

**Ex-Post Project Evaluation 2021:  
Package III -2  
(Papua New Guinea, Samoa)  
Evaluation Reports**

**January 2023**

**JAPAN INTERNATIONAL COOPERATION AGENCY**

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**QUNIE CORPORATION**

**Japan Economic Research Institute Inc.**

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Independent State of Papua New Guinea

FY2021 Ex-Post Evaluation Report of Japanese ODA Loan

“Port Moresby Sewerage System Upgrading Project” / “Technical Assistance Project related to ODA Loan “Port Moresby Wastewater Management Improvement Project”<sup>1</sup>”

External Evaluator: Hirofumi Azeta, Japan Economic Research Institute Inc.

## **0. Summary**

The Port Moresby Sewerage System Upgrading Project (hereinafter referred to as the ODA Loan Project) was implemented to provide sewerage services to the coastal area of Port Moresby and to prevent the discharge of contaminated water to the coastal waters by developing sewerage facilities in the area thereby contributing to the improvement in residents' living environment and industrial development through establishing a sanitary living environment and conserving the marine environment. The Port Moresby Sewerage Management Capacity Improvement Project (hereinafter referred to as the Technical Assistance Project) was also implemented in combination with the ODA Loan Project targeting on improving the management capacity of the National Capital District Water and Sewerage Limited (hereinafter referred to as 'Eda Ranu') that operated and managed sewerage facilities in Port Moresby.

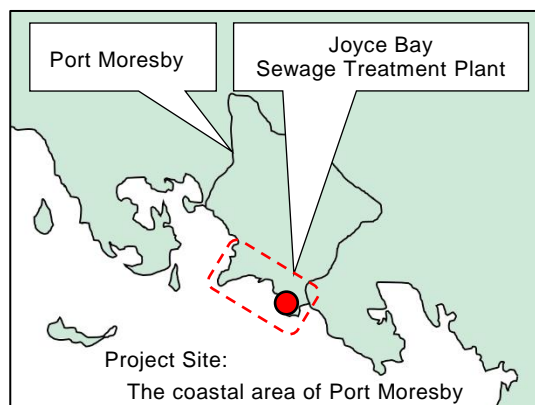
Although both projects (hereinafter referred to as the projects') were not implemented in coordination with other projects of JICA or other organizations other than JICA, they were highly relevant to the development policies and development needs at the time of the appraisal and ex-post evaluation. Therefore, their relevance and coherence are high. The outputs of the ODA Loan Project were revised based on the minutes of discussion (hereinafter referred to as M/D) concluded in 2014 after the ODA Loan Project was launched. The efficiency of the projects is high because the actual project cost and project period exceeded the planned project cost, which were recalculated in accordance with the revised project outputs, and revised planned project period, only slightly. The qualitative effects of the projects, such as the establishment of a sanitary living environment and conservation of the marine environment, were identified, and impacts, such as improvement in residents' living environment and industrial development, were partly identified. However, because quantitative effects such as the volume of sewage treatment and the utilization rate of sewerage facilities were much lower than the targets, the effectiveness and impact of the projects are moderately low. Although there were some minor issues in the operation and maintenance of the projects in terms of policy and system, as well as institutional and organizational aspect, the sustainability of the projects is high because they were expected to be settled.

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<sup>1</sup> "Port Moresby Wastewater Management Improvement Project" is an ODA loan project incidental to the "Port Moresby Sewerage System Upgrading Project" and is subject to an integrated evaluation. For details, please refer to "1.3 Evaluation Policy."

In light of the above, the projects are evaluated to be satisfactory.

## 1. Project Description



Project Location  
(Source: Japan Economic Research Institute)



Joyce Bay Sewage Treatment Plant  
developed under the ODA Loan project  
(Source: Japan Economic Research Institute)

### 1.1 Background

In Papua New Guinea, sewerage facilities were mainly developed in the capital city, Port Moresby, and local cities. Sewerage facilities were developed in the inland area of Port Moresby by Australia during the 1960s and the early 1970s before independence, while those in local cities such as Mount Hagen and Madang were developed with the loans from the Asian Development Bank (ADB) in 1999 and 2000.

In Port Moresby, three sewage treatment plants, located at Waigani, Morata, and Gerehu, were in operation and provided sewerage services to approximately 90,000 residents in the inland area out of a total population of approximately 290,000. However, there were no sewage treatment plants in the coastal area of Port Moresby, where 67,000 people lived, and sewage was either discharged into the sea through ocean outfalls or seeped underground after pretreatment in septic tanks.

Sewage discharged into the sea without sufficient treatment caused water pollution in the coastal area, which led to the deterioration of the sanitary environment for local residents and destruction of the marine environment, including coral reefs. Consequently, the waterborne disease rate was higher in coastal areas than in other areas. For example, the average diarrhea incidence rate was 31% in the coastal area and 5% in the city.

Therefore, improving the sanitary environment for local residents and the marine environment by constructing sewerage facilities in the coastal area of Port Moresby was necessary.

## 1.2 Project Outline

The objective of the projects was to provide sewerage services in the coastal area of Port Moresby and to prevent the discharge of sewage into the coastal waters by developing sewerage facilities in the area thereby contributing to the improvement in residents' living environment and industrial development through establishing a sanitary living environment and conserving the marine environment in the area.

### <ODA Loan Project> “Port Moresby Sewerage System Upgrading Project”

Loan Approved Amount/ Disbursed Amount	8,261 million yen / 8,181 million yen
Exchange of Notes Date/ Loan Agreement Signing Date	December 2009 / January 2010
Terms and Conditions	Interest Rate 0.2% Repayment Period 40 years (Grace Period 10 years) Conditions for Procurement Tied (Special Terms for Economic Partnership (STEP))
Borrower / Executing Agency	Independent Public Business Corporation (Renamed to Kumul Consolidated Holdings)
Project Completion	January 2020
Target Area	Coastal Area of Port Moresby
Main Contractors	Hitachi, Ltd. / Dai Nippon Construction
Main Consultant	NJS Consultants Co. Ltd.
Related Studies (Feasibility Studies, etc.)	The Study on Sewerage System of Port Moresby (1998) JETRO, The feasibility study of sewerage system development of Port Moresby in Papua New Guinea (2003) Special Assistance for Project Formation for Port Moresby Sewerage System Upgrading Project (2005)
Related Projects	[Asian Development Bank] The ADB Water Operators Partnership program (2013)

**<The Technical Assistance Project> “Port Moresby Wastewater Management Improvement Project”**

Overall Goal		Efforts to improve the level of sanitation and the living environment and to preserve the ocean environment of coastal area of Port Moresby City are continuously implemented.
Project Purpose		Capacity of sewerage management system in Port Moresby City, run by National Capital District Water and Sewerage Ltd. (Eda Ranu), is enhanced.
Outputs	Output 1	Operation and management capacity for sewerage system is strengthened.
	Output 2	Financial planning capacity for sewerage system is strengthened.
	Output 3	Implementing capacity for awareness activities and environment education activities for consumers is strengthened.
Total cost (Japanese Side)		351 million yen
Period of Cooperation		April 2017 - April 2020
Implementing Agency		National Capital District Water and Sewerage Limited (merged with Water PNG in 2020)

**1.3 Policy of the Evaluation**

In the projects, the sewerage facilities were developed under the ODA Loan Project, and the management capacity of Eda Ranu, which operated and managed the sewerage facilities, was strengthened through the Technical Assistance Project. Therefore, the ODA Loan Project and the Technical Assistance Project were evaluated in an integrated manner.

While relevance and coherence were collectively evaluated for the ODA Loan Project and Technical Assistance Project, efficiency was separately evaluated. As for effectiveness, the contributions of the Technical Assistance Project to the effects of the projects, such as improvement in the percentage of the sewered population as a result of environmental education and awareness-raising activities, were considered in the evaluation. As for impact, additional impacts of the Technical Assistance Project on the improvement of the living environment of residents and industrial development were considered in the evaluation of the projects.

Sustainability was evaluated in an integrated manner by considering the contributions of the Technical Assistance Project, such as the preparation of operation and maintenance manuals for sewerage facilities, proposals on organizational structure, and proposals on policies and systems, in addition to the evaluation of the ODA Loan Project.

## 2. Outline of the Evaluation Study

### 2.1 External Evaluator

Hirofumi Azeta (Japan Economic Research Institute Inc.)

### 2.2 Duration of Evaluation Study

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

Duration of the Study: November 1, 2021 – January 31, 2023

Duration of the Field Study: April 11 - May 1, 2022 and September 4 - September 11, 2022

## 3. Results of the Evaluation (Overall Rating: B<sup>2</sup>)

### 3.1 Relevance / Coherence (Rating: ③<sup>3</sup>)

#### 3.1.1 Relevance (Rating: ③)

##### 3.1.1.1 Consistency with the Development Plan of Papua New Guinea

Before the start of the projects, the government of Papua New Guinea gave expenditure priority to health care services in the *Medium-Term Development Strategy* (2005-2010), with particular emphasis on the improvement of primary healthcare services, including public health in urban areas. Protection of the natural environment, including coral reefs, was also one of the expenditure priorities.

At the time of the ex-post evaluation, the government of Papua New Guinea regarded infrastructure development, including water supply and sanitation, as one of the core strategic development areas in *Vision 2050* (2011). In the *Development Strategic Plan* (2010–2030), the government has set the target that 70% of the population will have access to improved sanitation, including flushing toilets, by 2030. The *Medium-Term Development Plan* (2018–2022), which regarded sustainable use of water as one of the goals, also aimed at improving access to safe drinking water and affordable sanitation, while the strategies of the *National Water, Sanitation and Hygiene Policy* (2015–2030) targeted “increased water, sanitation and hygiene sector funding,” “appropriate technology promotion,” and “increased sector capacity building and training.”

In light of the above, it can be concluded that the development policies emphasized improvement in public health and identified the need for investment in water and sanitation, both at the time of the appraisal and ex-post evaluation. Therefore, the projects were confirmed to be consistent with the development plans at the national level, both at the time of the appraisal and ex-post evaluation.

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<sup>2</sup> A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

<sup>3</sup> ④: Very High, ③: High, ②: Moderately Low, ①: Low

### 3.1.1.2 Consistency with the Development Needs of Papua New Guinea

Before the start of the projects, there were no sewage treatment plants in the coastal area of Port Moresby, and sewage was either discharged into the sea through ocean outfalls or seeped underground after pre-treatment in septic tanks. Sewage discharged into the sea without sufficient treatment causes water pollution in the coastal area, which has a considerable impact on the health of residents, such as the high incidence of waterborne diseases. For example, the diarrhea incidence rate of residents in the coastal area (31%) was higher than the city average of 5%.

At the time of the ex-post evaluation, most of the sewage from the coastal area of Port Moresby flowed into the Joyce Bay Sewage Treatment Plant, which was constructed under the ODA Loan Project. The sewage was treated in the plant and then discharged into the sea; thus, the water quality of the coastal waters considerably improved. However, because sewage is still discharged into the sea or rivers without sufficient treatment outside the project area, the water pollution problems remain unsolved in Port Moresby. In the interview survey conducted as part of this ex-post evaluation, many interviewees reported that they had diarrhea in the last year, suggesting that there were still issues in sanitary living conditions.

For the above reasons, improvement in the water quality of the coastal waters and sanitary living environment of the local residents was essential at the time of the appraisal and ex-post evaluation. Therefore, the projects were highly consistent with the development needs at the time of both appraisal and ex-post evaluation.

### 3.1.2 Coherence (Rating: ②)

#### 3.1.2.1 Consistency with Japan's ODA Policy

In the Fifth Pacific Islands Leaders Meeting held in May 2009, Japan regarded the environment and climate change as one of the main areas of support for Pacific island countries. In contrast, one of the priority areas for assistance to Papua New Guinea by JICA was infrastructure development in response to the country's rapid socioeconomic development. As the projects aimed to contribute to the improvement in residents' living environment and industrial development by developing sewerage facilities in the coastal area of Port Moresby, it can be said that the projects were consistent with Japan's ODA policy.

#### 3.1.2.2 Internal Coherence

There were no JICA projects that were linked, complemented, harmonized, or coordinated with the projects, both at the time of the appraisal and ex-post evaluation.



### 3.1.2.3 External Coherence

As the projects were to reduce the discharge of sewage into the sea and improve the residents' sanitary environment in the coastal area of Port Moresby, it can be said that the projects were consistent with the SDG targets "3. Good health and well-being" and "14. Life below water."

Although there is no unified international standard for treated sewage quality, treated sewage discharged from the Joyce Bay Sewage Treatment Plant, developed under the Projects, met the Japanese standard on the number of coli bacteria, biochemical oxygen demand (BOD) concentration and hydrogen ion concentration.

There was no specific coordination with other Japanese projects, other donors, or international frameworks at the time of the appraisal and ex-post evaluation.

The projects were consistent with the development plans of Papua New Guinea both at the time of the appraisal and ex-post evaluation, and development needs such as the need for improvement in the water quality of coastal waters prevalent at the time of the ex-post evaluation. The outputs of the ODA Loan Project were revised by the M/D in 2014, and the treatment capacity of the sewage treatment plant was expanded. This change in outputs seems reasonable, as the necessity for the gradual expansion of the treatment capacity was recognized even at the time of planning, as explained in Section 3.2.1. Despite this change in the outputs, the project logic leading from the inputs to outcomes and impacts that the projects were to provide sewerage services and to prevent the discharge of sewage into the coastal waters by developing sewerage facilities, thereby contributing to the improvement in residents' living environment and industrial development, remained unchanged, and there was no inconsistency in this logic either.

The projects were consistent with Japan's ODA Policy, but there were no specific linkages with other projects or assistance from JICA or with other organizations and international frameworks, both at the time of the appraisal and ex-post evaluation.

Therefore, its relevance and coherence are high.

## 3.2 Efficiency (Rating: ③)

### 3.2.1 Project Outputs

The planned and actual outputs of the ODA Loan Project were as listed in Table 1. The outputs of the ODA Loan Project were revised based on the M/D concluded between JICA and Papua New Guinea in May 2014. In the M/D, the treatment capacity of the sewage treatment plant was increased from the original plan, while the length of the sewer pipes was

shortened, and the number of pumping stations was reduced owing to the reduction in the project area.

Through the implementation of the ODA Loan Project, most of the project outputs, which were revised based on the M/D in May 2014, were achieved as planned.

Table 1 Planned and actual project outputs

Planned	Actual
<p>(1) Sewerage facilities</p> <p>a) Construction of sewage treatment plant, access road, and ocean outfall</p> <ul style="list-style-type: none"> <li>- Sewage treatment plant (13,800 m<sup>3</sup>/day, oxidation ditch process)</li> <li>- Access road (1.73 km)</li> <li>- Ocean outfall (1.4 km)</li> </ul> <p><u>This component was revised based on the M/D concluded in May 2014 as follows:</u></p> <ul style="list-style-type: none"> <li>- Sewage treatment plant (18,400 m<sup>3</sup>/day, oxidation ditch process)</li> <li>- Access road (1.5 km)</li> <li>- Ocean outfall (1.6 km)</li> </ul>	<p>(1) Sewerage facilities</p> <p>a) Construction of sewage treatment plant, access road, and ocean outfall</p> <ul style="list-style-type: none"> <li>- Sewage treatment plant (18,400 m<sup>3</sup>/day, oxidation ditch process)</li> <li>- Access road (1.25 km)</li> <li>- Ocean outfall (1.6 km)</li> </ul>
<p>b) Sewer pipe installation</p> <ul style="list-style-type: none"> <li>- Trunk sewer (17.2 km)</li> <li>- Branch sewer (17.7 km)</li> </ul> <p><u>This component was revised based on the M/D concluded in May 2014 as follows:</u></p> <ul style="list-style-type: none"> <li>- Trunk sewer (13.6 km)</li> <li>- Branch sewer (15.6 km)</li> </ul>	<p>b) Sewer pipe installation</p> <ul style="list-style-type: none"> <li>- Trunk sewer (12.4 km)</li> <li>- Branch sewer (13.2 km)</li> </ul>
<p>c) Construction and rehabilitation of pumping stations</p> <ul style="list-style-type: none"> <li>- Construction: 8 pumping stations</li> <li>- Rehabilitation: 9 pumping stations</li> </ul> <p><u>This component was revised based on the M/D concluded in May 2014 as follows:</u></p> <ul style="list-style-type: none"> <li>- Construction: 4 pumping stations</li> <li>- Rehabilitation: 9 pumping stations</li> </ul>	<p>c) Construction and rehabilitation of pumping stations</p> <ul style="list-style-type: none"> <li>- Construction: 4 pumping stations</li> <li>- Rehabilitation: 9 pumping stations</li> </ul>
<p>d) Construction of sludge drying beds at the Morata Sewage Treatment Plant</p> <p><u>This component was excluded from the project outputs because it was agreed that the sludge generated from the sewage treatment plant was to be dried by a more advanced process than the natural process of drying them on sludge drying beds, based on the M/D concluded in May 2014.</u></p>	
<p>(2) Consulting Services</p> <ul style="list-style-type: none"> <li>- Review of tender documents, tender assistance, and supervision of construction work</li> <li>- Training for Eda Ranu staff members on the operation and maintenance of sewerage facilities</li> <li>- Implementation of environmental</li> </ul>	<p>(2) Consulting Services</p> <ul style="list-style-type: none"> <li>- Review of tender documents, tender assistance, and supervision of construction work</li> <li>- Training for Eda Ranu (currently Water PNG) staff members on the operation and maintenance of sewerage facilities</li> <li>- Implementation of environmental</li> </ul>

<p>monitoring</p> <ul style="list-style-type: none"> <li>- Support on the implementation of a pilot project on the introduction of flush toilets for inhabitants in water-houses and on the implementation of hygiene and environmental education programs</li> <li>- Support on the implementation of HIV/AIDS prevention programs for workers employed for the ODA Loan project and the surrounding residents</li> </ul>	<p>monitoring</p> <ul style="list-style-type: none"> <li>- Support on the implementation of HIV/AIDS prevention programs for workers employed for the ODA Loan project and the surrounding residents</li> </ul>
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(1) Sewerage facilities

a) Construction of sewage treatment plant, access road, and ocean outfall

At the time of the appraisal, the treatment capacity of the sewage treatment plant under the ODA Loan Project was determined to be 75% (13,800 m<sup>3</sup>/day) of the projected sewage volume of 18,400 m<sup>3</sup>/day in 2020. The expansion of the treatment capacity to the remaining 25% was to be considered after the commencement of the operation of the sewage treatment plant. However, when the environmental permit issued by the Department of Environment and Conservation in 2007 expired in 2013, the Department indicated that the capacity of the sewage treatment plant had to be set based on the sewage volume in 2042, 25 years after the completion of the project, in order to renew the permit. Consequently, the government of Papua New Guinea and JICA agreed to revise the treatment capacity to be 18,400 m<sup>3</sup>/day in 2014.

It was not clear why the Department of Environment and Conservation changed the target year for setting the capacity of the sewage treatment plant from 2020 to 2042. However, both the original assumption, on which the treatment capacity was to be expanded gradually, and the revised assumption, on which the treatment capacity was to meet the sewage volume for at least 25 years after completion, were reasonable because both assumptions targeted the provision of sewerage services in the coastal area of Port Moresby over the long term.

The length of the access road was determined to be 1.5 km in the M/D concluded in 2014; however, it was changed to be 1.24 km prior to the tender construction. This change seems to be mainly owing to the location of existing dwellings.

b) Sewer pipe installation

The project area of the ODA Loan Project was reduced to the area south of Konedobu, called “POMSSUP South,” in the coastal area of Port Moresby, based on the M/D concluded in 2014, because the project cost was expected to increase because the treatment capacity of the sewage treatment plant expanded from 13,800 m<sup>3</sup>/day to 18,400 m<sup>3</sup>/day, as mentioned above. Hence, the lengths of the trunk sewer and branch sewer were reduced from 17.2 km to 13.6 km and from 17.7 km to 15.6 km, respectively.

Even during construction, the length of the trunk sewer was revised from 13.6 km to 12.4 km due to route changes caused by road construction. In addition, the length of the branch sewer was further shortened to 13.2 km because residential land development did not take place as planned and the branch sewer to be connected to the residential land became unnecessary.

c) Construction and rehabilitation of pumping stations

Four out of eight newly constructed pumping stations were not included in the POMSSUP South area mentioned above. Therefore, they were excluded from the project scope based on the M/D in 2014. The other 13 pumping stations were developed as planned (4 newly constructed pumping stations and 9 rehabilitated pumping stations).

d) Sludge drying beds at the Morata Sewage Treatment Plant

In the original plan, sludge drying beds, by which sludge was to be dried in the sun, were planned to be constructed on land next to the Morata sewage treatment plant. The transfer of sludge from the Joyce Bay Sewage Treatment Plan to the sludge drying beds was planned. However, the construction of the sludge drying beds was excluded from the project scope because it was agreed in the M/D concluded in 2014 that a more advanced sludge treatment process would be adopted.

The sludge drying beds were subsequently replaced with a centrifuge dewatering system installed at the Joyce Bay Sewage Treatment Plant.

(2) Consulting services

During the implementation of the ODA Loan Project, most of the consulting service activities such as tender assistance, supervision of construction work, training, and environment monitoring were carried out as planned, although the pilot project on the introduction of flush toilets for inhabitants in waterhouses was not implemented. This was because the village where the pilot project was to be implemented was excluded from the project area owing to the reduction in the project area described in (1)b.

### 3.2.2 Project Inputs

#### 3.2.2.1 Project Cost

The cost of the ODA Loan Project was 10,802 million yen (of which the ODA loan amount was 8,261 million yen) in the original plan at the time of the appraisal. The project cost at the time of the appraisal was estimated to be 12,260 million yen, which was 1,458 million yen more than the original project cost, if the project cost was recalculated considering the changes in the project outputs and the unimplemented pilot project for

inhabitants in waterhouses, as described in Table 2.

Table 2 Recalculation of planned project costs

	Project cost at the time of appraisal	Increase/decrease in project outputs	Recalculated project cost at the time of appraisal
Sewage treatment plant	4,690 million yen	33% increase : Treatment capacity increased from 13,800 m <sup>3</sup> /day to 18,400 m <sup>3</sup> /day.	+1,563 million yen
pumping stations	368 million yen	87% increase : Total pump capacity increased from 114 m <sup>3</sup> /min to 213 m <sup>3</sup> /min.	+319 million yen
Sewer pipe (trunk sewer)	1,128 million yen	28% decrease : Length of trunk sewer decreased from 17.2 km to 13.6 km.	-315 million yen
Sewer pipe (branch sewer)	362 million yen	25% decrease : Length of branch sewer decreased from 17.7 km to 15.6 km.	-92 million yen
Pilot project	16 million yen	Not implemented.	-16 million yen
Change in total project cost			+1,458 million yen

Note: Individual project costs and total values do not necessarily match owing to rounding.

The planned project cost at the time of the appraisal, recalculated project cost, and actual project cost are listed in Table 3. The actual project cost, which was 14,647 million yen (of which the ODA loan amount was 8,181 million yen), was 19% higher than the planned project cost after adjustment, slightly exceeding the planned cost.

As the project scope was not revised after the M/D was concluded in 2014, the actual project cost exceeded the recalculated planned project cost mainly owing to the price hikes resulting from the delayed start of the project. This is also because of the increase in the cost of consulting services due to the expansion of project outputs.

Table 3 Planned and actual project cost

(Unit: million JPY)

Item	Plan			Recul- culated Total	Actual		
	Foreign Currencies	Local Currencies	Total		Foreign Currencies	Local Currencies	Total
(1) Construction	2,541	4,024	6,565	8,023	3,723	9,375	13,098
(2) Consulting Services	384	393	777	777	966	216	1,182
(3) Price escalation	401	768	1,169	1,169	0	0	0
(4) Physical contingency	372	325	697	697	0	0	0
(5) Interest during construction	40	0	40	40	35	0	36
(6) Commitment charge	49	0	49	49	49	0	49
(7) Land acquisition	0	465	465	465	0	281	281
(8) Administrative cost	0	240	240	240	0	0	0
(9) Tax	0	800	800	800	0	0	0
Total	3,787	7,015	10,802	12,260	4,774	9,872	14,647

Source: Materials provided by JICA and Kumul Consolidated Holdings

Note: There are discrepancies in the totals due to rounding.

The actual project cost of the Technical Assistance Project was 351 million yen, which slightly exceeded the planned project cost of 320 million yen (110% of the plan) because the contract price determined through tender exceeded this.

### 3.2.2.2 Project Period

The project period at the time of the appraisal was 69 months, from January 2010 to September 2015, and was revised to 103 months until July 2018, when the project outputs were revised in 2014, as shown in Table 4.

When the project outputs were revised, Papua New Guinea proposed changing the treatment process of the sewage treatment plant from the oxidation ditch process to the sequencing batch reactor activated sludge process, and the discussion on the treatment process took considerable time. This caused a delay in tenders and contracts, as well as the commencement of construction. After the discussions, the Papua New Guinea and JICA sides agreed to employ the oxidation ditch process.

The actual project period was 121 months, from January 2010 to January 2020. This was 15% higher than the revised planned project period, and it was concluded that the actual project period slightly exceeded the plan.

Table 4 Planned and actual project periods

	Plan	Revised plan	Actual
Project period	January 2010 – September 2015 (69 months)	January 2010 – July 2018 (103 months)	January 2010 – January 2020 (121 months)
Consulting services (including detailed design)	Jan. 2010 – March 2015	-	January 2010 – March 2020
Tender and Contracts	January 2011 – July 2012	December 2011 – October 2014	May 2014 – December 2015
Construction works	July 2012 – September 2015	October 2014 – July 2018	December 2015 – January 2020

Source: Documents provided by JICA

The tender and contract process began in May 2014, after the M/D was concluded, and was completed in one year and eight months, almost as planned (one year and seven months). Although the tender and contract process had not started in 2014 when the M/D was concluded, the start of the tender and contract process specified in the M/D was undertaken in December 2011, which was prior to the conclusion of the M/D. The reason for this was not identified in the ex-post evaluation.

The construction period was 50 months, which slightly exceeded the original plan (39 months) and revised plan (46 months). One of the reasons was the construction work did not start until April 2016, after the construction contract was signed in December 2015 because the advance payment in Japanese yen by the government of Papua New Guinea was delayed due to the restrictions on foreign currency remittances in Papua New Guinea. The construction work also took longer because the construction period, which was planned to be 900 days (approximately 30 months) at the time of tender, was revised to 1,300 days (approximately 43 months) due to the lack of an annual budget for the government of Papua New Guinea.

The project period of the Technical Assistance Project was nearly as planned. The planned project period was three years—from March 2017 to February 2020—whereas the actual project period was three years and one month—from April 2017 to April 2020.

### 3.2.3 Results of Calculations for Internal Rates of Return (Reference only)

For this ODA Loan Project, only the economic internal rate of return (EIRR) was calculated at the time of the appraisal. The EIRR, recalculated at the time of the ex-post evaluation, was lower than that projected at the time of the appraisal. This was because the project cost, as well as operation and maintenance costs, were larger than estimated at the time of the appraisal due to the larger capacity of the sewage treatment plant; moreover, the benefits from tourism revenues and reduction in waterborne diseases were lower than those

estimated at the time of the appraisal.

Table. 5 Economic internal rate of return at the time of appraisal and ex-post evaluation

	At the time of appraisal (2010)	At the time of ex-post evaluation
EIRR	8.4% (Project life: 30 years)	5.9% (Project life: 30 years)
(1) Cost (2) Benefit	(1) Construction cost (excluding taxes), operating and maintenance cost (2) Increase of tourism revenue, reduction of waterborne diseases, increase of fish haul	(1) Construction cost (excluding taxes), operating and maintenance cost, and house connection cost (2) Increase of tourism revenue, reduction of waterborne diseases, increase of fish haul

The actual project cost of the ODA Loan Project exceeded the recalculated project cost at the time of the appraisal by 19%, mainly owing to price hikes as a result of the delay in the start of the project. In addition, the actual project period exceeded the revised project period at the time of the appraisal by 15% because the construction period was extended due to delays in the payment by the Papua New Guinea side. The planned project cost and project period of the Technical Assistance Project were nearly as planned.

In light of the above, both project cost and project period exceeded the plan only slightly; thus, the efficiency of the projects is high.

### 3.3 Effectiveness and Impacts<sup>4</sup> (Rating: ②)

The ODA Loan Project and the Technical Assistance Project aimed to achieve the same project objectives, as the ODA Loan Project was to develop sewerage facilities in the coastal area of Port Moresby, while the Technical Assistance Project was to enhance the management capacity of Eda Ranu (currently Water PNG), which managed the sewerage facilities. Therefore, the effectiveness and impact of these projects were evaluated in an integrated manner.

The targets at the time of the appraisal were compared to the achievements at the time of ex-post evaluation to evaluate effectiveness and impacts, and the contributions of the Technical Assistance Project were considered to determine the evaluation results.

<sup>4</sup> The impact is also taken into account in determining the effectiveness of the rating.



### 3.3.1 Effectiveness

#### 3.3.1.1 Quantitative Effects (Operational and Effect Indicators)

The effects expected by the ODA Loan Project were the provision of sewerage services in the coastal area of Port Moresby and the reduction in sewage discharge to coastal waters. Therefore, the volume of sewage treatment, utilization rate of sewerage facilities, and concentration of BOD discharged were selected as operational indicators, while the sewered population and percentage of sewered population were selected as effect indicators. The baseline, target, and actual values of these indicators are listed in Table 6.

Table 6 Planned and Actual Operational Indicators

	Baseline	Target	Actual
	2009	2017	2022
		2 Years After Completion	2 Years After Completion
Volume of sewage treatment (m <sup>3</sup> /day)	0	13,100	7,000
Utilization rate of sewerage facilities (%)	-	71.2	38.0
Concentration of BOD discharged (mg/L)	190	20	Smaller than 5

Source: Documents provided by JICA and implementing agencies

The volume of sewage treatment and the utilization rate of sewerage facilitated at the time of the ex-post evaluation were approximately half of the targets, mainly because the number of house connections to the sewerage system did not increase as expected. This was because the residents in the project area avoided the burden of connection fees (minimum fee of 600 kina and material costs) as well as because some residents did not have the necessity to connect to the sewerage system, as they did not even have sufficient water supplies due to non-payment of water charges.

In reaction to this, Water PNG, which manages the sewage treatment plant and the sewer network in Port Moresby at the time of the ex-post evaluation, was planning to launch “House Connection Project” in 2022 by its own budget to connect 1,010 households to the sewerage system in the next few years. Once all 1,010 households were connected, the daily volume of sewage treatment increased by 1,960 m<sup>3</sup> and the utilization rate of sewerage facilities increased from 38% to 49%<sup>5</sup>.

The baseline, target, and actual values of the effect indicators, such as the sewered population and the percentage of the sewered population, are shown in Table 7.

<sup>5</sup> The population per household was assumed to be 7.2 persons based on the 2011 census results. The sewage volume per person per day was assumed to be 0.27 m<sup>3</sup> based on the volume of sewage treatment and the sewered population at the time of the appraisal.

Table 7 Planned and Actual Effect Indicators

	Baseline	Target	Actual
	2009	2017	2022
		2 Years After Completion	2 Years After Completion
Sewered population (people)	0	48,600	26,000
Percentage of sewered population (%)	27	61	38

Source: Documents provided by JICA and implementing agencies

The sewered population at the time of the ex-post evaluation was estimated to be approximately 26,000 people from the volume of sewage per person per day (0.27 m<sup>3</sup>). This means that the achievement level of the target for the sewered population, 48,600 people, was approximately half.

Estimating the population of the project area at the time of the ex-post evaluation as 67,156, assuming that the annual population growth was 2.1% on average since 2011<sup>6</sup>, the percentage of sewered population at the time of the ex-post evaluation was 38%. This was much lower than the target of 61%.

The achievements of the effect indicators were rather low, mainly because the number of house connections to the sewerage system in the coastal area did not increase as expected for the reasons mentioned above.

Although the Plan for Environmental Education Activities was prepared for community awareness of house connections to the sewer network, and related activities were implemented through the Technical Assistance Project, the number of new connections after the completion of the Technical Assistance Project was only approximately 10. Therefore, identifying the Technical Assistance Project's additional contributions to improving the utilization rate of sewerage facilities or the percentage of sewered population was not possible.

### 3.3.1.2 Qualitative Effects (Other Effects)

At the time of the appraisal of the projects, (1) establishment of a sanitary living environment, (2) conservation of the marine environment, (3) improvement in residents' living environment, and (4) industrial development were expected as qualitative effects. However, because (3) improvement in residents' living environment and (4) industrial development were considered as impacts for their nature, they are explained in Section 3.3.2 Impacts.

<sup>6</sup> Source: United Nations, World Population Prospect

### (1) Establishment of a sanitary living environment

According to Water PNG, there were almost no sewage overflows in the project area as a result of sewer line installation by the ODA Loan Project; thus, the ODA Loan Project led to improvement in the sanitary living environment of the project area.

Using the maintenance records registered in the sewer network ledger system developed by the Technical Assistance Project, the Sewerage Operation Department of Water PNG identified the locations where sewage overflows occurred frequently, replaced sewer pipes, and improved manholes even outside the project area. As a result, the number of overflows decreased outside the project area, and the Technical Assistance Project also contributed to the improvement of the sanitary living environment in Port Moresby.

### (2) Conservation of marine environment

The daily volume of sewage flowing into the sewer network and discharged to the ocean was estimated to be 3,891 m<sup>3</sup> in 2009 from the population in the coastal area, percentage of the sewer population, and sewage volume per person per day in the same year. At the time of the ex-post evaluation, all sewage flowing into the sewer network was treated at the Joyce Bay Sewage Treatment Plant. Therefore, it was confirmed that the water quality of the coastal waters at Port Moresby greatly improved, as shown in Table 8.

Table 8 Water Quality Information Before and After the ODA Loan Project

	2009	2019	Year 2021
E. coli (MPN/100 mL)	23 - 2,400	20	0.0
Ammonia nitrogen (mg/L)	1.4 - 4.2	0.01	0.2
Phosphate (mg/L)	0.21 - 0.69	0.02	0.005

Source: Documents provided by JICA and Water PNG

## 3.3.2 Impacts

### 3.3.2.1 Intended Impacts

#### (1) Quantitative Effects

##### Improvement in residents' living environment

According to Water PNG, sewage overflows happened 10–12 times every week in the coastal area of Port Moresby before the implementation of the projects, and this reduced to 3–4 times until the time of the ex-post evaluation, suggesting that the residents' living environment improved. In addition, the quality of fish and shellfish consumed by residents also seems to have improved as a result of the improvement in ocean water quality.

In this ex-post evaluation, an interview survey was conducted on the street targeting 150 people in the coastal area of Port Moresby to examine the impacts of the projects on the

residents' living environment. Of the 150 interviewees, 62% were male and 38% were female, 47% were in their 20s and 30s, 44% were in their 40s and 50s, and 9% were over 60.

The survey indicated that 38% of the interviewees had diarrhea in 2021: confirming whether the waterborne disease rate, which was 31% at the time of the appraisal, decreased was not possible<sup>7</sup>. Moreover, it was not possible to confirm a decrease in medical expenses for waterborne diseases either, as most of the interviewees answered to the question on the changes in waterborne medical expenses over the last three years as “almost same<sup>8</sup>.”

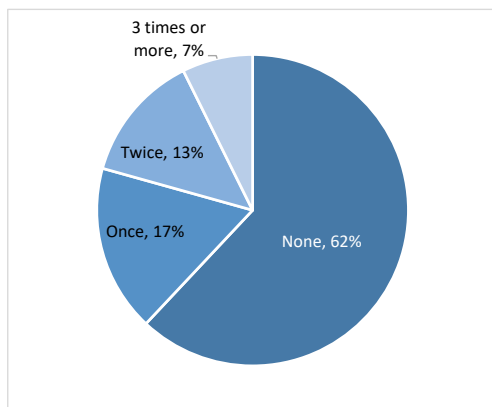


Figure 1 Number of Waterborne Diseases in 2021

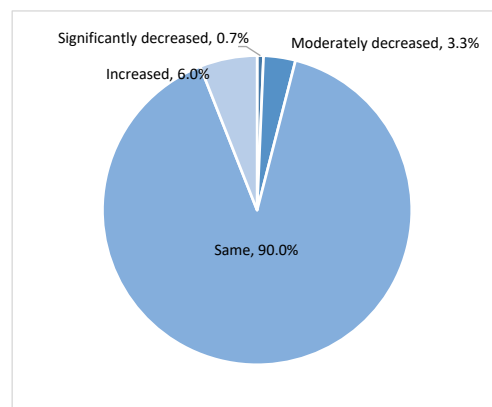


Figure 2 Change in Waterborne Disease Medical Expenses over the Last Three Years

However, as shown in Figure 3, the interviewees living in dwellings connected to the sewerage system answered that they had diarrhea 0.49 times per year on average, while those who were not connected answered that they had diarrhea 0.95 times per year. Similarly, as shown in Figure 4, the proportion of interviewees who had diarrhea within a year among those with sewerage connection was only 27%, while the proportion of those without sewerage connection was 45%. This suggests that an increase in sewerage connections leads to a decrease in the waterborne disease rate. Although the increase in the number of house connections was limited at the time of the ex-post evaluation, it is expected that the waterborne disease rate in Port Moresby will decrease in the future as the number of house connections increases.

<sup>7</sup> Many of the survey interviewees who had diarrhea would not have received medical care. Therefore, the percentage of the interviewees having diarrhea identified in the survey would be higher than the "waterborne disease rate" which was compiled from the information provided by medical institutions.

<sup>8</sup> Similarly, this may be due to the fact that the majority of interviewees did not receive medical cares or use medicines even if they had diarrhea.

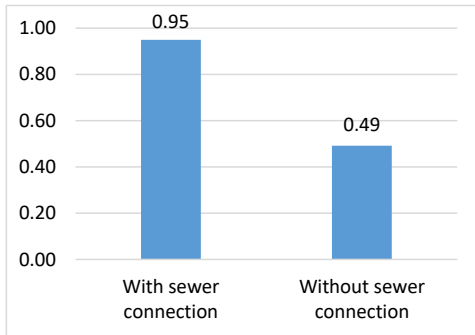


Figure. 3 Number of Waterborne Disease Incidents by Sewer Connection

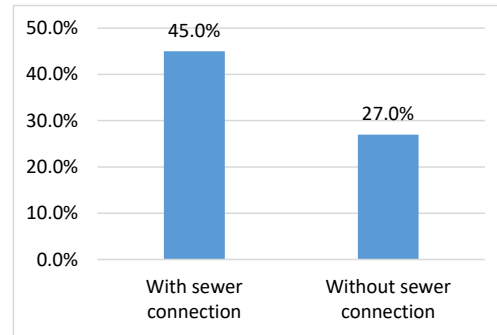


Figure. 4 Percentage of Waterborne Disease Incidence by Sewer Connection

In addition, residents living near the Joyce Bay Sewage Treatment Plant started catching fish and shellfish for their own consumption on the beach as a result of the improvement in the water quality of the ocean. This also indicates that the implementation of the projects led to an improvement in the livelihood of nearby residents.

#### Industrial development

Ela Beach, located in the coastal area of Port Moresby, started attracting tourists at the time of the ex-post evaluation because sewage is no longer discharged to the ocean as a result of the projects. According to the Investment Promotion Agency and other stakeholders, the number of hotels, restaurants, and apartments increased at Ela Beach, although information on the number of new establishments was not obtained. New manufacturing and food processing plants were built in the vicinity of the Joyce Bay Sewage Treatment Plant, as the odor problem was resolved.



Photo 1 Ela Beach

#### (2) Qualitative effects

Except for the effects mentioned above, the other qualitative effects of the projects were not identified. Although the environmental education activities implemented with the support of the Technical Assistance Project explained the importance of hand washing and the harmful effects of dumping garbage into manholes on local residents, no visible effects were identified.

### 3.3.2.2 Other Positive and Negative Impacts

#### 1) Impact on the Natural Environment

For its location in the environmentally sensitive area, the ODA Loan Project was classified as Category A based on the JBIC guidelines for Confirmation of Environmental and Social Consideration (April 2002). The Environmental Impact Assessment Report for the ODA Loan Project was approved in May 2006, and an environmental permit was issued in December 2007. As there were coral reefs in the area where the ocean outfall pipe was planned to be installed, countermeasures were to be taken, for example, by preventing sediment discharge and spreading into the ocean, selecting the lowest impact ocean outfall pipe route, and transplanting corals on the ocean outfall pipe route.

The installation route of the ocean outfall pipe was determined at the location where the impacts on the coral reefs were minimal based on the survey results. In addition, the contractor of the construction works protected and transplanted corals and monitored the settlement of corals for one year after transplantation. The monitoring results were compiled in coral relocation reports, and no particular issues were identified during monitoring.

During the construction of the sewage treatment plant and installation of the ocean outfall pipe, sufficient measures such as the installation of curing sheets for the prevention of sediment spread, were undertaken; thus, no particular issues were identified in sediment discharge and spread.

Furthermore, the environmental permit was renewed by the Conservation and Environment Protection Authority (CEPA) in December 2019 before the sewage treatment plant started operation. Water PNG conducted environmental monitoring based on this permit and submitted monitoring reports to CEPA on a regular basis at the time of the ex-post evaluation. Water PNG operated the sewage treatment plant without any deviation from the monitoring indicators specified in the environmental permit, such as the concentration of BOD discharged.

#### 2) Resettlement and Land Acquisition

In the ODA Loan Project, a project site with an area of approximately 11 ha was acquired, as planned. Kumul Consolidated Holdings evaluated land prices and paid compensation to owners based on the laws in Papua New Guinea and the JBIC Guidelines for Confirmation of Environmental and Social Consideration (April, 2002). Because there were no residents at the project site, no resettlement occurred.

In addition, as 10 households resided on the construction site of the access road without land ownership, the government of Papua New Guinea completed the payment of compensation and resettlement processes based on an agreement with the residents before the start of the ODA Loan Project. No issues with the residents were identified through

interviews with the implementing agency and residents at the time of the ex-post evaluation.

### 3) Gender Equality

Although there were no gender related activities in the ODA Loan Project or the Technical Assistance Project, the projects contributed to the improvement in the livelihoods of women, as women in the coastal area started selling shellfish collected from the sea at fish markets as shellfish increased owing to the improvement in the water quality of the ocean after the completion of the projects, according to the National Fisheries Authority of Papua New Guinea.

### 4) Marginalized People

The residents of several low-income villages in the vicinity of the Joyce Bay Sewage Treatment Plant began to catch fish and shellfish as a result of the improved water quality of coastal waters after project completion. Therefore, the projects led to the improvement in the livelihoods of residents in low-income villages.

### 5) Social Systems and Norms, Human Well-being, and Human Rights

Through the consulting services of the ODA Loan Project, HIV/AIDS awareness-raising activities for construction workers were organized in collaboration with the Department of Health of Port Moresby. In addition, environmental education activities were conducted targeting the residents living in the vicinity of the Joyce Bay Sewage Treatment Plant under the Technical Assistance Project, wherein the importance of the house connection to the sewerage system and hand washing, as well as the harmful effects of dumping garbage into the sewer network, were emphasized.

However, identifying the extent to which awareness-raising activities led to the prevention of HIV/AIDS infection in Port Moresby at the time of the ex-post evaluation was not possible, as it was not possible to track construction workers. It was also difficult to find residents who received environmental education; thus, identifying the specific impacts of the environmental education activities was not possible. In addition, local residents continued dumping garbage into the sewer network or into the ocean even at the time of the ex-post evaluation, but environmental education activities were not carried out by Water PNG or any governmental institutions.

### 6) Unintended Positive/Negative Impacts

Except for impacts mentioned above, no other positive or negative impacts were identified.

### 3.3.2.3 Effectiveness and Impacts of the Technical Assistance Project

#### (1) Effectiveness of the Technical Assistance Project

The project purpose of the Technical Assistance Project was to enhance the capacity of the sewerage management system in Port Moresby, run by the National Capital District Water and Sewerage Limited (Eda Ranu, currently Water PNG), and the indicators set for the project purpose were as follows:

- Indicator 1: The sewerage system is managed based on the administration organization system and division of office work for sewerage system prepared by the project.
- Indicator 2: Sewerage facilities are managed in accordance with the plans and manuals prepared for the project.

At the time of planning for the Technical Assistance Project, the Sewerage Operation Department of Eda Ranu operated and managed the existing sewer network in Port Moresby, while the Joyce Bay Sewage Treatment Plant Department, which was to be newly established, was planned to operate and manage the sewerage facilities to be developed by the ODA Loan Project.

The Technical Assistance Project supported the establishment of the Joyce Bay Sewage Treatment Plant Department and made a proposal on the organizational system and division of duties for the Joyce Bay Sewage Treatment Plant Department, the Sewerage Operation Department, and other related departments.

At the time of the ex-post evaluation, it was confirmed that the Joyce Bay Sewage Treatment Plant Department of Water PNG, which merged with Eda Ranu, operated and managed the sewage treatment plant and sewer network developed by the ODA Loan Project, while the Sewerage Operation Department operated and managed the existing sewer network, in collaboration with each other.

However, some Water PNG departments have not yet been given clear mandates after the merger between Eda Ranu and Water PNG in 2020; therefore, some activities such as environmental education and awareness-raising activities, which were prepared with the support of the Technical Assistance Project, were not continued at the time of the ex-post evaluation.

At the time of the ex-post evaluation, utilization of the Sewer Network Maintenance Manual, which was prepared by the Technical Assistance Project, and the Joyce Bay Sewage Treatment Plant and Pumping Stations Operation and Maintenance Manual were confirmed. The “Draft Standard Procedure for House Connections,” which was prepared for the promotion of house connections, was also utilized. Therefore, it can be said that the sewerage facilities were operated and managed based on plans and manuals prepared by the Technical Assistance Project. However, there were some other plans that were not fully utilized, also due to the merger of Eda Ranu with Water PNG mentioned above, such as “Port Moresby Trade Waste Policy and Management Plan” and “Medium to Long Term Business Operation Plan for Sewerage Service in Port Moresby.”



In light of the above, it can be said that the indicators of the project purpose were mostly achieved, and the capacity of the sewerage management system in Port Moresby was enhanced for the most part, as targeted by the project purpose.

## (2) Impacts of the Technical Assistance Project

The overall goal of the Technical Assistance Project was “Efforts to improve the level of sanitation and the living environment and to preserve the ocean environment of the coastal area of Port Moresby City are continuously implemented,” and its indicators are as follows.

Indicator 1: The situation of sewerage management in Port Moresby is periodically reported.

Indicator 2: Criteria of water quality management is prepared.

Water PNG, which operates and manages the sewerage facilities in Port Moresby, regularly reports its operations to its shareholder, Kumul Consolidated Holdings, and thus Indicator 1 has already been achieved.

At the time of the ex-post evaluation, the bill for the establishment of the National Water and Sanitation Authority was being drafted, which would be responsible for the political aspects of water supply and sewerage in Papua New Guinea. It is expected that Water PNG, as the executing body, reports the water supply and sewerage operational status based on policies and regulations to be developed by the Authority in the future.

Although criteria for water quality management have not been developed at the time of the ex-post evaluation, it is expected that discussions for the development of such criteria are initiated by the National Water and Sanitation Authority mentioned above, once it is established.

Although some mandates related to the sewerage operations of Water PNG have not yet been clarified because its organizational structure was not finalized after its merger, the project purpose of the Technical Assistance Project was mostly achieved. The overall goal, which was not partly achieved at the time of the ex-post evaluation, is expected to be achieved in the future. Therefore, it can be said that the expected outcomes and impacts were generally achieved as planned.

### [Summary of 3.3 Effectiveness and Impacts]

The operational and effect indicators of the ODA Loan Project, such as the volume of sewage treatment, utilization rate of sewerage facilities, sewered population, and percentage of sewered population, were considerably below targets because house connections were limited. However, because sewage, which used to be discharged into the sea, was now treated and the number of sewage overflows in Port Moresby decreased, it can be concluded that qualitative effects such as the establishment of a sanitary living environment and conservation of the marine environment

were realized. In addition, impacts such as the improvement in residents' living environment and industrial development were partly realized.

The Technical Assistance Project targeted the enhancement of the management capacity of Water PNG, which manages water and sewerage operations in Port Moresby, and the effectiveness and impact of the Technical Assistance Project itself are high. In addition, the Technical Assistance Project partly contributed to the improvement in residents' living environment, which was one of the expected impacts of the projects, through the decrease in sewage overflows.

As the effects realized by the implementation of the projects can only be identified to a certain extent compared with the plan, it is concluded that the effectiveness and impact of the project are moderately low.

### 3.4 Sustainability (Rating: ③)

As the ODA Loan Project was to construct sewerage facilities in the coastal area of Port Moresby, and the Technical Assistance Project was to improve the management capacity of Eda Ranu (currently Water PNG), which was to manage the same sewerage facilities, it can be said that the two projects targeted the realization of the same project outcomes. Therefore, the sustainability of the two projects was evaluated in an integrated manner.

The sustainability of the activities of the Technical Assistance Project, which affected the sustainability of the ODA Loan Project, was reflected in the evaluation of the sustainability of the projects.

#### 3.4.1 Policy and System

The implementing agency of the ODA Loan Project was Kumul Consolidated Holdings. It is an organization renamed from the Independent Public Business Corporation, and its governing law is the Independent Public Business Corporation of Papua New Guinea Act of 2002. Kumul Consolidated Holdings is mandated to manage all government-owned commercial assets except oil and mineral resources.

Water PNG is responsible for the operation and management of the sewerage facilities developed under the ODA Loan Project. The former body of Water PNG was the National Water and Sewerage Board, established under the National Water Supply and Sewerage Act 1982 to be responsible for the management of water supply and sewerage facilities throughout the country. Water PNG was then corporatized in March 2017 by the National Water Supply and Sanitation Act 2016. The shares of Water PNG are wholly owned by Kumul Consolidated Holdings.

Eda Ranu, which was established in 1996 based on National Capital District Water Supply and Sewerage Act and National Capital District Commission Act, used to be responsible for the operation and management of water supply and sewerage facilities in Port Moresby,

while Water PNG were responsible outside Port Moresby. When Eda Ranu merged with Water PNG in 2020, its operations, assets, liabilities, and employees were transferred to Water PNG based on the National Water Supply and Sanitation Act revised in 2020.

Note that the draft legal system for the promotion of house connections, which was drafted by the Technical Assistance Project, had not been approved at the time of the ex-post evaluation. Similarly, the draft Port Moresby Trade Wastewater Policy, which was also prepared by the Technical Assistance Project, had not been approved either because it had not been integrated with the trade wastewater policy of Water PNG.

Although the names of the executing agency of the ODA Loan Project and the operating body of the sewerage facilities changed and the operating body was merged with other body, there were no major issues in policy and system of the Projects, and thus it can be concluded that the validity for the realization of project effects would continue. However, there were some issues in the aspects of policy and system, as the draft legal system and policy related to the operation and management of sewerage facilities, which were prepared with the support of the Technical Assistance Project, were not approved at the time of the ex-post evaluation.

#### 3.4.2 Institutional/Organizational Aspect

Water PNG, which merged with Eda Ranu in 2020, is the body which operates and manages the sewerage facilities developed under the ODA Loan Project.

At the time of the appraisal of the ODA Loan Project and at the time of the planning of the Technical Assistance Project, the sewerage facilities in Port Moresby were operated and managed by Eda Ranu. In Eda Ranu, the Sewerage Operation Department operated and managed the existing sewer network, whereas the Joyce Bay Sewage Treatment Plant Department, which was planned to be newly established, was to operate and manage the sewerage facilities to be developed by the ODA Loan Project. The Technical Assistance Project supported the establishment of the Joyce Bay Sewage Treatment Plant Department. In addition, the Technical Assistance Project made a proposal on the organizational system and division of duties for the Joyce Bay Sewage Treatment Plant Department, the Sewerage Operation Department, and other related departments.

Upon merger, both the Joyce Bay Sewage Treatment Plant Department and the Sewerage Operation Department were transferred from Eda Ranu to Water PNG. At the time of the ex-post evaluation, the Joyce Bay Sewage Treatment Plant Department and the Sewerage Operation Department operated and managed the sewage treatment plant and sewer network developed by the ODA Loan Project and the existing sewer network, respectively, in collaboration with each other.

Although the number of staff members in both departments slightly decreased after the completion of the Technical Assistance Project in 2020, both departments made it possible to operate and manage facilities with fewer staff members by installing surveillance cameras

and replacing existing sewer pipes with their own funds.

Therefore, it can be said that there were no problems due to staff shortages and that there were no issues in the institutional and organizational aspects of the operation and management of the Joyce Bay Sewage Treatment Plant and sewer network.

However, the Administration Department and the Environment & Quality Control Department, which were responsible for environmental education and awareness-raising activities, did not continue the activities because their mandates were not finalized after the merger between Eda Ranu and Water PNG.

### 3.4.3 Technical Aspect

At the time of the appraisal, Eda Ranu, which was to operate and manage the sewerage facilities developed by the ODA Loan Project, did not have any experience in the operation and management of sewage treatment plants with an oxidation ditch process employed for the ODA Loan Project. Therefore, the contractor and consultants provided guidance, including on-the-job training, after completion of the plant. In addition, the sewer network maintenance manual was prepared by the Technical Assistance Project and the training program was organized according to the manual.

When Eda Ranu merged with Water PNG in 2020, the Joyce Bay Sewage Treatment Plant Department, which operated and managed the sewage treatment plant and sewer network developed by the ODA Loan Project, and the Sewerage Operation Department, which operated and managed the existing sewer network in Port Moresby, were both transferred to Water PNG. In addition, many personnel who received technical guidance from the Technical Assistance Project continued working for Water PNG. Therefore, it can be said that Water PNG maintained a sufficient level of technical expertise.

The maintenance of the sewer network and operation and management of the sewage treatment plant and pumping stations were carried out in accordance with the manuals, and the operation and maintenance activities were recorded in logbooks. In addition, because no failures in the facilities that were left unaddressed for a long period of time were identified, there were no technical problems related to operation and maintenance. Furthermore, guidance was provided based on the manuals to the new staff members assigned to the Joyce Bay Sewerage Treatment Plant Department and the Sewerage Operation Department.

In addition, the Business Development and Strategic Planning Department of Water PNG was able to prepare and update its own medium-term investment plan, although the Medium to Long Term Business Operation Plan, which was prepared by the Technical Assistance Project, was not utilized at the time of the ex-post evaluation due to the merger of Eda Ranu with Water PNG. Therefore, Water PNG does not seem to have any issues in terms of the capacity to formulate and update the Medium to Long Term Business Operation Plan.

Environmental education and awareness-raising activities were the responsibility of the Administrative Department and the Environment and Quality Control Department. Because the staff members who received technical guidance from the Technical Assistance Project remained in these departments, neither department would have technical issues. However, as mentioned above, neither department had clear mandates and thus did not carry out any related activities at the time of the ex-post evaluation.

#### 3.4.4 Financial Aspect

The financial status of Eda Ranu up to the merger, which managed the sewage treatment plant developed by the ODA Loan Project and the sewer network in Port Moresby, is shown in Table 9. Eda Ranu did not seem to have any major financial status issues, as its capital adequacy ratio was high despite its low profitability.

In FY2020, the operating income of Eda Ranu increased, mainly because it canceled the outsourcing of water fee collection. However, it recorded loss before an income tax of 41.8 million kina, due to the impairment of account receivables, which amounted to 67.8 million kina, in preparation for the merger with Water PNG. The loss in FY2020 was only temporary, and it achieved a profit before a tax of 17.7 million kina in 2021.

Table 9 Financial status of Eda Ranu

	2018	2019	2020 (15 months)
Revenue	116.8	118.1	150.9
Operating income	34.8	67.1	67.1
Profit / loss before income taxes	-1.4	-41.8	17.7
Total assets	177.4	168.1	-
Total equity	139.4	106.7	-
Capital adequacy ratio	78.6%	63.5%	-

Source: Documents provided by Water PNG

Unit: million kina

Note: The financial result for FY2020 is 15 months, as the fiscal year was adjusted to align with the fiscal year of Water PNG. The figures for FY2020 are not definitive, as audited financial statements were not provided by Water PNG. A balance sheet for FY2020 was not provided.

The financial status of Water PNG is shown below. Note that the financial result for FY2021 is that after the merger with Eda Ranu. Although it incurred a loss in FY2019, it made a profit in both FY2020 and FY2021. As the capital adequacy ratio of Water PNG is also high, it does not seem to have any financial issues.

Table 10 Financial status of Water PNG

	2019	2020	2021
Revenue	106.8	118.0	200.1
Operating income	14.0	30.0	48.5
Profit / loss before income taxes	-5.2	24.9	11.1
Total assets	555.0	583.4	1,080.6
Total equity	321.8	332.7	598.1
Capital adequacy ratio	58.0%	57.0%	55.3%

Source: Documents provided by Kumul Consolidated Holdings

Unit: million kina

Water and sewerage tariff, which the Independent Consumer and Competition Commission (ICCC) authorizes, are supposed to be revised every five years in Papua New Guinea. However, owing to the merger between Eda Ranu and Water PNG, the tariffs were not revised as scheduled in January 2020.

At the time of the ex-post evaluation, Water PNG was discussing the revision of tariffs with the ICCC, and a new tariff structure was expected to be applied from January 2023. Under the new tariff structure, sewerage tariffs are expected to be revised to the level at which Water PNG can recover the operating and managing costs of the Joyce Bay Sewage Treatment Plant and other facilities developed under the ODA Loan Project. Under the new structure, same tariff rates are going to be applied throughout the country after this, although different rates were applied to Port Moresby, under the responsibility of Eda Ranu, and the rest of the country, under the responsibility of Water PNG.

Although Water PNG canceled the outsourcing and started collecting tariffs by itself, there were no issues in the tariff collection rates at the time of the ex-post evaluation. The draft billing system developed by the Technical Assistance Project may have contributed to the enhancement of the tariff collection of Water PNG.

The budget allocated to and executed by the Joyce Bay Sewage Treatment Plant Department is listed in Table 11. There were no maintenance activities that could not be performed owing to budget shortages. In addition, the Joyce Bay Sewage Treatment Plant Department, as well as the Sewerage Operation Department, were able to procure spare pumps that needed to be replaced periodically, and purchased additional equipment and materials, such as vehicles. Therefore, no issues were observed in budget allocation for operations and management.

Table 11 Budget Executed by Joyce Bay Sewage Treatment Plant Department

	2019	2020	2021
Budget execution	6.0	5.8	5.5

Source: Documents provided by Water PNG

Unit: million kina

The sewerage tariff setting for Port Moresby prepared by the Technical Assistance Project for the enhancement of financial planning capacity for sewerage system was not utilized at the time of the ex-post evaluation because a new tariff structure, which was to be applied throughout the country, was being developed as mentioned above.

Similarly, although the Medium to Long Term Business Operation Plan for Sewerage Service prepared for Eda Ranu by the Technical Assistance Project was used as a reference when Water PNG developed its medium-term plan, the extent to which it contributed to the enhancement of the financial aspect of Water PNG was not clear.

#### 3.4.5 Environmental and Social Aspect

The Joyce Bay Sewage Treatment Plant Department of Water PNG, responsible for the operation and maintenance of the sewerage facilities developed by the ODA Loan Project, operated and managed the sewage treatment plant following the monitoring indicators listed in the environmental permit issued by the CEPA. In addition, Water PNG monitored the water quality of the treated sewage discharged into the sea, carried out sample testing on water quality in the sea on a regular basis, and submitted the monitoring reports to CEPA.

The environmental permit is valid until 2043, and Water PNG is supposed to continue environmental monitoring following the permit; thus, it can be said that the sustainability in the aspects of environmental and social considerations is secured for the future.

#### 3.4.6 Preventive Measures to Risk

Although, the impacts of natural disasters on the proposed sewage treatment plant construction site and the area where the ocean outfall pipe was to be installed were foreseen at the time of the appraisal, no impact of natural disasters or unforeseen risks incurred. Similarly, no factors that could affect sustainability in the realization of project outcomes were identified.

#### 3.4.7 Status of Operation and Maintenance

At the time of the ex-post evaluation, both the sewage treatment plant and pumping station were operated and maintained in accordance with the manuals prepared by the Technical Assistance Project, and no issues were observed in their maintenance status. Using the IT system installed by the ODA Loan Project, the Joyce Bay Sewage Treatment Plant

Department was able to monitor the operational status of the sewage treatment plant and pumping stations on a real-time basis, and the department responded to problems such as garbage clogging within the following day if such problems occurred in pumping stations. In addition, it was also confirmed that necessary materials, such as spare parts were procured by the Water PNG budget.

The sewer pipes were maintained in accordance with the manuals prepared by the Technical Assistance Project, and no issues were identified in their operation and maintenance. Because Water PNG replaced some sewer pipes with larger ones and improved manholes utilizing the maintenance records registered in the sewer network ledger system developed by the Technical Assistance Project, the number of sewage outflows and emergency responses decreased, even outside the project area. As a result, Water PNG was now able to conduct preventive maintenance activities.

Through site visits to the sewage treatment plant and pumping stations conducted during the ex-post evaluation, no issues were identified in the operation and maintenance status.

Regarding policy and system, although the legal backgrounds of the executing agencies were clear, there were minor issues because the legal system for the promotion of house connections and the Trade Wastewater Policy were not approved. However, because Water PNG worked on them, there are good prospects for resolution.

There were no major issues in institutional, organizational, and technical aspects because the departments in charge of operation and maintenance of sewerage facilities continued their duties even after the merger of Eda Ranu with Water PNG, and their personnel were also transferred to Water PNG. However, there were some minor issues because environmental education and awareness-raising activities were not continued due to the mandates of the departments in charge not being finalized. From a financial aspect, there were no issues, as Water PNG had been making profits since the merger, and it had allocated a sufficient budget for operation and maintenance. In addition, environmental and social aspects were monitored following pre-determined indicators, and sufficient preventive measures against risk were taken. In addition, there were no issues in the status of operation and maintenance, as Water PNG operated and maintained sewerage facilities in accordance with the manuals and responded to the abnormalities and emergencies.

Furthermore, it was confirmed that the support provided by the Technical Assistance Project led to improvements in the technical aspects of operation and maintenance and that the proposed collection system developed by the Technical Assistance Project contributed to the improvement in the financial aspect. Thus, it can be said that the Technical Assistance Project contributed to the improvement in the sustainability of the projects.



In light of the above, although some minor issues were observed in the policy, systems, institutional, and organizational aspects, they are expected to be settled. Therefore, the sustainability of the project effects is high.

## **4. Conclusions, Lessons Learned and Recommendations**

### 4.1 Conclusion

The ODA Loan Project was implemented to provide sewerage services to the coastal area of Port Moresby and to prevent the discharge of contaminated water to the coastal waters by developing sewerage facilities in the area thereby contributing to the improvement in residents' living environment and industrial development through establishing a sanitary living environment and conserving the marine environment. The Technical Assistance Project was also implemented in combination with the ODA Loan Project targeting on improving the management capacity of Eda Ranu that operated and managed sewerage facilities in Port Moresby.

Although the projects were not implemented in coordination with other projects of JICA or other organizations other than JICA, they were highly relevant to the development policies and development needs at the time of the appraisal and ex-post evaluation. Therefore, their relevance and coherence are high. The outputs of the ODA Loan Project were revised based on the M/D concluded in 2014 after the ODA Loan Project was launched. The efficiency of the projects is high because the actual project cost and project period exceeded the planned project cost, which were recalculated in accordance with the revised project outputs, and revised planned project period, only slightly. The qualitative effects of the projects, such as the establishment of a sanitary living environment and conservation of the marine environment, were identified, and impacts, such as improvement in residents' living environment and industrial development, were partly identified. However, because quantitative effects such as the volume of sewage treatment and the utilization rate of sewerage facilities were much lower than the targets, the effectiveness and impact of the projects are moderately low. Although there were some minor issues in the operation and maintenance of the projects in terms of policy and system, as well as institutional and organizational aspect, the sustainability of the projects is high because they were expected to be settled.

In light of the above, the projects are evaluated to be satisfactory.

### 4.2 Recommendations

#### 4.2.1 Recommendations to the Executing Agency

##### Improved utilization rate of sewerage facilities by strengthening house connections

The utilization rate of sewerage facilities of the Joyce Bay Sewage Treatment Plant

developed under the ODA Loan Project was only 38%; thus, the number of house connections needs to be increased. Therefore, Water PNG plans to increase the number of connections and the utilization rate of sewerage facilities by waiving connection fees, which are supposed to be covered by users. As an increase in the number of connections would lead to an improvement in the utilization rate of sewerage facilities and the improvement in residents' living environment, this effort should be continued in the future.

However, because the budget of Water PNG is limited, it is recommended that Kumul Consolidated Holdings and the government allocate a budget to Water PNG to increase the number of house connections. In addition, Water PNG should resume publicity and environmental education activities for residents to increase the number of connections.

#### Integration of trade wastewater policies

At the time of the ex-post evaluation, the trade wastewater policy of Water PNG covering the area outside Port Moresby was already approved, whereas the draft trade wastewater policy prepared for the former Eda Ranu covering Port Moresby was not approved. Therefore, Water PNG, which merged with Eda Ranu, did not have the authority to conduct on-site inspections of business establishments in Port Moresby at the time of the ex-post evaluation and could not prohibit them from discharging sewage exceeding standards into the sewer network.

Therefore, it is recommended that Water PNG consolidate the two trade wastewater policies mentioned above and approve them by its Board of Directors to have the authority to conduct on-site inspections of business establishments in Port Moresby.

#### Finalization of organizational structure

At the time of the ex-post evaluation, environmental education and awareness-raising activities supported by the Technical Assistance Project had not been implemented because the mandates of departments in charge were not made clear since the completion of the Technical Assistance Project. Environmental education and awareness-raising activities are expected to lead to stable operation and management of the sewage treatment plant by reducing the amount of garbage dumped into the sewer network by residents and sewage exceeding the standard discharged into the sewer network. It is therefore recommended that Water PNG finalizes its organizational structure and mandates of departments, and resumes environmental education and awareness-raising activities.

#### 4.2.2 Recommendations to JICA

None

#### 4.3 Lessons Learned

##### Consideration of increase in the number of house connections to sewerage system during project planning and implementation

In the projects, the number of house connections did not increase as expected despite the completion of sewerage facilities because users avoided bearing connection fees. As a result, the volume of sewage treatment of the sewage treatment plant and the percentage of sewered population in the project area were smaller than planned; thus, the achievements of the project effects were limited.

Therefore, when developing sewerage facilities, it is recommended to confirm whether any issues related to residents' housing connections to the sewerage system might arise during project planning and implementation. If there is a possibility that such issues related to house connections arise, JICA, the implementing agency and relevant organizations need to discuss solutions to these issues, such as mandatory sewer connections, during project planning and implementation.

##### Expiration date of environmental permit at time of the appraisal

The environmental permit originally issued for the ODA Loan Project needed to be renewed because it expired in 2013 during project implementation. During this renewal process, the treatment capacity and treatment process of the sewage treatment plant were discussed, and the project period became longer. To avoid major changes in the project scope during implementation, it is recommended that permits and approvals, including environmental permits, cover the periods up to the completion of the project.

## **5. Non-Score Criteria**

### 5.1 Performance

#### 5.1.1 Objective Perspective

JICA has contributed to the improvement of technical levels of the operation and management of sewerage facilities of Water PNG, in addition to the support provided in the projects, during and after the implementation of the projects, by accepting several Water PNG staff members for subject-specific training programs such as "Sewerage System Maintenance Management" and "Sewerage and Urban Drainage Management."

(end)

### Comparison of the Original and Actual Scope of the Project

Item	Plan	Actual
<p>1. Project Outputs</p> <p>(1) Sewerage facilities</p>	<p>a) Construction of sewage treatment plant, access road, and ocean outfall</p> <ul style="list-style-type: none"> <li>- Sewage treatment plant (13,800 m<sup>3</sup>/day, oxidation ditch process)</li> <li>- Access road (1.73 km)</li> <li>- Ocean outfall (1.4 km)</li> </ul> <p><u>This component was revised as follows:</u></p> <ul style="list-style-type: none"> <li>- Sewage treatment plant (18,400 m<sup>3</sup>/day, oxidation ditch process)</li> <li>- Access road (1.5 km)</li> <li>- Ocean outfall (1.6 km)</li> </ul> <p>b) Sewer pipe installation</p> <ul style="list-style-type: none"> <li>- Trunk sewer 17.2 km</li> <li>- Branch sewer 17.7 km</li> </ul> <p><u>This component was revised as follows:</u></p> <ul style="list-style-type: none"> <li>- Trunk sewer 13.6 km</li> <li>- Branch sewer 15.6 km</li> </ul> <p>c) Construction and rehabilitation of pumping stations</p> <ul style="list-style-type: none"> <li>- Construction: 8 stations</li> <li>- Rehabilitation: 9 stations</li> </ul> <p><u>This component was revised as follows:</u></p> <ul style="list-style-type: none"> <li>- Construction: 4 stations</li> <li>- Rehabilitation: 9 stations</li> </ul> <p>d) Construction of sludge drying beds at the Morata Sewage Treatment Plant</p> <p><u>This component was excluded from the project output.</u></p>	<p>a) Construction of sewage treatment plant, access road, and ocean outfall</p> <ul style="list-style-type: none"> <li>- Sewage treatment plant (18,400 m<sup>3</sup>/day, oxidation ditch process)</li> <li>- Access road (1.25 km)</li> <li>- Ocean outfall (1.6 km)</li> </ul> <p>b) Sewer pipe installation</p> <ul style="list-style-type: none"> <li>- Trunk sewer 12.4 km</li> <li>- Branch sewer 13.2 km</li> </ul> <p>c) Construction and rehabilitation of pumping stations</p> <ul style="list-style-type: none"> <li>- Construction: 4 stations</li> <li>- Rehabilitation: 9 stations</li> </ul>

(2) Consulting Services	<ul style="list-style-type: none"> <li>- Review of tender documents, tender assistance, and supervision of construction work</li> <li>- Training for Eda Ranu staff members on the operation and maintenance of sewerage facilities</li> <li>- Implementation of environmental monitoring</li> <li>- Support on the implementation of a pilot project on the introduction of flush toilets for inhabitants in water-houses and on the implementation of hygiene and environmental education programs</li> <li>- Support on the implementation of HIV/AIDS prevention programs for workers employed for the ODA Loan project and the surrounding residents</li> </ul>	<ul style="list-style-type: none"> <li>- Review of tender documents, tender assistance, and supervision of construction work</li> <li>- Training for Eda Ranu (currently Water PNG) staff members on the operation and maintenance of sewerage facilities</li> <li>- Implementation of environmental monitoring</li> <li>- Support on the implementation of HIV/AIDS prevention programs for workers employed for the ODA Loan project and the surrounding residents</li> </ul>
2. Project Period	January 2010 - September 2015 (69 months)	January 2010 - January 2020 (121 months)
3. Project Cost		
Amount Paid in Foreign Currency	3,787 million yen	4,774 million yen
Amount Paid in Local Currency	7,015 million yen (178 million kina)	9,872 million yen (271 million kina)
Total	10,802 million yen	14,647 million yen
ODA Loan Portion	8,261 million yen	8,181 million yen
Exchange Rate	1 kina = 39.5 yen (As of January 2010)	1 kina = 36.4 yen (Average between January 2010 and January 2020)
4. Final Disbursement	March 2020	

(end)

Country Name	<b>The Project for Reconstruction of Bridges on New Britain Highway</b>
Independent State of Papua New Guinea	



Location of the Project Site  
(Source: External Evaluator)



The bridges reconstructed under this project:  
Aum Bridge (above) and Kapiura Bridge (below)  
(Source: External Evaluator)

**I. Project Outline**

Background	<p>Roads in Papua New Guinea were underdeveloped, with a number of sections not yet opened, roads connecting major cities in the country being fragmented, and there were few detours or alternative routes. This had a serious impact on the economy and the lives of residents, as heavy rains during the rainy season caused landslides and overflowing rivers, making it impossible to move people and transport goods between regions.</p> <p>The New Britain National Highway is a trunk road connecting Kimbe, a major city in West New Britain Province, and Rabaul, a major city in East New Britain Province, and was used by small farmers and marketers in West New Britain Province, where palm oil production was thriving. However, of the bridges on the New Britain National Highway, the Aum and Kapiura bridges, which were built by a Japanese company in the early 1980s, were no longer capable of carrying the design load due to aging and damages to members caused by vehicle collisions. As a result, the Aum Bridge was closed to traffic and the Kapiura Bridge had weight restrictions on passing vehicles, hindering logistics including palm oil transportation. The Kapiura Bridge was also feared to be in danger of falling due to the passage of large vehicles, and the temporary bridge for the Aum Bridge was a fragile bridge constructed of logs, which not only hindered logistics but also posed a major safety issue for traffic.</p> <p>The instability of both of these bridges could have had a negative impact on the livelihood of the residents and the development of key industries in Papua New Guinea, and this project was undertaken in response to a request for cooperation from the Papua New Guinean government for the road sector development plan.</p>
Objectives of the Project	<p>The objective of this project was to improve the performance of the bridges and traffic safety by replacing Aum Bridge and Kapiura Bridge on the New Britain National Highway, thereby contributing to ensuring access to markets for local residents and promoting and facilitating logistics.</p>
Contents of the Project	<ol style="list-style-type: none"> <li>1. Project Site: West New Britain Province, Independent State of Papua New Guinea</li> <li>2. Japanese side: 1) Details of civil works and procured equipment (The table shows the actual results. There were minor changes in quantity and specifications compared to the plan.)</li> </ol>

Item	Specification
1. Removal of two existing bridges	1-1. Aum Bridge (one-lane) ➤ Bridge length: 50 m, Effective width: 5.8 m, Underpass steel truss bridge 1-2. Kapiura Bridge (one-lane) ➤ Bridge length: 116 m, Effective width: 5.8 m, Underpass stiffened arch bridge (Langer girder bridge)
2. Construction of two new bridges	2-1. Aum Bridge (two-lanes) ➤ Bridge length: 76 m, Effective width: 13.9 m - 9.5 m, Steel 2-span continuous plate girder bridge 2-2. Kapiura Bridge (two-lanes) ➤ Bridge length: 137 m, Effective width: 9.5 m, Steel 3-span continuous plate girder bridge
3. Construction of temporary approach road	Construction of temporary approach roads (including the installation of guardrails, road signs, etc.) ➤ Aum Bridge: 124 m ➤ Kapiura Bridge: 443 m
4. Installation of gabions	Installation of gabions to prevent scouring of abutment

2) Soft component  
None

3. Papua New Guinea side:  
Lease cancellation of land required for the project, Lease of land as construction yard, Securing land for dumping soil and collecting sand/crushed stones, Construction of approach roads (including pavement, guardrails, road signs and drainage works)

Implementation Schedule	E/N Date	23 January 2015	Completion Date	April 2020 <sup>1</sup>
	G/A or L/A Date	30 January 2015		
Project Cost	E/N Grant Limit / G/A Grant Limit: 3,160 million yen, Actual Grant Amount: 3,110 million yen			
Executing Agency	Department of Works (hereinafter referred to as "DOW") <sup>2</sup>			
Contracted Agencies	Main Contractor: Dai Nippon Construction Main Consultant(s): CHODAI CO., LTD. and INGÉROSEC Corporation Procurement Agent: None Equipment Procurement Agent: None			

## II. Result of the Evaluation

### Summary

This project aimed to improve the performance of the bridges and traffic safety by replacing Aum Bridge and Kapiura Bridge on the New Britain National Highway in West New Britain Province, thereby contributing to ensuring access to markets for local residents and promoting and facilitating logistics.

This project has high level of relevance and coherence as it was consistent with the development policy, development needs of Papua New Guinea and Japan's development cooperation policy at the time of planning. In addition, the collaboration and coordination with other JICA-assisted projects and projects of non-JICA organizations were also found as initially expected, and concrete outcomes were confirmed.

The effectiveness and the impact of this project were also high as it had achieved the logistics promotion and facilitation, secured traffic in the event of a disaster, ensured pedestrian safety and ensured access to markets for the residents as expected at the time of planning. No negative impacts on the social and natural environment and resettlement were identified. As for the outputs of the project, the Japanese portion of the project, including the bridge replacement and construction of temporary approach roads, was completed as planned, but the Papua New Guinea portion of the project, including the revetment work and removal of a log bridge, was partially incomplete due to a change in the scope of the Japanese and Papua New Guinean portions of the project, mainly as a result of bidding failure. As for inputs, both the total project cost and the project period exceeded the plan, mainly due to bidding failure. Therefore, the efficiency of this project is moderately low.

In terms of policies and systems, the national development plan emphasizes the maintenance of road and bridge infrastructure, and in terms of institutional and organizational aspect, the DOW-West New Britain Office (DOW-WNB) has no shortage of personnel to implement maintenance activities. In terms of the technical aspect, the educational background and work experience of the DOW-WNB staff are both sufficient for maintenance, and there are no particular issues in terms of environmental and social considerations and preventative measures to risks. On the other hand, from a financial point of view, sufficient financial resources have not been secured as a budget for regular maintenance, and with regard to actual operation and maintenance, the inspection items assumed at the time of planning have not been carried out regularly, the maintenance manual has not been utilized, and an alternative maintenance management plan has not been clearly defined. Therefore, the sustainability of the project is moderately low.

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

<sup>1</sup> The completion date for the Japanese side was 27<sup>th</sup> March 2019 (see "Efficiency" for details).

<sup>2</sup> In this report, DOW means the Department of Public Works as a whole. When it is necessary to distinguish between the DOW head quarter and the DOW West New Britain office, they are hereafter referred to as DOW-HQ and DOW-WNB, respectively.

Overall Rating <sup>3</sup>	B (Satisfactory)	Relevance & Coherence	③ <sup>4</sup>	Effectiveness & Impacts	③	Efficiency	②	Sustainability	②
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## 1 Relevance/Coherence

### <Relevance>

- Consistency with the Development Policy of Papua New Guinea at the Time of Ex-Ante Evaluation

At the time of ex-ante evaluation, The *Medium Term Development Plan 2011-2015* developed by the Papua New Guinea Government identified the importance of maintaining existing highways in good condition in order to improve access to markets and public services for local residents. Also, the *Development Strategic Plan 2010-2030* state that sixteen priority roads, including the New Britain National Highway, will be drastically upgraded by 2030. Therefore, this project was consistent with the government's development policy at the time of ex-ante evaluation.

- Consistency with the Development Needs of Papua New Guinea at the Time of Ex-Ante Evaluation

At the time of ex-ante evaluation, the area along the New Britain National Highway, located in West New Britain Province, was the area where the palm oil and lumber industries were thriving and the highway was the only lifeline. However, the Aum and Kapiura bridges on the New Britain National Highway were dilapidating due to damages to members caused by vehicle collisions and aging. The Aum Bridge was closed to traffic and the Kapiura Bridge had weight restrictions on passing vehicles. In this regard, there was a high need to promote and facilitate logistics, ensure market access, and secure traffic in the event of a disaster by improving bridges. In addition, as the replacement bridge for the Aum Bridge was a fragile bridge constructed of logs, and the Kapiura Bridge was at risk of falling due to lack of durability, there was a high need for rapid safety assurance through bridge improvement. Given these factors, this project was consistent with the development needs of Papua New Guinea at the time of ex-ante evaluation.

### <Coherence>

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

At the 6th Pacific Islands Leaders Meeting in 2012 (PALM 6), the Government of Japan expressed the importance of developing a reliable transport network to ensure sustainable development and human security. In addition, in "JICA Country Analysis Paper for Papua New Guinea," socio-economic infrastructure was identified as an important area. Also, "Strengthening of the Socio-Economic Infrastructure" was mentioned as a priority area in "Japan's ODA: Rolling Plan for Papua New Guinea," which focused on the development and maintenance of economic infrastructure, including transport infrastructure. For these reasons, this project was highly consistent with Japan's ODA policy at the time of ex-ante evaluation.

- Internal Coherence

JICA had implemented a technical cooperation project "The Project for Capacity Development on Road Maintenance" (2013-2017) in parallel with this project. These projects provided opportunities for engineers with limited field experience to implement projects and use equipment. They were also able to acquire further knowledge through communication with Japanese counterparts and experts. Interviews with the executing agency confirmed that these elements contributed to the smooth implementation of the project. Therefore, JICA's other projects are considered to have contributed to the generation of the project outcomes and the securing of project sustainability.

- External Coherence

In 2018-2020, at around the same time as the implementation of this project, the Asian Development Bank (ADB) implemented the "Bridge Replacement for Improved Rural Access Project (BRIRAP)" for 27 small simple steel (Bailey) bridges on five arterial roads, including the New Britain National Highway. In addition, a "Major Bridge Survey" was conducted to investigate the need to replace bridges that were not covered by BRIRAP on the same five routes as BRIRAP. There was no overlap between this project and those of other donors including ADB, and the two projects can be said to have complemented each other, as the ADB project and this project together reduced the travel time on the New Britain National Highway.

Although no concrete quantitative outcomes were confirmed in terms of consistency with the international framework, from the perspective of improving traffic safety, ensuring access to markets for local residents, and promoting and facilitating logistics by replacing bridges, this project is considered to have been consistent with several goals of SDGs, such as "1. End poverty in all its forms everywhere," "9. Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation," and "11. Realize inclusive, safe, resilient, and sustainable cities and human settlements."

### <Evaluation Result>

In light of the above, the relevance and coherence of the project are high<sup>5</sup>.

## 2 Effectiveness/Impacts<sup>6</sup>

### <Effectiveness>

As the quantitative and qualitative effects of the project have been generated as expected at the time of ex-post evaluation, the project

<sup>3</sup> A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

<sup>4</sup> ④ : Very High ③: High, ②: Moderately low, ①: Low

<sup>5</sup> Relevance: ③, Coherence: ③

<sup>6</sup> When providing the sub-rating, Effectiveness and Impacts are to be considered together.



objective can be said to have been achieved.

a. Quantitative Effects

The Aum and Kapiura bridges replaced in the project were observed to be in use for traffic without any major problems. According to DOW, the bridge load carrying capacity (Indicator 1) for both bridges satisfied the target value of 88 tonnes, and it was observed that some 45-tonne trucks fully loaded with palm oil and logs passed through the bridges during the field survey. The average driving speed on each bridge (Indicator 2) was set at the target value of 60 km/h. It was confirmed that the speed of vehicles passing on both bridges were generally above 60 km/h by visually checking at the field survey although the actual speed was not measured according to DOW. Therefore, it is considered that Indicator 2 has been achieved. The annual average daily traffic volume (Indicator 3) refers to the number of vehicles per day between Kimbe and Bialla. According to DOW, the target of 772 vehicles/day has been achieved. In addition, all vehicles were observed to be passing smoothly during the field survey though it should be noted that the traffic volume survey has not been conducted after the completion of the project and it is DOW's estimate of traffic volume.

Table 1 Quantitative Effects

Quantitative Effects (Effect Indicators)		Baseline 2014	Target 2020 3 Years after Completion	Actual 2022 3 Years after Completion
<u>Indicator 1</u> Bridge load carrying capacity (tonne)	Aum Bridge	44	88	<ul style="list-style-type: none"> <li>According to DOW, the actual value is 88 tonnes as targeted.</li> <li>It was observed at the field survey that there was no weight limit for the traffic on either bridges, and that some 45-tonne trucks with full of palms and logs frequently passed through the bridges.</li> </ul>
	Kapiura Bridge	44	88	
<u>Indicator 2</u> Average driving speed on each bridge (km/h)	Aum Bridge	11.0	60	<ul style="list-style-type: none"> <li>According to DOW, the actual value has not been measured.</li> <li>It was observed at the field survey that vehicles were passing on both bridges at about 60-80 km/h.</li> </ul>
	Kapiura Bridge	18.4	60	
<u>Indicator 3</u> Annual average daily traffic volume (number of vehicles/day)	Kimbe-Bialla	493	772	<ul style="list-style-type: none"> <li>According to DOW, although no traffic volume survey has been conducted since the project was completed, the actual number of vehicles traveling is more than 772 vehicles/day, based on their road management experiences.</li> </ul>

Source : Data from ex-ante evaluation paper of JICA and the data provided by DOW

b. Qualitative Effects

The qualitative effects of the project were expected to be “securing traffic in the event of a disaster,” “ensuring pedestrian safety,” and “effective use of river water.” At the field survey, it was observed that both bridges were constructed in accordance with the originally planned specifications and that the bridges were passable even in the event of a disaster. Therefore, it is assumed that “securing traffic in the event of a disaster” has been achieved without any problems. “Ensuring pedestrian safety” is also considered to have been achieved since it was found during the field survey that both bridges have pedestrian walkways installed on one side of the bridges. Regarding “effective use of river water”, stairway construction was to be carried out on both bridges in the original plan. This was because the installation of stairways for river water use by women was supposed to be a standard component in ADB's BRIRAP project from a gender perspective. However, it was found in the field survey that no stairways were installed on either bridge. According to the project consultant, the stairway construction was supposed to be done by DOW together with the revetment construction, but as the revetment construction has not been commenced, the stairway has not been constructed either. Although it was initially assumed that water from the river would be used by the residents of the neighborhood, according to DOW-WNB, the fact is that there have been no residents living in the neighborhood since before the construction of both bridges, and it is unlikely that residents will use the river in the vicinity of either bridges. Therefore, no negative impact is expected due to the lack of stairway construction.

<Impacts>

In this project, the impacts were assumed to be “promotion and facilitation of logistics” and “ensuring access to markets for local residents”. Regarding the “promotion and smoothing of logistics,” according to interviews with major users of the bridges including DOW, a palm oil company, a logging company and the General Hospital in Kimbe, the volume of goods transported such as logs, palms and foodstuffs has increased, transport efficiency has improved and traffic safety has been ensured. Specifically, the bridges can now be used to transport palms and logs with a full load. In addition, traffic safety is ensured at all times because the log bridge to bypass the Aum Bridge, which was dangerous during the rainy season when the river was rising, was replaced by the new one. The traffic on the Kapiura Bridge and the approach road was also observed to be smooth after the project was implemented, although the bridge and road were previously unstable due to the bumpy surface. As for “ensuring access to markets for the residents,” according to DOW-WNB, the project has improved the convenience of transportation of food and other goods to markets.

No adverse impact on the natural environment was found due to the implementation of the project (the guideline for environmental and social considerations applied to the project is the “JICA Guidelines for Environmental and Social Considerations” (2010), with the environmental category of “B”). According to the interview with the Environmental Unit of DOW, the environmental impact assessment

was conducted at the time of project implementation. Also, regarding monitoring during project implementation, monthly site inspections of both bridges were conducted and reports were provided to the Conservation and Environment Protection Authority (CEPA). As for the environmental monitoring items assumed at the time of planning, the waste generated during construction was properly disposed of. No negative impact was also found for other items (water, soil and air pollutions). Regarding land acquisition, according to the interview with a logging company, the state-owned land that had been leased to them was returned to the government for use as a construction yard. They gladly accepted the government's request because, as a road and bridge user, the construction of the two bridges would bring benefits to them in the form of improved traffic convenience. In addition, it was confirmed that resettlement did not occur and the project did not cause any negative impacts on gender and the marginalized people.

The revetment construction, which was to be carried by the Papua New Guinea side, has not yet been started. It may have a negative impact on the structural stability of the piers of the bridges in the long-term. According to the project consultant, the piers of the bridges have been built to the depth of the river bedrock in accordance with regulations of river management structures in Japan. Therefore, there is no immediate risk of the piers flowing out and the bridges falling due to floods in normal scale. However, depending on the magnitude of the flood, the stability of the piers may be affected by scouring due to levee sediment runoff near the piers.

<Evaluation Result>

In light of the above, the effects were generated as planned through the implementation of this project, and the effectiveness and impacts of the project are high.



A truck with full of palms is passing through the Aum Bridge (Source: External Evaluator)



Palms are waiting for collection (At a house of a small farmer along the New Britain National Highway) (Source: External Evaluator)



An approach road leading to the Kapiura Bridge has been constructed (Source: External Evaluator)



Curbside walkway has been installed on the Aum Bridge (Source: External Evaluator)

3 Efficiency

Both the total project cost and the project period exceeded the original plan mainly due to bidding failures during the selection stage of the contractor.

The bidding failures were mainly due to the fact that the unit prices of sand and crushed stone actually offered by the bidders were significantly higher than the values initially estimated. Specifically, the unit prices used in the estimation were based on the one used by DOW when they directly procure sand and crushed stones. However, the DOW procurement unit price was not applied when the private companies procured the materials. Normally, the prices are determined through direct negotiations with the sand and stone operators (landowners), which means that the unit price is to be significantly increased. This resulted in a large gap between the both unit prices<sup>7</sup>. As

<sup>7</sup> Two contractors participated in the first round of bidding but were not awarded the contract because their bid prices were significantly higher than the

a result, it was decided to transfer the initially planned project scopes that used a large amount of sand and stone to the component to be borne by the Papua New Guinean Government. The initial scope was divided into Japanese Grant Aid and DOW's own budgeted projects (as shown in the table below).

Table 2 Contents after changing the project scope

Phase	Project operator	Planned contents after changing the project scope
Phase 1	Japan (Grant aid)	<ul style="list-style-type: none"> <li>• Demolition of old Aum Bridge and Kapiura Bridge</li> <li>• Construction of new Aum Bridge and Kapiura Bridge (including paving of bridge with asphalt)</li> <li>• Construction of temporary approach roads (including installation of guardrails, road signs, etc.)</li> <li>• Construction of gabions</li> </ul>
Phase 2	Papua New Guinea (DOW's own budget)	<ul style="list-style-type: none"> <li>• Construction of approach roads (including DBST pavement, installation of guardrails, road signs, drainage etc.)</li> <li>• Construction of revetment</li> <li>• Demolition of log bridge which was an alternative route to the old Aum Bridge</li> <li>• Cancellation of lease contract, lease of land for yard, and securing land for sand and crushed stones</li> </ul>

Source : Project completion report and Defects inspection report of JICA

The outputs at the time of the ex-post evaluation are generally as described in “I. Project Outline, Contents of the Project” above although there were minor design changes. It was confirmed that there are no particular problems with road access for vehicles. While it was also confirmed that the Japanese portion of the project was completed, it was found in the field survey that the demolition of the log bridge as an alternative route to the old Aum Bridge and the construction of revetment for both bridges, which were the items to be borne by the Papua New Guinea side, have not been completed. At the time of the ex-post evaluation, no major problems due to non-implementation of the construction were specifically identified. However, there is a concern that the stability of the piers may be adversely affected in the long run in the cases of scouring due to major flooding, etc. though there was no immediate negative impact.

With regard to the inputs, the project cost on the Japanese side was within the planned amount (planned project cost: 3,160 million yen, actual cost: 3,110 million yen). As for the Papua New Guinea side, the actual project cost was approximately 294 million yen<sup>8</sup> and exceeded the original plan of 18 million yen due to the change of project scope. Therefore, the total project cost was 3,404 million yen, exceeding the plan (107% of the plan).

Table 3 Comparison of Planned and Actual Project Costs

Unit: Million Yen

	Plan	Actual	Difference
Japanese side	3,160	3,110	▲50
Papua New Guinea side	18	294	+276
Total project cost	3,178	3,404	+226

Source : Ex-ante evaluation paper of JICA, Preparatory survey report of JICA and Interview with DOW

Regarding the project period, the planned period was 28 months from February 2015 to May 2017, whereas the actual period was 63 months, 225% compared to the plan, from February 2015 to April 2020. The project period exceeded the plan by 35 months, due to the delays in the construction period of the Papua New Guinea side of the project because of tender failures and heavy rainfall disasters.

<Evaluation Result>

Based on the above, although the project effects initially expected are considered to have been achieved even with partially unimplemented part of outputs on the Papua New Guinea side, the total project cost and period were 107% and 225% respectively compared to the plan. Therefore, the efficiency of the project is moderately low.

estimated prices. The main reason was that there was a significant difference in the construction prices for the approach road and the river embankment, which used a lot of sand and stones. The project was affected by the unique business practice in Papua New Guinea whereby foreign contractors were required to pay higher royalties to landowners when they purchased sand. The project had a large price difference between DOW's direct purchase and the Japanese contractor's purchase of the materials. The prices of sand and stones in the estimated price were almost the same as DOW's purchase price. DOW was not in a position to coordinate price negotiations between the private company and the landowner, and DOW could not directly purchase sand and crushed stones so that the Japanese contractor could do the construction. Therefore, the project was divided into two phases and the construction work that used a lot of sand and stones was transferred to the Papua New Guinea side.

<sup>8</sup> According to DOW, the actual project cost on the Papua New Guinea side was 8,535,185 Kina. The IMF annual average exchange rate was used for the yen exchange rate (based on the average for the project period, February 2015 - April 2020).



Log bridge incompletely demolished near the Aum Bridge  
(Source: External Evaluator)



Unimplemented revetment works of the Aum Bridge  
(Source: External Evaluator)

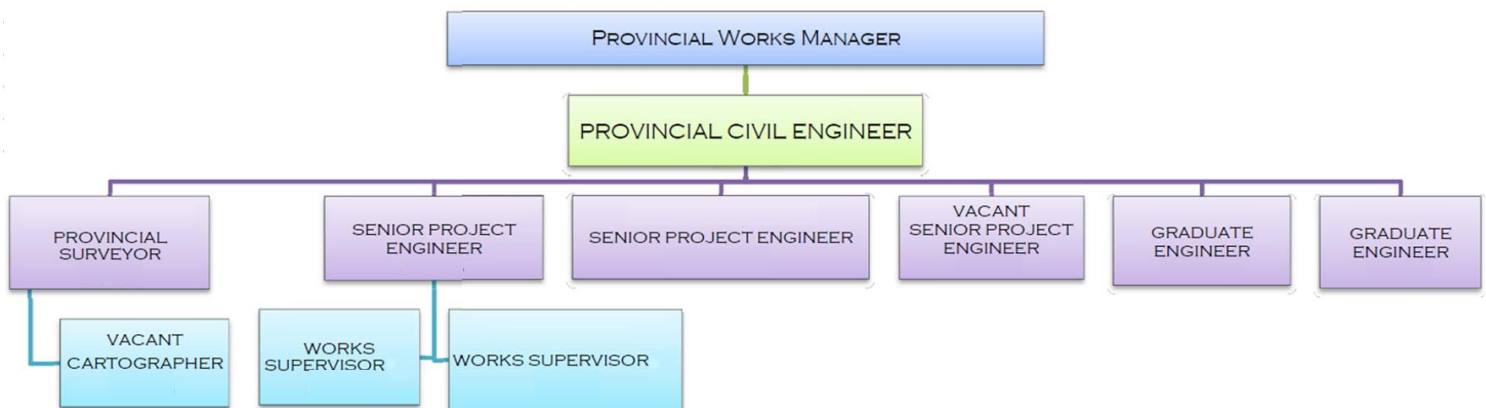
#### 4 Sustainability

- Policy/System

The Government of Papua New Guinea places a high priority on road infrastructure. Specifically, the road infrastructure sector has been identified as a key area in the national development plans and sector plans such as *the Connect PNG Road Program*, *the Papua New Guinea Vision 2050*, *the Medium Term Development Plan III 2018-2022* and *the National Road Network Strategy 2018-2037*. In addition, DOW, the executing agency of this project, is responsible for the development and maintenance of the road network. Therefore, the policy and system necessary to sustain the project's effectiveness are considered to be secured.

- Institutional/Organizational Aspect

According to DOW-WNB, the number of posts in the Civil Engineer Section which covers maintenance services is 11 and unchanged since the project was completed. The number of employees is ten under the Provincial Works Manager, including one Civil Engineer, five Engineers, two Supervisors, and one Surveyor. There are two vacant posts being advertised. The maintenance structure is considered to be adequate, but securing the staff is an urgent issue.



Source : Materials provided by DOW-WNB

Figure 1 Organizational structure of Civil Engineer Section in DOW-WNB

- Technical Aspect

According to DOW-WNB, most of the staff members have academic degrees at a Diploma level or higher and between three and 15 years of work experience. In terms of training, the staff participate in training programs arranged by DOW's Human Resources Department as necessary, and also attend disaster-related training courses of JICA. In addition, the engineers were able to acquire knowledge and improve their ability to operate the equipment through guidance from Japanese engineers through the implementation of the grant aid project "The Project for Improvement of Road Maintenance Equipment" (2013-2014) and the technical cooperation project "The Project for Capacity Development on Road Maintenance" (2013-2017). According to DOW, participation in Japanese cooperation projects was also a good opportunity for the engineers with limited field experiences to gain practical experiences.

- Financial Aspect

According to DOW-WNB, there is no budget allocation from the DOW Headquarters for the maintenance of bridges and approach roads developed under this project and the financial situation is not adequate in terms of maintenance budget. According to DOW Headquarters, the maintenance budget is not secured on a nationwide basis. Also, the budget is secured mainly through donor assistance when the need for repairs arises (see also "Current Status of Operation and Maintenance" below). In terms of other donor support, "Transport Sector Support Program (TSSP)" from Australia provides between 3 and 5 million Kina per year for routine maintenance of roads and bridges along the New Britain National Highway. However, the assistance is only used for minor maintenance items such as signage and guardrail painting maintenance and does not include the necessary maintenance of the bridges themselves.

- Social and Environmental Aspect

As mentioned in “Impacts” above, there has been no significant adverse impact on the society and the environment. Also, it is not assumed that negative impacts will be generated in the future.

- Preventative Measures to Risks

No particular risks which had been estimated at the time of planning have occurred. Similarly, no particular risks against the sustainability of the project effects generated can be assumed. However, it is critical to carry out the revetment works to ensure the long-term stability of the abutment structure.

- Current Status of Operation and Maintenance

It was confirmed that both bridges were in good condition at the time of ex-post evaluation. According to DOW-WNB, however, maintenance inspections are being carried out irregularly and the maintenance items specified at the time of planning are not comprehensively inspected. In addition, the maintenance manual developed at the time of project completion has not been utilized, and a maintenance plan has not been formulated. Under such circumstances, there is a concern that the bridges could be deteriorated earlier in the future. Therefore, there are issues in the current operation and maintenance status. Spare parts and other components need to be funded from the above-mentioned Australia-assisted budget and the regular budget of DOW-WNB. The drain covers that had been stolen at the time of project completion were installed through the donation of a private company. (At the time of ex-post evaluation, the covers had been replaced with bolt-fixed ones with anti-theft measures).

It was found during the field survey that there have been betel nuts spitting and graffiti on the footpath, concrete barrier walls and guardrails, and driftwood retention near the piers of the bridges. These will not have significant impacts on the generation of project effects of the bridges themselves but appropriate measures through regular maintenance work were considered to be required.

<Evaluation Result>

Based on the above, no major problems were identified in terms of policy/system, institutional/organizational, technical, social and environmental aspects and the preventative measures to risks. On the other hand, it was observed that the budget for maintenance was not secured, manuals on maintenance were not utilized, maintenance plans or other guidelines were lacking, and the items required for the maintenance work were not regularly carried out. There is still room for improvement in terms of the financial aspect as well as operation and maintenance. Therefore, the sustainability of the project effects is moderately low.

### III. Recommendations & Lessons Learned

- Recommendations to Executing Agency

In order to sustain the effectiveness of the two bridges developed under this project, it is necessary that DOW-WNB utilizes the maintenance manual, develops a maintenance plan for the New Britain National Highway that it covers and performs regular maintenance work. In the ex-post evaluation, it was found that the maintenance manual prepared by the Japanese side during the implementation of the project was not utilized and that regular maintenance work was not being carried out. If this situation continues, there is concern that the future deterioration of the bridges will be accelerated. Therefore, it is important that the DOW Headquarters allocate sufficient maintenance budget to DOW-WNB and realize adequate outsourcing and supervision of maintenance contractors.

In addition, in order to ensure the long-term structural stability of the abutment, it is necessary to complete the revetment works and the demolition of the log bridge which have not yet been completed by the Papua New Guinea side.

- Recommendations to JICA

None

- Lessons Learned

Necessity to estimate the project costs considering the specific context in the project site.

In this project, the project period increased significantly, mainly due to the unsuccessful bidding process. In addition, the implementation of the executing agency's share of the project was delayed after the separation of the project components due to the bidding failures, which resulted in the delay of more than one year for the full effects of the project to be generated. When implementing a project in Papua New Guinea, it is important to avoid delays in project implementation as much as possible by thoroughly estimating project costs in consideration of geographical and social conditions at the planning stage, and by allocating reserve funds because of the potential for additional expenses, which vary from region to region, as well as the factor of rising construction costs. In addition, when separating the components, it is desirable to provide support in terms of construction supervision, such as procurement of materials and continued use of equipment, by separately signing a construction supervision contract for the portion of the work to be borne by the counterpart government so that it can promptly implement the work, rather than the Japanese side leaving all the work to be performed by the counterpart government and terminating the project.

### IV. Non-Score Criteria

None

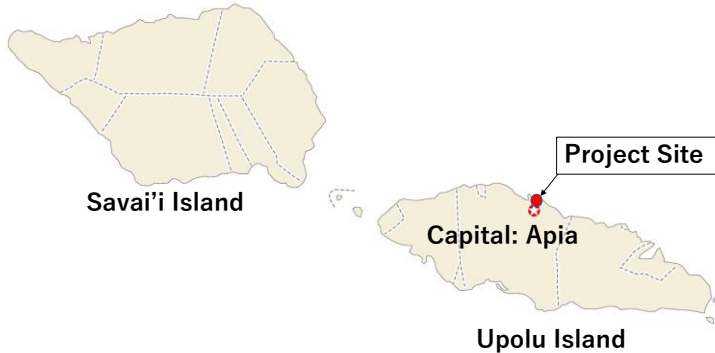
# FY2021 Simplified Ex-Post Evaluation Report of Japanese Grant Aid Project

External Evaluator: Keisuke Nishikawa, QUNIE CORPORATION

Duration of the Study: November 2021 - January 2023

Duration of the Field Study: None (remotely conducted)

Country Name	<b>The Project for Enhancement of Safety of Apia Port</b>
Independent State of Samoa	



Location of the project site  
(Source: External Evaluator)



New wharf developed in this project and a cargo vessel in berthing  
(Source: External Evaluator)

## I. Project Outline

Background	<p>Samoa is an island nation located almost in the center of the South Pacific, and its geographical conditions make it heavily dependent on maritime transportation for both its people's livelihood and economic activities. Apia Port, located in the capital, serves as the country's most important international port.</p> <p>In 1966, a 185-meter-long wharf (the old wharf) was constructed with support from New Zealand. However, problems such as load restriction due to aging and increased offshore waiting time due to an increase in the number of vessels have arisen. In response to these problems, a new 165-meter-long wharf was constructed (in 2001) under Japan's grant aid project, "The Project for the Second Development of Apia Port."</p> <p>However, in addition to the aging of the old wharf and two tugboats, the recent increase in the size of vessels led to the arrival of large 290-meter cruise ships, which far exceeded the length of the new wharf and the old wharf, threatening the safety of vessels when entering, leaving, and mooring. In addition, when cruise ships called at the port, cargoes and passengers were mixed in the narrow space behind the wharf, and ensuring passenger safety was also an issue.</p>																		
Objectives of the Project	<p>The objective of the project is to improve the safety of incoming and outgoing vessels, port operations and passengers by rehabilitating port facilities and upgrading tugboats at Apia Port, thereby contributing to the strengthening of the maritime transport sector, which is essential for Samoa's economic growth.</p>																		
Contents of the Project	<ol style="list-style-type: none"> <li>Project Site: Apia Port, Matautu-tai, Apia</li> <li>Japanese side [Civil engineering works and procurement of equipment] (Actual results in the table. Some changes from the plan) <table border="1"> <thead> <tr> <th>Facility</th> <th>Details</th> </tr> </thead> <tbody> <tr> <td>Wharf</td> <td>Extension of new wharf (137 m), Depth 11 m</td> </tr> <tr> <td>Container yard</td> <td>New pavement: 1,970 m<sup>2</sup>, Total area repaired: 23,000 m<sup>2</sup></td> </tr> <tr> <td>Fender</td> <td>Existing wharf area: 15 units, New wharf area: 13 units</td> </tr> <tr> <td>Mooring facility</td> <td>Installation of seven 70-tonne mooring pillars and one 100-tonne mooring dolphin on the extended pier</td> </tr> <tr> <td>Separation of cargo and passenger traffic</td> <td>Walkway: 1.5 m-wide, approximately 50 m-long Mobile fence: 1.85 m-high, 70 m-long</td> </tr> <tr> <td>Navigation aids</td> <td>Repair and renewal of navigation signs (five buoys and existing leading lights)</td> </tr> <tr> <td>Equipment</td> <td>Details</td> </tr> <tr> <td>Tug boat</td> <td>Restoration (two vessels (MV Tafola and MV Atafa). Hull repair, engine maintenance and repair work of navigation equipment)</td> </tr> </tbody> </table> </li> <li>Samoan side: Obtaining environmental and construction permits, securing of temporary yard, change of use of oil tank (from oil to water) and rehabilitation of access road</li> </ol>	Facility	Details	Wharf	Extension of new wharf (137 m), Depth 11 m	Container yard	New pavement: 1,970 m <sup>2</sup> , Total area repaired: 23,000 m <sup>2</sup>	Fender	Existing wharf area: 15 units, New wharf area: 13 units	Mooring facility	Installation of seven 70-tonne mooring pillars and one 100-tonne mooring dolphin on the extended pier	Separation of cargo and passenger traffic	Walkway: 1.5 m-wide, approximately 50 m-long Mobile fence: 1.85 m-high, 70 m-long	Navigation aids	Repair and renewal of navigation signs (five buoys and existing leading lights)	Equipment	Details	Tug boat	Restoration (two vessels (MV Tafola and MV Atafa). Hull repair, engine maintenance and repair work of navigation equipment)
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Implementation Schedule	E/N Date	June 22, 2015	Disbursement Date	
	G/A Date	June 22, 2015	Completion Date	June 27, 2018
Project Cost	E/N Grant Limit / G/A Grant Limit: 3,477 million yen		Actual Grant Amount: 3,315 million yen	
Executing Agency	Samoa Ports Authority (hereinafter referred to as “SPA”)			
Contracted Agencies	Main Contractor: Wakachiku Construction Co., Ltd.			
	Main Consultant: Oriental Consultants Global Co., Ltd.			
	Agent: None			

## II. Result of the Evaluation

### Summary

This project aimed to improve the safety of vessels entering and leaving the port and the safety of port operations and passengers by developing port facilities and rehabilitating tugboats at Apia Port, thereby contributing to strengthening the infrastructure of the maritime transport sector, which is important for Samoa’s economic growth. It was confirmed that this project was consistent with Samoa’s development policy and development needs at the time of planning. Although there were no JICA-related projects during the planning and implementation period of this project and the effects of collaboration between JICA and projects supported by other organizations were not generated at the time of ex-post evaluation, this project was consistent with Japan’s ODA policy at the time of planning. Therefore, the overall relevance and coherence of this project is high. The implementation of the project was generally as planned, with minor changes. In addition, both the project cost and project duration for the implementation of the project were within the plan, and the efficiency of the project can be said to be very high.

With regard to project effects, it was confirmed that all quantitative effects envisaged at the time of planning were achieved, and that port users’ evaluations of safety were also high. It was also observed that although cruise ships no longer visited the port due to border blockade measures following the global spread of the new coronavirus infection, Apia Port played a sufficient role in supporting the increased cargo handling operations. There were no negative impacts on the natural environment, no resettlement or land acquisition associated with the implementation of the project, and no negative impacts on gender aspects, on the marginalized people, and on social systems, norms and people’s well-being. As a whole, the effectiveness and impacts of the project are high.

Regarding sustainability, in terms of policy and systems, the importance of infrastructure development and management was mentioned in various plans, and it was confirmed that the executing agency has been positioned as the agency responsible for port management. Sufficient staff members have been allocated to operate and maintain the facilities and equipment developed, the technical capacity required to implement maintenance has been ensured, and necessary repairs have generally been carried out. There are no financial challenges, with record profits, and the maintenance costs have been adequately allocated. Therefore, the overall sustainability of the generated project effects is high.

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

<b>Overall Rating<sup>1</sup></b>	<b>A</b>	<b>Relevance &amp; Coherence</b>	③ <sup>2</sup>	<b>Effectiveness &amp; Impacts</b>	③	<b>Efficiency</b>	④	<b>Sustainability</b>	③
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### <Special Perspectives Considered in the Ex-Post Evaluation / Constraints of the Ex-post Evaluation>

In the ex-post evaluation of this project, it was envisaged that the evaluator would travel to Samoa to conduct a field survey, but due to the difficulties in entering Samoa following the global spread of the new coronavirus infection, information was collected remotely from the executing agency and the site survey was conducted by the local assistant. The evaluator himself was unable to check the facilities and equipment directly, and consultations with various stakeholders and beneficiaries were inadequate in some respects, so the evaluation judgement was made based on the information that could be obtained.

### 1 Relevance/Coherence

#### <Relevance>

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

The national development plan at the time of ex-ante evaluation of the project was the *Strategy for the Development of Samoa (SDS)* (2012-2016). One of the priority areas of the plan was infrastructure development, with the goal of establishing “efficient, safe and sustainable transport system and networks.” With regard to infrastructure development, the *Samoa National Infrastructure Strategic Plan* was developed

<sup>1</sup> A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

<sup>2</sup> ④: Very High ③: High, ②: Moderately low, ①: Low

in 2011. Regarding the port sector, the strategic direction was to meet the needs of international maritime cargo. Specifically, international port facilities were to be improved in a phased manner. Also effective at the sector level was the *Transport Sector Plan (2013-2018)*, which listed “Improve effectiveness, safety, security and competitiveness of maritime services” as one of the Plan’s five goals. It stated there that the plan would improve safety and security systems and compliance in all ports and maritime-related services, and included improving the operational efficiency of SPA, the executing agency.

Based on the above, it can be said that the project was in line with the Samoan Government’s policy as it provided efficient and safe infrastructure development at Apia Port, a nexus point for maritime and land transport.

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

Apia Port had a wharf that was built in 1966, but to cope with its aging and the increased offshore waiting time for vessels, a new wharf (165 m-long, 11 m-deep) was built on an adjacent plot under the Japanese grant aid “The Project for the Second Development of Apia Port” (2001). However, further deterioration of the old wharf, aging of the tugboats and the arrival of large cruise ships (290 m class), which far exceeded the length of the new and old wharves, threatened the safety of ships when entering, leaving and mooring at the port. In addition, when cruise ships called at the port, cargo and passengers were mixed in the narrow space behind the wharf, and ensuring passenger safety was also an issue. This project is judged to have met these needs, as it aimed to improve the safety of vessels entering and leaving Apia Port, as well as the safety of operations in the port and passengers, through the rehabilitation of port facilities and tugboats.

- Appropriateness of Project Design/Approach

Prior to the implementation of this project, JICA had implemented “The Project for the Development of Apia Port” (1988), “The Project for Construction of a Tugboat for Apia Port” (2000) and “The Project for the Second Development of Apia Port” (2001) (all grant aid) in the maritime infrastructure sector in Samoa. The steady progress in the development of Apia Port through these projects provided the basis for the planning and implementation of this project. In particular, the project extended the wharf by a further 137 m, building on the achievements of the 165 m wharf under “The Project for the Second Development of Apia Port”. This produced the outcome that the wharf became able to safely accommodate the visits of cruise ships, which had become larger in recent years. The repair of tug boats built under “The Project for Construction of a Tugboat for Apia Port” was also included in the component of this project. In these respects, it can be said that this project was appropriately implemented based on the previous aid projects.

<Coherence>

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

In the Okinawa Kizuna Declaration adopted at the sixth meeting of the Pacific Islands Leaders Meeting (2012), a summit meeting held every three years since 1997 between Japan and the Pacific island countries, the importance of good infrastructure in ensuring a reliable transport network was stressed. The “JICA Country Analysis Paper for the Pacific Region” also positions “strengthening the infrastructure for economic activities/maintaining lifelines” as a priority area, as the maritime infrastructure is an essential lifeline for the economic activities and daily lives of the islanders. Furthermore, Japan’s Country Assistance Policy for Samoa sets “overcoming vulnerability” as a medium-term objective, and support for maritime transport, which forms the basis of economic activities and social life, was mentioned.

Based on the above, it can be said that this project was in line with these development cooperation policies for the Pacific region and Samoa.

- Internal Coherence

No other JICA projects were being planned or implemented at the time this project was planned and implemented. Therefore, no linkage between JICA projects was envisaged, and no particular internal consistency was identified.

- External Coherence

At the time of project planning, there were no other projects expected to be linked to this project, but around the time the decision was made to implement this project, the Asian Development Bank (ADB) planned the Enhancing Safety, Security and Sustainability of the Apia Port Project (hereinafter referred to as “ESSSAP”) (Project cost: US\$ 62 million; Project period: 2019-2024), and the construction work started in 2019 after the completion of this project. That project includes the rehabilitation of the breakwater, the installation of a reefer container power supply system, the installation of additional lighting throughout the port, the construction of a maintenance workshop, and the construction of a new tugboat at Apia Port, which is expected to further improve the safety of the port. In addition, New Zealand has been supporting the development of the coast in the Apia urban area under the Apia Waterfront Development Plan since the mid-2010s. Although there are no direct synergistic effects with this project, it is expected to benefit cruise ship passengers in the tourism sector, such as walking along the coast.

<Evaluation Result>

In light of the above, the relevance and coherence of the project are high<sup>3</sup>.

2 Effectiveness/Impacts<sup>4</sup>

<Effectiveness>

(Quantitative Effects)

The following four indicators were assumed to be used to measure the quantitative effects of this project, and the degree of achievement

<sup>3</sup> Relevance: ③, Coherence: ②

<sup>4</sup> When providing the sub-rating, Effectiveness and Impacts are to be considered together.



of each indicator was as follows.

(Indicator 1) The existing wharf (165 m) and the new wharf (137 m) were made available in an integrated manner through the implementation of this project, resulting in a wharf extended to 302 m. No cruise ships exceeding the length of the newly extended wharf have visited, and it can be said that the improved wharf is sufficiently meeting the demand<sup>5</sup>.

(Indicator 2) It was confirmed that due to the proper installation of fenders, there have been no collisions between the wharf concrete and vessels and no damage to the vessels' hulls.

(Indicator 3) When cruise ships arrive, a passenger walkway is provided to the entrance of the port site, and it was confirmed that the lines of flow between passengers and cargoes are sufficiently separated.

(Indicator 4) The navigation aids (beacons and lights) were installed in such a way that they perform as planned, and as a result, the distance to identify the harbor entrance from vessels is sufficiently secured, leading to the achievement of the targeted values.

#### Quantitative Effects

Indicators	Baseline 2014 Planned Year	Target 2021 3 Years after Completion	Actual 2019 1 Year after Completion	Actual 2020 2 Years after Completion	Actual 2021 3 Years after Completion
Indicator 1 Wharf length against cruise ship: Rate of the ships where more than 30 % of the lengths overall overhanging beyond the wharf length while berthing	58.3%	0%	0%	0%	0%
Indicator 2 Accidents due to insufficient fenders: Damage to ship's hull by hitting the wharf concrete	1-2 times	0 times	0 times	0 times	0 times
Indicator 3 Separation of passenger and cargo flows: Separation rate of passengers and cargoes by mobile fences on the trestle	0%	100%	100%	100%	100%
Indicator 4 Navigation aids: Visible distance of harbor entrance from the ship at sea (from the height 10 m above sea surface on a sunny day)	Daytime: 12.2 km Night time: less than 1.9 km	Daytime: 20.7 km Night time: 10.9 km	Daytime: 20.7 km Night time: 10.9 km	Daytime: 20.7 km Night time: 10.9 km	Daytime: 20.7 km Night time: 10.9 km

Source: Project Ex-ante Evaluation Report, Response to the questionnaire

#### (Qualitative Effects)

As the qualitative effects of this project, it was assumed that (1) port users' satisfaction would increase and (2) the environment for port calls by cruise ships would improve. In particular, the following were listed as the indicators for measuring the improvement of satisfaction in (1).

- a. Complaints from shipping companies (several complaints per year at the time of planning) due to inadequate wharf fenders would be eliminated.
- b. The evaluation of safety by port users, such as seafarers and the staff of ship agencies would improve.

Regarding (1), according to the executing agency, there have been no complaints at all regarding the fenders since the wharf was put into service in June 2018. SPA also noted that port users' satisfaction with the extended wharf and expanded container yard has increased, and that quarterly meetings between port users and SPA executives have elicited positive responses regarding the improved facilities. According to interviews with port users during the ex-post evaluation survey, port safety has improved significantly, and port users expressed that they had no safety concerns since the completion of the project. In addition, while only one vessel could berth before the project was implemented, after completion, two cargo vessels can berth at the same time, making the schedule more efficient. As a whole, the improvement of the facility has been highly evaluated, as there have been no more ship collisions with the wharf and no more complaints.

As for (2) the improvement of the environment for cruise ship calls, the wharf was extended to 302 m after the completion of the project, which facilitated the berthing of cruise ships over 200 m in length, which would have exceeded the existing wharf before the project was implemented. As a result, the wharf is now able to accommodate larger vessels than before.

Based on the above, both quantitative and qualitative effects have been generated as expected at the time of planning.

#### <Impacts>

##### (1) Intended Impacts

The expected impact of this project was that "the current status of Apia Port would be improved, cargo handling operations and users would increase, and economic activities associated with port activities and cruise ship tourism would become more vibrant."

The number of vessel calls, gross tonnage, and number of containers handled at the Port of Apia are shown in the table below (the number of users was unknown).

<sup>5</sup> Judged from the data up to FY 2019/20, as no cruise ships visited the port after March 2020 due to the global spread of new coronavirus infection.

### Key Data of Apia Port

	FY 2014/15	FY 2015/16	FY 2016/17	FY 2017/18	FY 2018/19	FY 2019/20	FY 2020/21
Total number of vessels calling at port (number of vessels)	365	472	528	525	621	637	403
of which, container ships	131	123	145	154	169	148	125
of which, cruise ships	15	16	14	5	17	2	0
of which, fishing vessels	54	222	240	220	240	292	200
Gross registered tonnage (thousand tons)	2,692	2,898	2,997	2,439	3,673	2,499	1,899
Number of containers (TEU)	32,387	34,588	34,950	37,091	42,102	41,200	43,933

Note 1: "Fiscal year" is from July to June of the following year

Note 2: In FY 2017/18, the number of cruise ships calling at the port temporarily decreased significantly, but this is due to scheduling adjustments associated with the construction in this project.

Note 3: In addition to the container, cruise, and fishing vessels listed in the table above, other vessels calling at the port include general cargo ships, fuel tankers, gas carriers, and research vessels.

Source: SPA Annual Report, various years

As a result of the ban on the entry of cruise ships due to the global spread of the new coronavirus, the number of cruise ships calling at the port has drastically decreased since FY 2019/20. In addition, container ships and fishing vessels were not allowed to disembark their crews, and the Ministry of Health checked each vessel for new coronavirus when they arrived at the port. As a result, the total number of vessels calling at the port in FY 2020/21 was significantly reduced by 37% compared to the previous year. However, in terms of cargo transport, the number of containers handled per vessel increased and the overall number of containers (TEUs) reached a record high, as shipping companies changed their transport routes throughout the region and began to use Apia Port more as a transshipment port for cargo.

Although the port has not contributed to the tourism industry as cruise ships no longer visit the port due to the new coronavirus, cargo handling operations increased compared to before the project was implemented, and as the only international port in Samoa, the port is supporting import activities in particular. As a result of the improvement of Apia Port, through the increase in handling capacity and actual volume handled, it is considered that the project has greatly contributed to the activation of economic activities through the revitalization of logistics.

The number of cruise ship users (passengers) has dropped to zero due to the new coronavirus, but this should be viewed as a force majeure that could not be anticipated at the time of project planning.

#### (2) Other Positive and Negative Impacts

##### 1) Impact on the Natural Environment

The guideline for environmental and social considerations applied to this project is the "JICA Guidelines for Environmental and Social Considerations" (2010), with the environmental category of "B." In order to implement the project, it was necessary to conduct an Environmental Impact Assessment (EIA) and obtain a permit from the Planning and Urban Management Agency of the Ministry of Natural Resources and Environment. The permit was obtained prior to the commencement of the project and no special compliance requirements were set. During the project implementation, measures were taken as planned for air quality, wastewater, water quality, noise and vibration, and no specific negative environmental impacts were observed during the construction. During the construction, an engineer hired by the project, in coordination with SPA, monitored and recorded water quality, seabed pollution, noise and vibration. According to SPA, no negative impacts on the natural environment occurred even after the project was completed, and no problems were found as a whole.

##### 2) Resettlement and Land Acquisition

As this project was implemented entirely within the existing port site, no resettlement or land acquisition occurred.

##### 3) Response to Gender Equality, Marginalized People and Human Rights

All exports and imports in Samoa are conducted through Apia Port, the only gateway for international trade, which handles all commodities. In this regard, this project plays a role that benefits all Samoan residents, and it is considered that no people have been disadvantaged as a result of the implementation of this project.

##### 4) Social Systems, Norms and Human Well-being

For shipping companies, the extension of the wharf made it possible for them to berth two vessels, while only one vessel was able to berth before the project. This has made it easier to adjust the port call schedule and has eliminated the increase in transportation costs caused by vessels waiting offshore. This project is considered to have improved convenience by widely meeting the needs of Samoan citizens for a range of goods through the realization of smooth importation of goods.

#### <Evaluation Result>

Therefore, the planned effects were generated through the implementation of this project, and the effectiveness and impacts of the project are high.

### 3 Efficiency

#### (1) Project Outputs

The output of this project is described in "I. Project Outline, Contents of the Project" above, and although several minor changes were made to the plan, the facilities and equipment were generally implemented as planned as a whole. The major changes were as follows.

- Changes to the placement and extension of pile driving for the new pier, and changes in the number of fenders removed and installed (due to softer-than-expected ground conditions)

- Change in the quantity of fenders removed and installed at the existing wharf
  - Installation of mooring dolphins (due to softer-than-expected ground conditions)
  - Repair of navigation aids (replacement of three pile-foundation type with floating light beacons)
  - Tugboats: 28 changes made on both vessels, including changes to hull fenders and additional replacement of engine operating levers
- As described above, although several changes were made to the output of this project, the executing agency and the project consultant confirmed that these changes were necessary to ensure and improve safety and did not impair the effectiveness of the project. Therefore, it is judged that there were no problems with these changes.
- The items to be borne by the Samoan side were implemented as planned, and the site survey by the field survey assistant confirmed that they were actually implemented.

#### (2) Project Cost

The Japanese side's project cost was 3,315 million yen (2,858 million yen for construction, 280 million yen for equipment, and 177 million yen for design and supervision), which was within the plan (95% of the plan). The exact amount of the Samoan side's project cost was unknown, but according to the executing agency, it was less than the planned amount of 230,000 tala (less than 10 million yen when converted to yen at the average rate for the project period). Therefore, although the total project cost of the project could not be accurately ascertained, it is judged to have been within the plan.

#### (3) Project Period

The project period was from June 2015 (signing of G/A) to June 2018 (completion of construction), implemented in 37 months as planned (100% of the plan). In addition, it was confirmed that the items borne by the Samoan side were also implemented within the project period.

#### <Evaluation Result>

Based on the above, both the project cost and period are within the plan. Therefore, the efficiency of the project is very high.

### 4 Sustainability

#### ▪ Policy/Systems

In Samoa, a long-term development plan, *Samoa 2040*, was announced in 2021 and emphasizes investment in resilient infrastructure to support economic and social development. In addition, Apia Port is heavily used and needs to be expanded in the long term. The shorter-term national development plan *Pathway for the Development of Samoa* (FY 2021/22 - FY 2025/26) identifies "Structured public works and infrastructure" as one of the key strategic outcomes, with "Integrated Infrastructure Management" as a key priority area. In addition, the *Samoa National Infrastructure Strategic Plan* (2011) and the Executing Agency's Corporate Plan (FY 2020/21 - FY 2023/24) remain in effect. Also, SPA is responsible for port management under the Port Authority Act (1998). Therefore, the sustainability in the aspect of policy and systems is high.

#### ▪ Institutional/Organizational Aspect

The SPA continues to be the executing agency for the project. SPA owns land, port facilities, buildings, and equipment related to the port, including Apia Port, and is responsible for the management and operation of the ports in Samoa. At the time of ex-post evaluation, SPA consists of seven divisions (Maritime, Port Operations, Audit, Legal, Finance, Corporate Services divisions and General Manager's Office) with a total of 137 staff members. Of these, the port facilities are operated and maintained by the maintenance section of the Port Operations Division (6 staff members), and the tugboats are operated and maintained by the Maritime Division (24 staff). The number of staff is sufficient and civil engineers have been secured. According to SPA, it is desirable to secure a staff member with expertise in marine engineering, but it continues to be difficult to secure appropriate personnel in Samoa in a short time.

Sufficient human resources have been secured for the maintenance of the project facilities and equipment. It was confirmed that civil engineers have also been secured, and as a whole, there are no major issues in terms of the institutional and organizational aspects.

#### ▪ Technical Aspect

The staff members in charge of port operation and maintenance are qualified in the field of engineering and have, on average, more than 10 years of work experience. While it can be said that the technical skills necessary to take on the operation and maintenance have been secured, there is a need to constantly improve their skills and qualifications as new technologies and international standards are introduced one after another. For this reason, SPA has been training and qualifying senior pilots by having them attend training at New Zealand educational institutions as needed. In addition, a training needs analysis survey is conducted annually and a mechanism to determine the skills needed for the staff has been established.

Therefore, it is judged that the technical capacity to sustain the effects of this project has been equipped.

#### ▪ Financial Aspect

SPA's financial situation was confirmed to be very stable. In FY 2020/21, the number of vessels calling at the port decreased, but the volume handled per vessel increased, resulting in the highest profit since SPA's inception in 1999. SPA expects to generate similarly high profits also in FY 2021/22. Although the amount of repair and maintenance expenditures was less than the amount assumed at the time of planning, it is believed that the necessary amount has been spent, since sufficient maintenance activities have been carried out and there are no problems with the maintenance status, as described below.

### SPA's Operating Balance

(Unit: thousand tala)

	FY 2016/17	FY 2017/18	FY 2018/19	FY 2019/20	FY 2020/21
Revenue	18,319	16,406	21,015	21,065	24,092
Operating Income	11,080	10,023	13,084	12,843	14,701
Deferred Revenue Amortized	1,923	1,923	3,219	3,174	3,196
Recoveries	2,719	2,877	2,738	2,846	3,713
Others	2,597	1,583	1,974	2,202	2,482
Expenditure	11,333	10,734	12,327	13,467	14,999
Operating Costs	2,448	2,659	2,888	3,071	2,697
<i>Of which, Repair and Maintenance</i>	163	238	182	129	235
Personnel Costs	3,826	3,520	3,831	4,112	4,504
Depreciation	3,584	3,829	4,972	4,931	4,794
Others	1,475	726	636	1,353	3,004
Operating Balance	6,985	5,672	8,688	7,599	9,094

Note 1: Fiscal year is from July to June of the following year.

Note 2: Recoveries: Electricity costs and labor costs for vessel operations in the port are temporarily advanced by SPA, which later collects them from shipping companies and agents. This refers to the collected fees.

Source: SPA Annual Report (various years)

SPA has established a maintenance fund through the ADB-assisted ESSAP to prepare for future maintenance of port facilities and other assets. The financial sustainability of SPA is considered to be sufficiently secured for the future.

#### ▪ Social and Environmental Aspect

As described above, it was confirmed that there were no specific negative impacts on the natural environment, but the executing agency has not conducted any periodic environmental monitoring since the completion of the project. In the ESSAP underway at the time of ex-post evaluation, an initiative to make the port more environmentally friendly (Greenport Initiative) has been initiated, and a safety officer to work on this initiative is to be appointed.

#### ▪ Preventative Measures to Risks

A part of the old pier, which is more than 50 years old, does not have sufficient strength and has been subject to weight restrictions during cargo handling operations. This part of the pier is not accessible to heavy machinery or fully loaded containers and is used only for storing empty containers. This problem is expected to be resolved as it is going to be rehabilitated in the ESSAP

#### ▪ Current Status of Operation and Maintenance

All the facilities and equipment developed under the project are being utilized, and a system is in place for the maintenance personnel to constantly check the status of the port. Regarding the operation and maintenance of port facilities, the Port Operations Division was in the process of formulating a new manual at the time of the ex-post evaluation. With regard to the tugboats, it was confirmed that monthly, quarterly, and annual maintenance work was being conducted and records were being kept. Procurement of the parts for the tugboats has been generally done without any issues, but the gearbox of the MV Tafola, which is over 30 years old, is not replaceable due to the absence of a matching replacement. Considering the vessel's age, there should be no port safety issues if the vessel can be utilized while undergoing repairs until a new one is built under the ESSAP (one new tugboat is scheduled to be built under the ESSAP). Therefore, as a whole, the operation and maintenance of the port is generally adequate while addressing minor issues.

#### <Evaluation Result>

Therefore, the sustainability of the project effects is high.

### III. Recommendations & Lessons Learned

#### ▪ Recommendations to Executing Agency

Through the implementation of this project, urgent issues in terms of safety assurance and efficient operations at Apia Port were resolved. The remaining issue of strengthening the safety of the old pier will be improved through the ESSAP, and once the project is completed, it will be possible to operate the port efficiently and safely in the future while fully meeting Samoa's import/export demand. Therefore, ensuring the completion of the ESSAP and implementing appropriate inspections, repairs, etc., by utilizing the maintenance fund are considered important to further enhance the effects of the project and to underpin international trade in Samoa. In addition, when cruise ship operations are resumed and cruise ship passengers begin to arrive, it is important to ensure the safety of passengers by separating the traffic flows as thoroughly as before.

#### ▪ Recommendations to JICA

None.

▪ Lessons Learned

Identification of issues and precise project planning through long-term assistance for the entire sector

This project was implemented to further improve the safety of Apia Port. Through the implementation of this project, it became possible to accommodate larger cruise ships, the safety of berthing and unberthing of vessels improved, and the efficiency and safety of cargo handling operations improved through the construction and repair of container yards, enabling Apia Port to function smoothly as an international port. This project was implemented on the basis of grant aid projects that provided port facilities and tugboats in the past, and it can be said that these cooperation projects as a whole have led to the securing of efficiency and safety at Apia Port, and realized the facilitation of trade activities. This is a particularly good example of how cooperation that was concentrated over many years on the country's most important ports has come to function as a whole. In addition, although no specific medium- to long-term plan was formulated, the short-term measures taken to improve safety through the JICA-assisted project and the subsequent medium- to long-term improvements through the ADB-assisted ESSAP are also highly commendable efforts.

In this way, this project is characterized by the fact that it was planned and implemented based on the accurate understandings of the issues related to port development through the past cooperation, and it showed a high degree of project effectiveness. Therefore, in formulating similar projects in the port sector in the future, regardless of whether Japanese assistance was provided in the past or not, it is important to fully analyze the content, results, and challenges of past projects in the target port, and to provide intensive assistance tailored to the challenges from a short-term, medium- to long-term perspective in order to fully realize the project effects.

**IV. Non-Score Criteria**

▪ Performance (Objective Perspective)

JICA provided appropriate project supervision from the time of planning to the time of completion to ensure smooth implementation of the project, which resolved safety issues at Apia Port, the only international port in Samoa, and achieved safety in vessel berthing and unberthing, cargo handling, and passenger movement. The project consultant/contractor also held regular progress report meetings with the executing agency and smoothly responded to the need for various changes, resulting in the completion of the project as planned.



New wharf developed in this project  
(Source: Taken by the Local Associate)



Two tug boats rehabilitated in this project  
(Source: Taken by the Local Associate)