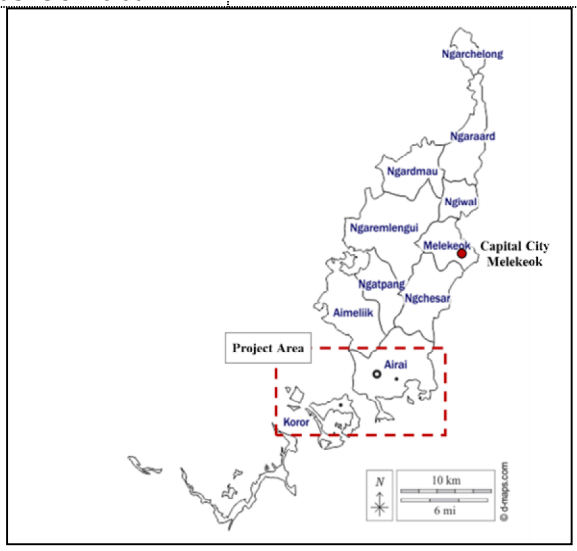
FY2021 Simplified Ex-Post Evaluation Report of Japanese Grant Aid Project

External Evaluators: Keisuke Nishikawa, Yoko Sugimoto, QUNIE CORPORATION

Duration of the Study: September 2021 - November 2022
Duration of the Field Study: 11 January 2022 - 21 January 2022

Country Name	The Project for Improvement of Water Supply System
Republic of Palau	



Location of the Project site (source: d-maps.com)

Malakal service tank, newly constructed under this project (source: taken by the evaluator)

I. Project Outline

Background	Some water supply facilities in Koror and Airai states, the economic centers of Palau, were developed during the period of Japanese mandate and had been deteriorating. In particular, the major water distribution pipelines in central Koror were made of asbestos cement and had frequent leakages, which was the cause of the high Non-Revenue Water (hereinafter referred to as "NRW") ratio (about 48%). It was necessary to blockade part of the road when repairing the leaks, which seriously affected Palau's economic activities. In addition, only one water transmission pipe supplied purified water from the Airai Water Treatment Plant, the only water purification facility, to the central Koror and Airai states. The facility's water transmission capacity was significantly insufficient to meet the water demand at that time. Malakal Island, located at the end of the water supply system, routinely had low water supply pressure. Also, the upland area of Koror Island (Ngerbeched area) had frequent low water supply pressure that did not reach the prescribed water supply pressure, resulting in an imbalance in the benefits of the water supply. Such an unstable water supply system could negatively affect residents' living conditions and the Palauan tourism industry. This project was implemented in response to the Palauan government's request for grant aid to improve the water supply system.
Objectives of the Project	The objective of the project is to ensure a stable and equal water supply in Koror State and Airai State by improving the transmission mains (double pipelines), replacing the distribution lines, and reforming the water distribution zones, thereby contributing to the improvement of the residents' living conditions.
Contents of the Project	1. Project Site: Koror State, Airai State 2. Japanese side 1). Contents of construction of facilities and procurement of equipment (The table shows the actual outputs, and some numbers were changed from the plan.)

Items	Facilities
1. Improvement of Water Transmission System	1-1 Installation of additional water transmission mains from the Airai Water Treatment Plant up to the Ngerkesoaol service tank ➢ L = 5,416 m、Ductile Cast Iron Pipe (DCIP) Nominal Diameter (DN) 400 mm
2. Improvement of Water Distribution Networks (Re-arrangement of Water Distribution Zones)	2-1 Installation of exclusive water transmission mains for the establishment of the Malakal water distribution zone ➢ L = 3,094 m, DCIP DN 250 mm 2-2 Re-arrangement of water distribution zones (Construction of Malakal service tank[1], Installation of flow meters at each service tank) ➢ Service tank: 1 unit, Capacity: 950 m^3, Reinforced Concrete (RC)-made, Rectangle ➢ Flow meter: DN 150-200 mm, 5 units
3. Improvement of Water Distribution Networks	3-1 Replacement of deteriorated Asbestos Cement (AC) pipe ➢ Target distribution pipeline extension :12.92 km^2, Polyvinyl Chloride

[1] There had been a Malakal service tank on Malakal Island. However, it had never been used, and its durability could not be guaranteed due to possible leakages. Therefore, it was newly constructed under this project.

	(Replacement of Major Water Distribution Pipelines)	(PVC) DN 200-300 mm ➢ Lateral connection: 305 units[3], PVC DN 50 mm

2). Soft Components
(1) Guidance on analysis of water transmission/distribution volume (Creation of management tools for water transmission and distribution, customer water usage, and NRW data)
(2) Guidance on leak detection techniques (Practical training of screening survey and ground microphone survey for leak detection, Preparation and support of report of water leakage repair, and Preparation of the water leakage survey plan / NRW reduction plan)

3. Palauan side:
Improvement of access road to the Malakal service tank facility, Provision of required power cable for service tanks, Provision of lateral connections for each household (connection of water supply pipes), etc.

Implementation Schedule	E/N Date	May 20, 2015	Completion Date	April 25, 2018
	G/A Date	May 28, 2015		
Project Cost	E/N Grant Limit / G/A Grant Limit: 1,843 million yen, Actual Grant Amount: 1,761 million yen			
Executing Agency	Palau Public Utilities Corporation: PPUC			
Contracted Agencies	Main Contractor(s): TOBISHIMA CORPORATION Main Consultant(s): Yachiyo Engineering Co., Ltd., NIHON SUIKO SEKKEI Co., Ltd. Agent: N/A			

II. Result of the Evaluation

Summary

The objectives of the project were to ensure a stable and equal water supply in Koror State and Airai State by improving the transmission mains (double pipelines), reforming the water distribution zones, and replacing the distribution lines , thereby contributing to the improvement of the residents' living conditions. The project was relevant and coherent with the development policy of Palau, Japan's ODA policy towards Palau, and the global framework such as SDGs at the time of Ex-Ante Evaluation. Also, it has synergistic effect/mutual relation with JICA's other projects and other donors' support. Therefore, the relevance and coherence is high. By implementing the project, the capacity of the facilities' water transmission was improved to the level of meeting the water demand, and the issue of water supply pressure in the area suffering from low water pressures was improved. As a result, the project has realized a stable and equal water supply and improved the living conditions of residents and the business operation environment of the business owners. It has also made it easier for the executing agency to manage water distribution, detect water leakage, etc., which is expected to positively affect future financial improvements. Therefore, the effectiveness and impacts of the project are high. Although both the project cost and period exceeded the plan, they were not increased or extended to the extent that it significantly impacted the project. Therefore, the efficiency of the project is high. The facilities developed under the project have been operated without problems and appropriately maintained and managed. Sustainability is ensured in terms of policy and institution, the organization and structure of the executing agency (PPUC), and technical aspects in Palau, but some challenges have been observed in the financial aspects. However, PPUC is working with the government to research and make coordination to raise water tariffs. Also, the technical cooperation project (The Project for Strengthening Capacity in Non-Revenue Water Reduction in Palau) that began in 2022 is expected to provide assistance to reduce NRW, and there are prospects for future resolution and improvement. Therefore, the sustainability is high.

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

Overall Rating[4]	**A (Highly satisfactory)**	**Relevance & Coherence**	**③[5]**	**Effectiveness & Impact**	**③**	**Efficiency**	**③**	**Sustainability**	**③**

<Special Perspectives Considered in the Ex-Post Evaluation/Constraints of the Ex-post Evaluation>

・The quantitative effects of the project were evaluated primarily based on the achievement of the two indicators, "Capacity of clear water transmission" and "Service pressure," which were set at the time of the Ex-Ante Evaluation. However, "ratio of the population connected to the public water," "water quality," and "number (frequency) of water outages" were also examined as complementary information.

1 Relevance/Coherence

<Relevance>

・Consistency with Development Policy of Palau at the Time of Ex-Ante Evaluation

In "The Palau Medium Term Development Strategy 2009-2014," "improvement of the water supply system" and "proper management and sound financial management" were high-priority projects. Installation of additional water transmission mains, re-arrangement of water distribution zones including the construction of the Malakal distribution zone, and replacement of water distribution pipeline implemented by this project contributed to a stable and equal water supply in the central Koror and Airai states, proper management and operation, and improvement of the financial situation in the future. Therefore, this project was consistent with the development policy of Palau at the time of the Ex-Ante Evaluation.

[2] The total length of the deteriorating main water distribution pipes was approximately 32.5 km, but since it was difficult to renew all of them at once due to construction management, this project renewed 12.92 km of high-priority pipes as the first phase.
[3] The number was 308 units at the time of planning, but was changed to 305 units (Refer to "Efficiency" for details).
[4] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory
[5] ④ : Very High ③: High, ②: Moderately low, ①: Low

・Consistency with the Development Needs of Palau at the Time of Ex-Ante Evaluation

At the time of the Ex-Ante Evaluation in 2015, the Koror-Airai water supply system required improvement due to unstable and unbalanced water supply, including insufficient water transmission capacity to meet the demand and frequent low water supply pressure in Malakal Island and the upland area of Koror Island (Ngerbeched area). In addition, the high NRW ratio, presumed to be caused by water leakage, led to increased water purification and transmission costs, putting pressure on the financial situation of the executing agency. Therefore, this project was consistent with the development needs of Palau at the time of Ex-Ante Evaluation.

<Coherence>

・Consistency with Japan's ODA Policy at the Time of Ex-Ante Evaluation

In the Okinawa "Kizuna" Declaration adopted at the sixth Pacific Islands Leaders Meeting held in 2012, the Japanese government had positioned "environment and climate change" as one of the pillars of cooperation and expressed support for water resource management. In addition, the water sector was positioned as a priority area, "Strengthening the Economic and Growth Infrastructure," in Japan's Country Assistance Policy for Palau and was placed in "Environmental Conservation" in JICA's country analysis paper for the Pacific region, which intended to support proper operation and management of water supply in the islands. Therefore, this project was consistent with Japan's ODA Policy for Palau at the time of Ex-Ante Evaluation.

・Internal Coherence

JICA has established water supply systems in Koror and Airai states under the Grant Aid Project the "Project for Improvement of Water Supply System (1990)." Also, the "The Project for Strengthening Capacity in Non-Revenue Water Reduction in Palau (2022)" is being implemented after the completion of this project. Therefore, this project has synergistic effects/mutual relations with JICA's other projects.

・External Coherence

In the past, ADB supported the installation of customer meters and the replacement of water pumps. Together with the installation of flow meters in each service tank under this project, it has enabled PPUC to visualize the amount of water supply, revenue water, and NRW by each distribution zone. ADB also supported the development of sewage systems. Through this, the wastewater treatment system was in place to handle the increase in water use that would result from improvements to the water supply system by this project. Therefore, this project does not have overlaps with other donors' support and has synergistic effects/mutual relations.

Regarding the global framework, the project was consistent with the perspective of improving water use efficiency and expanding support for capacity building in developing countries, as outlined in GOAL 6 (Ensure access to water and sanitation for all) of the SDGs.

<Evaluation Result>

In light of the above, the relevance and coherence of the project are high[6].

2 Effectiveness/Impact[7]

<Effectiveness>

At the time of Ex-Post Evaluation, the quantitative and qualitative effects of the project were confirmed as expected, so the objectives of the project have been achieved.

(1) Quantitative Effects

It was confirmed during the field survey that all facilities established under this project were in proper working order. The capacity of clear water transmission (Indicator 1), an indicator of quantitative effectiveness, refers to the maximum amount of water that the facility can deliver based on the design. Since water is not actually delivered up to the maximum amount in normal operations, the executing agency could not ascertain whether it met the designed capacity of clear water transmission. However, because the facilities were constructed as planned, the water transmission capacity of 4.0 MG/day as an operational index is considered to be met. According to the executing agency, the actual average water transmission amount at the time of the Ex-Post Evaluation was about 3.2 MG/day, and it can be said that the water transmission capacity is maintained to meet the demand.

Regarding the service pressure (Indicator 2), in the Ngerbeched area, where the pressure was the lowest, the water supply pressure has greatly exceeded the target since the completion of the project. The reinforcement and renewal of the water transmission mains and the reorganization of water distribution zones, including the creation of the Malakal distribution zone, enabled the water level in the service tank to remain constantly high, resulting in a stable and high water supply pressure. The water supply pressure is very much higher than the target value. Still, this target value (20 psi) was set as the minimum water supply pressure required for firefighting activities, and 40 psi is usually considered to be the optimum water supply pressure. Although the 2019 actual value (56 psi) is slightly higher than the optimal level, PPUC stated that it was not a value that would cause new problems such as water leakage in this area[8].

As other complementary information, the ratio of the population connected to the public water, water quality, and the number (frequency) of water outages were also examined in the Ex-Post Evaluation. The ratio of the population connected to the public water was almost 100% both before and after the completion of the project (at the time of the ex-post evaluation) (This project did not aim to expand the population connected to the public water. There were no problems in terms of the ratio of the population connected to the public water before and after the completion of the project). Regarding water quality, PPUC and the Environmental Quality Protection Board (hereinafter referred to as "EQPB") confirmed the results of quality inspections before and after the completion of the project and found no significant changes. It was found that the Koror-Airai water supply system met the water quality standards set by the EQPB before the project was implemented and continued to do so at the time of the Ex-Post Evaluation. On the other hand, when checking with PPUC regarding the number of water outages, although accurate data was not recorded, the number of water outages was dramatically reduced

[6] Relevance: ③, Coherence: ③

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

[8] However, some sections of the water distribution lines are ageing, and water leakage may occur in the long term. It is necessary to renew aged water distribution lines in areas where water supply pressure has increased as a result of this project.

due to improved management of water distribution lines. Also, the extent of water outages has been narrowed through the reorganization of water distribution zones, which confirms the effectiveness of the project implementation.

Quantitative Effects

Indicators	Base Year 2013 Planned year	Target Year 2020 3 years after the completion	Actual 2018 Year of the completion	Actual 2019 1 year after the completion	Actual 2020 2 years after the completion
Indicator 1 Capacity of clear water transmission (MG/day(m^3/day)) (※1)	2.1 MG/day (7,950 m^3/day)	4.0 MG/day (15,140 m^3/day)	With the installation of the designed additional transmission line, capacity is expected to be as planned (4.0 MG/day) since the beginning of the operation (the actual average water transmission amount at the time of the Ex-Post Evaluation was about 3.2 MG/day)		
Indicator 2 Service pressure (psi (MPa)) (※1)	Less than 2 psi (0.014 MPa) in the central Koror and overall Airai states	More than 20 psi (0.14 MPa) in the central Koror and overall Airai states (※2)	38 psi	56 psi	44 psi

Source: Ex-ante Evaluation Paper, Data provided by PPUC
(※1) 1 MG (Million Gallons) = 3,785 m^3、1 psi (pound per square inch) = about 0.007 MPa
(※2) the monitoring area is Ngerbeched area, the lowest pressure area

(2) Qualitative Effects

As a qualitative effect of the project, it was assumed that water distribution management and water leakage detection would become easier due to the reorganization of water distribution zones. According to PPUC, water distribution management and water leakage detection have become easier through the rearrangement of water distribution zones and technical assistance in water leakage detection through the soft component, and qualitative effects are realized. In terms of water distribution management, in the Koror-Airai water supply system, water intake and purification are performed on Babeldaob Island, where Airai State is located, and the water flows from the east side of Koror Island via transmission mains finally reach Malakal Island at the western end (Figure 1). There are several service tanks along the way. Still, before the completion of this project, there were no service tanks in the eastern part of Koror Island, which is the first distribution zone after water was delivered from the Airai water treatment plant, and water was distributed directly from the treatment plant. A system that directly connects the water purification plant to the water distribution zone without service tanks could not guarantee a stable water supply service, and it was also difficult to control the volume of water distributed. When maintenance was required in the area, it was necessary to stop the water supply from the Airai water treatment plant, which affected the entire water supply system. The project has eliminated the direct water distribution zone by adding a transmission main and enabled the distribution of water from the service tank (Figure 2). That has enabled the management of water distribution volume and maintenance for each distribution zone, as well as more concrete monitoring of water leakage conditions.

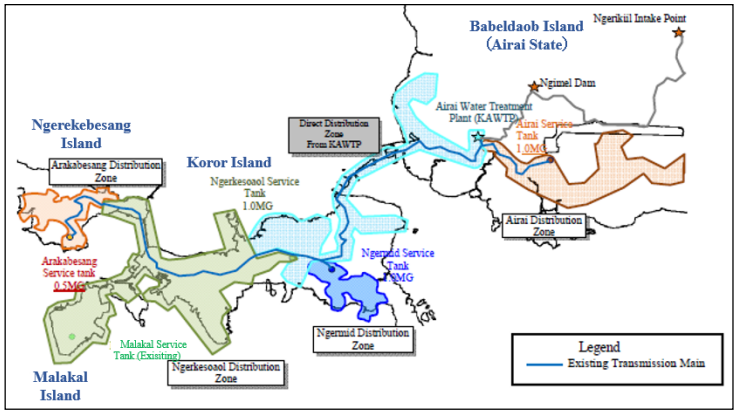


Figure 1：Water Distribution System before the Project

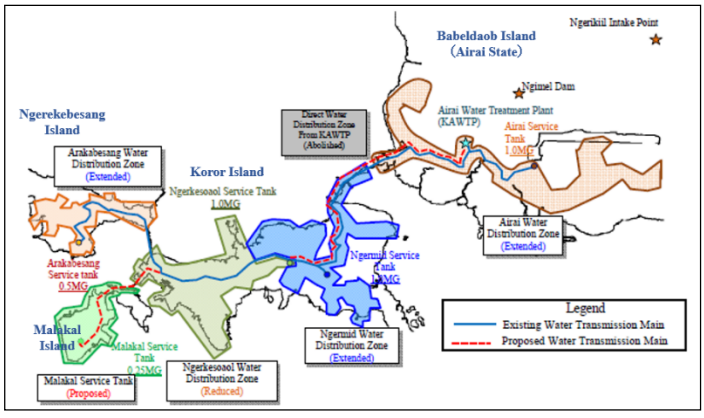


Figure 2：New Water Distribution System after the Project

Source: Preparatory Survey Report

Before the project, the equipment for leak detection was inadequate, and the skills of staff members, including how to use the equipment, were insufficient. Through the soft component of the project, the staff learned the correct method of leak detection on actual roads, and are now able to keep records and perform the work on a regular basis while keeping track of the results. In addition, the "The Project for Strengthening Capacity in Non-Revenue Water Reduction in Palau," which has been implemented since 2022, aims not only to further improve leak detection and repair capabilities but also to enable specific measures to be taken regarding NRW. Support is being provided to implement more effective NRW measures through pipe replacement and NRW management in the pilot area. Reducing the amount of NRW is expected to improve water utility management because it reduces unnecessary water distribution, which in turn reduces operation and maintenance costs (e.g., personnel expenses and electricity costs).

<Impacts>

There were three main impacts assumed for this project at the time of Ex-Ante Evaluation.

As for the first expected impact of the project, "the living conditions of the residents will be improved through the stable and equal water

supply," interviews with residents in the Ngerbeched and Malakal areas who had been suffering from low water supply pressure were conducted[9]. It was confirmed that both water supply volume and water pressure became stable throughout the day after the completion of the project and that the project has improved the living conditions of the residents. In addition, according to PPUC, before the project was implemented, the residents and business owners often complained to PPUC about the low water pressure. However, after the project, PPUC no longer receives any complaints, which indicates that the situation has improved.

Regarding the second impact, "stabilization of water supply is expected to contribute to strengthening economic activities of foreign visitors," the impact on businesses, mainly in the tourism industry, was confirmed. According to interviews with the Palau Chamber of Commerce and local businesses owners (hotels, restaurants, apartment managers, tour companies, etc., in the low water pressure area[10]), the water supply volume and water pressure issues have been greatly improved, as mentioned above. That enabled them to provide stable quality services to their customers and to conduct business operations without concerns about the low water pressure.

Regarding the third impact, "the stable water supply and installation of water meters are expected to improve PPUC's financial situation by providing a fair water supply and clarifying fee collection," the financial situation had not yet improved at the time of the Ex-Post Evaluation. However, the rearrangement of water distribution zones and installation of flow meters enabled PPUC to identify and manage where and how much NRW was being generated. The necessary preparations were in place to improve the financial situation in the technical cooperation project initiated in 2022 (Refer to “4 Sustainability” for details of the financial situation).

The environmental permit from the EQPB was obtained in October 2016, with the incidental condition regarding air quality, water quality, noise, and waste during construction, which the contractors addressed to meet the country's domestic emission and environmental standards. During construction, there were also incidental conditions related to traffic monitoring and safety on public roads. Traffic monitors were deployed and managed to ensure safe passage for drivers and pedestrians during construction. The negative impact on the natural environment due to the implementation of the project was minor (the guideline for environmental and social considerations applied to the project was "JICA Guidelines for Environmental and Social Considerations (2010)," and the environmental category was B). PPUC, the EQPB, and the project consultants took measures on environmental mitigation and safety as planned, and it was confirmed that the monitoring during construction was carried out without problems. Resettlement did not occur, and the small farming lands used by nearby residents near the service tank in Malakal Island were peacefully vacated after explanation by the Koror State Government. In addition, it was confirmed through interviews with PPUC, the EQPB, the Palau Chamber of Commerce, and other organizations that no negative impacts on gender equality, human rights or marginalized people occurred due to the project implementation.

<Evaluation Result>

From the above, the effects were generated as planned, by the implementation of this project, and therefore, the effectiveness and impacts of the project are high.

3 Efficiency

The outputs of the project are as described in "I. Project Outline" above, and with the exception of some changes, the project was generally implemented as planned. The main change is in the number of installed lateral connections for the water distribution system improvement (from 308 to 305 units). That is reasonable since the location of the existing pipes did not match the management record and could not be located within the project period, and the Japanese and Palauan sides agreed upon the change. Also, the number of units decreased by only three, which was a minor decrease and did not significantly impact the overall project (it was confirmed that these three units were installed after the completion of the project as the obligatory work by the Palauan side.)

Regarding the inputs, the Japanese side's planned project cost was 1,843 million yen, while the actual cost was 1,761 million yen, well within the planned range. The Palauan side's actual project cost was approximately 113 million yen[11], compared to the original plan of 27 million yen. Therefore, the total project cost was 1,874 million yen, slightly exceeding the plan (100.2% of the plan). The cost on the Palauan side is mainly for the connection of the water supply pipe to each house, which includes surveying the existing water pipe installation, excavation, and installation of a new pipe (including valves) to connect the new water pipe to the customers' existing water pipes. Due to the lack of drawings of the existing system, the number of connections increased (from 308 in the original plan to 313 in the end[12]), and the connection distance was extended (because the connection point turned out to be farther than originally expected), resulting in additional costs.

While the project period was planned for 29 months, from June 2015 to October 2017, the actual project period was 35 months, from June 2015 to April 2018, which exceeded the plan (121% of the plan). It was due to additional time required by factors such as unsuccessful bids, suspension of construction and changes in excavation methods because of the discovery and disposal of UXO, and delays in obtaining environmental and construction permits.

<Evaluation Result>

From the above, both the project cost and the project period exceeded the plan, but the increase in cost and extension of the project period were not so large as to have a significant impact on the project (less than 125% compared to the plan), so the efficiency of the project is high.

4 Sustainability

・Policy/and System

The government's priority for the water sector remains high and is also a priority in the "Palau National Infrastructure Investment Plan

[9] Interviews were conducted with six respondents, three each from the Ngerbeched and Malakal areas. All respondents indicated that water supply issues have improved since the project was completed.

[10] Interviews were conducted with a total of seven business owners.

[11] Actual USD 997,779.4, and planned USD 230,820.1, based on average annual exchange rate of USD/JPY from 2015-2018 ((121.04+108.79+112.17+ 110.42)/4 = 113.105)

[12] The plan was to connect 308 units, but as stated, only 305 units were connected during the project. After completing the project, the Palauan side completed the remaining three connections. By further investigation on the Palauan side, it was found that not only the planned 308 connections but also five additional connections were needed, so 313 connections were finally installed.

2021-2030." It was confirmed that efforts are being made to sustain the effects generated in the project, particularly in a move by the government and PPUC to research and make coordination for raising water tariffs to improve the financial situation.

・Institutional/Organizational Aspect

According to PPUC, PPUC as a whole has 301 employees, and the Water and Wastewater Operation (WWO) has 81 staff members in charge of operations in the Water Operation Department and 19 in charge of operations in the Wastewater Operation Department. Among them, the Koror-Airai water supply system is operated and managed by 15 personnel, including two experts in leak detection. Although more engineers are needed to improve the operation and management services, the number of engineers is sufficient to ensure that there are no problems implementing operation and maintenance management for the facilities developed under the project.

・Technical Aspect

According to PPUC, the staff has many years of experience in water system management operations and retains sufficient competence to perform maintenance activities. In addition, they use the "Data Management Manual of NRW (2018)," a manual developed under the project to identify and manage the NRW ratio. Also, the human resources department is preparing a training program (capacity development plans for different departments, such as power and water) to improve employees' skills (scheduled to start by the end of 2022[13]). Therefore, the environment that will allow the technology to be passed on in the future is in place.

・Financial Aspect

According to PPUC, the maintenance budget for the facilities related to this project is adequate. However, there has been no improvement in the Water Operations Department's cost recovery ratio (operating revenues divided by operating expenses) before and after the implementation of the project. The deficit situation caused by the operation of WWO's water supply business has not improved (Table 1). Although the annual budget and actual expenditures for operation and maintenance specific to the facilities constructed under the project were not clear, the income statement of the Water Operations Department (Table 2) shows that the department has not secured enough revenue to cover its annual expenses. Because the payment collection ratio has been very high, almost 100% since 2013, the low water tariffs have significantly impacted. Although the operation and maintenance budget for the facilities has been secured, the operation and maintenance budget continues to rely on government subsidies, etc., as it did before the implementation of the project. The Water Operations Department appears not financially strong enough to sustainably continue its operations. However, as mentioned above, the government and PPUC are researching and coordinating to raise water tariffs, and an ongoing technical cooperation project is also helping to improve the NRW ratio, one of the causes of the problem. Therefore, there are prospects for future resolution and improvement of the financial situation.

Table 1: Revenues and Expenses of Water Operations Department of WWO
(1,000 USD)

	2016	2017	2018	2019	2020
Operating revenues	3,085	3,575	2,102	3,068	2,898
Operating expenses	4,240	3,657	4,367	4,405	4,437
Cost recovery rate	73%	98%	48%	70%	65%

Source: PPUC Independent Auditor's Report 2016 (p.46), 2017 (p.48), 2018 (p.56), 2019 (p.51), 2020 (p.55)

Table 2: Profit and Loss Statement of WWO, PPUC (1,000 USD)

	2016	2017	2018	2019	2020
【Operating revenues】	**7,212**	**5,498**	**6,967**	**3,001**	**5,781**
Water and Wastewater Operations	4,390	5,436	5,616	4,815	4,572
Other	119	157	374	348	122
Provision for uncollectible receivables	-22	-22	-588	-56	-80
Operating subsidies from the government	2,267	0	1,695	0	1,600
Other nonoperating revenues/expenses	458	-73	-131	-2,107	-433
【Operating expenses】	**7,620**	**7,494**	**9,007**	**9,237**	**9,288**
Water and Wastewater Operations	5,048	4,786	5,987	5,687	5,792
Depreciation	1,753	1,703	1,848	2,305	2,239
Administration	818	1,004	1,172	1,245	1,256
【Revenues and loss before capital contributions】	**-408**	**-1,996**	**-2,040**	**-6,236**	**-3,506**
Capital contribution*1	1,380	10,319	5,194	672	167
Change in net position	971	8,323	3,154	-5,564	-3,339
Net position at beginning of year	6,758	8,675	16,998	20,152	14,588
Net position at end of year	**7,729**	**16,998**	**20,152**	**14,588**	**11,249**

*1: Capital contribution from the Government of Palau and grant aid from the Japanese government, etc.
Source: PPUC Independent Auditor's Report 2016 (p.46), 2017 (p.48), 2018 (p.56), 2019 (p.51), 2020 (p.55)

[13] It is in preparation as of May 2022.

・Social and Environmental Aspect

Inspection and maintenance of the facilities constructed under the project are being conducted daily. Water quality testing is also conducted regularly by PPUC and the EQPB, and no significant negative environmental or social impacts are anticipated in the future.

・Preventative Measures to Risks

The project was implemented as planned, and none of the risks anticipated at the time of planning (e.g., insufficient budget secured by the Palauan side or insufficient construction costs due to price increases) occurred. The risk in sustaining proper operation and maintenance in the future is the financial strength of PPUC. Looking at the financial situation, PPUC has not been able to secure a sufficient budget to continue operation and maintenance with water utility revenues since the Ex-Ante Evaluation. Low water tariffs and the high NRW ratio are the factors in the challenges, and with regard to the water tariffs, the government and PPUC are continuing research and coordination to raise them. However, to gain the public's understandings of the rate increase, it is first necessary to improve the efficiency of operations by reducing NRW, which is planned to be improved through the "The Project for Strengthening Capacity in Non-Revenue Water Reduction in Palau" starting in 2022. Based on the above, it appears that measures are taken to address this risk.

・Current Status of Operation and Maintenance

At the time of the Ex-Post Evaluation, the facility was in good operating condition. Water quality and quantity measurements and records, daily inspections, and routine maintenance are being performed as planned. No major problems were identified in the procurement of spare parts.

<Evaluation Result>

Although there are some financial issues, there are prospects for improvement. There are no major problems in other aspects such as Policy/System, Institutional/Organizational Aspect, Technical Aspect, Social and Environmental Aspect, Preventative Measures to Risks, and Current Status of Operation and Maintenance. Therefore, the sustainability of the project effects is high.

III. Recommendations & Lessons Learned

・Recommendations to Executing Agency

PPUC continues to operate at a loss. In order to sustainably operate and maintain water supply facilities and provide appropriate water supply services, the improvement of the financial structure is an important issue. The causes of this problem are low revenues due to the low water tariffs and the high NRW ratio leading to the increases in costs, both of which require improvement. The improvement of NRW is being implemented through the technical cooperation "The Project for Strengthening Capacity in Non-Revenue Water Reduction in Palau" starting in 2022, and more specific NRW improvement activities are planned through pilot activities and other means. The installation of flow meters and technical assistance provided by this project have enabled an accurate understanding of the current status of NRW, and the groundwork has been laid for the improvement. However, to link this to the results of the technical cooperation project, it is important to make efforts to maintain and improve the technical skills by continuing to analyze water distribution volume and detect water leakage, utilizing the guidance provided. Along with this, it will be necessary to prioritize distribution pipes that need to be renewed and to develop mid- to long-term plans for renewal and preventive maintenance of water distribution pipes, through the technical cooperation project and others. Since water tariffs are currently at an extremely low level, it will be necessary to lobby the government for appropriate pricing to raise tariffs, and to communicate and explain to customers to understand the tariff increase while improving business efficiency in conjunction with the NRW improvements as mentioned above.

・Recommendations to JICA

For the Koror-Airai water supply system, JICA has provided grant aid twice so far, including this project, and has continued to provide long-term tangible and intangible support, including technical cooperation from 2022. Although each project has resolved issues and contributed to the improvement of the water supply system, as mentioned above, there are still issues in operation and maintenance of water supply systems in Palau. In particular, NRW is mainly caused by leakage from aged asbestos cement distribution pipes. In order to solve the fundamental problem in the future, it will be necessary to continue discussions with the executing agency on future actions regarding the need to renew aged main water distribution pipes that were not subject to renewal under this project, based on the pipe renewal plan to be prepared through the technical cooperation project. Especially in areas where water supply pressure has increased as a result of this project, there is a possibility that leaks will occur and increase in the future. It is important to renew aged water distribution pipes in these areas.

・Lessons Learned

Importance of the long-term support to solve issues of the entire water supply system, and of the project planning that clearly defines positioning of each project

This project improved waterworks facilities based on past grant aid projects. It facilitated the understanding of the current status and identification of issues in the entire water supply system, such as where and to what extent water leakage is specifically occurring, through the rearrangement of water distribution zones, the installation of flow meters, and the technical assistance for analysis of water distribution volume. Renewal of the entire aged water distribution pipes, which are the main cause of leakage, has been difficult to accomplish in this project, and the scope of the project has been defined by prioritizing within the limited budget.. The skills to understand the current status of NRW enabled through this project will lead to subsequent technical cooperation (The Project for Strengthening Capacity in Non-Revenue Water Reduction in Palau). That project is then expected to formulate specific pipeline renewal plans and implement NRW improvement activities. Through these supports, not only the improvement of infrastructure and technical skills in operation and maintenance, but also the improvement of the deficit financial situation, which has been a longstanding issue for the executing agency, and ultimately, their business situation, will be promoted. The fact that the project plan was made with this sequence of events in mind from the time of implementation of this project will be helpful when considering procedures for improving the water system as a whole. When

designing infrastructure improvement projects in other countries facing similar issues, it is important to provide continuous long-term support for resolving issues in the entire water supply system as in this project. Also, designing projects with an overall vision and path toward resolving the issues and clarifying the positioning of each project will be important. Therefore, in providing cooperation in the field of the water supply system, it is effective to have a viewpoint that the end-users will benefit from the overall plan formulated through sufficient consultation with the recipient country's government. Also, it is important to keep in mind that support in developing water supply systems can be provided either independently or in cooperation with other donors, depending on the scale of the water supply system[14].

IV. Non-Score Criteria

・Performance (Objective Perspective)

This project started with JICA's timely dispatch of a survey team in response to a request from the Palauan government. The urgency and appropriateness of the issues were recognized, leading to the implementation of this grant aid project, which in turn contributed to a stable water supply in the target area. Despite the occurrence of unexpected situations such as the difficulty of project planning due to the absence of detailed drawings of water distribution pipelines, the discovery of unexploded ordnance, unidentified pipes and structures, and the effects of delays in the ADB sewerage project, the project was completed with a delay of only six months due to repeated investigation, consultation and adjustment under cooperation between JICA, the project consultants and the executing agency, as well as flexible changes in excavation methods, construction routes, and project schedules. In addition, the project was completed without causing any major problems to the social and natural environment due to the appropriate project supervision structure. During the implementation and after the completion of the project, the executing agency and JICA have held regular discussions to improve the water sector in Palau. A good cooperative relationship has been established for the future resolution of the country's issues.

Airai Water Treatment Plant (Out of the scope of this project) (source: taken by the evaluator)

Flow Meter at Ngerkesoaol Service Tank Installed under This Project (source: taken by the evaluator)

[14] This project did not involve in-depth coordination or meetings with ADB, providing support for sewerage systems simultaneously. However, PPUC coordinated with both parties by checking their schedules so that construction could proceed more efficiently and avoid duplication of efforts, resulting in a successful collaboration.