

Kingdom of Cambodia

FY2019 Ex-Post Evaluation of Japanese Grant Aid Project

“The Project for Expansion of Water Supply Systems in Kampong Cham and Battambang”

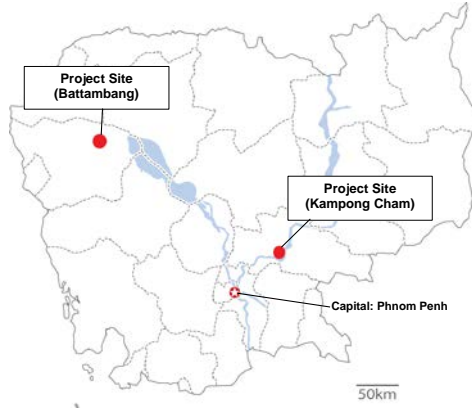
External Evaluator: Masumi Shimamura, Mitsubishi UFJ Research and Consulting Co., Ltd.

0. Summary

This project expanded water supply facilities in Kampong Cham City and Battambang City to improve access to safe water for residents of both Cities. This project, which aims to improve water supply capacity, is consistent with Cambodia’s development policy, development needs and Japan’s assistance policy at the time of planning and the ex-post evaluation. Therefore, the relevance of the project is high. In terms of project implementation, both the project cost and project period were within the plan. Therefore, efficiency of the project is high. As for project effects, quantitative indicators set at the time of planning are mostly achieved. As for qualitative effects, it was confirmed from the interviews with local residents that improvement of insufficient water volume and pressure from taps have realized and stable water supply has achieved. Regarding impacts, it can be considered that the project has contributed to the improvement of hygiene situation, promotion of employment of women and facilitation of school attendance of children, based on the interviews with local residents. In addition, this project has effectively collaborated with other donors’ support and contributed to the promotion of water connections for poor households. Therefore, this project has mostly achieved its objectives and thus, effectiveness and impacts of the project are high. No negative impacts on natural environment and resettlement have been reported. Regarding operation and maintenance, no major problems have been observed in the institutional/organizational, technical, financial aspects and current status. Therefore, sustainability of the project effects is high.

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

1. Project Description



Project Location



Flocculation Basin (front) and Sedimentation Basin (back) (Kampong Cham)

1.1 Background

In Cambodia, after the civil war, with the support of Japan and other donors, development support of water supply facilities in the capital city of Phnom Penh and development support of human resources for operation and maintenance have been provided to improve water supply capacity. On the other hand, water supply capacity in local cities other than the capital was still low, and safe water supply to the entire population was not realized. In 2006, in Cambodia's local cities, Kampong Cham City and Battambang City, water supply facilities were expanded with the support of the Asian Development Bank (hereinafter referred to as "ADB"). In addition, in Kampong Cham City, the United Nations Human Settlement Program (hereinafter referred to as "UN-HABITAT") provided support for development of water distribution pipes. Furthermore, from 2007 to 2011, JICA implemented a technical cooperation project "The Project for Capacity Building for Water Supply System (Phase 2)" with the aim of improving capacity of the staff of the waterworks in 8 local cities including the both Cities. In this way, in Cambodia, both in terms of hard measures and soft measures, water supply capacity of local cities was being improved, however, there was an urgent need to expand water supply facilities to further improve water supply capacity.

1.2 Project Outline

The objective of this project is to improve access rate to safe water by expanding water supply facilities in Kampong Cham City and Battambang City, thereby contributing to the improvement of urban living environment of residents in both Cities.

| | |
|--|--|
| Grant Limit/Actual Grant Amount | 3,355 million yen/3,327 million yen |
| Exchange of Notes Date /Grant Agreement Date | June 2013/June 2013 |
| Executing Agency | Ministry of Industry and Handicraft: MIH |
| Project Completion | June 2016 |
| Target Area | Kampong Cham City and Battambang City |
| Main Contractors | Kubota Construction Co., Ltd. |
| Main Consultants | Nihon Suido Consultants Co., Ltd./Kitakyushu City Water and Sewer Bureau/CTI Engineering International Co., Ltd. (JV) |
| Preparatory Survey | May 2012 – March 2013 |
| Related Projects | <p>[Technical Cooperation]</p> <ul style="list-style-type: none"> - The Project on Capacity Building for Water Supply System (Phase 1–3) (2003–2006, 2007–2011, 2012–2017) <p>[ODA Loan]</p> <ul style="list-style-type: none"> - Niroth Water Supply Project (March 2009–August 2014) <p>[Grant Aid]</p> <ul style="list-style-type: none"> - The Project for Replacement and Expansion of Water Distribution Systems in Provincial Capitals (2011–2013) <p>[ADB]</p> <ul style="list-style-type: none"> - Provincial Towns Improvement Project (2000–2006) <p>[UN-HABITAT]</p> <ul style="list-style-type: none"> - The Mekong Water and Sanitation Programme (2005–2015) |

2. Outline of the Evaluation Study

2.1 External Evaluator

Masumi Shimamura, Mitsubishi UFJ Research and Consulting Co., Ltd.

2.2 Duration of Evaluation Study

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

Duration of the Study: September 2019–November 2020

Duration of the Field Study: December 1–20, 2019, March 2–12, 2020

3. Results of the Evaluation (Overall Rating: A¹)

3.1 Relevance (Rating: ③²)

3.1.1 Consistency with the Development Plan of Cambodia

At the time of planning, Cambodian government's *the National Strategic Development Plan (2014–2018)* set out as one of priority development objectives to secure access to safe water. In addition, *the National Policy on Water Supply and Sanitation (February 2003)*, which was valid at the time of planning clearly stated the policy of strengthening urban water supply in each province. Cambodian government has been developing water supply sector with the aim of ensuring that people receive safe water supply, have sanitation facilities, and enjoy safe, sanitary and environmentally-friendly living environment.

At the time of the ex-post evaluation, Cambodian Government's *the Rectangular Strategy Phase IV (2019–2023)* points out the importance of further investment in water supply infrastructure development and rehabilitation. Furthermore, *the National Strategic Development Plan (2019–2023)* states the target to realize 100% access to safe water in urban areas by 2025. Cambodian government also aims to provide affordable water supply services, ensuring quality, safety and sustainability. Thus, the implementation of the project is also consistent with the development policy of Cambodia at the time of the ex-post evaluation.

3.1.2 Consistency with the Development Needs of Cambodia

At the time of planning, quality of water supply service in local cities of Cambodia was low, and water supply rate was only 33%³ (2008). Kampong Cham City (population of about 65,000) and Battambang City (population of about 145,000), which are the target Cities of the project, are the 4th and the 2nd most important cities in terms of population size, but water supply rates remained at about 32% and 31%,⁴ respectively due to insufficient supply capacity of water treatment plants. Thus, development of water supply facilities was urgently needed.

At the time of the ex-post evaluation, stable supply of water continues to be essential for improving the living environment of residents. Population of Kampong Cham Province and Battambang Province in 2019 is 895,763 and 987,400, respectively.⁵ The figures are much larger than the population served by Kampong Cham Waterworks and Battambang Waterworks which is 53,243 and 136,725, respectively in 2019.⁶ In both provinces, expansion of water supply area by each Waterworks and increasing population with access to safe water continues to be an urgent issue, and for this purpose, it is necessary to further strengthen water supply

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

² ③: High, ②: Fair, ①: Low

³ Information from the materials provided by JICA.

⁴ Ibid.

⁵ Data from the General Population Census of the Kingdom of Cambodia 2019.

⁶ Information from the materials provided by Kampong Cham Waterworks and Battambang Waterworks.

capacity of both Waterworks. From the above, the importance of the project is still maintained at the time of the ex-post evaluation.

3.1.3 Consistency with Japan's ODA Policy

At the time of planning, Project Development Plan (April 2012) of Japan's *Country Assistance Program for Cambodia* placed "development of water supply and sewage infrastructure" as one of the important development issues. In addition, *the Country Assistance Policy* (April 2012) stipulated to support development of water supply in major cities in the provinces with the aim of improving access to safe water based on the know-how of the Phnom Penh Water Supply Authority (hereinafter referred to as "PPWSA"), which has achieved a high level of operation and technology through Japan's support to water supply sector. In addition, JICA's *Country Analysis Paper* (March 2014) put up its policy that collaboration among ODA schemes will take place to contribute to the improvement of water services and realization of sound management of major waterworks in the provinces. The purpose of the project is to improve access rate to safe water by expanding water supply facilities in Kampong Cham City and Battambang City. The aim was to extend the PPWSA's successful cases to the local public waterworks, through collaboration with technical cooperation projects. All of these are in line with the above policy.

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: ③)

3.2.1 Project Outputs

This project expanded water supply facilities in Kampong Cham City and Battambang City to improve access rate to safe water for residents. Tables 1, 2 and 3 compare the planned and actual outputs of major outputs.

Table 1: Comparison of Major Planned and Actual Outputs (Construction of Facilities)

| Plan | | Actual/ Comparison |
|-----------------------|---|--|
| Item | Facility Scale | |
| Kampong Cham | | |
| Intake Facility | 12,650 m ³ /day, Intake Pump: 4 sets | As planned |
| Conveyance Facility | Conveyance pipe length: 0.9 km | As planned |
| Treatment Facility | 11,500 m ³ /day, Rapid Sand Filtration | As planned |
| Transmission Facility | Transmission pipe length: 0.9 km | As planned |
| Distribution Facility | Distribution pipe network length: 57.8 km, Distribution Flow Monitoring System | Distribution pipe network length: 57.9 km |
| Battambang | | |
| Intake Facility | 24,200 m ³ /day, Intake Pump: 3 sets | As planned |
| Conveyance Facility | Conveyance pipe length: 4.4 km | 4.3 km |
| Treatment Facility | 22,000 m ³ /day, Rapid Sand Filtration | As planned |
| Distribution Facility | Distribution pipe network length: 65.5 km, Distribution Flow Monitoring System | Distribution pipe network length: 64.8 km |

Source: Results from questionnaire survey of Kampong Cham Waterworks and Battambang Waterworks

Table 2: Comparison of Major Planned and Actual Outputs (Installation of Facilities)

| Plan | | | Actual/ Comparison |
|---|---|------------|-----------------------|
| Category | Item | Quantity | |
| Kampong Cham | | | |
| Equipment for Water Quality Analysis | Jar Tester | 1 set | As planned |
| | Turbidity Continuous Measurement Equipment | 1 set | As planned |
| | Residual Chlorine Analyzer | 1 set | As planned |
| | Reagents | 1 set | As planned |
| | Glassware | 1 set | As planned |
| Tools for Mechanical Equipment | Vibration Checker | 1 set | As planned |
| Equipment and Materials for Service Connections | Socket Fusion Equipment | 1 set | As planned |
| | Materials and Equipment for Service Connections | 2,529 sets | As planned |
| Battambang | | | |
| Equipment for Water Quality Analysis | Jar Tester | 1 set | As planned |
| | Distillation Apparatus | 1 set | As planned |
| | Turbidity Meter | 1 set | As planned |
| | Turbidity Continuous Measurement Equipment | 1 set | As planned |

| | | | |
|---|---|------------|------------|
| | Laboratory Table | 1 set | As planned |
| | Residual Chlorine Analyzer | 1 set | As planned |
| | Chlorine continuous measurement equipment | 1 set | As planned |
| | Uninterruptible Power System (UPS) | 1 set | As planned |
| | pH Meter (glass electrode) | 1 set | As planned |
| | pH Meter (BTB) | 1 set | As planned |
| | Reagents | 1 set | As planned |
| | Glassware | 1 set | As planned |
| Tools for Mechanical Equipment | Vibration Checker | 1 set | As planned |
| Equipment and Materials for Service Connections | Socket Fusion Equipment | 1 set | As planned |
| | Materials and Equipment for Service Connections | 5,346 sets | As planned |

Source: Results from questionnaire survey of Kampong Cham Waterworks and Battambang Waterworks

Table 3: Comparison of Major Planned and Actual Outputs (Consulting Services)

| Item | Actual/ Comparison |
|--|-----------------------|
| Detailed design, tendering assistance, construction supervision | As planned |
| Capacity building program (Soft Component) <ul style="list-style-type: none"> • Operation and maintenance of treatment facility • Operation and Maintenance of transmission and distribution facility • Production management | As planned |

Source: Results from questionnaire survey of Kampong Cham Waterworks and Battambang Waterworks

Regarding construction of facilities, there were some changes from the initial plan – changes in distribution pipe network length in Kampong Cham and conveyance pipe length and distribution pipe network length in Battambang took place. Change in distribution pipe network length in Kampong Cham was due to the modification of construction section by the other donor (UN-HABITAT). Reduced length of conveyance pipe in Battambang was due to reexamination of underground buried materials along the conveyance pipe route, and reduced distribution pipe network length in Battambang was due to the progress of development by Battambang Waterworks. All of these modifications have taken place to correspond to changes in various conditions after the preparatory survey and are considered appropriate.

Regarding installation of facilities and consulting services, it was confirmed through interviews with the Ministry of Industry and Handicraft (hereinafter referred to as “MIH”), which is the executing agency, and the project consultants that they have been implemented as

planned.

Among the items to be borne by the Cambodian side, as for the “connection of water pipes to each house and procurement and installation of water meters,” as a result of interviews with both Waterworks in Kampong Cham and Battambang, the progress is as follows at the time of the ex-post evaluation. As for Kampong Cham Waterworks, of the 2,529 sets of water supply materials provided, 2,339 sets (92%) have been installed, and for Battambang Waterworks, installation of all 5,346 sets has been completed in April 2018. The reason why it is taking time to connect to each house in Kampong Cham is that Kampong Cham Waterworks is securing construction budget, taking into consideration water revenue (commercial feasibility), etc. The newly connected households of the Waterworks originally used well water and rainwater, and the volume of water consumption is less compared to the existing connected households. In addition, there are households which do not connect even if water pipes are installed up to the front of their houses, because connection fee and other charges (initial cost) are required. Kampong Cham Waterworks is proceeding with construction work, while ensuring commercial feasibility, taking into account these situations. While it is taking time to connect to each house, it is expected that the installation will be completed by the end of 2020 through securing planned budget. As a result of interviews with the MIH, it was confirmed that other tasks to be undertaken by the Cambodian side (land acquisition and leveling of water treatment plant site, obtaining permission of water intake from the river, drawing in electricity to new water intake plants and water treatment plants, etc.) have been duly implemented without any problems.



Intake Pump
(Kampong Cham)



Operation Room of Intake Pump and
Generation Room (Exterior of the Building)
(Kampong Cham)



Chemical Feeding Facility (Kampong Cham)



Sedimentation Basin and Administration Building (Battambang)



Transmission Pump and Distribution Pump (Battambang)



Pump Station Control Room (Battambang)

3.2.2 Project Inputs

3.2.2.1 Project Cost

The project cost was planned to be 3,355 million yen on the Japanese side and 38 million yen on the Cambodian side. Of which, the actual cost born by the Cambodian side for connection of water pipes and installation of water meters to each house, drawing in electricity to the new water intake and the water treatment facilities, etc., was not available because it was not recorded separately from the other routine expenditure of the Waterworks. Consequently, the project cost was evaluated by comparing the planned and actual cost born by the Japanese side. The actual cost by the Japanese side was 3,327 million yen, falling within the plan and accounting for 99% of the planned cost.

3.2.2.2 Project Period

While the overall project period was planned as 36 months – from July 2013 (at the start

of detailed design) to June 2016 (completion of construction), the actual period was 35 months – from August 2013 (at the start of detailed design) to June 2016 (completion of construction), which is within the plan (97% of the initial plan). Table 4 summarizes the comparison of planned and actual project period.

Table 4: Comparison of Planned and Actual Project Period

| Plan | Actual |
|---|-----------------------------------|
| July 2013–June 2016 (36 months) | August 2013–June 2016 (35 months) |
| Breakdown: Detailed Design and Tendering Period | |
| July 2013–March 2014 (9 months) | August 2013–April 2014 (9 months) |
| Breakdown: Construction and Procurement Period | |
| April 2014–June 2016 (27 months) | June 2014–June 2016 (25 months) |

Source: Information provided by JICA and results from questionnaire survey of the MIH

Note 1) The definition of project initiation is at the start of detailed design and the definition of project completion is at the time of completion of construction. Project period does not include warranty period for both plan and actual.

Both the project cost and project period were within the plan. Therefore, efficiency of the project is high.

3.3 Effectiveness and Impacts⁷ (Rating: ③)

3.3.1 Effectiveness

3.3.1.1 Quantitative Effects (Operation and Effect Indicators)

At the time of planning, “served population,” “daily average water supply volume,” “service ratio,” and “number of service connection” were set as quantitative effects of the project. Table 5 summarizes baseline, target and actual figures between 2017 and 2019 for each indicator. As the project completion is June 2016, the target year to be compared is 2019, 3 years after completion. The target achievement rates are shown in parentheses in the table.

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

Table 5: Quantitative Effects of the Project

| Indicators | Baseline | Target | Actual | | |
|---|----------|--|---------------------------------------|--|-------------------------------------|
| | 2011 | 2019 3 Years After Completion | 2017 1 Year After Completion | 2018 2 Years After Completion | 2019 3 Years After Completion |
| Kampong Cham Note 1) | | | | | |
| Served Population (person) | 21,571 | 58,719 | 39,302 | 45,027 | 53,243 (91%) |
| Daily Average Water Supply Volume (m ³ /day) Note 2) | 5,155 | 13,500 | 9,208 | 9,943 | 11,606 (86%) |
| Service Ratio (%) Note 3) | 32.8 | 84.8 | 45.11 | 51.56 | 61.11 (72%) |
| Number of Service Connections | 4,499 | 12,248 | 9,140 | 10,464 | 12,382 (101%) |
| Battambang Note 4) | | | | | |
| Served Population (person) | 45,377 | 126,696 | 101,485 | 119,600 | 136,990 (108%) |
| Daily Average Water Supply Volume (m ³ /day) Note 5) | 8,132 | 27,518 | 17,884 | 21,124 | 24,946 (91%) |
| Service Ratio (%) Note 6) | 31.1 | 84.8 | 44.46 | 47.10 | 56.79 (67%) |
| Number of Service Connections | 9,065 | 25,310 | 20,297 | 23,920 | 27,398 (108%) |
| Reference (Non-revenue water) Note 7) | | | | | |
| Kampong Cham | — | — | 7.21% | 6.58% | 6.00% |
| Battambang | — | — | 10.56% | 8.39% | 8.07% |

Source: Information provided by JICA and results from questionnaire survey of Kampong Cham Waterworks and Battambang Waterworks

Note 1) Water supply area of Kampong Cham Waterworks includes the support areas of the ADB and the UN-HABITAT. At the time of planning, 4 communes were covered, but at the time of the ex-post evaluation, water supply area was expanded to 8 communes.

Note 2) Daily average water supply volume (m³/day) is the volume derived by dividing the annual water supply of each Waterworks by 365. For reference, water supply volume on the peak day of each year is 11,017 m³ (June 24, 2017), 10,514 m³ (April 23, 2018) and 12,765 m³ (May 25, 2019).

Note 3) Service ratio (%) = number of people receiving water from each Waterworks/population within each Waterworks' service area. At the time of planning, figures were for 4 communes, but the actual figure is the service ratio for 8 communes. For reference, service ratios for the original 4 communes were 88.53% (2017), 96.29% (2018), and 97.83% (2019).

Note 4) Water supply area of Battambang Waterworks includes the ADB's support area. At the time of planning, 10 communes

were covered, but at the time of the ex-post evaluation, water supply area was expanded to 17 communes.

Note 5) Daily average water supply volume (m³/day) is the volume derived by dividing the annual water supply of each Waterworks by 365. For reference, water supply volume on the peak day of each year is 24,688 m³ (November 17, 2017), 29,749 m³ (April 24, 2018) and 35,521 m³ (April 23, 2019).

Note 6) Service ratio (%) = number of people receiving water from each Waterworks/population within each Waterworks' service area. At the time of planning, figures were for 10 communes, but the actual figure is the service ratio for 17 communes. For reference, service ratios for the original 10 communes were 55.45% (2017), 60.79% (2018) and 68.99% (2019).

Note 7) Non-revenue water rates are shown as reference figures.

The actual figures of each indicator set at the time of planning have increased year after year since the project was completed for both Kampong Cham and Battambang. Looking at the actual figures in 2019, "Served populations" are 53,243 people and 136,990 people in Kampong Cham and Battambang respectively, and the target achievement rates are 91% and 108%, respectively. "Daily average water supply volumes" are 11,606 m³ and 24,946 m³ for Kampong Cham and Battambang respectively, and the target achievement rates are 86% and 91%, respectively. "Service ratios" are 61.11% and 56.79% for Kampong Cham and Battambang, respectively, and the target achievement rates are 72% and 67%, respectively, and "number of service connections" are 12,382 and 27,398 for Kampong Cham and Battambang, respectively, and the target achievement rates are 101% and 108%, respectively.

The target achievement rates of "Service ratio" are lower than the achievement rates of other indicators because water supply areas of both Kampong Cham and Battambang are expanding. (As shown in note 1 and note 4 of Table 5, water supply area of Kampong Cham has expanded from 4 communes to 8 communes and that of Battambang has expanded from 10 communes to 17 communes.) In other words, service ratios declined because population within each water supply area by the Waterworks which is the denominator has increased. According to the project consultant, expansion of the water supply area was not considered when setting the target figures for service ratio. For reference, the actual service ratio in 2019 for the original 4 communes in Kampong Cham is 97.83%, which is 115% of the target, and the actual service ratio in 2019 for the original 10 communes in Battambang is 68.99%, which is 81% of the target.

With regard to "Number of service connections," it can be said that water supply connection work for each house at both Waterworks is progressing as expected, as both Kampong Cham and Battambang have achieved their targets.

While "Number of service connections" has achieved the target, "Daily average water supply volumes" for both Kampong Cham and Battambang are slightly below the targets.

This is because people in Kampong Cham consumed less water than expected per each household. According to Kampong Cham Waterworks, there are households which use water from other sources (well water, rainwater, etc.) to save water bills during the rainy season. As regards Battambang, it is thought that production capacity is almost full. According to Battambang Waterworks, although there are intake facilities developed by the ADB in 2007 in addition to the intake facilities constructed under this project, it is said that further production would be difficult due to the decrease in pumping capacity because of deterioration of the ADB facilities. In addition to this, the decrease in pumping capacity in the dry season due to the decrease in the water volume of the Sangke River as the water source is also causing difficulty to produce more. In fact, it has been pointed out that demand volume may exceed water supply volume within 2020. In response to this, Battambang Waterworks is expecting to secure new water sources from the multipurpose dam that is being developed with the support of the Korea Export-Import Bank. Battambang Waterworks is also expecting early construction and completion of water treatment facilities and other facilities by the ADB project⁸ that is currently underway.

Regarding non-revenue water rates shown as reference figures, the actual figures for both Kampong Cham and Battambang are decreasing, and they are 6.00% and 8.07%, respectively, in 2019. This indicates that their operational status of water supply business is very excellent.

3.3.1.2 Qualitative Effects (Other Effects)

As qualitative effects of the project, “Improvement of insufficient water volume and pressure from taps” and “Provision of stable water supply” were expected.

(1) Kampong Cham

According to Kampong Cham Waterworks, water pressure was low (water supply pressure was less than 1 bar⁹) and water volume was not sufficient before the project, but at the time of the ex-post evaluation, water pressure for the additional 4 communes is 1 bar to 2.5 bar, and for the original 4 communes is 3 bar to 5 bar. In addition, before the project, it was not a 24-hour water supply, and stable water supply was not possible, however after the project, 24-hour water supply is realized in a stable manner.

Furthermore, as a result of conducting interview survey with 11 local residents¹⁰ during

⁸ Provincial Water Supply and Sanitation Project (scheduled for 2018 – 2023). Water supply capacity of 50,000 m³/day and expansion of water pipes of 120 km are planned. According to the MIH and the ADB, consultants were selected in December 2019 and consulting services have initiated.

⁹ The power to push water up to a height of 10 m.

¹⁰ The interviewees consisted of 4 men (2 in 40s, 1 in 50s, and 1 in 60s) and 7 women (2 in 30s, 1 in 40s, 3 in 60s, and 1 in 70s). Interviews were conducted to the following 4 categories of residents.

the project site inspection, it was confirmed that water volume and water pressure are sufficient after the project, and the insufficient conditions before the project were resolved. It was also confirmed that stable water supply has realized 24 hours a day, 365 days a year. When asked why the unconnected residents do not connect, one respondent said that because she is using well water and rainwater. She also pointed out that while water tariff of the Waterworks is reasonable, the initial cost required for connection is high (connection fees: 292,400 Riel (about USD 73), deposit: 37,800 Riel (about USD 9), and thus she has not connected. The other respondent is a vegetable farmer who does not have a stable monthly income and cannot pay monthly water tariff to the Waterworks. Therefore, she mentioned that she is using a family-owned well water in the neighborhood, which is expensive, but can delay payment until she can earn income during the harvest season.

(2) Battambang

According to Battambang Waterworks, water volume and water pressure were not sufficient before the project, but at the time of the ex-post evaluation, the water pressure became 2 bar. In addition, before the project, it was not a 24-hour water supply, and stable water supply was not possible, but after the project, 24-hour water supply was realized in a stable manner.

Furthermore, as a result of conducting interview survey with 12 local residents¹¹ during the project site inspection, it was confirmed that water volume and water pressure are sufficient after the project, and the insufficient conditions before the project were resolved. It was also confirmed that stable water supply has realized 24 hours a day, 365 days a year. When asked why the unconnected residents do not connect, one respondent said that she is using well water in the garden, and the wells are still operating without problems, thus she has not connected to the water pipe. In addition, 1 resident pointed out that she is not connected because the initial cost at the time of connection is high. Another resident

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- Residents who have been connected to the water pipe before the project and can compare the differences before and after the project. (2 people: 1 man in his 60s and 1 man in his 40s.)
 - Residents who have newly connected to the water pipe after the project. (2 people: 1 woman in her 30s and 1 woman in her 60s.)
 - Target residents of the connection support system for the poor. (5 people: 1 man in 40s, 1 man in 50s, 1 woman in 40s, 1 woman in 60s and 1 woman in 70s.)
 - Residents who are unconnected. (2 people: 1 woman in her 30s and 1 woman in her 60s.)
- ¹¹ The interviewees consisted of 4 men (1 in 40s, 1 in 50s, and 2 in 60s) and 8 women (1 in 30s, 1 in 40s, 3 in 50s, and 3 in 60s). As same as Kampong Cham, interviews were conducted to the following 4 categories of residents.
- Residents who have been connected to the water pipe before the project and can compare the differences before and after the project. (2 people: 1 man in his 60s and 1 woman in her 50s.)
 - Residents who have newly connected to the water pipe after the project. (4 people: 1 man in his 40s, 1 man in his 60s, 1 woman in her 30s and 1 woman in her 60s.)
 - Target residents of the connection support system for the poor. (3 people: 1 man in his 50s and 2 women in their 50s.)
 - Residents who are unconnected. (3 people: 1 woman in her 40s and 2 women in their 60s.)

responded that she was absent for a long time at the time of construction of water pipe and did not know the procedures for connecting to the water pipe.

From the above, it is considered that the indicators of quantitative and qualitative effects set at the time of planning have mostly achieved.

3.3.2 Impacts

3.3.2.1 Intended Impacts

As impacts of this project, state of generation of “Improvement of hygiene condition” and “Facilitation of female employment and children’s school attendance” were evaluated.

(1) Improvement of Hygiene Condition

According to both Kampong Cham Waterworks and Battambang Waterworks, residents are taking more showers and doing more laundries because of the clean tap water supplied by the project. In addition, it was pointed out that public schools are also connected to tap water after the project, and 1) hand-washing areas are established with school budget and hand-washing environment has improved (if it were still using well water, surrounding areas would be all wet and unsanitary) and 2) because toilets became clean, more children use them at school without putting up (originally, toilet water was from rivers and wells and was unsanitary, so many children used to put up with toilets).

In addition, results of interviews with local residents¹² indicated that hygiene condition of residents has improved after the project. In addition to the above pointed out by the Waterworks (increase in the number of showers and washing), there were also responses that residents can now properly wash vegetables when cooking and thus they are using more water. Residents also pointed out that they can use tap water at ease since it is clean and thus, they are drinking the water without boiling. On the other hand, no residents pointed out changes in their physical conditions regarding incidence of water-borne diseases such as diarrhea, typhoid fever, and dysentery before and after the project.

(2) Facilitation of Female Employment and Children’s School Attendance

As a result of interviews with local residents,¹³ it was confirmed that employment of women and children’s school attendance have been promoted after the project. Specifically, there were following responses. “By connecting to water supply and saving time to fetch water, women can go to the market to sell crops, and children can go to school for a whole day (rather than half a day) as well as to cram schools. (Before connecting to water supply,

¹² The interviewees are the same residents listed in footnotes 10 and 11.

¹³ Same as the above.

they could only go to school for almost always half a day when there was a school.),” “As fetching water became unnecessary, the resident can now do more housework and child-raising.” “Before connecting to water supply, a resident was worried about safety because her children also went to the river to fetch water, but after connecting to water supply, she can take care of children and do field work by using the saved time for fetching water.” “After connecting to water supply, the resident’s life became more convenient, and can devote time to work at the shop as well as do more housework.”

From the above, it is considered that impact indicators have been largely achieved.

3.3.2.2 Other Positive and Negative Impacts

(1) Impacts on the Natural Environment

This project does not fall under a large-scale project in water supply sector stipulated in the *JICA Guidelines for Confirmation of Environmental and Social Considerations* (promulgated in April 2010), and undesirable effects on environment were judged not to be serious. In addition, the project does not fall in the area of sensitive characteristics and sensitive areas. Therefore, the project was classified as Category B. According to the MIH, an Initial Environmental Impact Assessment (IEIA) has been prepared and submitted to the Ministry of the Environment and the IEIA was approved by the Ministry of the Environment in 2013. Both Kampong Cham and Battambang Waterworks have explained to the local residents prior to project construction and explained that environmental burden during construction would be avoided as much as possible.

According to both Kampong Cham and Battambang Waterworks, and the project consultants, environmental monitoring during the project implementation has been carried out based on the environmental monitoring plan, and monitoring of air, water quality, waste, noise, and vibration has been carried out once a month, and bad odors once a week. No major problems such as exceeding the standard have been reported. In addition, according to both Waterworks, as environmental mitigation measures, consideration was made during construction based on the environmental management plan such as avoiding construction at night (Construction hours were 7–11:30 am and 1–5 pm. Noise-free construction was until 10 pm.), and the material transportation trucks were used after cleaning tires with water before using them, and their load capacity was also properly complied with. Furthermore, after water services are in place, sludge produced by the water treatment process has been dried and then buried in the lagoon within each Waterworks’ premises to manage it. As a result, no negative impacts on natural environment have been reported and no complaints have been pointed out from local residents. From the interviews with both

Waterworks and local residents, as well as from the results of site survey, no major problem with respect to natural environment has been identified.

(2) Resettlement and Land Acquisition

According to both Kampong Cham and Battambang Waterworks, land acquisition and resettlement did not take place.

(3) Other Impacts

At the time of planning, “Cooperation with other donors” and “Promotion of water supply connection of poor households” were expected as other impacts of the project. The state of generation of these impacts is as follows.

1) Cooperation with Other Donors

In Kampong Cham, coordination with the ADB project¹⁴ (2004–2006) and the UN-HABITAT project¹⁵ (2011–2013) and in Battambang, coordination with the ADB project¹⁶ (2003–2007) has taken place, generating synergetic effects.

In Kampong Cham, the ADB and the UN-HABITAT projects conducted water supply development using well water as the water source. On the other hand, this project did not use well water, but the Mekong River as the water source to expand the service area. In Battambang, this project aimed to respond to increased demand in light of deterioration of facilities developed by the ADB project and the increase of population. It should be noted that each donor has conducted the project based on the support of previous donors and there was no overlap of support. Different types of water pipes were used by different donors, but they had compatible specifications. In addition, in the soft component (capacity building such as operation and maintenance of water distribution facilities, production management, etc.) of the project, comprehensive support was provided, taking into account previous donor support and projects conducted by both Kampong Cham and Battambang Waterworks themselves.

2) Promotion of Water Supply Connection of Poor Households

It was confirmed that both Kampong Cham and Battambang Waterworks are promoting water supply connection of poor households. Tables 6 and 7 show trends in the number of new connections for the poor households for each Waterworks.

¹⁴ The ADB supported the improvement of water treatment system for wells and the development of water pipes for 20 km along the main road.

¹⁵ The UN-HABITAT developed water pipes in the form of expanding the ADB project. It also provided support for the introduction of preferential treatment as a measure to promote water supply connection for the poor.

¹⁶ The ADB supported the development of water intake facilities and water treatment plants in the Sangke River.

Table 6: Number of New Connections to the Poor Households for Kampong Cham Waterworks

| | ID Poor 1 | ID Poor 2 |
|-------|-----------|-----------|
| 2017 | 98 | 135 |
| 2018 | 27 | 72 |
| 2019 | 3 | 7 |
| Total | 128 | 214 |

Source: Results from questionnaire survey of Kampong Cham Waterworks

Note 1) The evaluation criteria for poverty categories 1 and 2 are based on (1) house material (palm leaf, galvanized iron, wood), and (2) the source of income. The staff of the Waterworks actually visits the house and makes a decision in consultation with the target person. The village chief makes approval at the end.

Note 2) The number of new connections is decreasing year by year, as explained above, because the Waterworks is developing water distribution pipes while considering commercial feasibility, and thus it seems to take time to connect to each house. Also, the number of connections is smaller than that of Battambang Waterworks, because of the difference in population size.

Table 7: Number of New Connections to the Poor Households for Battambang Waterworks

| | Number of connections of ID Poor |
|-------|----------------------------------|
| 2016 | 1,600 |
| 2017 | 2,068 |
| 2018 | 1,678 |
| 2019 | 1,728 |
| Total | 7,074 |

Source: Results from questionnaire survey of Battambang Waterworks

Note 1) There is no category under ID poor. Regarding judgment of the poor, as with Kampong Cham Waterworks, the staff of Battambang Waterworks actually visits the house and makes a decision in consultation with the target person. The village chief makes approval at the end.

Kampong Cham Waterworks has introduced preferential treatment for the poor for the exemption from connection fee payment or reduction of burden as a measure to promote water supply connection to poor households.¹⁷ This is because the revolving

¹⁷ Regarding the initial cost required for water supply connection, the preferential treatment for the poor in Kampong Cham is as follows. (There is no change according to length of intake pipe and diameter of water pipe. Because the poor people use less water, water pipe diameter is the smallest figure of 15 mm.)

- Connection fee (with preferential treatment): Free for those who are in poverty category 1. Targets of Category 2 will be charged 57,000 Riel (approximately USD 14), but interest-free and installment payments are possible.
- Deposit (same rate as other users, but interest-free and installment payments are possible): 37,800 Riel

fund¹⁸ introduced by the UN-HABITAT in its past support (Urban Poverty Reduction Project) has been successful, and the fund is still functioning. Both Kampong Cham and Battambang Waterworks allow the poor to make payments of initial costs (connection fee and deposit) without interest and with installments. In addition, in Kampong Cham, resident information meetings to explain to local residents are held 8–10 times a year to promote water supply connection regardless of the poor. As mentioned in “3.3.1.2 Qualitative Effects (Other Effects),” there are still residents who are using water from other water sources (well water, rainwater, etc.), and some residents do not feel the need to pay the initial cost and water bill to connect to water supply. For this reason, Kampong Cham Waterworks disseminates the importance of use of safe and hygienic tap water to unconnected families and carries out enlightened activities.



ID Poor of poor residents and water supply contracts with Kampong Cham Waterworks

Tables 8 and 9 show the water connection fees and deposits in ordinary cases. The same fee system is used for Kampong Cham and Battambang. According to both Waterworks, connection fee is charged only for the cost of construction, and no profit is generated.

(approximately USD 9) for both poverty categories 1 and 2.

In Battambang, connection fee and deposit required for water supply connection are charged the same amount as other users to the poor, but the poor can make interest-free and installment payments.

- Connection fee: 292,400 Riel (approximately USD 73).
- Deposit: 37,800 Riel (approximately USD 9).

¹⁸ The UN-HABITAT has set up a revolving fund to provide urban poor to access to clean water supply at affordable prices. Specifically, funds to support the community infrastructure of the urban poor are operated as revolving fund, and the repayment funds are used to supplement water supply connection costs for the poor in Kampong Cham. In Battambang, support from the UN-HABITAT is not provided, and there is no preferential treatment like the case of Kampong Cham.

Table 8: Water Connection Fee (Kampong Cham and Battambang)

Unit: Riel

| Length of water intake pipe from the main pipe to each household (m) | Diameter of water pipe (mm) | | | | |
|--|-----------------------------|---------|---------|-----------|-----------|
| | 15 | 20 | 25 | 30 | 40 |
| 0–10 | 292,400 | 533,820 | 633,600 | 1,091,100 | 1,548,600 |
| 11–20 | 350,000 | 579,100 | 678,600 | 1,161,900 | 1,645,200 |
| 21–30 | 421,600 | 624,500 | 723,600 | 1,232,700 | 1,741,800 |
| 31–40 | 499,400 | 669,800 | 769,200 | 1,304,100 | 1,839,000 |
| 41–50 | 576,700 | 714,700 | 814,200 | 1,374,900 | 1,935,600 |

Source: Information provided by Kampong Cham Waterworks (MIH Ministerial Decree 140/2016) and information provided by Battambang Waterworks (MIH Ministerial Decree 258/2017)

Table 9: Deposit (Same Fee System for Both Waterworks)

Unit: Riel

| | Diameter of water pipe (mm) | | | | |
|-----|-----------------------------|---------|---------|---------|---------|
| | 15 | 20 | 25 | 30 | 40 |
| Fee | 37,800 | 118,100 | 165,400 | 318,900 | 472,500 |

Source: Information provided by Kampong Cham Waterworks (MIH Ministerial Decree 140/2016) and information provided by Battambang Waterworks (MIH Ministerial Decree 258/2017)

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 Aspect of Operation and Maintenance

The operation and maintenance of the project after completion is undertaken by Kampong Cham Waterworks and Battambang Waterworks under the supervision of the MIH and the Department of Industry and Handicraft (hereinafter referred to as “DIH”), which is the branch organizations of Kampong Cham Province and Battambang Province.

At the time of the ex-post evaluation, there are 51 staff members in Kampong Cham Waterworks, and headed by the Director, personnel are assigned to Business Section, Production Section, Network Section, Accounting Section and Personnel Section. There are 102 staff members in Battambang Waterworks, and headed by the Director, personnel are assigned to Business Section, Production and Supply Section, Network and Service Section, Planning/Accounting/Finance Section and Management/Personnel Section. Table 10 shows

the technical sections in charge of operation and maintenance of the project, work contents, and the number of staff assigned. It is considered that the number of staff is adequately secured when taking into account the scale of facilities of each Waterworks.

Table 10: Technical Sections in Charge of Operation and Maintenance of the Project, Work Contents and the Number of Staff

| Kampong Cham Waterworks (Number of staff members) | Battambang Waterworks (Number of staff members) | Work Contents |
|---|---|--|
| Business Section (18) | Business Section (31) | Responsible for sales to individual customers, water supply connection and management of individual households, meter reading and billing for each house, meter maintenance, etc. |
| Production Section (20) | Production and Supply Section (22) | Responsible for on-site management/monitoring work 24 hours a day, such as operation management of water intake pump facilities and water treatment facilities, and water quality testing, and responsible for identifying and responding to problems before they occur. |
| Network Section (7) | Network and Service Section (26) | Responsible for leakage inspection and repair of main water distribution pipes, connection of new water pipes, renewal and maintenance of old water pipes, etc. (Various efforts are being made to reduce non-revenue water rate.) |

Source: Results from questionnaire survey of Kampong Cham Waterworks and Battambang Waterworks

The MIH, the DIH, Kampong Cham Waterworks and Battambang Waterworks are constantly in communication and close collaboration system is in place. (Each Waterworks reports to the MIH and the DIH every month, and the reporting sessions are held every six months at the MIH.) In addition, decision-making process and authority are clear and no problems have been observed. As regards securing budget for operation and maintenance as well as recruitment of staff, each Waterworks makes application to the MIH through the DIH and then budget allocation and personnel recruitment are carried out after approval from the MIH.

As mentioned before in “3.3.1.1 Quantitative Effects (Operation and Effect Indicators),” non-revenue water rates of both Waterworks are decreasing, and the actual figures in 2019 are

6.00% for Kampong Cham Waterworks and 8.07% for Battambang Waterworks, and they are maintaining very excellent operating conditions. In order to reduce non-revenue water rate, both Waterworks: 1) established a 24-hour hotline for customers and set up a system which can respond in a timely manner when problems occur, including night time, 2) conduct periodical water leak monitoring, and established a system to prevent problems, 3) replace old water pipes, 4) strengthen capacity of staff in charge of operation and maintenance (carry out various trainings within each Waterworks to accumulate knowledge and experiences so as to respond promptly in the field), and 5) procure and use equipment with good quality and longer service life, and aiming for further operational improvement.

From the above, no particular problem has been identified regarding the institutional/organizational aspect of operation and maintenance of the project.

3.4.2 Technical Aspect of Operation and Maintenance

There is no qualification for waterworks operators in Cambodia, and at both Waterworks, there is no qualification holders for the operation and maintenance staff in the field (electrical machinery, machinery, engineering, IT, etc.) with the exception of one civil engineer, who is the Production Section Manager of the Kampong Cham Waterworks. However, staff in charge of operation and maintenance of both Waterworks have accumulated necessary experiences and knowledge through the soft component of this project, training by the JICA technical cooperation projects, “The Project on Capacity Building for Urban Water Supply System in Cambodia (Phase 2, 3)” (see Box 1), as well as guidance through on-the-job-training. Thus, they are at a sufficient level to carry out daily operation and maintenance work.

In the soft component of the project, training and technology transfer regarding operation and maintenance of water treatment plant, operation and maintenance of water distribution facilities, and production management were carried out by the project consultant, Kitakyushu City Water and Sewer Bureau. In addition to Kitakyushu City staff, PPWSA staff members participated in the training as instructors.¹⁹ Participants of the training were all technical staff in charge of operation and maintenance in both Kampong Cham and Battambang Waterworks,

¹⁹ PPWSA has strengthened its capacity through receiving technology transfer from Kitakyushu City Water and Sewer Bureau related to water supply business operation and maintenance, and now PPWSA staff is in a position to provide technical guidance to local waterworks as trainers. In short, PPWSA is rolling out its own success stories to local public waterworks. During the time when the former PPWSA Director Ek Sonn Chan, who realized the reconstruction of water supply business through PPWSA reform, was the head of the MIH (2014-2016), support for local public waterworks was bolstered. Technology transfer by PPWSA is considered that these efforts are still being passed down. At the time, Ek Sonn Chan called that training as “Provincial Tour” and visited local public waterworks with the staff of the MIH, PPWSA and Kitakyushu City to diagnose their management and operation and maintenance situation and to instruct immediate action. He gave guidance and supervised them to achieve tangible results. (“Provincial Tour” was conducted as part of JICA technical cooperation project, “The Project for Capacity Building for Water Supply System (Phase 3).”) As a result, local public waterworks have improved their management and strengthened their capacities, which have also contributed significantly to strengthen the foundation of operation and maintenance of this project.

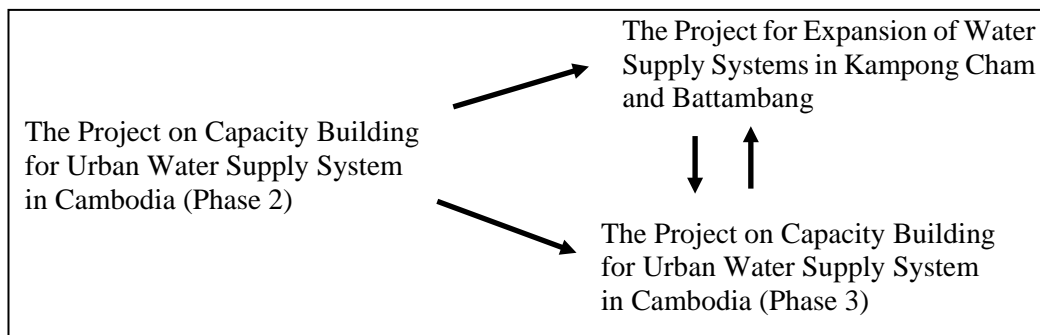
and they received lectures and hands-on training. Trainings were conducted in Khmer, and some of the handouts were in English and some in Khmer, and there were no language problems. In addition, some lectures were given by the staff of PPWSA, as the staff of Kitakyushu City explained, and the staff of PPWSA made interpretation. Trainings were conducted after clarifying the definitions of technical terms and various indicators in advance and confirming that there was no discrepancies in recognition between the parties concerned. According to the MIH and both Waterworks, the staff of Kitakyushu City may have had a two-way learning – transferring technology to the staff of Waterworks and learning the context of water supply business in local cities of Cambodia.

Regarding the content of the training, according to the trainees in Kampong Cham Waterworks, they were able to fully understand since the trainings were consistent with the needs in the field and the level of staff, and that they continue to utilize that knowledge in their daily work. According to the trainees in Battambang Waterworks, some staff pointed out that although the trainings were very useful, the level was high and that they could not fully understand without basic knowledge, especially with regard to electrical machinery and machinery related matters. At the time of the ex-post evaluation, none of the trainees from both Waterworks have resigned. Contents of the trainings have also been shared to and utilized by other staff and newly hired staff after the project. In addition, the operation manuals prepared under the soft component are always available in the field for both Waterworks and are referred to and utilized in their daily operations. Battambang Waterworks revises and updates the operation manuals according to the actual situation in the field.

[BOX 1: Effective Coordination with JICA Technical Cooperation Projects]

This project has effectively collaborated with the JICA technical cooperation project, “The Project on Capacity Building for Urban Water Supply System in Cambodia (Phase 2, 3),” and provided consistent technology transfer to the staff in the field in charge of operation and maintenance of both Waterworks.

In the technical cooperation projects, trainings were conducted for 8 public waterworks,²⁰ including both Waterworks. The Phase 2 (2007–2011) project provided support to strengthen operation and maintenance capacity of water facilities, and the phase 3 (2012–2017) project provided support to strengthen operation and management capacities of water utilities. This project was implemented based on the lessons learned and recommendations obtained in the Phase 2 project, and the soft component of this project was followed up in the Phase 3 project. In other words, close information exchange between this project and the technical cooperation projects took place, and effective collaboration was realized. Kitakyushu City staff participated in all of these projects as experts and were handed over among those staff who participated in each project and consistent guidance was provided. According to the trainees from both Waterworks, this project was implemented after the Phase 2 project, and follow-up and after care were provided in the soft component of this project, which has enabled to deepen their understanding and gave them confidence.



Through the field survey, it was confirmed that all staff of both Waterworks are striving to improve efficiency of their daily work in order to enhance daily access to safe water for residents, improve water services, and reduce non-revenue water rate as well as to respond promptly when problems occur. They are working enthusiastically with pride.

²⁰ Waterworks in Siem Reap, Battambang, Kampong Cham, Sihanoukville, Kompong Thom, Pursat and Svay Rieng. In Phase 1 project (2003–2006), support for strengthening operation and maintenance capacity of water supply facilities was provided for PPWSA.

From the above, staff members in charge of operation and maintenance have accumulated achievements and results based on the knowledge and technology acquired through the support so far and have sufficient technical capacity to carry out usual operation and maintenance work. Thus, there seems to be no particular problem.

3.4.3 Financial Aspect of Operation and Maintenance

As regards operation and maintenance costs of the project, the necessary amounts are estimated by both Kampong Cham and Battambang Waterworks, and the budget request will be made to the MIH via the DIH of each supervising province where it is scrutinized. Then, after the approval by the MIH, the budget will be allocated to both Waterworks. Tables 11 and 12 show the budget (requested amount), actual allocation and actual expenditure of operation and maintenance costs of each Waterworks. In both Waterworks, it is difficult to divide only the operation and maintenance cost of this project and show the amount, so the operation and maintenance cost of each Waterworks including this project is shown. Necessary operation and maintenance costs have been secured, and no problems have been observed at the time of the ex-post evaluation.

Table 11: Operation and Maintenance Cost for Kampong Cham Waterworks

(Unit: million Riel)

| | 2016 | 2017 | 2018 | 2019 |
|---------------------------|-------|-------|-------|-------|
| Budget (requested amount) | 271.1 | 326.7 | 337.9 | 498.9 |
| Actual allocation | 271.1 | 326.7 | 337.9 | 498.9 |
| Actual expenditure | 237.6 | 320.4 | 263.9 | 459.3 |

Source: Results from questionnaire survey of Kampong Cham Waterworks

Note 1) Personnel costs are not included in the operation and maintenance costs.

Note 2) Actual expenditure is less than the actual allocation due to good maintenance of facilities and equipment – replacement of spare parts, etc. has become unnecessary at the time indicated at the initial plan, and the costs were saved accordingly.

Table 12: Operation and Maintenance Cost for Battambang Waterworks

(Unit: million Riel)

| | 2016 | 2017 | 2018 | 2019 |
|---------------------------|-------|---------|---------|---------|
| Budget (requested amount) | 836.9 | 1,231.5 | 2,060.3 | 1,758.8 |
| Actual allocation | 753.9 | 1,071.0 | 2,036.2 | 1,685.6 |
| Actual expenditure | 746.3 | 722.3 | 1,982.3 | 919.2 |

Source: Results from questionnaire survey of Battambang Waterworks

Note 1) Personnel costs are not included in the operation and maintenance costs.

Note 2) The budget for 2018 has increased significantly due to the renewal of old water pipes. The budget for the following 2019 has decreased in light of the progress of the renewal work.

Note 3) The actual expenditure in 2019 is far below the actual allocation due to delays (time lag) in procurement procedures.

Tables 13 and 14 show the water tariff revenue of each Waterworks. When comparing the actual operation and maintenance costs in Tables 11 and 12 above, the costs are fully covered by the water tariff revenue.

Table 13: Water Tariff Revenue of Kampong Cham Waterworks

(Unit: million Riel)

| 2016 | 2017 | 2018 | 2019 |
|---------|---------|---------|---------|
| 3,275.9 | 4,467.7 | 4,745.6 | 5,362.3 |

Source: Results from questionnaire survey of Kampong Cham Waterworks

Table 14: Water Tariff Revenue of Battambang Waterworks

(Unit: million Riel)

| 2016 | 2017 | 2018 | 2019 |
|---------|----------|----------|----------|
| 7,926.3 | 10,236.7 | 11,763.5 | 16,889.3 |

Source: Results from questionnaire survey of Battambang Waterworks

According to both Kampong Cham and Battambang Waterworks, water tariff collection rate is almost 100%. Water tariff payment is made at the counter set on the 1st floor of each Waterworks building, and bank transfer is also possible for public institutions. When asked the Waterworks about the reasons why there was almost no uncollectable water tariff, following explanation was made: (1) Water tariff is affordable (many households make payment within the range of 10,000 to 20,000 Riel (about USD 2.5 to USD 5) per month), (2) residents are highly conscious (behind that, there is a stable supply of sanitary water 24 hours a day, 365 days a year, and the residents are satisfied with the water services), (3) water tariff collection system has been established (in case of payment delay, Waterworks staff will visit the target resident 3 times. If there is no payment for three months or more, water supply will be suspended.)

Tables 15 and 16 show the water tariff system of each Waterworks. Water tariffs are stipulated in the Ministerial Decrees, and the tariff has been revised in 2016 by Kampong Cham Waterworks and in 2017 by Battambang Waterworks. In this project, the necessity of appropriate tariff setting was addressed, and the revision of actual tariffs is said to be a

pervasive effect of “The Project for Capacity Building for Water Supply System (Phase 3),”²¹ Both Waterworks have introduced a block system for the poor, and the category with the least usage is the tariff for the poor. For Kampong Cham Waterworks, public institutions are to pay a flat rate of 1,600 Riel per 1 m³. Tariffs are to be revised once every five years by the MIH Ministerial Decrees, and according to the MIH, there are plans to change the tariff system to three categories – household, business, and public intuition – in the future. (However, tariff level will continue to be set differently for each Waterworks.) In order for each Waterworks to continue to run a profit, tariff increase is planned in the future. As a result of interview survey with local residents²² on tariff level at the time of site inspection, responses were that the tariff level is relevant and reasonable, including for the poor, and there is no problem even if there is a slight increase of tariff in the future.

Table 15: Water Tariff (Kampong Cham Waterworks)

(Unit: Riel)

| Category | Usage (m ³) | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|-------------------------|-------|-------|-------|-------|-------|
| Households (including Commercial) | 0–6 | 900 | 900 | 900 | 900 | 900 |
| | 7–15 | 1,250 | 1,250 | 1,250 | 1,250 | 1,250 |
| | 16– | 1,600 | 1,600 | 1,600 | 1,600 | 1,600 |
| Public Institutions | Flat rate | 1,600 | 1,600 | 1,600 | 1,600 | 1,600 |

Source: Information provided by Kampong Cham Waterworks (MIH Ministerial Decree 140/2016)

Table 16: Water Tariff (Battambang Waterworks)

(Unit: Riel)

| Category | Usage (m ³) | 2017 | 2018 | 2019 | 2020 | 2021 |
|--|-------------------------|-------|-------|-------|-------|-------|
| Classification only according to the usage | 0–3 | 1,200 | 1,200 | 1,200 | 1,200 | 1,200 |
| | 4– | 1,500 | 1,500 | 1,500 | 1,500 | 1,500 |

Source: Information provided by Battambang Waterworks (MIH Ministerial Decree 258/2017)

From the above, no particular problem has been identified regarding the financial aspect of operation and maintenance.

²¹ Information from the terminal evaluation of “The Project for Capacity Building for Water Supply System (Phase 3),” Revision of water tariff contains the awareness of a following virtuous cycle, “improvement of water services → increase of residents’ willingness to pay and possibility of political agreement → realization of tariff increase → enhancement of sustainability of water utility management.”

²² The interviewees are the same residents described in footnotes 10 and 11.

3.4.4 Status of Operation and Maintenance

It was confirmed that both Waterworks have been operating water facilities/equipment in good condition and have been appropriately operating and maintaining them, including those facilities constructed and equipment procured by the project. At the time of the ex-post evaluation, there were no particular problems with the facilities and equipment of Kampong Cham Waterworks. Battambang Waterworks has some problems and malfunction, and Battambang Waterworks and the MIH are currently considering measures to cope with the situation. Specifically, (1) the underground distribution pipe is partially damaged, and (2) the distribution flow monitoring system²³ is not working, and water volume data is not displayed on the monitor in the central monitoring room. Regarding (1), the underground distribution pipe under the road in front of a house was damaged and not operating due to the loosening of the ground caused by erosion of the Sangke River. The residents are not affected since water is supplied to the water supply area with other water distribution pipes. (2) is a software issue, which Battambang Waterworks is contacting the local vendor to resolve the problem. According to Battambang Waterworks, erosion problems of the Sangke River were surveyed at the time of planning the project, but no particular indication was pointed out regarding the effect to the site, and thus, it can be considered that the problem occurred unexpectedly.

Based on the maintenance and inspection guidelines, both Waterworks carry out daily patrols and inspections and regular maintenance (weekly, monthly, every three months, every six months, every year, etc.) of facilities and equipment and record them, which will be utilized for the preparation for large-scale repair in the future.

Spare parts are stored in the warehouse of each Waterworks, and the inventory lists are updated. Most spare parts can be procured in Cambodia, and they have been procured in a timely manner, and no problems have been observed.

From the above, there are some problems in the operation and maintenance status at the time of the ex-post evaluation, but as a whole, there is no problem because facilities are properly operated and maintained.

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

²³ The distribution flow monitoring system was introduced for the purpose of grasping distribution volume and managing flow volume data in a centralized manner. Specifically, electromagnetic flow meters and local stations are installed at 2 locations in total – the crossing point of the Sangke River and the outlet point of the treatment plant. Flow data are sent to the central monitoring room in the administration building of the Battambang Waterworks for monitoring.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

This project expanded water supply facilities in Kampong Cham City and Battambang City to improve access to safe water for residents of both Cities. This project, which aims to improve water supply capacity, is consistent with Cambodia's development policy, development needs and Japan's assistance policy at the time of planning and the ex-post evaluation. Therefore, the relevance of the project is high. In terms of project implementation, both the project cost and project period were within the plan. Therefore, efficiency of the project is high. As for project effects, quantitative indicators set at the time of planning are mostly achieved. As for qualitative effects, it was confirmed from the interviews with local residents that improvement of insufficient water volume and pressure from taps have realized and stable water supply has achieved. Regarding impacts, it can be considered that the project has contributed to the improvement of hygiene situation, promotion of employment of women and facilitation of school attendance of children, based on the interviews with local residents. In addition, this project has effectively collaborated with other donors' support and contributed to the promotion of water connections for poor households. Therefore, this project has mostly achieved its objectives and thus, effectiveness and impacts of the project are high. No negative impacts on natural environment and resettlement have been reported. Regarding operation and maintenance, no major problems have been observed in the institutional/organizational, technical, financial aspects and current status. 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 Executing Agency

Importance of taking early measures to cope with facility problems due to the erosion of the Sangke River and the software problems in Battambang

Regarding the distribution pipes constructed by the project, the underground distribution pipe under the road in front of a house was partially damaged due to the loosening of the ground caused by erosion of the Sangke River in Battambang. In this regard, it is important that the MIH takes the initiative and coordinates/collaborates with the Ministry of Public Works and Transport (MPWT), which has jurisdiction over revetment works of the Sangke River and its branch organization, the Department of Public Works and Transport (DPWT) as well as with the Ministry of Water Resources and Meteorology (MOWRAM) and its branch organization, the Department of Water Resources and Meteorology (DOWRAM) as soon as possible, and takes actions against the erosion problems. In addition, regarding the software

problem, the distribution flow monitoring system is not working. Therefore, it is important that Battambang Waterworks, in coordination with the MIH and the DIH takes actions to repair and restore the system as soon as possible.

4.2.2 Recommendations to JICA

None.

4.3 Lessons Learned

Enhancement of project effects through cooperation with other donors, JICA technical cooperation and efforts in Cambodia to reform the water supply sector

This project provided comprehensive support, building on top of the ADB and the UN-HABITAT projects, which were implemented in the past, expanded water supply areas, and promoted connection of poor households utilizing these projects. In addition, capacity building for operation and maintenance work and production management provided through the soft component of the project was consistent with the series of capacity building support implemented by JICA's long-term technical cooperation, and the implementation of the project took place in appropriate timing and sequence. Furthermore, in good coordination with JICA's technical cooperation, PPWSA carried out technology transfer to local public waterworks. As a result of such a series of support and efforts, both Kampong Cham and Battambang Waterworks have solidified appropriate management bases for water supply business, reduced non-revenue water, and carried out appropriate operation and maintenance, and thus have realized improvement of access to safe water. Therefore, when implementing similar projects in the future, cooperation with other donors in the same sector as well as provision of coherent assistance with JICA's other technical cooperation and reform initiatives of the recipient country would be considered effective.

Program approach that utilizes various actors is effective

Sustainability of the effects produced by this project is high because of the effective cooperation (program approach) between this project (Grant Aid) and the long-term technical cooperation. As described in Box 1, JICA has been aiming to realize synergetic effects by collaborating multiple projects across the framework of individual projects and strategically providing support as one cooperation program. With the participation of Kitakyushu City, which has a long history of cooperation and is familiar with the local situation, in this series of support, JICA was able to strengthen consistent program management. Therefore, program approach that utilizes various actors is effective as a strategic cooperation approach.

[BOX 2: Kitakyushu City's Contribution to Cambodia's Water Supply Sector]

Regarding contribution of Kitakyushu City to this project and in Cambodia, following remarks were made by the Director of Kampong Cham Waterworks, the project consultants (Nihon Suido Consultants Co., Ltd.), and Kitakyushu City.

<Remarks by the Director of Kampong Cham Waterworks>

Kitakyushu City's support for Kampong Cham Waterworks through JICA projects has become 15 years. After completion of the ADB project (2004–2006), water treatment and water supply functions have improved, but there were various issues regarding operation and maintenance of facilities and equipment and the financial aspects of water supply business. Under such circumstances, Kitakyushu City provided support through JICA's technical cooperation project, "The Project on Capacity Building for Urban Water Supply System in Cambodia (Phase 2, 3)" to promote technology transfer and capacity building. In parallel with this, this grant project was also implemented, and JICA comprehensively provided support including the soft component, which Kitakyushu City has undertaken, utilizing the water supply and distribution infrastructures developed by the ADB. Kitakyushu City's contribution was also substantial in the "Provincial Tour" (see footnote 19), which was implemented as part of "The Project on Capacity Building for Urban Water Supply System in Cambodia (Phase 3)." The Tour was conducted to reconfirm how Kitakyushu City's knowledge of water supply business operation was being used in the field. In this way, as a result of Kitakyushu City's constant involvement and continuous and consistent support, non-revenue water rates of Kampong Cham Waterworks were reduced from 50% (2006) to 6% (2019). In addition, financial situation was strengthened, and deficit was resolved in 2010. Since then, Kampong Cham Waterworks has been running a profit. Up to now, the experiences of Kitakyushu City have been utilized in Cambodia through lectures and practical training, but the experiences and knowledge of the City do not always match the actual situation of Cambodia, and PPWSA complemented that part well – development to provincial areas has been carried out based on PPWSA's own growth experiences. Specifically, training was provided tailored to the situation of facilities and equipment in Cambodia and the skill levels of the staff based on the inputs and advice from PPWSA. Since Cambodia does not have modern facilities and equipment like Japan, trainings were carried out according to the actual conditions of Cambodia. Also, since there were few engineers with specialized knowledge in Cambodia, practical trainings were conducted according to their capacities. The staff of Kitakyushu City are good coaches, good friends, and good leaders, and they have provided support while building a very good

relationship with the staff of Kampong Cham Waterworks. We are very grateful to them.

<Remarks by the project consultants (Nihon Suido Consultants Co., Ltd.)>

Long-standing cooperation of Kitakyushu City Water and Sewer Bureau in Cambodia has also become extremely important when implementing projects by the consultants. As a Japanese water utility, in addition to being familiar with the water business in the field, it has a deep understanding of project implementation capacity of the Cambodian side and has become a voice for them. For example, at the design stage, considering the operation and maintenance, Kitakyushu City was able to improve quality of design by providing useful inputs to the consultants while taking into consideration the intentions of the Cambodian side. In this respect, it can be said that Kitakyushu City has greatly helped the communication between the consultants and the counterpart organizations.

Cooperation and advice of Kitakyushu City Water and Sewerage Bureau is convincing because it has experiences and know-how in cooperation related to water supply business in Cambodia, backed by many years of experience and achievements. In addition to this, great strength of Kitakyushu City is that for many years, the staff have been staying in the field without interruptions and they understand the background of project implementation as well as they are able to respond flexibly when issues arise. Through such long-standing cooperation over 20 years, maintaining close relationships at the individual level is also considered that it contributes to sustainability of bilateral cooperation. The Cambodian counterparts who have received trainings before are now involved in decision making as a manager class personnel.

In this respect, Kitakyushu City has a special presence in the water supply business in Cambodia, and it can be considered that this is one model of a long-term technical cooperation by a Japanese water utility.

<Remarks by Kitakyushu City>

Kitakyushu City has been deeply involved with Cambodia as a water utility, including human relations, trust relationships, and network building, and has made international contributions firmly including technology transfer. In the past, Kitakyushu City has made various efforts to deal with problems such as drought and water leakages. It is a unique contribution of a water utility to be able to provide specific advice and recommendations to the Cambodian side, based on the experience and knowledge gained from its own history of water supply business management. The advantages of Kitakyushu City's participation in the ODA projects include following points. (1) International sense of the staff in charge can be fostered, (2) In Kitakyushu City, maintenance work is the main activity, and the number of staff involved in expansion projects is decreasing. However, there are many expansion projects overseas, and

it is possible to develop human resources through OJT that cannot be carried out in Japan, and (3) The Water and Sewer Bureau can diversify its work. On the other hand, challenges are that securing human resources is difficult. Since ODA projects have a long-time span of 5 to 10 years, and there are personnel changes during the period, it is difficult to secure and assign substitute staff who can adapt to overseas projects. In addition, as an organization, it is not always possible to have overseas projects stably. Thus, there are many challenges in securing human resources under such situations. On the other hand, in Kitakyushu City, as a future city of SDGs set by the Cabinet, Kitakyushu City is committed to contributing to 6 (water and sanitation), 8 (growth and employment), 9 (innovation), and 17 (means of implementation) among the 17 goals of SDGs, through overseas water business. Kitakyushu City believes that contributions to Cambodia with achievements and results so far can be greatly appealed as the City and considers that this will lead to the civic pride of the citizens.