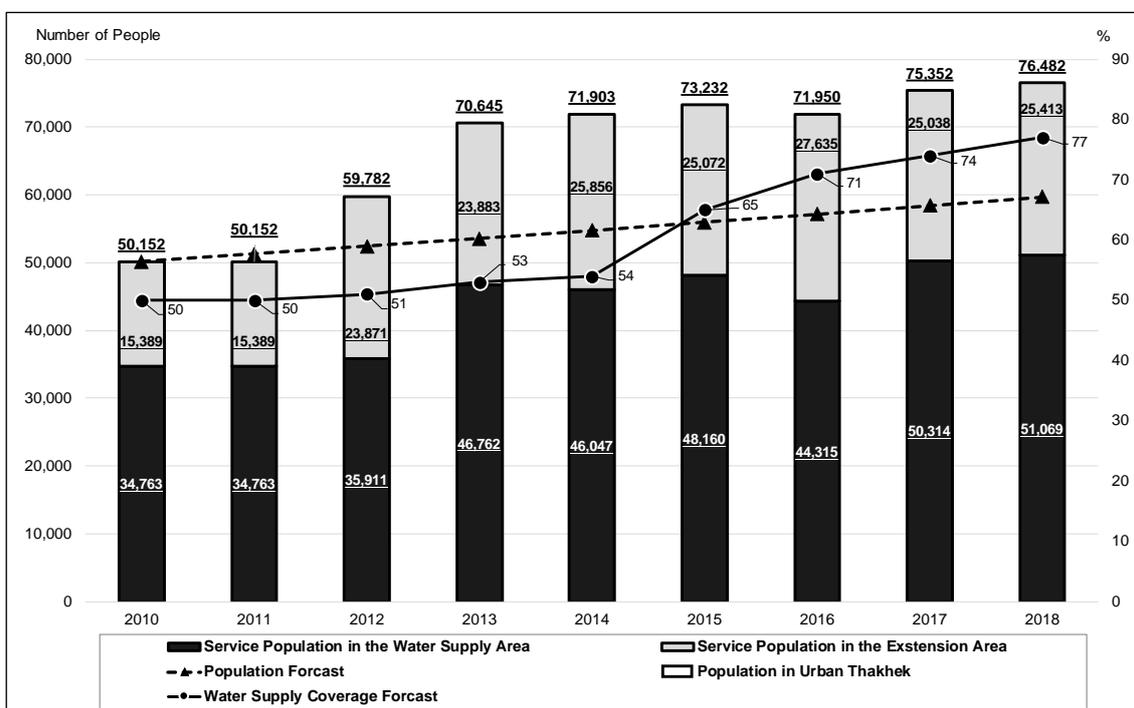
¹ A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

² ③: High, ②: Fair, ①: Low

³ The definition of the water supply coverage rate in the said prime ministerial decree is "the coverage of the piped water supply service by the Water Supply State Enterprises (Nam Papa) and/or private companies in urban areas." However, it is said that the 80% water supply coverage rate as a target in the National Socio-Economic Development Plan was calculated based on the proportion of the aggregated number of the service population in urban areas and the population with access to the water supply system in rural areas. The Ministry of Public Works and Transport is responsible for the chargeable piped water supply in urban areas, whereas the water supply system by using water wells in rural areas is under the jurisdiction of the Ministry of Health and water use is free of charge.

3.1.2 Consistency with the Development Needs of Laos

At the time of project planning, Thakhek, the capital city of Khammouane Province, had the fifth largest population in the country (approximately 86,000 people in 2010). However, the water supply coverage rate in the urban area remained low, at 50% in 2010. The improvement of water supply facilities to serve local residents was a pressing issue. In addition, after completion of the third Mekong Friendship Bridge in 2011, it was expected that factories would be moved into Thakhek along with the improvement of interregional logistics between Thailand. It was assumed that this would lead to an increase in the industrial water demand and therefore there were concerns about the supply capacity gap at the time.



Source: preparatory survey report and data provided by the executing agency

Note 1: Population data for 2011 is missing

Note 2: Data for the population in urban Thakhek in 2018 was undisclosed. A forecast value was calculated based on a 1.5 % increase rate.

Figure 1: The Comparison between Actual and Forecast Population (Population and Water Supply Coverage rate) in Urban Thakhek

At the time of the ex-post evaluation, the population in 2018 was larger than the forecast by approximately 17,000, suggesting a parallel increase in the water supply and demand. Furthermore, with the developing ASEAN regional economy, cement factories, and a motel with a large parking area for numbers of heavy trucks were opened, becoming contracted customers in the extension area. The geographical location of Thakhek meant increases in water demand as a part of public service provision along with construction and the presence of long-distance truck carriers around the urban area.

From the above, it is judged that the project was consistent with the development needs as the importance of improvement of the water supply in the urban area was high both at the time of project planning and the ex-post evaluation from the perspectives of population growth and the diversification of industries, and so on.

3.1.3 Consistency with Japan's ODA Policy

In its priority area of economic and social infrastructure development in the Country Assistance Program to Laos in 2012, valid at the time of project planning, support for water treatment plants was mentioned to contribute to the creation of a comfortable society harmonizing a sound environment for the achievement of balanced economic development. Furthermore, as Japan's sectoral development policy based on concerted international efforts, the importance of safe water and sanitation was addressed in the Millennium Development Goals (MDGs), "poverty eradication through high-quality growth" and this was upheld as one of the priority issues for development cooperation. The project was aimed for the improvement of facilities to support safe and sanitary water supply, and it was judged to be consistent with the above-mentioned areas and the policies of Japanese assistance to Laos.

3.1.4 Appropriateness of the Project Plan and Approach

With regard to the reduction in the installation of distribution mains from the initial project plan and to the switching of a part to the Laos portion due to exchange rate fluctuations, the following two points were confirmed: (1) the stance of the Government of Laos on the additional burden and its implementation status, (2) whether or not the planning of the reduction was made in the light of serving the project purpose.

First of all, the Government of Laos has been aware of its responsibility as there is an ongoing plan to carry out the construction work based on a 50 % shared budget of the MPWT and the Khammouane Provincial Government, as recorded in official documents submitted by the MPWT. In addition, according to the Khammouane Water Supply State Enterprise (hereinafter referred to as the 'NPKM'), regarding the planning of the reduced portion, the population density in the district and the distance from the new water treatment plant, especially the length of the water supply pipe connected to the residences of potential customers, were examined in advance. The project purpose was primarily considered in the planning, and it prioritized each of the distribution main routes to duly minimize the adverse impact on the potential service population.

This project has been highly relevant to the Lao development plan and development needs of Laos, as well as Japan's ODA policy. Furthermore, regarding the appropriateness of the project

plan and approach, the plan was changed in light of the project purpose through the due process of consultation with the Government of Laos. Therefore, its relevance is high.

3.2 Efficiency (Rating: ③)

3.2.1 Project Outputs

As mentioned above, exchange rate fluctuations incurred a shortage of project cost. As shown in Table 1 and Table 2 below, a part of the installation of distribution mains (23.9 km of the total planned 39.7 km extension) eventually became an additional burden for Laos. However, as shown in Table 3, the Laotian portion has not yet been completed, and it was yet under consideration for implementation (including the budget preparation). Therefore, at the time of the ex-post evaluation, the actual completion rate of the installation of the distribution mains was 49% of the total, based on the planned extension.

Table 1: Outline of the plan and changes to the Japanese Portion

Item	Plan	Change
Intake	16,500m ³ /day, Intake pipes type (pipe driving) Submersible pump 3 units	No change
Raw Water Transmission	Conveyance pipe (length: 0.6km)	No change
Water Treatment	15,000m ³ /day, Rapid sand filter Treated water reservoir (volume: 1,500m ³) Administration Bldg. (floor area: 784m ²)	No change
Transmission	Transmission pump 3 units (Air chamber) Transmission main (length: 10.8km)	Transmission pump (specification change)
Distribution	Elevated tank 2 tanks (volume: 700m ³ , 600m ³) Distribution mains (length: 39.7km) Pipe branch points 21 locations	Distribution mains (length: 15.8 km) Pipe branch points 39 locations
Water Quality Lab Test	Analytical balance, Draft chamber, Jar-tester, Desktop pH meter, pH comparator (BTB-type), Desktop turbidity meter, Color meter, Residual chlorine meter, Alkalinity Apparatus for measurement, Water purification system, Laboratory table, a set of Laboratory glassware (beakers, etc.)	Analytical balance (specification change)
Capacity building program	<ul style="list-style-type: none"> • O&M for the water treatment plant • Water distribution control 	No change

Source: preparatory survey report and information provided by JICA and the executing agency

Table 2: Outline of the plan and changes to the Laotian Portion

Item	Plan	change
Distribution	Distribution mains (length: 10.0km) Distribution branch (length: 33.0km)	Additional installation of mains (length: 23.9km)

Source: preparatory survey report and information provided by JICA and the executing agency

Table 3: The Installation Status of Distribution Mains through the Government Budget of Laos

Route code	Pipe diameter (mm)	Length (m)	Installation Status	Date of Completion	Cost (kip)
WSP1 (4-5)	200	3,748	Uncompleted		
	150	1,896	Uncompleted		
WSP2 (3-4)	250	1,733	Uncompleted		
WSP3 (2-3)	150	34	Uncompleted		
	100	1,800	Uncompleted		
WSP4 (1-2)	100	3,504	Completed	April 5, 2016	947,941,220
WSP5 (2-3)	150	2,930	Uncompleted		
	100	1,560	Uncompleted		
WSP7 (2)	100	1,523	Uncompleted		
WSP8 (1-2-3)	150	1,272	Completed	April 5, 2016	1,335,676,740
	100	3,672			
WSP2 (3-4)	150	3,444	Uncompleted		
	100	1,872	Uncompleted		
WSP6 (1-2)	150	2,340	Uncompleted		
	100	2,350	Uncompleted		

Source: data provided by the executing agency

3.2.2 Project Inputs

3.2.2.1 Project Cost

As stated in the evaluation constraints, as a target at the time of planning, the Laotian portion was scheduled for completion in the year 2020. Furthermore, at the time of the ex-post evaluation, it was impossible to see any prospect for completion of the portion. Thus, this evaluation deals solely with the project cost of the Japanese portion.

The project cost of the Japanese portion was within the plan, as the planned cost was 1,684 million yen, and the actual cost was 1,682 million yen (100% of the plan).

3.2.2.2 Project Period

As mentioned above, with all the Laotian portion including the burden of local residents, the project was scheduled to be completed in 2020. However, at the time of the ex-post evaluation, only a part of the plan had been implemented in Laos, and it was impossible to predict when the completion would be. Therefore, considering that the Laotian portion was incomplete, the project period was examined based on the Japanese portion.

The project period of this project was planned to be 35 months from the start of the detailed design by the contract agreement. The actual project period was 35 months from March 2013 when the detailed design survey was started, until January 2016 when the main construction was completed. Therefore, the project period of the project was as planned (100% of the plan).

Since the project was scheduled to be completed in 2020 as agreed with Laos, and the Laotian portion has not been completed, the efficiency of the project was determined only for the Japanese portion. The project cost of the Japanese portion was within the plan, and the project period was as planned.

As above, the project cost was within the plan, and the project period was as planned. Therefore, the efficiency of the project is high.

3.3 Effectiveness and Impacts⁴ (Rating: ②)

3.3.1 Effectiveness

At the time of the ex-ante evaluation, it was determined that the daily maximum and daily average water supply, the water supply service population, water supply coverage rate in Thakhek, as well as the facility utilization rate, would be the operation and effect indicators of the effectiveness. However, the target values for the water supply service population and water supply coverage rate in Thakhek were calculated with the premise of continued Laotian investment for the installation of distribution mains as well as the connection of water supply pipes after the project. Thus, the completion of the entire project scope was assumed to be the year 2020. Instead, however, the daily maximum and daily average water supply and facility utilization rates are examined as operation indicators for the effectiveness, and indicators of the water supply service population and its coverage rate in Thakhek was examined as impact. It should be noted, however, that the distribution mains network was partially extended by the Japanese portion, and the project effect expressed from the extension area was analyzed in the effectiveness. Therefore, in addition to the operation indicators such as water supply volume and facility utilization rate at the time of project planning, the number of new contracted customers in the expansion area was examined as a supplementary effect indicator. In addition, for the qualitative effect, water supply services in terms of 24-hour water supply, stable water supply, and the improvement of water quality were examined.

The target year of the project was not planned to be after three years, but scheduled for the year 2020, that is 5 years later after the project completion. This is because the completion year of the entire project scope was assumed to be around the year 2020, on the premise that considerable water distribution mains would have been installed with the Laotian governmental budget with the burden of up-front costs taken by new contracted customers for the installation of water meters and supply pipe connections at each household. In the evaluation judgment, the target year was reset to 2018, and the target value was adjusted in consideration of the preconditions (population growth rate, etc.).

3.3.1.1 Quantitative Effects (Operation and Effect Indicators)

To show the quantitative effects of the project, the following operation indicators were predetermined: (1) water supply volume (daily maximum and daily average) and (2) facility

⁴ Sub-rating for Effectiveness is to be put with consideration of Impacts.

utilization rates⁵ (maximum and average).

As stated above, since the initial target year was 2020, the target values of the year were calculated based on the demand forecast of the 2.2% population growth rate at the time of project planning. Accordingly, in line with the change to 2018, the year of the ex-post evaluation, the target values were revised. As a result,



Control panel of the water treatment plant

all the actual values in 2018 were achieved at more than 80% of the target values in terms of the total water supply and the facility utilization rate, as shown in Table 4.

Table 4: Operation Indicators of the Project

		Baseline	Target	Actual		
		2010	2018	2016	2017	2018
			2 year after Completion	Completion Year	1 Year After Completion	2 Years After Completion
Water supply capacity*1 (m ³ /day)	Daily maximum basis	8,600	15,500	13,167	13,056	12,897 [Attainment level] 83%
	Daily average basis	7,151	12,955	9,028	10,186	10,538 [Attainment level] 81%
Facility utilization rate (%)	Daily maximum basis	132	91	77	77	76 [Attainment level] 84%
	Daily average basis	110	75	53	60	62 [Attainment level] 83%

Source: Ex-ante evaluation sheet, preparatory survey report, and data provided by the executing agency

Note 1: The water supply facilities of the project are to supply water to the entire water supply area and the extension area.

On the other hand, with regard to the number of contracted customers in the extension area of the project, a total of 535 new customers was confirmed as shown in Table 5 below. However, based on the forecast at the time of project planning⁶, the water supply coverage rate of the extension area in 2018 was assumed to be 70% equivalent to approximately new 3,325 contracted customers⁷. Assuming that the household population of the extension area is

⁵ As the water supply volume of the water treatment plant of the project was planned to be 15,000 m³ per day, and the water supply volume from groundwater was 2,000 m³ per day, the maximum water supply volume was planned to be 17,000 m³ per day. Thus, the facility utilization rate was calculated by dividing the actual value of the maximum and average water supply amount by 17,000. It should be noted that the outdated water treatment plant before the project implementation was abolished.

⁶ Annual target value of the water supply coverage rate is thought to be different from the original plan by the change of installation schedule of distribution mains and branch after the scope cut of the Japanese portion. However, as the basis for calculation is not available, the forecast of the time of planning is applied.

⁷ At the time of project planning, the target number of new contract customers in the extension area was estimated to be approximately 3,800 in the year 2020 based on 80% water supply coverage rate.

relatively uniformly distributed⁸ and reflecting the fact that the installation of the distribution mains remained at only 49% of the planned output at the time of the ex-post evaluation, the target number of contracts was revised as 1,629 in 2018, in the extension area implemented by the Japanese portion. Despite the substantial population increase, the actual value remained at 535, achieving about 33% of the revised target value.

At the time of the ex-post evaluation, despite the relatively lower initial cost⁹ for a new contracted customers in the existing water supply area which is high density of residences, based on the fact that relatively shorter supply pipes were needed to connect each house from the distribution mains, there was still a certain percentage of non-contracted households, with the service population remaining at only about 70%. In the extension area, which is distant from downtown and where the population density is light in general, a potential customer needs to shoulder the higher costs of longer water pipes in proportion to the geographical distance to distribution mains. This makes it relatively difficult to form contracts in the area compared to the existing water supply area. Therefore, it is highly possible that the current system, where the contractual cost incurred is such a high burden on users, is a major obstacle to the water supply service.

Table 5: The Number of Contracted Customers in the Extension Area by the Project (Effect Indicator)

Zone / Village		2016	2017	2018
A	A1	12	11	7
	A2	11	5	1
	A3	55	11	11
	A4			
	A5			
	A6			
B	B1	21		
C	C1	19	32	11
	C2	4	4	1
D	D1	2		
	D2			
	D3			
	D4			
E	E1	5	4	4
	E2	1	23	11
F	F1	27	10	15
	F2			
G	G1	109	20	16
	G2	39	17	12
	G3			
	G4	4		
Total		309	137	89

Source: preparatory survey report, and data provided by the executing agency

Note: The blank columns in 2016 are the villages originally included in the plan, but where no distribution main had been installed at the time of the ex-post evaluation.

⁸ In practice, distribution mains were installed in relatively populous areas which are closer to the city center, presuming that the number of contracts would be larger than would be the case where they were installed uniformly. Even so, the target value was calculated without consideration of this.

⁹ In Laos, when a water supply contract is made, a service user must pay for the actual cost of a water meter and water supply pipe in proportion to the length from the water distribution main to the water inlet, as well as the standard installation cost. In Khammouane Province, besides the actual cost of the water supply pipe, any new customer is to be charged 200 USD for a water meter and installation work (10% tax included).

3.3.1.2 Qualitative Effects (Other Effects)

(1) Improvement of Unstable Water Supply

At the time of the ex-post evaluation, a stable supply of 24-hour treated water had been achieved. In the NPKM, staff at the water treatment plant work in shifts for operation to supply water for 24 hours. Prior to the completion of the project, water treatment became impossible every time a power failure occurred. In these cases, there was no alternative but to supply water stored in elevated tanks which might have been poor in quality. However, as a power generator was installed by the project, there was no water outage due to power grid failure after 2016. Any water outages are temporary and limited to when it is necessary to close a valve for the installation of a water supply pipe in a limited area. Unlike in the past, water outages do not continue for a long time.

Table 6: Power Outage Duration and Outage Time of Water Treatment in the Water Supply Facilities

	2010	2011	2012	2013	2014	2015	2016	2017	2018
Power outage duration	108.25	98.44	64.45	127.50	105.25	190.50	174.00	76.00	46.40
Outage time of water treatment	108.25	98.44	64.45	127.50	105.25	190.50	0	0	0

Source: data provided by the executing agency

(2) Safe and Hygienic Water Supply

Water quality is examined by taking samples from 6 water tanks in the water treatment plant every hour, 24 times a day in the laboratory in the water treatment compound built by the project. It was reported that when any outlier appears in the inspection, reference is made either refer to the emergency response manual prepared by the capacity-building program of the project, or methods are used that were learned through the relevant JICA technical cooperation project¹⁰.

Table 7 shows the implemented water quality inspection items and its frequency. According to the NPKM, it is recommended that the first to the fifth items are implemented daily. The test of alkalinity which is recommended to be performed once every three days, if not every day, has not been conducted



Testing water quality of samples

¹⁰ The Capacity Development Project for Improvement of Management Ability of Water Supply Authorities (MaWaSU)

because the reagent is not available. Among the recommended items, an inspection of the six items (hardness, total dissolved solids, chloride ions, E. coli, cyanide, iron) is outsourced to the laboratory of the Chinaimo water treatment plant in Vientiane. The test results from the Chinaimo water treatment plant in June 2016, showed analysis of four samples of the Mekong River (raw water), groundwater (raw water), coagulated water, and treated water that the NPKM sent to Vientiane. The sample treated water met all the required water quality standards of Laos. However, according to the NPKM, they have not been able to request water inspection since 2017, due to the breakdown of analytical equipment at the Chinaimo water treatment plant.

Furthermore, as shown in the untested items in the table below, even in outsourced inspection, there is low priority on testing heavy metals, and it seems inevitable that the NPKM will narrow down the items for inspection as the cost is their concern. A major reason for the low priority of heavy metal testing is that Laos is relatively less industrialized and there are not so many factories for industrial manufacturing that use and discharge heavy metals. However, as the water resource is the trans-boundary Mekong River, some concerns remain in light of the progress of industrialization in other countries in the basin.

Table 7: Inspected Items and Frequency of Water Quality Inspection
(yearly number of inspections)

Item*1	2015			2016			2017			2018		
	raw	coagulated	treated									
1 pH	365	365	48	365	365	48	365	365	48	365	365	48
2 Color	365	365	48	365	365	48	365	365	48	365	365	48
3 Turbidity	365	365	48	365	365	48	365	365	48	365	365	48
4 Odor		365	48		365	48		365	48		365	48
5 Residual Chlorine		365	48			48		365	48		365	48
6 Alkalinity												
7 Hardness				1	1	1						
8 TDS (=EC) *2				1	1	1						
9 KMnO4 consumption												
10 Chloride Ion				1	1	1						
11 e-coli	1			1	1	1						
12 Cyanide				1	1	1						
13 Ammonia												
14 As												
15 Cd												
16 Cr												
17 Hg												
18 Pb												
19 Cu												
20 Al												

Item*1		2015			2016			2017			2018		
		raw	coagulated	treated									
21	Fe				1	1	1						
22	Mn												

Source: preparatory survey report, and data provided by the executing agency

Note 1: The highlighted items from No. 1 to No. 5 were tested with the instruments provided by the project. In addition, the items No. 7, 8, 10, 11, 12, 21 are being tested at the Chinaimo water treatment plant in Vientiane. The items not highlighted are recommended but not tested.

Note 2: TDS (total dissolved solids) is the sum of evaporation residue (substance dissolved in water) and bicarbonate. This indicates the purity of water, while conductivity EC (Electricity conductivity) indicates the concentration of salt (ion). They are practically the same in content. The Chinaimo water treatment Plant was commissioned to inspect the EC in the list.

In addition to the tests conducted in the above-mentioned laboratory, the water quality is regularly inspected at a total of 40 locations (approximately 3 locations daily) in Thakhek every month. The test detects where the water quality of tap water changes in problem areas closer to the consumer. The number of cases where the quality of the water did not meet the standards was 7% (2015), 0% (2016) and 17% (2017) out of a total of 480 inspections annually.

3.3.2 Impacts

3.3.2.1 Intended Impacts

Improvement in the quantitative effects: improvement in the water supply service population and the water supply coverage rate was intended through the implementation of the project. At the time of the ex-post evaluation, the urban population is larger than the forecast in Thakhek¹¹. For comparison, if the water supply coverage rate is calculated based on the target value of the service population at the time of project planning and actual population in 2018, the target value of water supply coverage rate falls from 77% to 60%¹². As such, since the water supply coverage rate is a value obtained where the service population is divided by the entire population, it should be noted that the value is eventually influenced by the population increase stated above.

With regard to the water supply service population, a target value of 79% was achieved, while the water supply coverage rate remained low in light of the national goal of 80% water supply coverage rate by 2020, and even lowered compared with the baseline value in 2010. Thus, the impact of the project is limited.

¹¹ Contributing to this population growth, there are five junior collages in Thakhek where some of their students have relocated from neighboring areas. However, many of the students may live in dormitories and so this may not reflect on the number of contracted customers as households. Nevertheless, it is thought that this has substantially led to an increase in water consumption. In addition, although they are not included in the service population calculated based on the number of contracted customers by household, they are reflected in the total population, the denominator of water supply coverage rate. Thus, this is considered to be a depressing factor to a certain extent concerning the water supply coverage rate.

¹² Calculated by the actual population of 2018 as 76,482 as the denominator for the target service population of 45,920 at the time of project planning

Table 8: Quantitative Effects of the Impact

	Baseline	Target	Actual		
	2010	2018	2016	2017	2018
		2 years after Completion	Completion Year	1 Year After Completion	2 Years After Completion
Water Supply Service population	25,000*1	45,920	32,265	34,690	36,375 [Attainment level] 79%
Water supply coverage rate (%)	50	77	44	46	47 [Attainment level] 61%

Source: Ex-ante evaluation sheet, preparatory survey report, and data provided by the executing agency

Note 1: Approximate value based on the water demand forecast by the preparatory survey.

Table 9: The Population in Urban Thakhek and its Water Supply Service Population of the Water supply Area and the Extension Area

	2010	2011*1	2012	2013	2014	2015	2016	2017	2018*2
Population in urban Thakhek	50,152		59,782	70,645	71,903	73,232	71,950	75,352	76,482
Population in the existing water supply area	34,763		35,911	46,762	46,047	48,160	44,315	50,314	51,069
Service population in the existing water supply area	23,265		25,295	27,386	28,522	29,845	30,805	32,475	33,695
Population in the extension area	15,389		23,871	23,883	25,856	25,072	27,635	25,038	25,413
Service population in the extension area							1,460	2,215	2,680

Source: preparatory survey report and data provided by the executing agency

Note 1: Population data for 2011 is missing

Note 2: Data for the population in urban Thakhek in 2018 was undisclosed. A forecast value was calculated based on a 1.5 % increase rate.

3.3.2.2 Other Positive and Negative Impacts

(1) Benefits for Local Residents and the Target Area

In the qualitative survey, to confirm the effects of water supply service and water use compared with before the project implementation, interviews were conducted at schools, a prefectural hospital, and local companies, etc. located in the water supply areas as well as in the extension area¹³. The following were confirmed as benefits.

[New water users in the extension area]

➤ National Middle and High School (the largest middle and high school in Thakhek)

Satisfied with the supply as convenient and hygienic. Tap water is now of good quality and there is enough pressure. A simple hand-washing basin was set up within the school

¹³ Survey conducted in three places in the extended area (a junior-high school, an elementary school, and a motel) and three places in the water supply area in the city center (operation room and central supply room, NICU, pediatric ward, pathology laboratory in the prefectural hospital, the Clean Water Office of the Department of Health, and a tourist hotel, a car washing station) from 8 to 13 December 2018 in Thakhek, a total about 30 local residents were interviewed.

to encourage students to wash their hands. In addition to sanitation, water used to be hauled out from a pond for crops in a field at school. Now, tap water can be used and farming has become much easier.

- Motel (located along the Route 13 connecting Vientiane- Savannakhet, has a parking space for large heavy trucks)

Prior to 2016, it was difficult to wash used towels and sheets properly using groundwater leading to complaints from guests. After having made a contract with the NPKM, laundry was well-finished. Recently the number of guests has increased. As water usage tends to increase in the morning and the water pressure drops slightly, but there have been no sudden water outages.



Hand-washing basin at school

[Prior and existing water users in the water supply area]

- Khammouane provincial hospital¹⁴

Interviews conducted at the operating room, central supply room, neonatal intensive care unit (NICU), pediatric ward, and pathology laboratory with comments as follows¹⁵;

- A large amount of water is used to make distilled water. Now it is used directly from the tap without using water in the storage tank (operating room)
- Baby's bottles are washed by using tap water for premature infants in the incubator here. But symptoms of water-borne diseases, such as diarrhea, have not been observed so far (NICU)
- In Laos, as water outages occur daily, it is customary to store water in a container during the night-time for flushing toilets at home. However, to prevent dengue fever, the hospital always instructs patients to cover containers with a lid to avoid breeding mosquitoes. Now in Thakhek, as there are no water outages, it seems that there is no need to store water any longer (pathology laboratory).

¹⁴ In the hospital, a large amount of water is consumed on a daily basis. Therefore, in the past, groundwater and tap water were used in combination. However, they stopped using groundwater from wells in the hospital in 2018 and have used only tap water since then.

¹⁵ According to a nurse at the pediatric ward, there were 65 collective diarrheal symptoms recorded among infants from Mahaxay in 2016. As it occurred in relatively cooler season, not during the hot season when bacteria are prone to prevail, it was suggested that there was a problem in cleaning containers, such as baby bottles, and that household tap water might have caused the food poisoning. However, data has not been systematically recorded, and the cause of disease has not been clearly diagnosed. Further, since the situation of the water supply facilities in Mahaxay is unknown, it was not possible to make a robust comparison with the water supply facilities of the project in Thakhek.

- Hotel (a tourist hotel with the largest number of rooms in Khammouane province)
Prior to 2016, there were problems with the sedimentation of residual chloride on the faucet with odors. As for color, it was particularly bad during the rainy season, However, there have not been similar problems this year.
- Company owner (car washing station)
As for water use in the car washing business, it is now possible to use tap water for washing cars cleanly and quickly without being dirt left on. The station has, therefore, become the most popular car washing station in Thakhek and the business has acquired new customers. As for household water use, a child's white uniform turned reddish after washing as redtinged water came from the tap before. Also, mud-like cake was formed at the bottom of the pot used for steaming sticky rice. When her son was a baby, he sometimes got diarrhea, and he must be taken to hospital. It was suspected that it must have been caused by the poor quality of tap water.

In addition to the above, interviews were also conducted with the Clean Water Office of the Department of Health located on the premises of Khammouane Provincial Hospital. The office is a complaint window for residents in the province regarding water. Prior to the implementation of the project, complaints from residents were made almost every day, as there were outstanding problems of water quality (including chlorine odor and calcium residues) and no water running from the tap. In fact, when the Ministry of Health measured the chlorine level, it was found to be 10 times the concentration of the standard. After the project, it was down to normal. Presently, they have no complaints from residents.

From the above, it can be seen that water users have recognized that the service has become more convenient, and that water service quality has improved both in terms of water quality and a 24-hour stable water supply. In addition, although the 24-hour call center set up in the NPKM used to receive many complaints from residents every time a power failure occurred in Thakhek and struggled to handle emergencies, there have not been any complaints of water outages or about water quality from the residents in the project area.

(2) Impacts on the Natural Environment

Regarding the environmental impact during the project implementation, although no monitoring report on the project was prepared, according to the Khammouane Department of Public Works, Division of Environment / City Planning which is responsible for the environmental monitoring and management in the province, no environmental problem occurred during the project implementation and after the project completion. Furthermore, with

regard to the waste disposal of sludge generated from the water treatment plant noted at the time of project planning, the NPKM responded that sludge was duly disposed at a predetermined space as planned and that they had not received any complaints from the local residents. Although it is possible to make fertilizer as a by-product of sludge, because the necessary pretreatment requires expense, the sludge is merely disposed of.

In addition, according to the NPKM, the Ministry of Health has been on alert regarding polluted water discharged from China to the trans-boundary Mekong River and is concerned about the preservation of water quality. Since 2008, workshops with WHO have been held on the guidelines for Water Supply State Enterprises to implement monitoring, inspection, and evaluation of water quality, including verification and control of chemical fertilizers used by local farmers, and awareness-raising. The NPKM also participated in a "safe water conference" sponsored by the Ministry of Health. They responded that they are paying due attention to local water conservation as much as possible.

(3) Resettlement and Land Acquisition

As there was no resettlement or land acquisition occurred for the project, there was no related negative impact.

The targets of the operation indicators were achieved in the project. Newly constructed facilities have enabled the continuous treatment of water for 24 hours. Water quality inspection has been conducted daily to ensure basic water quality and safety, except for inspection items that require the cost of outsourcing and reagent. Thus, a safe and hygienic water supply is considered to have been mostly achieved. However, the number of new contracted customers has remained at about 30% of the target in the extension area.

As for the impact, although the water supply service population mostly attained its target value, on another front, the actual value of the water supply coverage rate has slid back from the level of before the project due to population increases beyond the projection. However, as benefits for residents, the convenience of tap water and hygiene improvement has been expressed by newly contracted customers in the extension area. In the existing water supply area, the improvement of the water service quality has been generally recognized. Thus, it can be considered that the project has had some effects.

This project has achieved its objectives to some extent. Therefore, the effectiveness and impacts of the project are fair.

3.4 Sustainability (Rating: ②)

3.4.1 Institutional / Organizational Aspect of Operation and Maintenance

As in the project plan, the executing agencies were the MPWT, the Department of Public Works and Transport, Khammouane Provincial Government, and the NPKM. The NPKM is also responsible for the operation and maintenance. As for the water tariff revision, it has been stipulated that after the deliberation in the prefectural assembly, that the approval of the prefectural governor is necessary.

At the time of the ex-post evaluation, the NPKM clearly held the responsibility for the operation and maintenance of the water supply facilities of the project. The NPKM operates a total of 5 district branch offices (Thakhek, Nong Bok, Mahaxay, Xebangfay, Nakai) in the Province. The total number of all staff (with all branch offices) including those in the employment plan up to 2020 is shown in Table 9 below. Hiring has been suspended since 2018 and several contract staff members have become permanent.

Table 10: The Number of Staff in the NPKM

		Before Completion	After Completion			Plan	
		2015	2016	2017	2018	2019	2020
Staff	Permanent	126	141	157	154	174	194
	Contract	49	68	54	54	34	14
Total		175	209	211	208	208	208
Newcomers (being employed for less than one year)	Permanent	11	15	16	0	0	0
	Contract	19	19	4	0	0	0

Source: data provided by the executing agency

From the observation of the operation of the facilities, it has been confirmed that current staff assigned to the Thakhek water treatment plant have had no difficulty in operation and maintenance. It is planned that staff will be assigned to the new branch offices, and the technicians of the Thakhek water treatment plant constructed by the project will be sequentially transferred as shown in Table 11. A shift system is inevitable at the water treatment plant as it operates 24 hours a day. The standardization of management skills for the operation and maintenance of all technicians and the improvement of capacity by training are crucial, anticipating future retirements and transfers to branch offices. As it is difficult for the NPKM to hire new staff, the in-service training of existing staff is to be enhanced to achieve more efficient operation. As for technicians at the Thakhek water treatment plant, contract staffs have become permanent staff members and the ratio in effect has gradually increased.

At the time of the ex-post evaluation, it was clear where the responsibility of the operation and maintenance lay. For the past three years, the staff of the NPKM and of the Thakhek water

treatment plant have been retained, and further training and retention of staff is promoted by the offer of permanent positions.

Therefore, there is no problem in terms of the institutional/ organizational aspects which may affect the sustainability of the project.

Table 11: The Number of Staff for the New Water Treatment Plant

		Actual			Planned	
		2016	2017	2018	2019	2020
No. of Staff for water supply facilities	Permanent	18	24	21	Transfer 2 to the new branch	Transfer 4 to the new branch
	Contract	19	16	13	--	--
Total No. of staff		37	40	34	--	--
No. of Newcomers	Permanent	0	0	0	--	--
	Contract	0	0	0	--	--
No. of Staff who worked for more than one year	Permanent	18	24	21	26	--
	Contract	0	0	0	--	--
No. of Staff who received training after the project	Permanent	5	4	1	2	2
	Contract	0	0	0	--	--
No. of Staff in Lab	Permanent	2	2	2	--	--
	Contract	3	3	3	--	--

Source: data provided by the executing agency

3.4.2 Technical Aspect of Operation and Maintenance

As for the acquisition of technology, according to the NPKM, as training for capacity building by the project was basically carried out through classroom lectures, there was a concern about actual operation all by themselves. However, the JICA Partnership Program implemented by the Public Enterprise Bureau of Saitama Prefectural Government for three years since 2016 complemented the periodical on-site training and instruction. Therefore, although familiarity with the operation of the new as-yet-untried water supply facilities took about six months, there was no problem in operation at the present time. Also, with a mid to long term perspective on the technical aspect in mind, training was carried out for the planning of human resource development at part of the ongoing JICA's MaWaSU2 project¹⁶. At the time of the ex-post evaluation, a plan was being drafted for the instruction of young staff on the operation and maintenance of the facilities, with the mid to long term perspective.

It was directly confirmed during the site visit that the manual for and format of work records provided by the project were being used on a regular basis. According to interviews with the staff of the NPKM, the facilities and equipment for on-site training at the Vientiane Training Center are of the almost same specification as those of the water treatment plant of the project, so the training was practical in the sense that it made for easy familiarisation of operation and

¹⁶ The Project for Improvement of Management Capacity of Water Supply Sector (2018-2023)

maintenance. Also, the fill-out forms for daily operation and maintenance such as work records (e.g. checklists) are the same as those of the Vientiane Water Supply State Enterprise.

In addition, the following external opinion was given through an interview with a person from the Public Enterprise Bureau of Saitama Prefectural Government who was in charge of on-the-spot guidance provided to the NPKM: although there is still a room for technical improvement, staff can autonomously cope with the operation of the facilities, and no particular problems were found. On another front, it was pointed out that it is desirable that the data of frontline work records should be tabulated and analyzed in order that feedback can lead to better performance in the next work period.

At the time of the ex-post evaluation, it was confirmed that technology had been sufficiently acquired through ample opportunities for on-the-job guidance and training for equipment, even when there had been no experience in operation before the project implementation. The manuals and fill-out forms are also being utilized for operation and maintenance.

Therefore, there is no problem in terms of the technical aspect to affect the sustainability of the project.

3.4.3 Financial Aspect of Operation and Maintenance

The MPWT and the Khammouane Provincial Government do not provide subsidies to the management of the NPKM¹⁷. The NPKM has to fulfill its primary responsibility to provide safe and hygienic water to residents in Thakhek. As such, they need to conduct financially sound operation and maintenance.

As shown in Table 12 below, at the time of project planning, the respective operation and maintenance costs in 2017 and 2018 incurred in the water treatment plant of the project, were converted into US dollars at the exchange rate of each year in order to compare with the projected cost of the year 2020. As the planned facilities were designed to be operated at maximum, the cost would be at its largest in 2020. Due to a difference in the method of calculating depreciation, a comparison between planned and actual values was not valid. Thus, the operation and maintenance costs of the project are to be compared without depreciation.

In a comparison of the plan and actual values, while expenses for electricity and chemicals are much lower than the projection, but personnel, fuel, miscellaneous and maintenance expenses exceed the projection. A large margin in personnel and miscellaneous expenses is particularly predominant. Actual facility utilization rates were 77% in 2017 and 76% in 2018 as shown in Table 4, but at the same time, in terms of total expense, they were 117 % and 89% of the

¹⁷ As for public investment related to water supply facilities in Laos, the Ministry of Public Works and Transport shall be in charge of budgetary measures, planning, and facility construction, then accordingly transfer the facilities to the Water Supply State Enterprise in each prefecture after completion of the construction. After the transfer, the Water Supply State Enterprise shall operate the facilities in a self-sustaining way primarily based on the water revenue. No subsidies are provided for deficit compensation stemmed from management issues, etc. by the central government, nor the prefectural governments.

predicted value of the year 2020. It is therefore deemed that the cost increase in operation and maintenance is exorbitance.

Table 12: The Comparison of O&M Cost between the Planned and Actual for the Water Treatment Plant of the Project

Unit: USD

		Project planning Predicted value in 2020 (1USD =7,900kip)	Actual value in 2017 (1USD=8,300 kip)	Actual value in 2018 (1USD=8,500kip)
Electricity		262,181	117,521	113,974
Chemical	Alum	115,049	10,575	13,806
	Calcium Hypochlorite		14,267	18,626
	Polymer		273	132
Personnel		74,962	122,108	113,917
Fuel		11,200	54,406	40,018
Others		684	177,817	98,557
Maintenance (e.g. purchase of spare parts)		19,515	68,662	33,469
Depreciation cost of renewed facilities of the project		258,228	94,890	1,604,041
Total (with depreciation cost)		741,819	660,020	2,036,542
Total (without depreciation cost)		483,591	565,629	432,499

Source: preparatory survey report, and data provided by the executing agency

To overview the effect of the project on the balance of payments of the NPKM, the ratio of the operation and maintenance cost (without depreciation) of the project to the total revenue of 2017 and 2018 as in Table 13 below, is 41% and 32%, respectively. There was an improvement from 2017 in 2018. However, on the whole, there was a chronic deficit of approximately 1 billion kips until 2015, which doubled in 2016, the year immediately after the project implementation. The amount has accumulated since then. On the other hand, conditionally excluding depreciation for each year, a surplus has been recorded and the revenue and expenditure are generally balanced. Although there is a pressing need to eliminate the deficit primarily through cost cutback, it is considered that at least in the short term, it is possible to conduct the operation and maintenance of the facilities under the project based on the operating revenue from water tariff. However, according to the NPKM, the ratio of the water charge collection was less than 40% from 2015 to 2017, and it still remained at 60% in 2018. Furthermore, the water meters of long-standing customers in the water supply area are becoming obsolete, suggesting that they may not be read accurately. For the improvement of the balance of payments, in addition to the overdue issue of the non-revenue water rate, it is necessary to have a deliberate plan for the efficient collection of arrearages. This should include the sequential replacement of water meters, convenient means for payment and the strengthening of penalties. It is thus an urgent issue to make a prudent investment as an overall management improvement plan.

It may be likely, however, that the NPKM will not be able to cover all the necessary expenses to replace water meters in the wider water supply area and/or to deal with extensive repairs of the facilities in the future unless it eliminates its financial deficit. Therefore, financial problems could cause the failure of public service delivery in the mid to long term.

Table 13: The Summarized Statement of Revenue and Expenditure of the NPKM

Unit: kip

		2015	2016	2017	2018
Total revenue		10,348,256,776	11,962,052,073	11,333,118,668	11,175,626,588
Government subsidies	Central	0	0	0	0
	Provincial	0	0	0	0
Revenue	Water revenue	8,828,619,070	8,771,458,460	9,574,922,610	9,821,712,929
	Pipe installation	568,682,500	1,011,024,000	781,001,500	592,782,640
	Others (portable water sales, water meter maintenance fees, reconnection charge for arrears)	950,955,206	2,179,569,613	977,194,558	761,131,019
Total expenditure		11,442,017,111	14,398,873,402	13,055,176,996	29,022,699,117
Personnel cost	Permanent	3,913,212,188	5,303,799,802	6,083,108,341	6,172,897,600
	Contract	414,699,500	585,695,000	544,511,500	476,428,500
Depreciation cost		1,600,038,692	1,630,297,951	1,570,269,940	18,616,595,383
O&M cost		252,875,000	202,172,000	190,655,000	249,725,700
Electricity		1,242,572,509	1,196,319,237	1,281,302,679	1,291,450,899
Fuel		1,133,118,000	896,956,300	602,854,500	579,440,000
Repayment (tax, commission)		62,881,302	44,691,046	42,381,613	62,465,453
Others (outsourcing, advertisement, transportation/ entertainment/training etc.)		2,822,619,920	4,538,942,066	2,740,093,423	1,573,695,582
Balance (current net profit)		-1,093,760,335	-2,436,821,329	-1,722,058,328	-17,847,072,529
Balance without depreciation cost		506,278,357	-806,523,378	-151,788,388	769,522,854

Source: data provided by the executing agency

At the time of the ex-post evaluation, the operation and maintenance cost of the facilities under the project exceeded the plan in consideration of the utilization status. The income and expenditure of the NPKM would be more or less balanced if not counting the depreciation cost. Although the operation is currently possible, however, the revenue required for large-scale repairs has not been obtained. Therefore, from the mid to long term perspectives, some challenging issues remain in the financial aspect.

3.4.4 Status of Operation and Maintenance

New intake facilities and water treatment plant have operated without problems and no serious accidents have been reported. The primary records in each division should be filled out all by hands in a prescribed format so that correction history is not erased. Records are submitted to each head of the division and are eventually confirmed by a plant manager. In addition, there is an internal regulation to report any abnormalities and accidents to all heads of division, the plant manager and the director-general.

Although sustainability is unaffected, the following issues were identified by the NPKM at the time of the ex-post evaluation;

- The pH meter at the laboratory procured by the project had broken down, but a new meter had already been obtained with the support of a related JICA project¹⁸.
- It was suspected that there was a problem with some water flow meter among three locations (filter tank / purified water storage tank / Mekong River water intake) as different values were shown even though there had been no hindrance in operation.
- Spare parts are still in stock so that no purchases had been made. It was noted, however, that the same water pipes cannot be acquired domestically as the procured pipes were made in Malaysia. An unconventional tool is required for repair as they are different in size from the standard product of Laos. However, pipe replacement is well handled by staff on-site and has not become a big problem.

The facilities constructed by this project have not been so seriously damaged as to prevent the realization of the project effects, and the issues have remained minor. Therefore, it is considered that there is no problem that affects sustainability in terms of the status of operation and maintenance.

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

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

The project aimed to solve problems such as water shortage in the dry season, unstable water supply conditions, unsanitary water, and the water supply coverage rate by improving water supply facilities in the urban area of Thakhek in Laos, thereby contributing to the expansion of the safe supply of water for the urban population in the district. The project was consistent with the development policy and development needs of Laos both at the time of planning and the ex-post evaluation. Furthermore, it was confirmed that it was consistent with the Japanese ODA policy at the time of planning. Thus, the relevance of the project is high. In the course of implementation, some part of the installation of the water distribution mains were shifted to the Laotian portion. If the cost of the part was excluded from the Japanese portion, the project cost was within the plan, and the project period was as planned. Therefore, efficiency is high. As for the project effects, after project implementation, not only overloaded operation of the water

¹⁸ The Capacity Development Project for Improvement of Management Ability of Water Supply Authorities (2012-2017)

treatment plant was resolved, but the water supply volume, and the facility utilization rate have also improved. Furthermore, a stable supply of safe and hygienic water for 24 hours has been mostly realized. Despite this, increases in the number of new customers have been sluggish in the water supply area where the water distribution mains were newly installed by the project (the extension area). Regarding impact, although the service population was increased by the project, it was difficult to achieve the target water supply coverage rate due to the total population increase in urban areas. However, improvements in the quality of public service attained through the project have been recognized by customers. Therefore, effectiveness and impact are fair. Regarding operation and maintenance, no major problems have been observed in terms of the institutional, technical aspects and status of operation and maintenance. However, there have been challenging problems in the financial status. Therefore, the sustainability is fair.

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

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

(1) The NPKM

Measures for Cost Reduction and Profitability Improvement

To maintain a core mission that is to retain the public service delivery, it is imperative that measures for cost reduction and profitability improvement are taken. In particular, it should be noted that personnel expenses tend to worsen the balance and it is extremely difficult to reduce them once they are raised. For this purpose, the personnel evaluation system should be reviewed in order to set clear task goals and to measure the achievement of each staff member. Incentives should be provided according to the contribution of the assigned post. It is highly desirable that a personnel policy synergizing both employee skills and overall efficiency is thoroughly implemented. With regard to profitability improvement, as a significant increase in new customers in the short term is hardly expected due to a rather low population density in the target area, it is strongly required to ensure the collection of water charges. In particular, in the case of the collection of arrears, staff members must be well informed of the breakeven point of the NMPK and the necessary collection targets at each current term. If the target is not achieved, concrete measures such as capping overheads should be considered. Furthermore, with regard to the revision of water charges, the NPKM is required to go through a political process after giving a detailed explanation of the necessary expenses, and therefore timing is also an unpredictable and uncertain element. Thus, for the time being, the NPKM should rather focus on improving its own earning structure as a priority, such as broadening revenue-generating enterprises and marketing for potential customers.

(2) The MPWT

Implementation of the Laotian Portion

With regard to the Laotian portion to be implemented by 2020, in light of the project purpose, clear prospects must be made on the specification of the location and the sequence of the installation of distribution mains, including the timing of the implementation and securement of the budget. In addition, in the case where the facility investment plan of the MPWT and the Khammouane Provincial Government is implemented, the opinion of the NPKM, who is in charge of the actual operation and maintenance, should be fully incorporated. Specific information that is required for actual operation and maintenance should be shared in advance. This should include skill sets essential for operation as well as detailed cost estimations such as fixed costs and variable costs based on an appropriate scale of facilities and equipment. By closely exchanging views with the NPKM to confirm and facilitate the readiness to accept facilities, consideration should also be made to avoid any serious problems in operation and maintenance after transfer of the facilities.

4.2.2 Recommendations to JICA

Follow-up of the Project not Completed by Partner Country

- It is deemed that the installation of distribution mains has been delayed due to the budgetary issues of the central government. Nonetheless, it is desirable to check the progress in the MPWT as necessary to discern whether there are any prospects of budgetary funds and disbursement achieving the national target of water supply coverage rate, and of any other specific measures.
- In order to ensure that the delivery of the water supply service by Water Supply State Enterprises is improved smoothly and autonomously in Laos, systematic follow up must be made, such as through coordination between relevant technical cooperation projects and the JICA Partnership Program. For example, it is conceivable that the NPKM would be encouraged to carry out water quality lab tests and guidance for Water Supply State Enterprises in neighboring provinces in the southern region by sharing the findings obtained through Japanese cooperation efforts and the utilization of water quality laboratory equipment by the project. That could lead to constructive collaboration by fostering mutual recognition of water quality and its contribution to the quality assurance and maintenance in each province in the same region. Furthermore, this may reduce not only the over-concentration of inspection requests and reliance on the water quality laboratory in Vientiane, but also it would enhance the ownership of the NPKM and realize efficient knowledge-sharing of water quality among Water Supply State Enterprises in each region.

4.3 Lessons Learned

The Necessity of Detailing Personnel Expenses Related to Operation and Maintenance

In this project, there was a wide gap between the predicted value and the actual value in personnel expenses that could not be explained by mere fluctuations of the exchange rate. Especially when dedicated staff members are unfamiliar with the operation and maintenance of new facilities, it is likely that personnel expenses might expand more than anticipated, as higher payments are necessary to retain and/or hire skilled staff. Therefore, in formulating a project for the construction of new facilities, besides training programs for operation and maintenance of the facilities per se, it is desirable that a prudent and realistic institutional arrangement is proposed that covers financing the operation and maintenance costs from the mid to long term perspectives. It is thus imperative to share an understanding of the need for financial prospect and sensitivity analysis of the entire enterprise management with the head of executing agency and the financial officers, reflecting changes in personnel expenses. Furthermore, it is desirable that there is not only provision of a technical manual for the facilities but also a corporate accounting/management manual to act as a guide for the securement of financial resources and the setting of the sound management targets of the mid-long term, covering the depreciation of the facilities newly constructed by the project.

The Necessity of Practical Instruction for the Facilities with Newly Introduced Technology

Water supply facilities and equipment were provided by the project that had completely different mode interfaces in operation from the outdated ones used previously. Aside from the fact that the facilities were designed to intake raw water from the trans-boundary Mekong River, it was anticipated that they would also deal with significant changes in raw water quality between the rainy and dry seasons. It was, therefore, necessary to operate the facilities while observing the actual changes in raw water for at least one year. A short-term capacity development program alone was hardly sufficient for technical training. For the project, the Public Enterprise Bureau of Saitama Prefectural Government gave practical hands-on instruction through the JICA Partnership Program for several years after implementation. As a result, staff of the NPKM were enabled to operate facility equipment in a self-sustaining way, and stable operation was more or less possible. In a case where the technical gap is obvious for the executing agency at the time of project planning, it is desirable that a partnership is planned and formed to complement technical training such as this, as well as to incorporate the international cooperation initiatives of local governments and private companies.

End