

**Ex-Post Project Evaluation 2021  
Package I-3 (Timor-Leste, Palau, Tonga, Indonesia)  
Evaluation Reports**

**January 2023**

**JAPAN INTERNATIONAL COOPERATION AGENCY**

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**Octavia Japan, CO., LTD.  
QUNIE Corporation  
(Joint Venture)**

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Democratic Republic of Timor-Leste

FY2021 Ex-Post Evaluation Report of  
Japanese Grant Aid Project  
“The Project for Construction of Upriver Comoro Bridge”

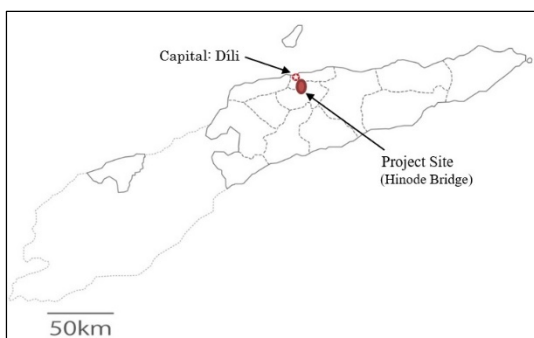
External Evaluator: Kenichi Inazawa, Octavia Japan, Co., Ltd.

## **0. Summary**

The aim of this project was to reduce traffic congestion by decentralizing traffic, improve east-to-west access efficiency, revitalize the economy and strengthen resilience in Dili City by constructing a bridge connecting east and west (hereinafter referred to as “Hinode Bridge”) and access roads. In this project, “consistency with the development plan” and “consistency with development needs” were confirmed. Regarding coherence, “consistency with Japan's ODA policy” can be said to be coherent, however “internal coherence” and “external coherence” did not confirm effects from specific collaboration or coordination. Based on the above, relevance/coherence is high. With respect to efficiency, although the outputs were mostly as planned, and the project cost was within the plan, the project duration was significantly longer than the initial plan due to the delay in land acquisition procedures. Therefore, the overall efficiency of the project is moderately low. Regarding the effectiveness/quantitative effects indicators, target 1) “volume of traffic crossing the river” was achieved, and it can be inferred that target 3) “freight traffic” was also achieved. Target 2) “average speed of traffic crossing the river” was not achieved, mainly because of increased traffic using the bridge, with speed curtailed by the large number of vehicles at peak times and during the day. According to the interview survey, the Hinode Bridge and access roads are fully utilized as a means of ensuring safety in the event of a heavy rain disaster, and are playing a role in preventing casualties and reducing economic damage. Therefore, the anticipated effects of the project have been achieved overall; effectiveness and impacts are high. With regard to sustainability, while there seems to be no major concern about the outlook for the sustainability of the effects generated by this project, it is fair to say that there are some problems because the budget for operation and maintenance and the status of some maintenance aspects are not entirely satisfactory. Therefore, sustainability of the project effects is moderately low.

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

## 1. Project Description



Project Location



Developed Hinode Bridge

### 1.1 Background

Before this project began, Dili City had limited room for new residential land development, for topographical reasons. The Comoro River flows through the west side of the city in a north-south direction. The city's population was expanding to the west, where the airport is located, and the traffic volume between the east and west of the city was increasing rapidly. However, there was only one bridge crossing the Comoro River, and the concentration of traffic on the bridge caused congestion, paralyzing the city traffic. The government of Timor-Leste started construction work to widen the bridge, from one lane to two lanes on each side, as an emergency measure, with a view to reducing traffic congestion. While the two lanes on each side became operational in June 2013, this measure was not sufficient to cope with subsequent increases in traffic, and there were also concerns from the perspective of disaster prevention and urban development. For these reasons, construction of a new bridge across the Comoro River, connecting the east and west of the city, was needed, and it was necessary to secure an alternative route and decentralize city traffic at an early stage.

### 1.2 Project Outline

The objective of this project is to reduce traffic congestion by decentralizing city traffic by constructing a bridge and access roads to connect east and west parts of the Dili urban area, thereby contributing to economic revitalization and resilience through improvement of east-west access efficiency and strengthening of the transportation sector.

Grant Limit/Actual Grant Amount	2,605 million yen/2,022 million yen
Exchange of Notes Date/ Grant Agreement Date	November 2015/November 2015
Executing Agency	Directorate of Roads, Bridges and Flood Control

	(hereinafter to as “DRBFC”), Ministry of Public Works
Project Completion	October 2018
Target Area	Comoro District, Dili
Main Contractor	Tobishima Corporation
Main Consultants	INGÉROSEC Corporation, Nippon Engineering Consultants Co., Ltd., IDEA Consultants, Inc. (JV)
Preparatory Survey	June 2013–February 2014
Related Projects	<p>[Technical Cooperation Projects]</p> <ul style="list-style-type: none"> <li>- “Project for Capacity Development of Road Works” (2010–2013)</li> </ul> <p>[Grand Aid Projects]</p> <ul style="list-style-type: none"> <li>- “Project for Improvement of Roads Between Dili and Cassa” (E/N signed in May 2004)</li> </ul> <p>[ODA Loan Projects]</p> <ul style="list-style-type: none"> <li>- “National Road No.1 Upgrading Project” (L/A signed in 2012)</li> </ul> <p>[Others]</p> <ul style="list-style-type: none"> <li>- Supporting formulation of the “National Road Master Plan for Timor-Leste” (Asian Development Bank (ADB), 2010–2019)</li> </ul>

## 2. Outline of the Evaluation Study

### 2.1 External Evaluator

Kenichi Inazawa, Octavia Japan, Co., Ltd.

### 2.2 Duration of Evaluation Study

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

Duration of the Study: September 2021–November 2022

Duration of the Field Study: No international travel was involved, and surveys were conducted remotely using a field survey assistant.

### 2.3 Constraints during the Evaluation Study

(Remote Field Survey Utilizing a Field Survey Assistant)

Due to COVID-19, the external evaluator did not travel internationally for this study. Using the local survey assistant, the external evaluator conducted the site visits remotely, collecting

information/data and conducting interviews with the individuals concerned. The external evaluator analyzed the information collated so as to conduct evaluation analyses and make appropriate judgements.

### **3. Results of the Evaluation (Overall Rating: B<sup>1</sup>)**

#### 3.1 Relevance/Coherence (Rating: ③<sup>2</sup>)

##### 3.1.1 Relevance (Rating: ③)

###### 3.1.1.1 Consistency with the Development Plan of Timor-Leste

Before the start of this project, the government of Timor-Leste formulated the *Strategic Development Plan* (2011–2030). Six economic development areas were designated nationwide in this plan, and provision was made for development of the economic infrastructure of Dili City and its surroundings through road and bridge construction work. The Tibar-Dili-Hera integrated economic region (the region that crosses Dili City and connects the northern coast to the east and west) was of particular importance. This project—construction of a new bridge across the Comoro River, connecting the east and west of Dili City—was aligned with the above plan.

At the time at which the ex-post evaluation was conducted, the above-mentioned *Strategic Development Plan* (2011–2030) was still valid. Aiming to realize a democratic and sustainable social environment, the government of Timor-Leste, in this plan, is continuing to promote infrastructure development such as roads and bridges, as at the time of planning, in order to meet increasing traffic levels in Dili City, which has not changed since the time of planning.

Based on the above, there has been a focus on measures for addressing traffic demand and alleviating congestion in Dili City, prior to the start of this project and at the time of the ex-post evaluation; therefore, the project is consistent with governmental policy and corresponding measures.

###### 3.1.1.2 Consistency with the Development Needs of Timor-Leste

Before this project began, Dili City had limited room for new residential land development, for topographical reasons. The Comoro River flows through the west side of the city in a north-south direction. The city's population was expanding to the west, where the airport is located, and the traffic volume between the east and west of the city was increasing rapidly. However, there was only one bridge crossing the Comoro River, and the concentration of traffic on the bridge caused congestion, paralyzing the city traffic. The government of Timor-Leste started construction work to widen the bridge, from one lane to two lanes on each side, as an emergency measure, with a view to reducing traffic congestion. While the two lanes on each side became operational in June

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<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

2013, this measure was not sufficient to cope with subsequent increases in traffic, and there were also concerns from the perspective of disaster prevention and urban development. For these reasons, construction of a new bridge across the Comoro River, connecting the east and west of the city, was needed, and it was necessary to secure an alternative route and decentralize city traffic at an early stage.

At the time of the ex-post evaluation, construction of the new Tibar Port is close to completion, and logistics and vehicles entering the port are expected to increase significantly. The DRBFC believes that the development of a road connecting this port and the Dili urban area will become even more important. As the traffic volume is expected to increase, construction of the “Hinode Bridge II” is under consideration.<sup>3</sup> In addition, the government of Timor-Leste is working towards achievement of a smooth traffic flow and enhanced transportation capacity through initiatives other than this project, such as the “Road Network Upgrading Sector Project (Tasitolu-Tibar Road Project)” and the “Golgota-Banana Access Road Development Project,” for the purpose of decentralizing city traffic, alleviating traffic congestion, disaster prevention measures and developing the city.

Based on the above, the government of Timor-Leste’s efforts are observed to work on smooth transportation and capacity enhancement in Dili City, before the start of this project as well as at the time of ex-post evaluation; therefore, this project is consistent with the development needs before the start of this project as well as at the time of ex-post evaluation.

### 3.1.2 Coherence (Rating: ②)

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

Before the start of this project, Japan formulated the *Country Assistance Policy for Timor-Leste* (2012), in which “establishing a foundation for promoting economic activities” was listed as one of the priority areas. This policy also stated that Japan would focus on supporting infrastructure development, development of economy-related systems and industrial human resource development, with a view to revitalizing Timor-Leste’s economic activities.

This project was designed to contribute to revitalizing economic activities through the development of transportation infrastructure facilities (bridges and roads) in Timor-Leste, so it is consistent with Japan’s ODA policy.

#### 3.1.2.2 Internal Coherence

JICA has assisted Timor-Leste’s transportation sector through a grant aid project, “Project for Improvement of Roads Between Dili and Cassa” (2004–2006), and a technical cooperation project,

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<sup>3</sup> Although specific and clear information has not been obtained about the plan, the DRBFC is discussing the possibility of building a bridge of the same size, to be built with its own funds in the immediate vicinity of the Hinode Bridge constructed by this project.

“Project for Capacity Development of Road Works” (2010–2013). However, since these projects were completed in chronological order before the start of this project, there was no specific and direct collaboration or assumption between these and this project.

### 3.1.2.3 External Coherence

So far, road maintenance projects in Timor-Leste have been implemented with the support of the World Bank<sup>4</sup> and the ADB.<sup>5</sup> However, there is no specific conflict or crossover with this project. Rather, from the viewpoint of improving and expanding the road network of the country and realizing smooth transportation, it can be said that the objectives of this project have some commonality with and complement previous initiatives supported by the World Bank and the ADB.<sup>6</sup>

#### <Summary of Relevance/Coherence>

In this project, “Consistency with the development plan” and “consistency with development needs” are confirmed. As for coherence, while this project is “consistent with Japan’s ODA policy,” no specific collaboration/coordination is identified for “internal coherence.” In terms of “external coherence”, other donors are also implementing road network improvement/expansion projects to realize smooth transportation, and there is commonality in this perspective. However, no specific collaboration/coordination is identified. Therefore, its relevance and coherence are high.

## 3.2 Efficiency (Rating: ②)

### 3.2.1 Project Outputs

Table 1 shows the planned and actual outputs of this project.

Table 1: Planned and Actual Outputs of This Project

At the Time of Planning	Actual
[Planned Inputs of the Japanese Side] 1) Civil engineering work; procurement of equipment: a bridge (one lane on each side; a prestressed concrete (PC) box girder bridge, about 250 m long) and access roads (one	[Actual Inputs of the Japanese Side] 1) Civil engineering work; procurement of equipment: a bridge (one lane on each side; a prestressed concrete (PC) box girder bridge, 250 m long) and access roads (one lane on

<sup>4</sup> These include the following: “Estrada halilaran-balibar, Lot 1,” “Dili-Ainaro Road, Namely Aituto-Hatobuilico-Letefoho-Gleno Road (Survey Feasibility and Design)” and “Upgrading and Maintenance of the Dili Ainaro Road, Lot 2, 3, 4, 5.”

<sup>5</sup> These include the following: “Dili to Baucau Highway Project, Manatuto-Baucau Section,” “Road Network Upgrading Sector Project” and “Upgrading and Maintenance of Baucau to Viqueque Highway Project.”

<sup>6</sup> In addition, it can be said that at the time of planning, the contents described were consistent with the international framework. This project is positioned as a transportation infrastructure facility that supports the economic growth and industrial development of east Timor, and it can be said to support stable logistics and transportation, that is, to contribute to the resilience of national power.



lane on each side; maintenance extension of about 3 km);  2) Consulting Services: detailed design and construction supervision.	each side; maintenance extension of 3.76 km) → <u>implemented as planned</u> ;  2) Consulting Services: detailed design and construction supervision → <u>implemented as planned</u> .
[Planned Inputs of the Timor-Leste Side] 1) Environmental and social considerations (house relocation and compensation, land acquisition costs, environmental monitoring);  2) Relocation of existing public services (relocation of water pipes, communication lines, electric wires and utility poles);  3) Temporary yard leveling (camp yard leveling before commencement of construction);  4) Others (tax exemption-related cost associated with this project to be borne by the Timor-Leste side etc.).	[Actual Inputs of the Timor-Leste Side] <u>implemented as planned.</u>

Source: documents provided by JICA; answers to the questionnaire

In this project, the outputs of both the Japanese side and the Timor-Leste side were implemented as per the plan.<sup>7</sup>

From March 29<sup>th</sup> to April 4<sup>th</sup>, 2021, there was heavy rain across all of Timor-Leste, and although the Hinode Bridge and areas around the access roads were at risk of flooding, there was no direct damage or impact. This will be elaborated on below in 3.3.1.2 Qualitative Effects (Other Effects) under Effectiveness.

### 3.2.2 Project Inputs

#### 3.2.2.1 Project Cost

The total cost of this project was initially planned to be approximately 2,786 million yen (of which 2,164 million yen was to be borne by the Japanese side, and approximately 622 million yen was to be borne by the Timor-Leste side). The actual spend was approximately 2,414 million yen (2,022 million yen borne by the Japanese side and approximately 392 million yen borne by the Timor-Leste side), which was within the plan (approximately 87% of the planned figure). The difference between the planned and actual project costs on the Japanese side was mainly due to realization of efficient bids for the construction works. A key reason for the difference between

<sup>7</sup> Of the actual outputs produced by the Timor-Leste side, 2) Relocation of existing public services (relocation of water pipes, communication lines, electric wires and utility poles) was done by the Departments of Water Supply and the telecommunications department under the Ministry of Transport and Communications.

the planned and actual project costs on the Timor-Leste side was that various costs turned out to be less than originally anticipated, e.g., expenses required for house relocation and compensation; land acquisition costs; environmental monitoring; costs related to tax exemptions associated with the project; and preparation of land for temporary yards etc.

### 3.2.2.2 Project Period

This project was planned to run from March 2014 to February 2017 (36 months). In reality, it lasted from March 2014 to October 2018 (56 months), which was significantly longer than planned (approximately 156% of the planned timeframe). This was mainly because the land acquisition procedure and other related processes associated with the project sites (compensation cost estimation, communication with related ministries/agencies, securing budgets, explaining the details of the project to target residents and paying compensation, etc.) took time,<sup>8</sup> even though the implementation design (detailed design survey) was carried out mostly as planned. In particular, securing the budget and procedures took considerable time (approximately 3 months) because administrative functions were stagnant in 2015 due to a series of political events, such as establishment of a coalition government and a structural reform of the Cabinet. In November 2015, when there was a good prospect for concluding the land acquisition, the grant agreement (G/A) and the exchange of notes (E/N) were signed, followed by the tendering and construction works.<sup>9</sup> Construction took slightly longer than originally anticipated because the land surveys and construction of pavements, drainage, sidewalks, etc., for the extension airport road in Dili City took longer than expected (approximately 2.5 months). Overall, it was delayed by about a year.

As discussed above, the outputs of this project were mostly as per the plan, and the project cost was within the plan. However, the project period was significantly longer than planned. Therefore, efficiency of the project is moderately low.

## 3.3 Effectiveness and Impacts<sup>10</sup> (Rating: ③)

### 3.3.1 Effectiveness

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

Table 2 shows the quantitative effect indicators (baseline, target and actual values) for this

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<sup>8</sup> The preparatory survey and compensation subject evaluation for the land acquisition began in May 2014, with a different timeline from that of the implementation design (detailed design survey) for this project. The DRBFC side of the process, such as securing budgets, explaining the details of the project to residents and making compensation payments, was completed by December 2015. Acquisition of land took approximately a year and 8 months.

<sup>9</sup> According to JICA's documents, at the time of planning, the period required for the land acquisition procedure was expected to be about a year and a half, from June 2013 to December 2014. In other words, the procedure was expected to be completed in December 2014. Given that it was completed in November 2015, it can be said that the procedure for land acquisition was delayed by about 11 months.

<sup>10</sup> Sub-rating for Effectiveness is to be put with consideration of Impacts.

project. In addition, as reference information, Table 3 shows the changes in number of newly registered vehicles nationwide.

Table 2: Quantitative Effect Indicators for This Project (Baseline, Target and Actual)

Indicator	Baseline	Target	Actual	Actual
	2013	2020	2018	2020
		3 Years After Project Completion	The Year of Project Completion	2 Years After Project Completion
1) Volume of traffic crossing the river (unit: pcu/day) *Note 1	38,000 *Note 2	57,000 *Note 3 Existing bridge: 43,000 Hinode Bridge: 14,000	51,787 *Note 5 Existing bridge: 36,198 Hinode Bridge: 15,589	92,852 Existing bridge: 58,028 Hinode Bridge: 34,824
2) Average speed of traffic crossing the river (unit: km/h)	40 *Note 2	60	N/A	35-45 *Note 6
3) Freight traffic (unit: vehicle/day) *Note 4	3,400 *Note 2	4,700 *Note 3 Existing bridge: 3,700 Hinode Bridge: 1,000	N/A	No data (*However, it is estimated that more than one in 10 vehicles crossing the river are trucks or trailers.)

Source: JICA's documents, answers to the questionnaire (DRBFC's data) and measurements taken by driving across the bridge in a vehicle

Note 1: pcu stands for passenger car unit.

Note 2: Numbers at the existing bridge.

Note 3: This shows the total traffic volume on the existing bridge and the Hinode Bridge. As for vehicle types, this is the total number of mopeds, passenger cars, buses, trucks and trailers. The actual values are composed likewise.

Note 4: Prior to the start of this project, according to JICA's documents, the annual cargo volume handled at the new Tibar Port was expected to be 100,000 TEU, while the annual cargo volume handled at Dili Port is currently 40,000 TEU. It was anticipated that the new Tibar Port would open in 2017 and that the volume of trucks and trailers driving across the Hinode Bridge and on the access roads constructed by this project would also increase.

Note 5: Taken from JICA's documents.

Note 6: At the time of the field survey for this study (November 2021), we actually got in a vehicle and measured the travel speed on the Hinode Bridge (measured multiple times during the day and at peak times).

(Reference) Table 3:

Number of new vehicle registrations nationwide (changes over 2006–2020)

(Unit: vehicle)

2006	2007	2008	2009	2010	2011	2012	2013
1,441	3,115	5,559	10,216	9,660	9,146	10,556	13,860
2014	2015	2016	2017	2018	2019	2020	
15,850	17,510	19,201	17,253	13,693	18,490	19,533	

Source: National Directorate of Land Transportation (Direção Nacional de Transportes Terrestres)

Regarding the quantitative effect indicators for this project, at the time of planning, three

indicators were set to measure effects: “volume of traffic crossing the river,” “average speed of traffic crossing the river” and “freight traffic.” In this study, actual values were obtained and compared with the target values. Below is an analysis of each indicator.

### 1) Volume of Traffic Crossing the River

The actual 2020 volume significantly exceeded the target. The reasons are as follows: the traffic volume that used to congest the existing bridge and the arterial road (national road A03) is now being absorbed by the Hinode Bridge developed by this project; the number of vehicles is on the rise,<sup>11</sup> as the table of newly registered vehicles (Table 3) shows; and the population of Dili City is on the increase. The traffic volume is increasing on both the existing bridge and the Hinode Bridge. As shown in Table 2, the traffic volume of the existing bridge (2020) recorded an increase of approximately 1.35 times the target value. However, the traffic volume on the developed Hinode Bridge recorded an increase of approximately 2.5 times, bearing a greater traffic load than the existing bridge. Therefore, it can be concluded that the target has been achieved, with the Hinode Bridge accommodating the initially expected traffic load.

As mentioned earlier, a significant increase in logistics is expected once construction of the new Tibar Port is complete.<sup>12</sup> The DRBFC believes that development of transportation infrastructure connecting the port and Dili urban area will become even more important, further increasing the significance of the Hinode Bridge and access roads.

### 2) Average Speed of Traffic Crossing the River

In this survey, we actually drove across the Hinode Bridge and measured the speed we were able to travel at; it was about 35 to 45 km per hour.<sup>13</sup> As shown in 1) above (average volume of traffic crossing the river), the originally anticipated speed (60 km/h) has not been achieved because the Hinode Bridge has heavy traffic, which slows down the vehicles regardless of the time of day. In other words, the target has not been achieved. As discussed in Section 3.1.1.2 (Consistency with the Development Needs), the government of Timor-Leste needs to continue implementing transportation measures in anticipation of the opening of the new Tibar Port.

### 3) Freight Traffic

Although the DRBFC did not have any recorded data, firsthand observations confirmed that more than one in 10 vehicles driving across the Hinode Bridge seemed to be heavy vehicles, such as trucks and trailers. According to the DRBFC, the volume of heavy vehicles has been increasing

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<sup>11</sup> It is possible that the increase is due to economic revitalization and an increase in people’s disposable income and purchasing power.

<sup>12</sup> It is scheduled to be completed in 2022.

<sup>13</sup> During the day, we made multiple trips across the Hinode Bridge during peak hours to measure the speed, and we calculated the average value.

on both the Hinode Bridge and the existing bridge in recent years. One of the factors in this is that there is a construction material warehouse (one of the largest in Dili City) situated near both bridges, and gravel, blocks, road pavement materials, etc., are often transported. Based on the above, it can be inferred that the originally anticipated freight traffic load has been sufficiently absorbed, and the target has been achieved.



Photo 1: Location of Dili City, the New Tibar Port, Hinode Bridge and Access Road (At the Time of Planning)

\*Source: JICA's Preparatory Survey Report (2013)



Photo 2: Around the Planned Construction Site of the Hinode Bridge Before the Start of This Project (2013) (The yellow part is where the Hinode Bridge was to be constructed. ) \*Source: Google Earth



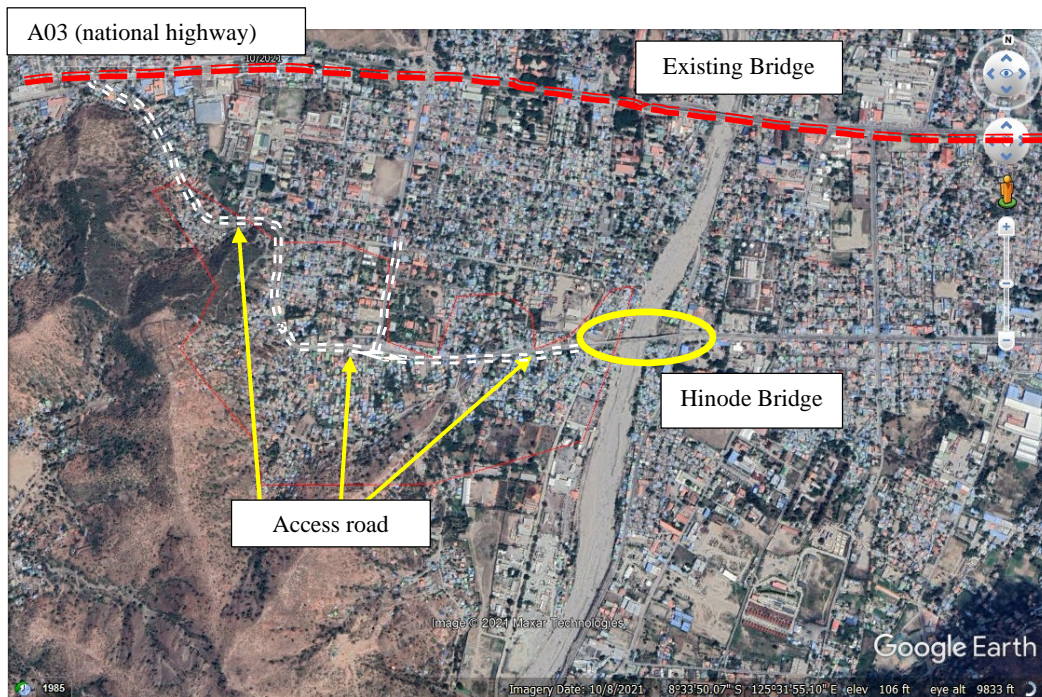


Photo 3: Area Around the Hinode Bridge at the Time of the Ex-Post Evaluation (2021)  
 (The yellow line and arrows show the Hinode Bridge and access roads.)

\*Source: Google Earth

### 3.3.1.2 Qualitative Effects (Other Effects)

As Photo 1 shows, the Hinode Bridge was constructed at a key location as a detour/alternative route for the existing bridge and the arterial road (national road A03). Apart from providing connections to different parts of Dili City, to the airport and to the new Tibar Port (under construction), this project is also thought to be contributing to alleviation of traffic congestion and a reduction in traffic accidents.

Traffic congestion is becoming a pressing issue in Dili City, and traffic volume on arterial roads is particularly high and increasing. There have been cases where vehicles that were initially concentrated on the existing bridge along national highway A03 were dispersed in the event of a natural disaster and used the Hinode Bridge to evacuate. Heavy rains continued in Timor-Leste from March 29<sup>th</sup> to April 4<sup>th</sup>, 2021, causing flash floods in rivers and landslides in mountainous areas. Damage was confirmed in all 13 municipalities in the country. Dili City and the surrounding area were also severely affected. Different government agencies, including JICA, provided emergency and humanitarian assistance, totaling US \$ 19.42 million.<sup>14</sup> At the time of the disaster, the airport roundabout intersection of national highway A03 (Photo 1) passing through the existing bridge (located downstream) was flooded and so were small and medium-sized rivers in

<sup>14</sup> Nationwide, 30,322 households were affected in one way or another, of which 24,816 were in Dili; 4,212 houses were severely damaged; 34 people were dead or missing, 22 of whom were Dili citizens. These numbers are from the “Timor-Leste Floods – Situation Report No. 11” (as of July 16<sup>th</sup>, 2021).

the city crossing national highway No. 3, creating traffic problems. The Hinode Bridge and the access road located upstream were not flooded, and there was no overflow from the Comoro River or traffic obstruction. Although it is unclear how many vehicles and residents were actually using the Hinode Bridge and access roads at the time of this event, it is an example of how this development functioned as a detour in the case of an emergency. It is presumed that this project is contributing to the prevention of casualties<sup>15</sup> and a reduction in economic damage.<sup>16</sup>

In 2021, the consultants in charge of supervising construction under this project visited Dili to check whether there was road flooding, overflow from the Comoro River and/or any traffic obstructions; they checked for damage to the Hinode Bridge and access roads (resulting from the above-mentioned heavy rain) by talking to local people involved and visiting the sites. According to the consultants, while no direct damage was found, the pillar blocks designed to prevent scouring around the riverbed pier of the Hinode Bridge were destroyed, so they advised the DRBFC to restore the blocks.<sup>17</sup>



Photo 4: Developed Hinode Bridge (1)

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<sup>15</sup> For example, it secures time (lead time) for local residents to evacuate, enabling them to do so quickly and safely.

<sup>16</sup> Examples include preventing vehicle submersion, reducing damage, and safeguarding commuter access for work and other purposes.

<sup>17</sup> One of the reasons for the rooting block damage could be that the circular hole dug at the time of gravel collection, near the rooting block, expanded due to the flood flow and reached the rooting block, causing it to slide or run off; the consultants therefore advised the DRBFC that collection of gravel around the rooting block should be restricted.



Photo 5: Developed Hinode Bridge (2)



Photo 6: Developed Access Road



Photo 7: Housing Development Status Along the Access Road

### 3.3.2 Impacts

#### 3.3.2.1 Intended Impacts

(Contribution to Economic Revitalization and Resilience by Improving East-West Access Efficiency and Strengthening the Transportation Sector)

The aim of this project was to disperse city traffic, thereby reducing traffic congestion in Dili City, by constructing a new bridge that crosses the Comoro River and connects the east and west sides of Dili City. It was anticipated that it would contribute to ensuring logistics punctuality, strengthening the transportation sector and revitalizing the economy, in conjunction with the opening of the new Tibar Port. Table 4 shows the GDP growth rates of Timor-Leste since the start of this project, as reference data.<sup>18</sup> Considering that the rates were negative for 2017–2018 and positive for 2019, it is not easy to talk about the relationship between this project and economic

<sup>18</sup> A large part of the government of Timor-Leste’s revenue is gains from the sale of oil and natural gas, but in recent years, it has been aiming to promote sustainable economic growth through economic diversification.



revitalization. However, as mentioned above, the opening of the new Tibar Port and the increase in container cargo transactions are expected to positively impact the economic statistics. Next, Table 5 shows changes in the population of Dili. It has increased significantly over the last 10 years.<sup>19</sup> Had the Hinode Bridge and access roads not been developed amidst the economic revitalization and population growth, it is possible that traffic paralysis would have worsened as city traffic would not have been dispersed. In either case, it is important for the government of Timor-Leste to implement appropriate transportation measures, including construction and renovation of roads and bridges.

(Reference) Table 4: GDP Growth Rate of Timor-Leste

(Unit: %)					
2015	2016	2017	2018	2019	2020
2.91	3.36	-4.01	-1.05	18.72	-8.70

Source: World Bank

(Reference) Table 5: Changes in the Population of Dili City

(Unit: number)		
2010	2015	2021
193,563	222,323	262,530

Source: World Population Review

Note: Timor-Leste has a total population of approximately 1.31 million (source: United Nations, 2021 data)

In addition, as shown in Photos 2 and 3 above, a comparison of the situation before the start of this project (2013) and at the time of the ex-post evaluation (December 2021) shows that development of housing etc. is progressing around the Hinode Bridge and the access road. Land prices around the access road have also risen significantly. Residents who purchased land adjacent to the access road were interviewed as part of the field survey, and the following comment was received: “The price per square meter of land before the construction of Hinode Bridge (around 2014) was about US \$ 30, but at the time of the ex-post evaluation (November 2021), it has risen to around US \$ 150. I think the benefits (of constructing the Hinode Bridge and access roads) are great for the landowners.”

From the above, it can be inferred that development of the Hinode Bridge and access roads has brought about improved traffic access in Dili City and revitalization of the regional economy by promoting development around the target area.

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<sup>19</sup> The factors behind the increase are a greater population influx from rural areas, increased life expectancy and a high birth rate.

### 3.3.2.2 Other Positive and Negative Impacts

#### 1) Impacts on the Natural Environment

This project does not fall into the large-scale road/bridge sector listed in the Japan International Cooperation Agency Guidelines for Environmental and Social Considerations (promulgated in April 2010), and it was judged that any undesirable impact on the environment would be negligible; therefore, it was classified as category B. Based on the project plan submitted by the DRBFC, the Environment Bureau of the Ministry of Economy and Development of Timor-Leste issued an environmental certificate before the start of this project.

During implementation of this project, the DRBFC was responsible for environmental monitoring, and a construction supervision consultant carried out the actual tasks. This consultant has taken measures in line with the environmental management plan, to minimize the impact on the natural environment by considering noise, vibration, drainage, air pollution, etc., generated by the construction sites. In this survey, site inspections, interviews with DRBFC representatives and answers to the questionnaire confirmed that there was generally no negative impact on the natural environment, e.g., air pollution, noise/vibrations and disturbance of ecosystems. Environmental monitoring after project completion<sup>20</sup> is undertaken by the DRBFC's Department of Training Planning and Cooperation. The Irrigation Facility Department of the Ministry of Agriculture and Fisheries is in charge of water quality and contaminated wastewater. If a negative problem arises, these organizations are supposed to discuss the matter and cooperate with one another to deal with the issue; however, as mentioned above, no serious problems had occurred as of the time at which the ex-post evaluation was conducted.<sup>21</sup>

#### 2) Resettlement and Land Acquisition

Land had to be acquired before the Hinode Bridge and access roads could be constructed. In total, 80 households<sup>22</sup> were targeted, including 40 households for the bridge construction and 40 households for the access road development and widening. The acquisition area was approximately 6.8 ha, and the compensation amount was US \$ 452,038.96. For resettlement and land acquisition, the DRBFC was responsible for coordinating actions involving other ministries. According to the DRBFC, "residents who were subject to the resettlement and those involved in the project (the DRBFC, related ministries, project consultants, etc.) shared a common understanding for proceeding with the project through information exchange so as to realize

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<sup>20</sup> This includes regular site monitoring, field surveys, discussions and negotiations with landowners.

<sup>21</sup> As a special note, before the start of this project (2014), "the possible impact on the ecosystem due to the improvement of access roads was pointed out because the project area was close to the Tasitolu Important Bird Areas." However, it was decided that this road would not be located near this area, so there was no impact. According to the DRBFC, no particular negative impacts or complaints have been reported.

<sup>22</sup> This comprises the following: 38 households that were "affected because they owned buildings and plants (trees, etc.);" 18 households that "did not own buildings but owned farmland;" and 24 households that "owned buildings" (80 households in total). Of these, 24 households needed to be relocated due to the construction work.

smooth transportation and congestion relief in Dili City. The DRBFC held briefing sessions for the target people (multiple times), and by answering inquiries carefully, they ensured that affected people understood the necessity of developing the Hinode Bridge and access roads, and that they understood that their land would be affected.” At the start of the land acquisition procedure, compensation with the reacquisition was paid based on compensation evaluation surveys, interviews and briefing sessions with residents<sup>23</sup>. Given these measures, the DRBFC is of the opinion that the series of processes was in line with the contents of the JICA Guidelines for Environmental and Social Considerations.

### 3) Gender Equality, Marginalized People, Social Systems and Norms, and People’s Well-Being

With respect to the impact on gender equality, marginalized people, social systems and norms, and people’s well-being concrete cases could not be confirmed in this survey. However, in Dili City, the increase in traffic volume and the opening of the new Tibar Port will be a trigger, and economic revitalization is expected. It is presumed that the effects of this project, such as alleviating traffic congestion, will have a positive impact on job creation and opportunities for social participation. In other words, improvement of the working environment and the advancement of women into society may be promoted further, and many people and companies may benefit as well.

Regarding consideration of marginalized people, as discussed in 2) above (resettlement and land acquisition), the DRBFC and other project personnel carefully explained the government’s land guidelines, the basis for estimating compensation costs, the procedure for remittance of compensation costs, and the relocation grace period for target households, before seeking their agreement to the land acquisition. It can be concluded that the appropriate process was carried out carefully. In addition, as shown in Photo 5, pedestrians can walk safely and comfortably on the Hinode Bridge. Lighting has also been installed at regular intervals, providing good visibility at night. An easy-to-use, fair and versatile design was adopted in this project, which has also benefited pedestrians crossing the Hinode Bridge.

This project has mostly achieved its objectives. Therefore, effectiveness and impacts of the project are high.

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<sup>23</sup> There was no particular impact on the livelihoods of the target people as a result of the land acquisition and resettlement. No complaints were also received at the time of the ex-post evaluation.

### 3.4 Sustainability (Rating: ②)

#### 3.4.1 Policy and System

According to the *Strategic Development Plan (2011–2030)* formulated by the government of Timor-Leste, sustainable social environment development is a policy goal, in line with infrastructure development such as roads and bridges, to respond to the increase in traffic around Dili City. This project is contributing to the country's transportation sector measures by addressing the issue of increasing traffic demand; therefore, it can be said to be in line with governmental policies and directions at the time of the ex-post evaluation.

#### 3.4.2 Institutional/Organizational Aspect

The executing agency is the DRBFC at the time of the ex-post evaluation, and its Dili office (a local office) is in charge of operations and maintenance. The number of staff in the office is 356 (including 324 technical engineering staff), and there are 22 people in charge of bridges and roads developed by this project (data as of the end of 2020). The actual maintenance work is to be carried out by an outsourcer (private company) once the office has signed a contract. The Hinode Bridge and access roads had just been completed at the time of the ex-post evaluation, and according to the DRBFC, there are currently no problems with the output status. Routine and regular maintenance has not yet begun, and expenditure has yet to be defrayed. When maintenance is carried out in the future, this office will supervise and inspect outsourced works via its established system. Feedback from the questionnaire and interviews with staff in the DRBFC Dili office indicates that the number of staff responsible for maintenance of the Hinode Bridge and access roads developed seems to be sufficient. However, as the outsourcing contract has not been concluded at the time of the ex-post evaluation and actual maintenance work has yet to be carried out, it is difficult to evaluate, make judgements or examine the actual operation and maintenance system. On the other hand, as will be discussed in Section 3.4.7 (Status of Operation and Maintenance), it is necessary to carry out regular inspections, cleaning, road repairs, etc., more thoroughly; and it is also necessary to formulate a maintenance plan.

#### 3.4.3 Technical Aspect

The DRBFC gained knowledge pertaining to “creating a database of maintenance of roads and bridges,” “creating a checklist for construction work,” a “case study of emergency and flood control on the Roes River” and a “case study of the Sahen Bridge and the Hinode Bridge” through JICA's “Project for Capacity Development of Road Works” (2010–2013). According to the DRBFC, the content of the abovementioned project was useful for maintenance of the Hinode Bridge and access roads. On the other hand, no specific training has been conducted since completion of the project, according to the DRBFC. As the developed Hinode Bridge and access

roads have only just been completed, the need for maintenance had not yet arisen as of the time at which the ex-post evaluation was conducted. It was also indicated that maintenance manuals are not particularly utilized. Although no major problems have been observed, it would be prudent to continue work on the training plans and utilization of the manuals. As an OJT for new employees of the DRBFC, technical training on roads, bridges and flood control is being conducted.

#### 3.4.4 Financial Aspect

In recent years, regular and daily operation and maintenance budgets for the Hinode Bridge and access roads have not been allocated. According to the DRBFC, its policy is to allocate a budget for the Hinode Bridge and access roads after assessment of the need for repairs or construction in the event of serious damage occurring (e.g., obstruction of the passage of vehicles).<sup>24</sup> As a matter of fact, there are no particular obstacles for vehicles to pass, and no problems have occurred. Nevertheless, budget allocations and expenditure should be made with due consideration of responses to the traffic demand of Dili City. It would be advisable for the DRBFC to establish such a system and work on budget allocation and expenditure.<sup>25</sup>

#### 3.4.5 Environmental and Social Aspect

Feedback from the DRBFC questionnaire and site inspection interviews indicated that no special environmental and social mitigation measures were being taken at the time of the ex-post evaluation; nor is any impact currently expected. As discussed in Section 3.3.2.2 (Other Positive and Negative Impacts), it is thought that as of the time at which the ex-post evaluation was conducted, no significant negative impact had occurred.

#### 3.4.6 Preventative Measures to Risk

When the ex-post evaluation was conducted, the political situation and security had not deteriorated in Timor-Leste. There were no major changes in the national development plans and policies concerning roads and bridges. As discussed in Section 3.1.1.2 (Consistency with the Development Needs of Timor-Leste), considering that the number of vehicles driving across the Hinode Bridge is expected to increase in the wake of the opening of the new Tibar Port, and that

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<sup>24</sup> It was confirmed that US \$ 240,000 has been secured as a daily maintenance budget for the entire east-west city road in Dili City.

<sup>25</sup> As a side note, the financial resources of the government of Timor-Leste have been somewhat limited in recent years. Financial resources are allocated to each ministry and agency in the form of budgets, and each ministry and agency prepares a budget for operation and infrastructure development within the set limits. The government documents consulted indicated that the maintenance budget for existing infrastructure facilities tends to be limited. It seems that budgets for development and expansion of infrastructure facilities are prioritized, and maintenance budgets are not of high priority (source: Budget Overview 2021, Timor-Leste). As discussed above, a daily maintenance budget of US \$ 240,000 is secured, which is thought to be utilized when and as needed.

construction of the “Hinode Bridge II” is under consideration in response to likely future increases in traffic volume in Dili City, there have been no policy changes concerning roads and bridges. In addition, no particular risks, external conditions or events needing to be controlled (either at present or in the future) have been identified.

### 3.4.7 Status of Operation and Maintenance

There are no major problems with the developed Hinode Bridge and access roads at present, although, as shown in Photos 8 and 9, some maintenance and repairs were necessary for a part of the access roads. (NB. the DRBFC plans to use the maintenance budget of the “Dili Western City Road” project for repairs to relevant parts.) In any case, the outsourced company which is expected to carry out onsite maintenance needs to work diligently on regular inspections, cleaning, road repairs, etc., and the DRBFC’s Dili office should formulate the maintenance plans and duly conduct the supervision and monitoring.<sup>26</sup> Regarding the spare parts, as the Hinode Bridge and access roads have just been completed, there is no need for these yet. Nevertheless, it is necessary to identify the situation, and work on securing and storing spare parts.

Some minor issues have been observed in terms of the institutional/organizational, financial, and current status of the operation and maintenance system. It is not expected to be improved/settled. Therefore, sustainability of the project effects is moderately low.



(Reference) Photo 8: Uneven Spots Near the Connection Between the Hinode Bridge and the Access Road (Sand lodged in the dent)  
(Photograph taken in October 2021)

<sup>26</sup> According to the construction supervision consultant who visited Timor-Leste for a status survey during 2021, when heavy rain damage occurred, “many parts of the drainage of the access road on both sides were clogged with dirt and sand. The consultant requested that the DRBFC handle the matter properly, as there was a need to carry out inspections and cleaning on a daily basis.”



(Reference) Photo 9: Uneven Spots on the Access Road  
(Dent occurred) (Photograph taken in October 2021)

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

##### 4.1 Conclusion

The aim of this project was to reduce traffic congestion by decentralizing traffic, improve east-to-west access efficiency, revitalize the economy and strengthen resilience in Dili City by constructing Hinode Bridge and access roads. In this project, “consistency with the development plan” and “consistency with development needs” were confirmed. Regarding coherence, “consistency with Japan's ODA policy” can be said to be coherent, however “internal coherence” and “external coherence” did not confirm effects from specific collaboration or coordination. Based on the above, relevance/coherence is high. With respect to efficiency, although the outputs were mostly as planned, and the project cost was within the plan, the project duration was significantly longer than the initial plan due to the delay in land acquisition procedures. Therefore, the overall efficiency of the project is moderately low. Regarding the effectiveness/quantitative effects indicators, target 1) “volume of traffic crossing the river” was achieved, and it can be inferred that target 3) “freight traffic” was also achieved. Target 2) “average speed of traffic crossing the river” was not achieved, mainly because of increased traffic using the bridge, with speed curtailed by the large number of vehicles at peak times and during the day. According to the interview survey, the Hinode Bridge and access roads are fully utilized as a means of ensuring safety in the event of a heavy rain disaster, and are playing a role in preventing casualties and reducing economic damage. Therefore, the anticipated effects of the project have been achieved overall; effectiveness and impacts are high. With regard to sustainability, while there seems to be no major concern about the outlook for the sustainability of the effects generated by this project, it is fair to say that there are some problems because the budget for operation and maintenance

and the status of some maintenance aspects are not entirely satisfactory. Therefore, sustainability of the project effects is moderately low.

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

## 4.2 Recommendations

### 4.2.1 Recommendations to the Executing Agency

At the time of the ex-post evaluation, there are thought to be no serious problems with the condition of the Hinode Bridge and access roads constructed. However, in recent years, the operation and maintenance budget has not been allocated as it should have been, and maintenance under a clear plan has not been carried out. Especially in the future, with the opening of the new Tibar Port, the traffic volume (mainly freight carriers) in Dili City is expected to increase. It would be advisable for the Timor-Leste government to identify the traffic demand and work to improve the transportation infrastructure so as to keep traffic running smoothly. At the same time, the DRBFC should work on regular and routine maintenance of the Hinode Bridge and access roads.

Although there was no direct damage to the Hinode Bridge during the heavy rain that occurred in 2021, it was confirmed that the rooting block that prevents scouring around the riverbed pier was affected. The construction supervision consultant for this project, who checked the current situation, has advised the DRBFC to restore the block. It would be a good idea for the DRBFC to act promptly with regard to implementing measures to address issues with the rooting block, based on the recommendation.

### 4.2.2 Recommendations to JICA

As discussed above, the construction supervision consultant for this project has advised the DRBFC to restore the block, pointing out the “impact on the rooting block designed to prevent scouring around the riverbed pier.” JICA should monitor the progress as much as possible and make a request as needed so that the measures are taken promptly.

## 4.3 Lessons Learned

### Importance of Steady Allocation of the Operation and Maintenance Budget

There are no significant maintenance-related problems, but there has been a lack of regular and adequate allocation of the operational and maintenance budget for the developed Hinode Bridge and access roads. The assistance provider and recipient country should have taken steps to allocate necessary budgets at appropriate points, based on what was agreed before the start of the project or during the project implementation, through discussions about disbursement of maintenance budgets after project completion. When formulating a similar project in the future, it would be desirable for both the assistance provider and the recipient country to discuss and agree a budget



for maintenance and how this should be used, at the earliest possible stage.

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

### 5.1. Performance

#### 5.1.1 Objective Perspective

None.

### 5.1. Additionality

None.

(end)

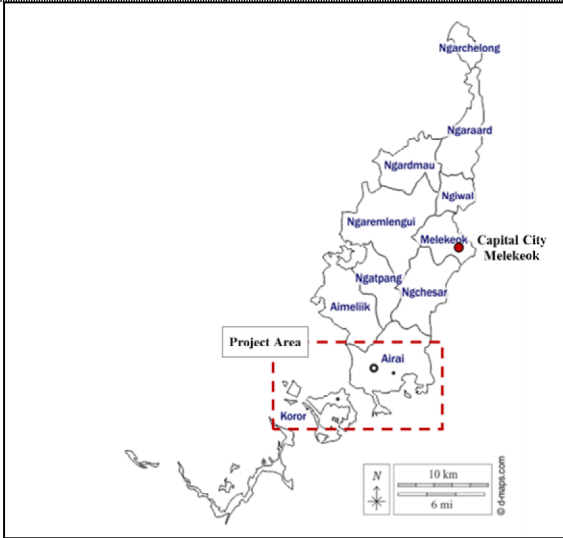
# FY2021 Simplified Ex-Post Evaluation Report of Japanese Grant Aid Project

External Evaluators: Keisuke Nishikawa, Yoko Sugimoto, QUNIE CORPORATION

Duration of the Study: September 2021 - November 2022

Duration of the Field Study: 11 January 2022 - 21 January 2022

Country Name	<b>The Project for Improvement of Water Supply System</b>
Republic of Palau	



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



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

## I. Project Outline

Background	<p>Some water supply facilities in Koror and Airai states, the economic centers of Palau, were developed during the period of Japanese mandate and had been deteriorating. In particular, the major water distribution pipelines in central Koror were made of asbestos cement and had frequent leakages, which was the cause of the high Non-Revenue Water (hereinafter referred to as "NRW") ratio (about 48%). It was necessary to blockade part of the road when repairing the leaks, which seriously affected Palau's economic activities. In addition, only one water transmission pipe supplied purified water from the Airai Water Treatment Plant, the only water purification facility, to the central Koror and Airai states. The facility's water transmission capacity was significantly insufficient to meet the water demand at that time. Malakal Island, located at the end of the water supply system, routinely had low water supply pressure. Also, the upland area of Koror Island (Ngerbeched area) had frequent low water supply pressure that did not reach the prescribed water supply pressure, resulting in an imbalance in the benefits of the water supply.</p> <p>Such an unstable water supply system could negatively affect residents' living conditions and the Palauan tourism industry. This project was implemented in response to the Palauan government's request for grant aid to improve the water supply system.</p>								
Objectives of the Project	<p>The objective of the project is to ensure a stable and equal water supply in Koror State and Airai State by improving the transmission mains (double pipelines), replacing the distribution lines, and reforming the water distribution zones, thereby contributing to the improvement of the residents' living conditions.</p>								
Contents of the Project	<ol style="list-style-type: none"> <li>1. Project Site: Koror State, Airai State</li> <li>2. Japanese side             <ol style="list-style-type: none"> <li>1). Contents of construction of facilities and procurement of equipment (The table shows the actual outputs, and some numbers were changed from the plan.)</li> </ol> </li> </ol> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;">Items</th> <th>Facilities</th> </tr> </thead> <tbody> <tr> <td>1. Improvement of Water Transmission System</td> <td>                     1-1 Installation of additional water transmission mains from the Airai Water Treatment Plant up to the Ngerkesoal service tank                      ➤ L = 5,416 m、 Ductile Cast Iron Pipe (DCIP) Nominal Diameter (DN) 400 mm                 </td> </tr> <tr> <td>2. Improvement of Water Distribution Networks (Re-arrangement of Water Distribution Zones)</td> <td>                     2-1 Installation of exclusive water transmission mains for the establishment of the Malakal water distribution zone                      ➤ L = 3,094 m, DCIP DN 250 mm                      2-2 Re-arrangement of water distribution zones (Construction of Malakal service tank<sup>1</sup>, Installation of flow meters at each service tank)                      ➤ Service tank: 1 unit, Capacity: 950 m<sup>3</sup>, Reinforced Concrete (RC)-made, Rectangle                      ➤ Flow meter: DN 150-200 mm, 5 units                 </td> </tr> <tr> <td>3. Improvement of Water Distribution Networks</td> <td>                     3-1 Replacement of deteriorated Asbestos Cement (AC) pipe                      ➤ Target distribution pipeline extension :12.92 km<sup>2</sup>, Polyvinyl Chloride                 </td> </tr> </tbody> </table>	Items	Facilities	1. Improvement of Water Transmission System	1-1 Installation of additional water transmission mains from the Airai Water Treatment Plant up to the Ngerkesoal service tank ➤ L = 5,416 m、 Ductile Cast Iron Pipe (DCIP) Nominal Diameter (DN) 400 mm	2. Improvement of Water Distribution Networks (Re-arrangement of Water Distribution Zones)	2-1 Installation of exclusive water transmission mains for the establishment of the Malakal water distribution zone ➤ L = 3,094 m, DCIP DN 250 mm 2-2 Re-arrangement of water distribution zones (Construction of Malakal service tank <sup>1</sup> , Installation of flow meters at each service tank) ➤ Service tank: 1 unit, Capacity: 950 m <sup>3</sup> , Reinforced Concrete (RC)-made, Rectangle ➤ Flow meter: DN 150-200 mm, 5 units	3. Improvement of Water Distribution Networks	3-1 Replacement of deteriorated Asbestos Cement (AC) pipe ➤ Target distribution pipeline extension :12.92 km <sup>2</sup> , Polyvinyl Chloride
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2. Improvement of Water Distribution Networks (Re-arrangement of Water Distribution Zones)	2-1 Installation of exclusive water transmission mains for the establishment of the Malakal water distribution zone ➤ L = 3,094 m, DCIP DN 250 mm 2-2 Re-arrangement of water distribution zones (Construction of Malakal service tank <sup>1</sup> , Installation of flow meters at each service tank) ➤ Service tank: 1 unit, Capacity: 950 m <sup>3</sup> , Reinforced Concrete (RC)-made, Rectangle ➤ Flow meter: DN 150-200 mm, 5 units								
3. Improvement of Water Distribution Networks	3-1 Replacement of deteriorated Asbestos Cement (AC) pipe ➤ Target distribution pipeline extension :12.92 km <sup>2</sup> , Polyvinyl Chloride								

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

	(Replacement of Major Water Distribution Pipelines)	(PVC) DN 200-300 mm ➤ Lateral connection: 305 units <sup>3</sup> , PVC DN 50 mm		
	<p>2). Soft Components</p> <p>(1) Guidance on analysis of water transmission/distribution volume (Creation of management tools for water transmission and distribution, customer water usage, and NRW data)</p> <p>(2) Guidance on leak detection techniques (Practical training of screening survey and ground microphone survey for leak detection, Preparation and support of report of water leakage repair, and Preparation of the water leakage survey plan / NRW reduction plan)</p> <p>3. Palauan side: Improvement of access road to the Malakal service tank facility, Provision of required power cable for service tanks, Provision of lateral connections for each household (connection of water supply pipes), etc.</p>			
Implementation Schedule	E/N Date	May 20, 2015	Completion Date	April 25, 2018
	G/A Date	May 28, 2015		
Project Cost	E/N Grant Limit / G/A Grant Limit: 1,843 million yen, Actual Grant Amount: 1,761 million yen			
Executing Agency	Palau Public Utilities Corporation: PPUC			
Contracted Agencies	Main Contractor(s): TOBISHIMA CORPORATION Main Consultant(s): Yachiyo Engineering Co., Ltd., NIHON SUIKO SEKKEI Co., Ltd. Agent: N/A			

## II. Result of the Evaluation

### Summary

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

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

<b>Overall Rating<sup>4</sup></b>	<b>A (Highly satisfactory)</b>	<b>Relevance &amp; Coherence</b>	③ <sup>5</sup>	<b>Effectiveness &amp; Impact</b>	③	<b>Efficiency</b>	③	<b>Sustainability</b>	③
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### <Special Perspectives Considered in the Ex-Post Evaluation/Constraints of the Ex-post Evaluation>

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

### 1 Relevance/Coherence

#### <Relevance>

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

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

<sup>2</sup> The total length of the deteriorating main water distribution pipes was approximately 32.5 km, but since it was difficult to renew all of them at once due to construction management, this project renewed 12.92 km of high-priority pipes as the first phase.

<sup>3</sup> The number was 308 units at the time of planning, but was changed to 305 units (Refer to "Efficiency" for details).

<sup>4</sup> A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

<sup>5</sup> ④ : Very High ③: High, ②: Moderately low, ①: Low

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

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

#### <Coherence>

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

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

##### ▪ Internal Coherence

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

##### ▪ External Coherence

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

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

#### <Evaluation Result>

In light of the above, the relevance and coherence of the project are high<sup>6</sup>.

## 2 Effectiveness/Impact<sup>7</sup>

### <Effectiveness>

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

#### (1) Quantitative Effects

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

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

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

<sup>6</sup> Relevance: ③, Coherence: ③

<sup>7</sup> When providing the sub-rating, Effectiveness and Impacts are to be considered together.

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

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

### Quantitative Effects

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

Source: Ex-ante Evaluation Paper, Data provided by PPUC

(※1) 1 MG (Million Gallons) = 3,785 m<sup>3</sup>, 1 psi (pound per square inch) = about 0.007 MPa

(※2) the monitoring area is Ngerbeched area, the lowest pressure area

### (2) Qualitative Effects

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

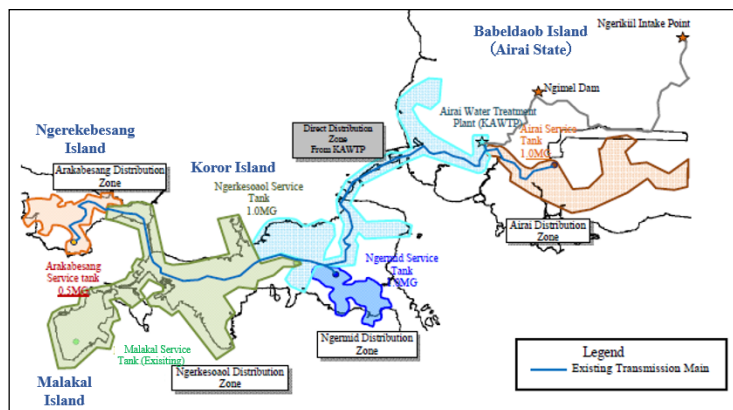


Figure 1 : Water Distribution System before the Project  
Source: Preparatory Survey Report

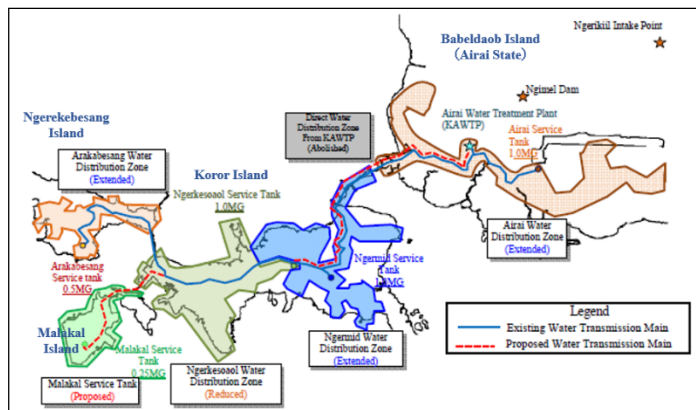


Figure 2 : New Water Distribution System after the Project

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

### <Impacts>

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

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

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

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

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

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

#### <Evaluation Result>

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

### 3 Efficiency

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

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

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

#### <Evaluation Result>

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

### 4 Sustainability

#### • Policy/and System

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

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

<sup>10</sup> Interviews were conducted with a total of seven business owners.

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

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

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

- Institutional/Organizational Aspect

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

- Technical Aspect

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

- Financial Aspect

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

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

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

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

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

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

\*1: Capital contribution from the Government of Palau and grant aid from the Japanese government, etc.

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

<sup>13</sup> It is in preparation as of May 2022.

- Social and Environmental Aspect

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

- Preventative Measures to Risks

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

- Current Status of Operation and Maintenance

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

<Evaluation Result>

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

### III. Recommendations & Lessons Learned

- Recommendations to Executing Agency

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

- Recommendations to JICA

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

- Lessons Learned

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

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



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

#### IV. Non-Score Criteria

- Performance (Objective Perspective)

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



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



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

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

Kingdom of Tonga

FY 2021 Ex-post Evaluation Report of Japanese Grant Aid Project

“The Project for Upgrading of Wharf for Domestic Transport”

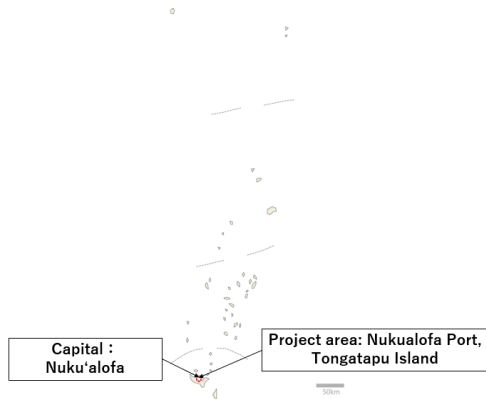
External Evaluator: Keisuke Nishikawa, QUNIE CORPORATION

## **0. Summary**

This project aimed to improve the efficiency of international and domestic cargo handling operations and ensure the safety of passengers by constructing a new wharf for large domestic transport vessels at the port of Nuku'alofa, Tonga's capital. While there was no specific coordination or synergy expected between this project and other JICA projects or support from other organizations during the planning and implementation period of this project and the effects of inter-project linkages were not observed, the project was consistent with Tonga's development plan and needs at the time of planning and ex-post evaluation, and was also found to be consistent with Japan's ODA policy at the time of planning. Based on the above, its relevance and coherence are high. Regarding the project implementation, the outputs were mostly as planned, and although the project period slightly exceeded in real terms, the project cost was within the plan. Therefore, the efficiency of the project is judged to be high. Regarding the effectiveness of the project, while qualitative effects such as shortening of unberthing / berthing operations, improvement of cargo handling efficiency, improvement of passenger comfort, and assurance of safety were fully realized, the overall generation of quantitative effects was significantly delayed due to the substantial delay in the commencement of use of the new wharf by a large domestic transport vessel. In addition, one of the indicators, “volume of cargo handled,” was substantially lower than the target, and economic effects and revitalization of cargo and passenger transport were not fully observed. Therefore, although there were some force majeure events associated with the global spread of the new coronavirus from the beginning of 2020 and the huge volcanic eruption in January 2022, the overall effectiveness and impact of the project as a whole were moderately low, as some aspects were not necessarily achieved as originally envisioned. Regarding the sustainability of the effects of the project, although the environmental monitoring system needs to be improved, no issues were found in terms of policy and system, organization and institution, finance, risk response, and operation and maintenance, and thus the sustainability of the effects of the project is considered to be high.

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

## 1. Project Description



Project location map  
(Source: External Evaluator)



Domestic wharf developed in this project<sup>1</sup>  
(Source: External Evaluator)

### 1.1 Background

Tonga is an island nation of more than 170 islands, comprising four archipelagos from the south: Tongatapu, Ha'apai, Vava'u, and Niua. Of these, the Tongatapu Islands are home to the capital city of Nuku'alofa, where more than 70% of the population resides. The port of Nuku'alofa, located in the capital, consisted of the Queen Salote Wharf, mainly used by international cargo ships and large domestic transport vessels, the Vuna Wharf, used by international passenger ships, and the Fua Wharf, used by small domestic transport vessels. Large vessels such as MV Otuanga'ofa, a domestic transport vessel playing a central role in inter-island transport within Tonga (a 53-meter-long, 1,534-ton cargo and passenger vessel procured through the FY 2008 Grant Aid), were berthed at the Queen Salote Wharf, where passengers were embarking and disembarking in the container yard. This caused a safety issue due to the complicated flow lines between cargo handling operations and passengers. In addition, the efficiency of cargo handling was poor because different cargo handling procedures for international and domestic cargo were conducted at the same Queen Salote Wharf. In response to these issues, the Tongan government set as its future port development plan the goal of improving the efficiency and safety of international port logistics and domestic cargo and passenger transport.

The existing Fua Wharf (a wharf for small domestic transport vessels) at Nuku'alofa Port did not allow large vessels such as MV Otuanga'ofa to berth and was not equipped with a passenger terminal or boarding ramp for loading and unloading. Therefore, a dedicated wharf was necessary for large vessels to berth.

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<sup>1</sup> The ship on the right in the photo is MV Otuanga'ofa, which was built under the Grant Aid "The Project for Construction of the Inter-Islands Vessel" (FY 2008).

## 1.2 Project Outline

The objective of the project is to improve the efficiency of the port through separating international and domestic cargo handling operations and ensure the safety of passengers getting on and off the vessels by constructing a new passenger terminal, wharf and basin etc. as well as a wharf for large domestic vessels at Fuaa Wharf of the Nuku'alofa Port in Tongatapu, thereby contributing to the revitalization of passenger and cargo transportation in Tonga.

Grant Limit / Actual Grant Amount	3,320 million yen / 3,209 million yen
Exchange of Notes Date / Grant Agreement Date	June 2015 / June 2015
Executing Agency(ies)	Ministry of Infrastructure
Project Completion	March 2018
Target Area	Nuku'alofa Port, Tongatapu Island
Main Contractor	TOA Corporation
Main Consultant	Oriental Consultants Global Co., Ltd.
Basic Design / Preparatory Survey	August 2014 - March 2015
Related Projects	<p>&lt;Grant Aid&gt;</p> <p>The Project for Provision of a Port Service Vessel (1993)</p> <p>The Project for Construction of the Inter-Islands Vessel (2008)</p> <p>&lt;Other international organizations, aid agencies, etc.&gt;</p> <p>(World Bank)</p> <p>Transport Sector Consolidation Project (2009-2018)</p> <p>(Asian Development Bank)</p> <p>Outer Islands Small Jetties Project (2013-2015)</p> <p>(New Zealand)</p> <p>Pacific Maritime Safety Programme (2011-)</p>

## 2. Outline of the Evaluation Study

### 2.1 External Evaluator

Keisuke Nishikawa (QUNIE CORPORATION)

### 2.2 Duration of Evaluation Study

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

Duration of the Study: September 2021 - January 2023

Duration of the Field Study: August 4 - 18, 2022

### 3. Results of the Evaluation (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 Development Plan of Tonga

At the time of planning of this project, Tonga's development policy was the *Tonga Strategic Development Framework* (2011-2014), and one of the priority areas was the development of properly planned and maintained infrastructure, and the implementation of the *National Infrastructure Investment Plan* was identified as a means of implementing it. The 2010 version of the *National Infrastructure Investment Plan* included the improvement of ports and terminals for international port logistics and domestic inter-island transport, and the 2013-2023 version will continue to implement the plan. The plan also emphasized the importance of increasing safety and resilience related to inter-island transport in maritime activities, which would require investments in infrastructure and complementary efforts to improve capacity, facilities, and systems.

At the time of ex-post evaluation, the *Tonga Strategic Development Framework* (2015-2025) is positioned as a national-level development plan, with the provision and maintenance of comprehensive, sustainable, and successful infrastructure and technology as one of its seven priorities. Specifically, the goal is to provide reliable, safe, and affordable transportation services and improve the movement of people and goods between islands.

The *National Infrastructure Investment Plan* (2013-2023) remains as a valid investment plan at the time of ex-post evaluation under the same framework. The following are other investment plans that are identified as the ones related to this project at the time of ex-post evaluation: a management plan for the Ministry of Infrastructure (hereinafter referred to as “MOI”) and the Ports Authority Tonga (hereinafter referred to as “PAT”), an overall long-term development plan for the Port of Nuku'alofa, and a recovery plan after the massive volcanic eruption in January 2022.

##### ➤ MOI Management Plan and Budget Summary (FY 2022/23 - FY 2024/25)

MOI's Management Plan. For the maritime and port sector, the plan states that the goal is to achieve safe, secure, and affordable domestic and international maritime transport, and to support the expansion of economic activities in the maritime transport sector, as well as to develop legislations and provide supervision and support for the

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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

sector as a whole.

➤ PAT Three-Year Business Plan (2023-2025)

PAT's Business Plan, developed in June 2022. The provision of more reliable, safe, and accessible transportation services is one of its goals based on the *Tonga Strategic Development Framework (2015-2025)*, which also emphasizes the participation and inclusion of vulnerable people.

➤ 20-Year Conceptual Master Plan

The plan presents a future development concept for the integrated development of the port area of Nuku'alofa. At the time of ex-post evaluation, the plan had not yet been documented, and an image of the development was presented in a video.

➤ Hunga Tonga = Hunga Ha'apai Volcano Eruption and Tonga Tsunami (HTHH Disaster) Recovery and Rehabilitation Plan (2022-2025)

The recovery plan was announced by the Prime Minister's Office on March 4, 2022 after the major eruption in January of the same year. The port is also included in the list of recovery targets because it was partially damaged. However, it is not a large-scale renovation plan, but mainly focuses on cleaning up eruption debris.

The MOI, as the ministry that oversees shipping infrastructure, supervises and supports the provision of stable maritime infrastructure services, and the domestic wharf developed under this project is positioned as an important core infrastructure for this purpose. PAT also emphasizes in the management plan to further improve its financial position as well as to realize reliable, safe, and accessible transportation services for all people, and this project is consistent with this direction. The 20-Year Concept Master Plan calls for the integrated development of the coastal area over the next 20 years, and the wharf developed in this project is part of this plan. It is positioned as a hub for domestic passenger and cargo transport.

Based on the above, the project is consistent with the direction of Tonga's national development plan, infrastructure development plan, and other related plans at the time of planning and ex-post evaluation.

### 3.1.1.2 Consistency with Development Needs of Tonga

At the time of planning of this project, Nuku'alofa Port did not have a wharf where large

vessels for domestic transport could berth and unberth, and large vessels for domestic transport were using part of the international wharf (Queen Salote Wharf). Since there were no adequate facilities for passengers to embark and disembark or to wait, the wharf had a dangerous mix of passenger and cargo flow lines.

The implementation of this project has secured a domestic wharf where multiple large vessels can berth at the same time. As a result, a part of the international wharf is no longer in use, and the risk of passenger and cargo traffic crossing has been eliminated. The wharf developed in this project still plays a significant role in maritime traffic to and from remote islands at the time of ex-post evaluation. The number of passengers, cargo volume, and the number of vessels entering and leaving the port in recent years are shown below, and the wharf constructed in this project also plays an important role as a port that meets these needs for movement and transportation.

Table 1: Tonga's Domestic Transport Data

Fiscal year	2017/18	2018/19	2019/20	2020/21	2021/22
Number of domestic passengers (persons)	104,887	121,569	58,652	90,794	68,185
Domestic cargo transport volume (tons)	31,913	39,313	25,794	34,123	24,184
Number of vessel arrivals and departures (times)	1,031	1,376	588	970	659

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

Note 2: Total of arrivals and departures at the port

Source: Information provided by PAT

The number of passengers, cargo transport volume, and vessel arrivals and departures have all declined since FY 2019/20 compared to previous years due to the restrictions placed on domestic transport following the outbreak of COVID-19 and a decrease in vessel operations following the massive eruption in January 2022. However, the domestic wharf at Nuku'alofa plays a key role to cater for most of Tonga's domestic maritime transportation, and the domestic wharf developed in this project is a highly needed facility for Tonga's domestic cargo and passenger transportation, both at the time of planning and at the time of ex-post evaluation.

### 3.1.1.3 Appropriateness of the Project Plan and Approach

The MV Otuanga'ofa (1,534 tons), a cargo and passenger vessel for domestic transport provided under JICA's grant aid "The Project for Construction of the Inter-Islands Vessel" (FY 2008), was renting a part of the international wharf as there was no wharf where the vessel could berth. In addition, there were safety issues at the wharf in terms of cargo and

passenger flows, and this project was designed to resolve these issues. In this respect, this project played a role in making safer and more effective use of the vessel provided by “The Project for Construction of the Inter-Islands Vessel,” and also enhanced the effectiveness of the project itself by allowing the vessel to use the wharf developed by this project. In this sense, the approach of this project is considered to have been appropriate.

### 3.1.2 Coherence (Rating: ②)

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

At the time of planning of this project, Japan had identified the expansion of economic activities as a priority issue in its country assistance policy for Tonga, and had decided to develop an “Economic Infrastructure Development and Maintenance Capacity Enhancement Program.” In addition, the “JICA Country Analysis Paper for the Pacific Region” also identified the development of shipping infrastructure as one of the priority issues.

This project provided support for the port, which is an economic and social infrastructure, and was in line with the priority areas of Japan's assistance to the Pacific region and Tonga at the time of planning.

#### 3.1.2.2 Internal Coherence

No other JICA projects were being planned or implemented when this project was planned and implemented. Therefore, no linkage between JICA projects was envisaged, and no particular internal coherence was identified.

#### 3.1.2.3 External Coherence

At the time of planning of this project, related projects were the World Bank-supported Transport Sector Consolidation Project (2009-2018), the Asian Development Bank (ADB)-supported Outer Islands Small Jetties Project (2013-2015), and the New Zealand-supported Pacific Maritime Safety Programme (2011-). In addition, the Vuna Wharf, which forms part of the Port of Nuku'alofa, was upgraded in 2012 with assistance from China.

In the World Bank-supported project, only partial improvement of ports in outer islands was implemented in the maritime transport sector; in the ADB-supported project, only safety assessments were conducted and routes were set up for safe navigation of ships. In the New Zealand-supported project, training was provided on search and rescue in the event of maritime accidents and response to oil spills. In addition, support was provided for the improvement of navigation facilities in domestic harbors, and measures were taken to prevent ships from running aground or colliding. Furthermore, it was confirmed that PAT



installed additional navigation aid facilities at the domestic wharf developed under this project after the project was completed, thereby enhancing the safety of navigation.

As a whole, no specific linkage with these projects was envisioned when this project was planned, and each was implemented independently, but the result was an improvement in safety in Tonga's maritime transport sector. In particular, PAT's installation of additional navigation aid facilities is considered to have increased safety within the new wharf after the project was completed.

The wharf developed in this project was planned from the beginning to be a robust facility that could withstand cyclones and other natural disasters, and was expected to contribute to the realization of sustainable shipping as a highly resilient infrastructure facility. In fact, the new wharf is a highly resilient infrastructure, and in terms of consistency with the international development framework, the new wharf is in line with the ninth goal of the Sustainable Development Goals (SDGs), "Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation" in that it developed a highly resilient infrastructure.

This project is consistent with Tonga's development policy and sector plans at the time of planning and ex-post evaluation, and is also responsive to development needs. In addition, although no specific linkage or synergy with JICA projects or other donors' projects was envisioned and no specific outcomes were confirmed, this project was judged to be in line with Japan's ODA policy at the time of planning.

Therefore, the relevance and coherence of this project are high.

### 3.2 Efficiency (Rating: ③)

#### 3.2.1 Project Outputs

This project involved the construction of a new domestic passenger terminal, wharf, and basin at the Port of Nuku'alofa. Specific components planned and implemented were as follows.

Table 2: Planed and Actual Components of the Project

Facility	Plan	Actual
Breakwater	Extension: approx. 250 m	253 m
Wharf	3 berths (2 berths L = 90 m, 1 berth L = 135 m)	3 berths (2 berths L = 90 m, 1 berth L = 135 m)
Boarding ramp	2 locations	2 locations
Ancillary facilities	Mooring poles, fenders, car stops, etc.	38 mooring poles, 34 fenders, 88 car stops, etc.
Routes and basin	Dredging (water depth -4.0 m)	Dredging (water depth -4.0 m)
Cargo handling yard	Including 8 LED yard lighting lamps	Including 8 LED yard lighting lamps
Passenger terminal building	Building area 2,100 m <sup>2</sup> , solar panel	Total area of 2,100 m <sup>2</sup> , solar panel
Entry road, parking lot	Asphalt pavement, road lighting	Asphalt pavement, for 102 cars
Exterior	Sidewalks, covered passenger walkways, drainage ditches, fences, green space	Sidewalks, covered passenger walkways, drainage ditches, fences, green space
Security guard room, garbage collection point	One-story building, 2 locations each	One-story building, 2 locations each
Navigation aids	2 beacon lights, 1 guiding light	2 beacon lights, 1 sector light

Source: Preparatory survey report and materials provided by JICA

The items borne by the Japanese side were generally implemented as planned. However, the following main changes were observed.

- Change in length and wall thickness of passenger terminal building foundation piles (to avoid future problems due to lack of support)
- Modification of the fence enclosure extension in the embankment area (due to the need to enhance the privacy of facilities and residences in the vicinity of the new wharf)
- Change in the reclamation height at the boundary with the adjacent Fuaa Wharf and associated change in drainage plan (changes associated with the development of the exterior of the building)
- Change of kitchen layout and furniture specifications in the passenger terminal building

The above changes were made to further enhance the durability, safety, and convenience of the project facilities, while taking into consideration the facilities and residents living near the wharf.

In addition, as the items to be borne by the Tongan side, it was agreed between the two countries to mainly implement the following items.

- Obtaining environmental permits, construction and installation permits, implementing

tax exemptions, and covering banking fees

- Provision of temporary yards
- Disposal of wrecks and miscellaneous materials in Fuaa Wharf
- Implementation of related work (planting work, installation of poles for power distribution, installation of electricity meters, telephone internet wiring work)

In fact, it has been confirmed that all of these items borne by the Tongan side were implemented as scheduled, and there were no particular problems.



Solar panels on the roof of the passenger terminal building  
(Photo by External Evaluator)



Covered passenger walkway  
(Photo by External Evaluator)

### 3.2.2 Project Inputs

#### 3.2.2.1 Project Cost

The project cost was planned to be 3,336 million yen, consisting of 3,320 million yen for the Japanese side and 16 million yen for the Tongan side.

The actual project cost on the Japanese side was 3,209 million yen (construction cost: 3,028 million yen, design and supervision cost: 180 million yen), although it was difficult to ascertain the amount borne by the Tongan side. Therefore, in this ex-post evaluation, only the project cost on the Japanese side was used. Although the cost borne by the Tongan side included the cost of office furniture and refrigeration/freezers, it was confirmed that these were actually installed at the direct expense of the shipping companies and tenants that occupied the building.

Based on the above, the actual amount of this project was 97% of the plan, which was within the plan.

### 3.2.2.2 Project Period

The period for this project was planned to be 33 months, including the detailed design and bidding period. The actual project duration was 34 months, from June 2015 to March 2018, as shown below.

Grant agreement signed: June 2015

Detailed design period: July 2015 - December 2015 (including bidding period)

Construction period: February 2016 - March 2018

In fact, due to the impact of the construction interruption caused by the super cyclone that hit Tonga in February 2018 (Instantaneous maximum wind speed: 78m/s), construction was completed in June 2018, and additional work was carried out until December 2018 to restore the damage and prevent future damage. In addition to the suspension of construction due to the cyclone damage, the project was also required to undergo multiple modifications during pre-completion inspections, making it difficult to complete construction as originally planned; however, the project was expected to be delivered in March 2018 without damage from the cyclone. Therefore, it can be said that the completion of the project was possible in March 2018. As described above, the project completion was determined to be March 2018 and the project period was judged to be 34 months from June 2015 to March 2018 (103% of the plan).

Based on the above, it can be said that the actual period for this project slightly exceeded the plan.

The output of the project was almost as planned. Although the actual project cost on the Tongan side was unknown, the project cost on the Japanese side was within the plan. The project period, excluding external factors such as the damages caused by the super cyclone, was slightly longer than the planned period.

Therefore, the efficiency of the project is high.

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

### 3.3.1 Effectiveness

#### 3.3.1.1 Quantitative Effects

At the time of project planning, the project's operation and effect indicators were set at 90 times/year, 45,000 tons/year, and 45,000 passengers/year for the number of 1,500-ton class vessel leaving and arriving at the new wharf, the volume of cargo handled, and the

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

number of passengers carried, respectively. The actual values of these indicators were confirmed in the ex-post evaluation and are shown in Table 3.

Table 3: Target and Actual Values of Effect Indicators of the Project\*1

		Baseline value	Target value	Actual (fiscal year*2)			
		2014	2021	2018/19	2019/20	2020/21	2021/22
			3 Years After Completion	Completion Year	1 Year After Completion	2 Years After Completion	3 Years After Completion
Number of 1,500-ton class vessels berthing and unberthing at the new wharf (times/year)*3	TTIV*4	0	90	0	0	0	97
	QS*5			149	67	111	0
	<u>Total</u>			<u>149</u>	<u>67</u>	<u>111</u>	<u>97</u>
Volume of cargo handled at the new wharf (tons/year)	TTIV	0	45,000	2,449	8,158	14,016	19,509
	QS			21,977	12,640	11,773	0
	<u>Total</u>			<u>24,426</u>	<u>20,798</u>	<u>25,789</u>	<u>19,509</u>
Number of passengers at the new wharf (persons/year)	TTIV	0	45,000	33,056	22,110	22,346	44,754
	QS			30,842	15,877	26,948	0
	<u>Total</u>			<u>63,898</u>	<u>37,987</u>	<u>49,294</u>	<u>44,754</u>

Source: Ex-ante Project Evaluation Paper, data provided by PAT

Note 1: All target and actual values for indicators are for domestic routes.

Note 2: The data held by the executing agency were compiled on a fiscal year basis (July to June of the following year), so the actual data are for the fiscal year.

Note 3: The indicator at the time of planning was the number of berthing, but since only the number of berthing and unberthing was available as an actual value, the indicator was changed to the number of berthing and unberthing, and the target value was changed from “number of berthing: 45” to “number of berthing and unberthing: 90.”

Note 4: The official name of the new domestic wharf developed in this project is The Taufua'ahau Tupou IV Domestic Wharf, named after the former king.

Note 5: Abbreviation for Queen Salote International Wharf; the 1,500-ton vessel MV Otuanga'ofa used part of this wharf until mid-2021.

As for the status of each indicator at the time of ex-post evaluation, the number of 1,500-ton class vessels berthing and unberthing at the new wharf and the number of passengers at the new wharf reached the target values, while the volume of cargo handled at the new wharf fell far short of the target value.

The only 1,500-ton class vessel in Tonga's domestic shipping fleet is MV Otuanga'ofa, which was provided through grant aid in the past, and the new wharf (TTIV Wharf), which was developed through this project, has been in use practically since FY 2021/22. Since the vessel was using the Queen Salote Wharf (QS Wharf) until FY 2020/21, the effects of the new wharf were not realized until three years after the completion of the project<sup>5</sup>. The water depth inside the new wharf is four meters at low tide, which is considered sufficient for

<sup>5</sup> However, cargo handling and passenger use of the new wharf had already started by several domestic vessels of less than 1,500 tons other than MV Otuanga'ofa, and some of the effects of the new wharf had already been generated.

MV Otuanga’ofa with a draft of three meters. However, the Friendly Islands Shipping Agency (FISA), which operates the vessel, took the position that the water depth was not necessarily sufficient and that sufficient dredging by the dredger<sup>6</sup> purchased by PAT was essential for the new wharf to be put into service, given the safety concerns for navigation. The MOI, on the other hand, stated that since the project was carried out as planned and the water depth was sufficient, FISA should have started using the new wharf earlier. After various adjustments, a berthing test of MV Otuanga’ofa at the new wharf was conducted in 2021, which confirmed that the wharf could be used safely, and FISA subsequently moved from the QS Wharf. Although it was difficult to make a technical judgment in the ex-post evaluation on whether the water depth of the berthing area was sufficient, the evaluation of the project effects, including the amount of cargo handled and the number of passengers, concluded that the effects of the project were significantly delayed.

The volume of cargo and passengers handled domestically is expected to increase to 45,000 tons and 45,000 passengers at the new wharf once the project was completed, and the 1,500-ton class and smaller vessels that had been using a portion of the QS International Wharf were completely transferred to the domestic wharf. However, for the domestic wharf, there is also Fuaa Wharf in addition to the new wharf, and not all domestic passenger and cargo transport was moved to the new wharf<sup>7</sup>, as Fuaa Wharf continued to be used by smaller vessels<sup>8</sup>. Furthermore, with the global spread of COVID-19 from the beginning of 2020, severe travel restrictions and other measures were implemented even within Tonga, which had no infected cases at the time, resulting in a decrease in the number of voyages, limiting the number of passengers per voyage<sup>9</sup>, and the suspension of operations following the massive eruption in early 2022. They limited the use of the new wharf, and as a result, the volume of cargo handled, in particular, fell far short of the target. Although some of these factors are considered to have been caused by force majeure, as a whole, some aspects of the project did not necessarily produce the effects as originally envisioned.

### 3.3.1.2 Qualitative Effects

When this project was planned, it was assumed that the implementation of the project would have the following four qualitative effects: (1) shortening the time for large vessels to berth and unberth, (2) improving the efficiency of cargo handling at the new wharf by

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<sup>6</sup> The dredger was purchased in 2020 and more than two years had already passed since the project was completed.

<sup>7</sup> The difference between Table 1 and Table 3 shows the volume of cargo handled at Fuaa Wharf, which was 4,675 tons in FY 2021/22. In addition, as shown in Table 1, the domestic cargo volume for Tonga as a whole itself was less than 45,000 tons.

<sup>8</sup> The TTIV wharf was designed for relatively large vessels carrying domestic transport, and the wharf is too high for smaller vessels. Therefore, it was assumed that small vessels would continue to use Fuaa Wharf.

<sup>9</sup> Antigen tests were also conducted for domestic travels, especially in outer islands where the medical system is weak.

improving the yard and organizing cargo and passenger flow lines, (3) improving passenger comfort by improving the waiting room at the new wharf, and (4) ensuring passenger safety by installing a dedicated passenger walkway at the new wharf. The status of these effects confirmed at the time of ex-post evaluation was as follows.

(1) Reduction in berthing and unberthing time for large vessels

Although no record of the time required for berthing and unberthing was available, the new wharf provides ample turning space and quay walls of appropriate height, allowing for more efficient berthing and unberthing operations. As a result, it can be said that time savings have been realized.

(2) Improvement of cargo handling efficiency in the new wharf through yard development and rearrangement of cargo and passenger flow lines

It was confirmed that cargo and passenger flow lines were separated and that multiple vessels can work on cargo handling at the same time.

(3) Improvement of passenger comfort by upgrading the waiting area at the new wharf

Compared to the situation before the project was implemented, visitors can now wait for ferry departures in the waiting room with ample space, regardless of weather conditions.

(4) Ensuring passenger safety by installing a passenger walkway at the new wharf

Even under bad weather conditions, nothing affects both loading and unloading of cargoes, which improved both safety and comfort.

As described above, the qualitative effects envisioned at the time of planning have been fully realized in all areas.

### 3.3.2 Impacts

#### 3.3.2.1 Intended Impacts

The implementation of this project was expected to increase revenues from the terminal building at the new wharf and to have economic effects through employment promotion, etc., and to revitalize cargo and passenger transportation at Nuku'alofa Port as a whole.

In Tonga, the status of revenue increase and employment increase specific to the new wharf alone were not ascertained, and it was not possible to conduct a quantitative analysis in the ex-post evaluation. However, as indicated in the “Effectiveness” section, it is considered that sufficient economic benefits have not been generated through this project as the use of the new wharf was limited until FY 2020/21, and the project was also negatively affected by the COVID-19 and the massive volcanic eruption. Regarding

domestic cargo and passenger transportation, it was confirmed that the inefficient transportation situation before the project was implemented has been improved through the consolidation of the domestic cargo and passenger transportation bases in the entire Nuku'alofa Port to the new wharf and the adjacent Fuaa Wharf, but the volume of cargo and passenger transportation has not increased due to the effects of COVID-19 and the massive volcanic eruption.

Therefore, no particular economic effects or revitalization of cargo and passenger transport generated by the new wharf was confirmed at the time of ex-post evaluation, although it is expected that the anticipated impacts will become apparent in the future in domestic transport as cargo and passenger demand will increase due to the significant relaxation of entry restrictions in Tonga from August 2022.

### 3.3.2.2 Other Positive and Negative Impacts

#### 1) Impacts on the Natural Environment

At the time of planning, the project was not large-scale, and its undesirable effects on the environment were judged to be not significant in the “JICA Guidelines for Environmental and Social Considerations” (April 2010), and the project was not going to be implemented in the area with sensitive characteristics and sensitive areas as listed in the Guidelines. The project was classified as Category B.

An Environmental Impact Assessment (EIA) was conducted before the project implementation and approved by the Ministry of the Environment in March 2015, prior to the commencement of the project. No special conditions were imposed, and as normal pollution countermeasures, it was planned that the contractor would perform regular vehicle inspections and maintenance and watering for air quality, install anti-pollution diffusion membranes for water quality, use low-noise equipment for noise and vibration, and implement regular inspections and maintenance of construction equipment and vehicles. In addition, MOI and PAT would work together to conduct regular turbidity and coral monitoring.

The ex-post evaluation confirmed that all of these items planned at the time of planning had been implemented. As for the compliance with the EIA during project implementation, according to the Department of Environment, regular checks were conducted by the officer in charge<sup>10</sup> and adequate measures were taken. In addition, even after the project was put into service, sewage was treated in septic tanks and subsequently collected and disposed of by the Waste Authority Limited. The conditions of corals were monitored through a

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<sup>10</sup> Since no standards have been set in Tonga, the inspections were conducted in accordance with the standards set by Australia/New Zealand for air quality, noise and vibration, and the World Health Organization (WHO) for water quality, according to the inspectors.



diving survey once during the project as well as after the project was completed, and no particular problems were identified. It was also confirmed that no complaints had been received from residents regarding the natural environment.

Based on the above, it is considered that measures to mitigate impacts on the natural environment were implemented as planned in this project, and that adequate measures were taken as a whole. No particular negative impacts on the natural environment have occurred after the completion of the project, and there are no particular concerns.

## 2) Resettlement and Land Acquisition

Since this project was located in the port area owned and managed by the Tongan government, no land acquisition or resettlement was required. At the time of planning, there was a group producing materials for a traditional costume called Ta'ovala at the project site, and as a result of public hearings and adjustments, the group was going to move its base of operations to the west of the capital Nuku'alofa. The ex-post evaluation confirmed that the group moved its base to the west of Nuku'alofa and continued its activities as originally planned.

## 3) Gender Equality, Marginalized People, Social Systems and Norms, Human Well-being and Human Rights

The facilities developed in this project are designed and constructed to fairly benefit all people who travel domestically by ship, regardless of gender or age, and to enable those with mobility difficulties to move between the first and second floors by installing a ramp in the terminal building. In this regard, it can be said that there are no gender-related issues and no one is prevented from equitable social participation.

Although there was nothing of note in terms of social systems, norms, human well-being, or human rights, the waiting area in the terminal building is wide and has a high ceiling, so it was used for various parties, receptions, and other occasions besides its original purpose, where people could have a good time.



Waiting area used for reception  
(Photo by External Evaluator)

## 4) Other Positive and Negative Impacts

As previously mentioned, Tonga experienced a massive eruption in January 2022, which caused very extensive damages, including the temporary disruption of communications.

The new wharf was also partially damaged by the ash fall caused by the eruption, as well as by the tsunami that swept through the area. However, the damage was minimal, and it subsequently played a central role in transporting relief supplies to the heavily damaged outer islands (especially the Ha'apai Islands) and in the evacuation of people in the outer islands to Tongatapu Island. In this respect, the new wharf was resilient to disasters and played a major role in the transportation of goods and passengers in the reconstruction after the massive volcanic eruption.

The effectiveness of the project was confirmed by the fact that the qualitative effects were fully realized, but there was a significant delay in the realization of the quantitative effects, and that the volume of cargo handled was well below the target level, even taking into account the influence of COVID-19 and the massive volcanic eruption.

Regarding the impacts, the economic effects and the revitalization of cargo and passenger transport were not fully observed. Although there were factors such as the restrictions on travel due to concerns over the outbreak and spread of COVID-19 and restrictions on operations due to the occurrence of the huge volcanic eruption, the wharf was not utilized at the expected level at the time of the ex-post evaluation due to delays in the relocation of MV Otuanga'ofa. There were no negative impacts for each of the other positive and negative impact items, and the impacts were being generated as expected.

Based on the above, it is concluded that the effectiveness and impact of the project are moderately low.

### 3.4 Sustainability (Rating: ③)

#### 3.4.1 Policy and System

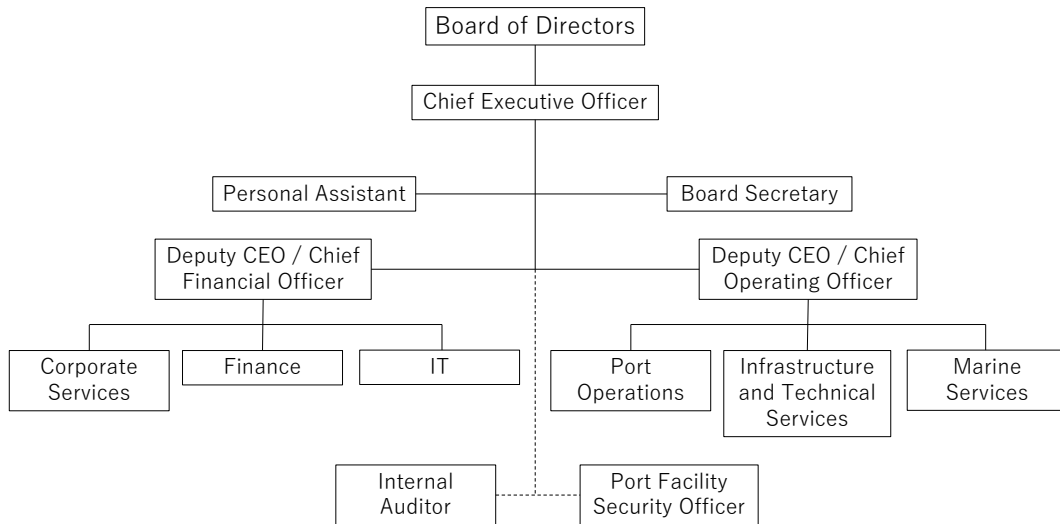
As verified in the “Relevance” section, the *Tonga Strategic Development Framework (2015-2025)* and the *National Infrastructure Investment Plan (2013-2023)* remain valid planning documents at the time of the ex-post evaluation and are highly consistent with the project. In addition, other MOI and PAT management plans remain valid. In terms of port administration, operation and maintenance, there is no change in the system whereby the MOI is responsible for the administration of shipping infrastructure, while the daily operation and maintenance of Nuku'alofa Port is managed by the PAT.

Based on the above, it can be said that the policy and systems sustainability of this project is high.

#### 3.4.2 Institutional/Organizational Aspect

Although the MOI was the executing agency for the project, PAT is responsible for the operation and maintenance of the developed facilities. PAT was established under the Ports

Authority Act of 1998 as a commercial company style entity; as of June 2022, it has 144 full-time employees and two temporary employees<sup>11</sup>.



Source: Prepared from PAT 3-Year Business Plan

Figure 1: PAT Organization Chart

Nuku'alofa's ports are managed in an integrated manner by PAT, with no distinction made between international and domestic ports. As shown in Figure 1, the operation and maintenance of the port is mainly carried out by a total of 75 personnel in three divisions: port operations, infrastructure and technical services, and marine services. The number of employees required for smooth operation and maintenance of the port is generally sufficient. As for the electromechanical maintenance, PAT has not been able to secure staff with sufficient knowledge and skills within the organization to adequately diagnose the situations, but the actual maintenance work is outsourced to Tonga Power Limited, Tonga Communications Corporation, and private companies as needed, and the necessary measures are being taken.

Based on the above, it can be said that PAT is responsible for the operation and maintenance of the domestic wharf developed under this project, and that it operates under the adequate organizational structure and number of staff. However, it is necessary to fill the vacant posts with appropriate personnel in due course.

### 3.4.3 Technical Aspect

No major breakdowns or malfunctions have occurred in the facilities developed by the project, and no technical problems were found in conducting routine inspections and repairs.

<sup>11</sup> There were additional 24 posts which were vacant at the time of ex-post evaluation.

The technical capabilities of the divisions in charge of operation and maintenance are considered sufficient. It was also confirmed that PAT provides training for its staff at its own expense by inviting outside lecturers every year in the fields of mechanical engineering, information and communication, plumbing, and electricity.

Therefore, the sustainability of the outcomes in terms of the technical aspect is judged to be high.

#### 3.4.4 Financial Aspect

PAT's income and expenditure for FY 2016/17 through FY 2020/21 were as shown in Table 4.

Table 4: PAT Operating Income and Expenditure

(Unit: thousand pa'anga)

Fiscal year	2016/17	2017/18	2018/19	2019/20	2020/21
Income	13,390	12,273	13,425	12,099	12,135
International cargo	11,093	10,278	10,995	9,462	10,005
Domestic vessel	385	371	306	366	317
Other	1,912	1,624	2,124	2,181	1,813
Expenditure	8,560	7,997	9,015	9,195	9,054
Depreciation and amortization	1,972	2,071	2,044	2,301	2,583
Administrative expenses	3,661	3,051	2,974	2,922	3,005
<i>Of which, repair and maintenance</i>	<i>411</i>	<i>262</i>	<i>719</i>	<i>371</i>	<i>596</i>
Personnel expenses	2,927	2,875	3,997	3,972	3,467
Operating balance	4,830	4,277	4,409	2,905	3,081
Financial expenses and taxes	1,278	1,088	1,098	850	891
Net profit	3,552	3,189	3,311	2,055	2,190

Source: PAT annual reports for each fiscal year (July to June of the following year)

PAT posted a positive financial result in FY 2020/21 (July 2020-June 2021), and has consistently been in a good financial position since FY 2016/17. The percentage of revenues from vessels on domestic routes is very small, with the majority coming from berthing fees and wharfage fees from international cargo vessels. The negative impact of COVID-19 was not significant, and the impact of the massive volcanic eruption was limited, therefore PAT is expected to continue to be profitable in FY 2021/22 and beyond.

The maintenance budget is shown in italics in Table 4. The fact that maintenance has been properly carried out, as described below, shows that the necessary amount of money has been invested, and there are no budgetary obstacles. No major repairs or replacements have been made to the facilities and equipment developed by the project, and no major repair costs have

been incurred. It is expected that relatively large-scale maintenance work will be required periodically in the future, and PAT will be able to provide the necessary budget for such work.

Based on the above, the financial sustainability of the project's outcomes is high.

#### 3.4.5 Environmental and Social Aspect

In “3.3.2.2 Other Positive and Negative Impacts,” it was mentioned that coral growth monitoring was conducted once after the project was completed. However, periodic environmental monitoring is not planned or implemented.

#### 3.4.6 Preventative Measures to Risks

As mentioned above, different agencies had different views on the depth of the basin, which also affected the effectiveness of this project, but since mid-2021, MV Otuanga'ofa has continued to use the wharf without any problems. PAT has a plan to measure the depth of the domestic wharf every three years and dredge as necessary, and similar risks are expected to be avoided in the future.

The damage to the wharf caused by the massive eruption in January 2022 was limited, but the tsunami caused some minor damages to the wharf as a result of the collision of anchored vessels with the wharf. Although there is no immediate operational impact, it is important to repair the damage as soon as possible.

#### 3.4.7 Status of Operation and Maintenance

All of the facilities developed under the project, including breakwaters, dredged basin, wharf, ancillary facilities to the wharf, yard aprons, ramps, and navigation aids, were in good condition and use, except that some of the wharf was damaged by the massive eruption and the terminal building walls were partially stained. It was also confirmed that PAT installed additional navigation signs after the completion of the project to further enhance safety, given that the entrance of the new wharf has a coral shoal that is difficult to navigate.

Regarding the use of the new wharf, dredging was conducted once in 2020, and the full use by MV Otuanga'ofa began in mid-2021. It was also confirmed that all other vessels were using the new wharf. Although the usability of the wharf is generally good, some of the shipping companies expressed that there are problems in securing water and electricity, and they would like to see underground burial work so that they can be used by their vessels at the wharf.

Although the facilities developed under the project did not require advanced repair techniques, maintenance was carried out in the form of quarterly inspections based on the Assessment Forms, and repairs were made as necessary. However, repairs were not always carried out in a timely manner, and there were delays in taking measures to prevent corrosion

of the structural frame due to salt damage, especially in the terminal building located along the sea.

In this project, the stone materials for the installed breakwaters were to be those that can be secured in Tonga, and the yard lighting was also to be LED lights to reduce maintenance costs, and these were performing as expected. According to PAT, there were no problems in procuring parts and materials necessary for repairs. In the future, PAT as a whole plans to formulate an asset management plan that compiles the assets of the entire international and domestic wharves, and to develop a maintenance plan.

From the above, it can be said that all of the facilities and equipment developed in this project are in good operating condition, and as a whole, the operation and maintenance status is good.

Although there was no system to regularly monitor corals, water quality in the environmental aspect, it was confirmed that the sustainability of the project was high in terms of policy and system aspect, organization and institution aspect, technical aspect, financial aspect, risk response aspect, and operation and maintenance status. Therefore, as a whole, the sustainability of the project effects generated through this project is judged to be high.

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

### **4.1 Conclusion**

This project aimed to improve the efficiency of international and domestic cargo handling operations and ensure the safety of passengers by constructing a new wharf for large domestic transport vessels at the port of Nuku'alofa, Tonga's capital. While there was no specific coordination or synergy expected between this project and other JICA projects or support from other organizations during the planning and implementation period of this project and the effects of inter-project linkages were not observed, the project was consistent with Tonga's development plan and needs at the time of planning and ex-post evaluation, and was also found to be consistent with Japan's ODA policy at the time of planning. Based on the above, its relevance and coherence are high. Regarding the project implementation, the outputs were mostly as planned, and although the project period slightly exceeded in real terms, the project cost was within the plan. Therefore, the efficiency of the project is judged to be high. Regarding the effectiveness of the project, while qualitative effects such as shortening of unberthing/berthing operations, improvement of cargo handling efficiency, improvement of passenger comfort, and assurance of safety were fully realized, the overall generation of quantitative effects was significantly delayed due to the substantial delay in the commencement of use of the new wharf by a large domestic transport vessel. In addition, one of the indicators, "volume of cargo handled," was substantially lower than

the target, and economic effects and revitalization of cargo and passenger transport were not fully observed. Therefore, although there were some force majeure events associated with the global spread of the new coronavirus from the beginning of 2020 and the huge volcanic eruption in January 2022, the overall effectiveness and impact of the project as a whole were moderately low, as some aspects were not necessarily achieved as originally envisioned. Regarding the sustainability of the effects of the project, although the environmental monitoring system needs to be improved, no issues were found in terms of policy and system, organization and institution, finance, risk response, and operation and maintenance, and thus the sustainability of the effects of the project is considered to be high.

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

## 4.2 Recommendations

### 4.2.1 Recommendations to the Executing Agency

Although the effects of the project were delayed by the fact that MV Otuanga'ofa did not begin to use for three years after the completion of the project, it was generally being effectively utilized at the time of ex-post evaluation. However, if further improvements are made in the following areas, it is expected that more stable operation of the facility and improved effectiveness will be observed.

#### <Human Resource Aspect>

By securing personnel in the electromechanical field within PAT, it will be possible to diagnose the operational status of equipment, etc., and to consider the best method of outsourcing inspections and repairs. In addition, since 14% of the established posts are vacant, it is necessary to make efforts to secure appropriate human resources.

#### <Environmental Aspect>

Since environmental monitoring after the completion of the project was limited, it is desirable that the monitoring plan be developed by the Department of Environment and PAT, and appropriate monitoring be conducted on a regular basis and necessary actions be taken according to the monitoring results.

#### <Operation and Maintenance Aspect>

The development of the asset management plan and the steady development and implementation of asset records and their maintenance plans are important for the long-term and proper management of the facilities and equipment. In particular, it is desirable to implement without delay anti-corrosion measures for the terminal building that is vulnerable to salt damage. In addition, since shipping companies using the wharf have expressed inconvenience in using electricity and water supply, it is important for MOI and PAT to consider measures to improve the quality of service to enhance convenience.

#### 4.2.2 Recommendations to JICA

Because of the development of highly resilient facilities under the project, the facilities were not severely damaged during the massive eruption in January 2022, but some of the quay walls were damaged when anchored vessels were lifted up by the tsunami. Since the damage was caused by force majeure and not by deterioration due to PAT maintenance, it is desirable to confirm and discuss with PAT about the repairs to these damages from the viewpoint of long-term facility management.

#### 4.3 Lessons Learned

##### Importance of consensus building through full consultation with all relevant agencies

In this project, the large vessel MV Otuanga'ofa did not enter the port for domestic transportation for three years after the completion of the project due to the difference in views of the related agencies on the water depth of the basin, which delayed the sufficient realization of the outcomes of using the constructed wharf. Although the project consultants worked closely with MOI, the executing agency, and PAT, the operation and maintenance agency, the project as a whole did not always reach a sufficient consensus on the use of the terminal building and water depth with FISA, the agency in charge of the vessel's operation, which was a particularly important aspect of the project. Although there were no problems from a technical standpoint, the fact that FISA's concerns were not fully dispelled led to the delay in the realization of the project outcomes. Therefore, when planning a similar project, it is important to obtain agreement on the details of the project through in-depth discussions with all the relevant organizations that play a particularly central role in the project, and to ensure that the executing agency continuously follows up on the project during its implementation to avoid any delays in the transfer of vessels from the existing wharf. It is important for the effective utilization of the facilities immediately after the completion of the project.

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

### 5.1 Performance

#### 5.1.1 Objective Perspective

This project was designed to create an environment for the smooth and safe use of the large domestic cargo vessel provided by Japan in the past and to separate international and domestic cargo handling operations. JICA provided appropriate project supervision from planning to completion for the development of the domestic maritime transportation hub. The project consultant and contractor also held regular progress report meetings with the executing agency and responded to the need for various changes. In particular, when the major cyclone hit the area towards the end of the project period, necessitating repair work and additional countermeasure



work, those related to JICA maintained appropriate contact with the executing agency and promoted the project.

## 5.2 Additionality

None.

(End)

Republic of Indonesia

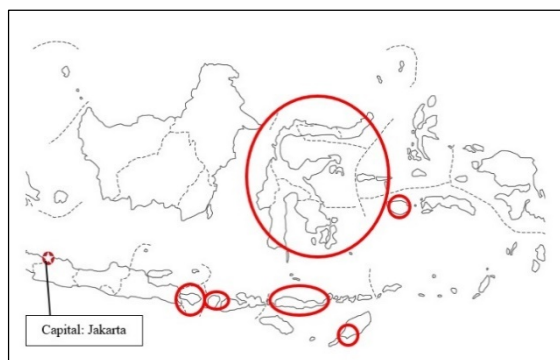
FY2021 Ex-Post Evaluation Report of  
Japanese ODA Loan Project  
“Decentralized Irrigation System Improvement Project (II)”  
External Evaluator: Kenichi Inazawa, Octavia Japan, Co., Ltd.

## 0. Summary

This project aimed to increase food production, such as rice, in the nine eastern provinces of Indonesia, by renovating, extending and newly constructing irrigation facilities and by assisting the development of operation and maintenance systems, thereby improving food security and the incomes of farmers in the target region. This project has “consistency with the development plan” and “consistency with the development needs.” As for coherence, “consistency with Japan’s ODA Policy” can be confirmed. On the other hand, no concrete cooperation was expected in relation to “internal coherence” at the time of the appraisal and “external coherence” has not been confirmed as there is no cooperation, due to the fact that the target areas of this project are different from those of other donors. Therefore, its relevance and coherence are high. Regarding efficiency, the outputs were mostly as planned, and the project cost was within the plan. However, the project period significantly exceeded the initial plan, due to land acquisition procedures and heavy rains and floods that delayed the construction process. Therefore, efficiency of the project is moderately low. Regarding effectiveness and quantitative effect indicators, the “area benefiting from the project” and “rice production” exceeded the targets, while “cropping intensity,” “rice yield” and the “rate of Water Users’ Association (hereinafter referred to as “WUA”) presence” almost reached the targets or exceeded the targets. It was confirmed during the interviews that this project has resulted in an increase in rice production and frequency of planting, and depending on the subproject, farm incomes have increased and labor (agricultural work) has been reduced, owing to the supply of more efficient irrigation water. Similarly, regarding impacts, it was observed that the living environment of farmers has improved. As the food security index of each province is high, in which the subprojects targeted by this project are located, it can be inferred that this project has contributed to the stable supply of rice and to the improvement of self-sufficiency. Therefore, effectiveness and impacts of the project are high. Regarding sustainability, while no major concerns have been observed, it has been noted that certain issues exist in the institutional/organizational (mainly personnel system), technical and financial aspects of operation and maintenance. Therefore, the sustainability of the project is moderately low.

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

## 1. Project Description



Project Locations  
(Project Areas are inside the Red Circles)



Developed Dam  
(Tommo Subproject)

### 1.1 Background

Before this project began, President Yudhoyono (the first administration) showed a plan to increase domestic food-sufficiency through increased domestic rice production; he announced a goal to increase the rice production target from 55 million tons (based on rice husk rice) to 61 million tons (same as above) by 2008. However, achieving the target was expected to be difficult, as there was already a limit on land use in Java Island, the main rice producing area at that time. On the other hand, the development potential of the eastern region of Indonesia was high, with a focus on agriculture and fisheries. However, employment opportunities were limited except for primary-related industries and economic development was delayed. The proportion of the population below the poverty line in the region was 18.8%, which was higher than the national average of 16.6%.<sup>1</sup> Therefore, in this region, it was important to invest in and develop the agricultural sector, which has a large working population. In particular, promoting improvements in agricultural productivity and farmers' incomes by expanding irrigation facilities was required urgently, so as to reduce regional disparities and poverty.

### 1.2 Project Outline

The objective of this project is to increase food production such as rice in the nine eastern provinces of Indonesia, by renovating, extending and newly constructing irrigation facilities, and by assisting the development of operation and maintenance systems, thereby improving food security and incomes of farmers in the target region.

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<sup>1</sup> The source is JICA data (2004 data). The Indonesian Central Statistics Bureau (BPS) set the poverty line standard (the standard during the first half of the 2000s) as the minimum spending level necessary to obtain food equivalent to 2,100 kcal per person per day and 25-27 non-food items, e.g., from the clothing, housing, education, health and transportation sectors.

Loan Approved Amount/ Disbursed Amount	8,967 million yen / 8,591 million yen
Exchange of Notes Date/ Loan Agreement Signing Date	March 28, 2008 / March 28, 2008
Terms and Conditions	Interest Rate                   1.40% (Civil Engineering Work) 0.01% (Consulting Services) Repayment Period               30 years (Grace Period                   10 years) Conditions for Procurement       General Untied
Borrower/ Executing Agency	Republic of Indonesia/ Director General of Water Resources (hereinafter referred to as “DGWR”), Ministry of Public Works and Housing
Project Completion	June 2016
Target Area	Nine provinces in eastern Indonesia (West Sulawesi, Southeast Sulawesi, North Sulawesi, South Sulawesi, East Nusa Tenggara, West Nusa Tenggara, Bali, Gorontalo, Maluku Provinces)
Main Contractor (s) (Over 1 billion yen)	No contractor over one billion yen
Main Consultant (s) (Over 100 million yen)	Euroconsult Mott Macdonald (Netherlands)/PT. Amurwa International (Indonesia)/ PT. Puser Bumi (Indonesia) (JV), PT. Tritunggal P. Konsultant (Indonesia)
Related Studies (Feasibility Studies, etc.)	“Implementation Plan (I/P),” DGWR (2007)
Related Projects	[ODA Loan Projects] - “Small Scale Irrigation Management Project (1)” (L/A signed in 1989) - “Small Scale Irrigation Management Project (2)” (L/A signed in 1994) - “Small Scale Irrigation Management Project (3)” (L/A signed in 1997) - “Small Scale Irrigation Management Project (4)” (L/A signed in 2002)  [Technical Cooperation Projects] - “The Project on Formulation of Irrigation Development and Management Strategy for Food Security” (2018–2022)  [Other International Organizations, Aid Agencies, etc.] - “Water Resources and Irrigation Sector Management Program” (World Bank, implementation period is unknown) - “Participatory Irrigation Sector Project” (Asian Development Bank, implementation period is unknown)

## **2. Outline of the Evaluation Study**

### 2.1 External Evaluator

Kenichi Inazawa, Octavia Japan, Co., Ltd.

### 2.2 Duration of Evaluation Study

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

Duration of the Study: September, 2021–November, 2022

Duration of the Field Study: No oversea travel. Surveys were conducted remotely utilizing a local survey assistant.

### 2.3 Constraints during the Evaluation Study

(Conducting Surveys Remotely Utilizing a Local Survey Assistant)

In this survey, due to COVID-19, the external evaluator did not travel to Indonesia. Utilizing the local survey assistant, the external evaluator remotely conducted the project site inspections, information/data collection and interviews of individuals related to the project. The information was examined by the external evaluator, based on which evaluation analysis and judgement were made.

(Evaluation Based on the Actual Situations Across the Visited Sites)

This project targeted many sites; there are 15 irrigation subprojects in total. Due to time constraints, all sites could not be visited during this survey. The following six sites (seven irrigation subprojects) were visited: (1) the Bena subproject and (2) the Mbay Kiri subproject in East Nusa Tenggara Province, (3) the Lamasi subproject and (4) the Saddang subproject (Phase 3 and 4) in South Sulawesi Province, (5) the Tommo subproject in West Sulawesi and (6) the Way Apu subproject in Maluku Province. Across these sites, information and data were collected, and interviews were conducted regarding the status of the outputs, project effect, impacts, operation and maintenance. Regarding the actual values based on the effectiveness and quantitative effect indicators, in addition to the six visited sites, information and data from additional six sites (six irrigation subprojects) were analyzed (although these sites were not visited, they answered the questionnaire). However, analyses on the effectiveness and qualitative effects, impacts and sustainability were conducted based on the situations across the six visited sites.<sup>2</sup>

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<sup>2</sup> Information and data were obtained from the following six sites (six irrigation subprojects): the Empus-Sungi (Bali Province), Bajo (South Sulawesi), Wawatobi (Southeast Sulawesi), Traut (North Sulawesi), Sangkub Kiri (North Sulawesi) and Paguyaman (Gorontalo) irrigation subprojects. Of the total 15 sites, answers to the questionnaire were not received from the Pengga Gebong and Jurang Sate irrigation subprojects (both are located in West Nusa Tenggara).

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

#### 3.1 Relevance/Coherence (Rating: ③<sup>4</sup>)

##### 3.1.1 Relevance (Rating: ③)

###### 3.1.1.1 Consistency with the Development Plan of Indonesia

Before this project began, the government of Indonesia formulated the *National Medium-Term Development Plan (RPJM)* (2004–2009), forecasting an annual growth rate of 3.5% for the agricultural sector by 2009, and listing the improvement of farm incomes and welfare as the main priority goals. In addition, to achieve domestic economic growth and food self-sufficiency, agricultural revitalization was advocated, while establishing improvements in food self-sufficiency, productivity, competitiveness and the added value, etc., of agricultural products. was regarded as basic policy.

At the time of the ex-post evaluation, the government of Indonesia developed the *National Medium-Term Development Plan (RPJMN)* (2020–2024), in which improvements in agricultural productivity, access to agriculture and the quality of agricultural products were highlighted as priorities. In addition, the *Long-Term National Development Plan (RPJPN)* (2005–2025), formulated by the government in 2005, was still ongoing at the time of the ex-post evaluation. In this plan, the improvement of citizens' nutrition and food security was set as a national development goal. Furthermore, the government announced the *2020-2024 Agricultural Strategic Policy* in 2019, aiming at improving agricultural productivity nationwide. Additionally, President Joko Widodo announced the expansion of the *Food Estate Program* in September 2020, which was intended to secure the domestic food supply and break the dependence on food imports; the areas expected to become agriculture centers, namely, the East Nusa Tenggara and Papua provinces in the eastern region of Indonesia were highlighted. In this region, the existing Paselloreng Dam, Ladongi Dam, Bintang Bano Dam and the Rotiklot Dam, etc., are being renovated for use as irrigation water sources, so as to increase the amount of water. It is expected that agricultural productivity, food production and farmers' incomes will increase in the surrounding areas.

Based on the above, improvements in agricultural productivity, food security and food self-sufficiency were regarded highly in terms of importance before this project began and also at the time of the ex-post evaluation. Therefore, there is consistency with the policies and measures.

###### 3.1.2.1 Consistency with the Development Needs of Indonesia

Before this project began, the economic development of the eastern region of Indonesia was delayed compared to the other regions of the country. Employment opportunities were limited

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<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

except for those in the primary industries, such as agriculture and fisheries. The percentage of the population below the poverty line in the region was 18.8%, higher than the national average of 16.6%. It was, therefore, important to invest in and develop the agricultural sector with such a large working population in this region. In particular, promoting improvements in agricultural productivity and farmers' incomes by expanding irrigation facilities was regarded as an urgent task, so as to reduce regional disparities and poverty.

At the time of the ex-post evaluation, in relation to the *National Medium-Term Development Plan (RPJMN)* (2020–2024) and the *2020-2024 Agricultural Strategic Policy* mentioned in 3.1.1.1, the DGWR anticipates a food crisis after 2022. For this reason, it is recognized that efforts to improve food self-sufficiency with a focus on rice, through the development of the agricultural sector, will become even more important. Progress on investments in the agricultural sector is expected, not only in the eastern region of Indonesia but nationwide.

Based on the above, efforts to invest in and develop the agricultural sector were observed before the start of this project, as well as at the time of the ex-post evaluation, such as improvements in agricultural productivity, food self-sufficiency and farm incomes across the entire country, including the eastern region of Indonesia. Therefore, this project is consistent with the development needs.

### 3.1.2 Coherence (Rating: ②)

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

Before the start of this project, Japan developed the *Country Assistance Program for Indonesia* (November 2004). This document listed the “creation of a democratic and fair society” as one of the priority areas, promoting to support the development and management of infrastructures related to the “development of agricultural and fishing communities.” In addition, the *Medium-Term Strategy for Overseas Economic Cooperation Operations* (April 2005), developed by JICA (formerly JBIC), listed “poverty reduction,” “foundation for sustained growth” and “human resources development,” etc., as priority areas.

This project supported the improvements in agricultural productivity and farm incomes by expanding irrigation facilities in the eastern region of Indonesia, where economic development was delayed. This is in line with Japan's response to the agricultural sector, specified in the *Country Assistance Program for Indonesia* and to the development of foundation for sustained growth specified in the *Medium-Term Strategy for Overseas Economic Cooperation Operations*. Therefore, this is consistent with Japan's ODA policy.

#### 3.1.2.2 Internal Coherence

JICA implemented ODA loan projects, such as the “Small Scale Irrigation Management Project

(1)-(4)” before this project began. This project is the fifth phase (succeeding project) and entails the development and renovation of irrigation facilities in the eastern region. While this project aimed to improve agricultural productivity through the development and renovation of irrigation facilities in the same region, the Saddang subproject in South Sulawesi Province, which was covered by the fourth phase project, continued to be the subject of this project (the fifth phase) as regards renovation works. This irrigation subproject targeted many irrigation canals that required renovation, and it is a major production area with vast agricultural land. Considering the high potential for increased rice production, this project was implemented in this area as a particular need was recognized. This is a case where an expectation for increased production was highlighted, in addition to the fact that there were significant needs within the same subproject. Although one can argue that there was “project continuity as expected,” no specific cooperation was anticipated at the time of the appraisal, and therefore, it cannot be concluded that there was internal coherence.

#### 3.1.2.3 External Coherence

Before this project began, the World Bank through its “Water Resources and Irrigation Sector Management Program” (WISMP) supported the improvements in terms of capacity to maintain water resources in river basins and irrigation facilities, as well as the improvement of productivity with irrigated agriculture. In addition, the Asian Development Bank through its “Irrigation Sector Project” supported irrigation management plans, capacity development for WUAs and the improved operation of irrigation facilities and irrigated agriculture, etc., with the aim of realizing sustainable irrigation systems and reducing poverty. These interventions complement this project and can be referred to as a “mutual complementary relationship” from the viewpoint of supporting the agriculture and irrigation sector in Indonesia. However, the target areas of these interventions were different from this project, therefore, it cannot be said that there was “cooperation among the projects.”

In relation to international frameworks, this project contributes to food security and increasing farm incomes through increased food production. From this viewpoint, it is considered to be consistent with the second Sustainable Development Goal (SDG), “End hunger, achieve food security and improved nutrition and promote sustainable agriculture.”



<Summary of Relevance/Coherence>

This project has “consistent with the development plan” and “consistent with the development needs.” This project has “consistent with the development plan” and “consistent with the development needs.” Regarding "internal consistency," although there was continuity in the project as planned, no specific cooperation was planned at the time of project appraisal. Regarding “external consistency,” although the project had a mutual complementary relationship with other interventions from the viewpoint of supporting the agriculture and irrigation sector in Indonesia, no cooperation was confirmed, as the other donors’ projects covered different areas from this project. However, "consistency with Japan's development cooperation policy" was confirmed. Therefore, its relevance and coherence are high.

3.2 Efficiency (Rating: ②)

3.2.1 Project Outputs

Table 1 shows the plan and actual outputs of this project at the time of appraisal and ex-post evaluation. The project has 15 sites (subprojects): new construction (one location), renovation (eight locations), extension (three locations) and renovation and extension (three locations) of the irrigation facilities across nine provinces of the eastern region. Table 1 shows the plan and actual outputs at the time of the ex-post evaluation. (The underlined sections highlight the main differences from the time of planning). In addition, Table 2 shows a list of subprojects, output types and areas which have benefited from the project.

Table 1: Plan and Actual Outputs of This Project

Plan (at the time of the appraisal: 2008)	Actual (at the time of the ex-post evaluation: 2021–2022)
1) Civil Engineering Work, etc. Renovation, extension, new construction of irrigation facilities (weirs, headworks, primary canals, secondary canals, tertiary canals, etc.) → 14 sites: the total area benefiting from the project is 81,600 ha	1) Civil Engineering Work, etc. Renovation, extension, new construction of irrigation facilities (weirs, headworks, primary canals, secondary canals, tertiary canals, etc.) → <u>Implemented almost as planned (15 sites, the total area benefiting from the project is 94,933 ha. (Breakdown: new construction 2,500 ha, renovation 80,390 ha, extension 12,043 ha, total 94,933 ha))</u>
2) Consulting Services Tendering assistance, construction supervision, support for strengthening irrigation facility operation and maintenance capacity (strengthening government-affiliated organizations and WUAs, water management (including farming support),	2) Consulting Services → <u>Implemented almost as planned (however the service period was extended)</u>

asset management, etc.), project evaluation and monitoring, project implementation assistance, etc.	
3) Strengthening of WUAs, Water Management and Asset Management The executing agency and local government lead the strengthening of irrigation facility maintenance and irrigation water management. The ODA loan consultants assist and supervise	3) Strengthening of WUAs, Water Management and Asset Management → <u>Implemented almost as planned</u>

Source: JICA documents (appraisal), Project Completion Report, answers to the questionnaire, and interviews (at the time of the ex-post evaluation)

Table 2: List of Project Areas, Output Types, Area Benefiting from the Project (Actual)

(unit: ha)

	Subproject	Type of Development	Area Benefiting from the Project	Type of Development Achieved		
				Renovation	Extension	New Irrigation
1	Empas Sungi	Renovation	4,462	4,462	-	-
2	Pengga Gebong	Renovation	4,790	4,790	-	-
3	Jurang Sate	Renovation	6,100	6,100	-	-
4	Bena	Extension	2,800	-	2,800	-
5	Mbay Kiri	Extension	388	-	388	-
6	Saddang Phase 3	Renovation	24,479	24,479	-	-
7	Saddang Phase 4	Renovation	18,342	18,342	-	-
8	Lamasi	Renovation/Extension	7,150	3,332	3,818	-
9	Bajo	Renovation/Extension	5,828	3,194	2,634	-
10	Wawotobi Phase II	Renovation	4,309	4,309	-	-
11	Tommo	New Construction	2,500	-	-	2,500
12	Toraut	Renovation	5,436	5,436	-	-
13	Sangkub Kiri	Extension	1,796	-	1,796	-
14	Paguyaman Phase II	Renovation	2,522	2,522	-	-
15	Way Apu	Renovation/Extension	4,031	3,424	607	-
Total:			94,933	80,390	12,043	2,500

Source: Project Completion Report

The differences between the plan and the actual achievements shown in Table 1 are explained below:

## 1) Civil Engineering Work

### a) Change and Increase/Decrease of the Subprojects

Although 14 sites were planned at the time of the appraisal, the actual number of sites was 15. This is because two of the subprojects requested by the Indonesian side were found to be difficult to develop; (1) in one subproject, developing irrigation facilities turned out to be difficult in terms of technical designs and (2) another subproject was located inside a nature conservation area. As a result, two other subprojects were selected as their alternatives.<sup>5</sup> In addition, the Sangkub Kiri subproject in North Sulawesi was newly selected for this project, as North Sulawesi was recognized by the parties involved in the project as a region with great potential for increasing food production.<sup>6</sup>

### b) Increase/Decrease of Area Benefiting from the Project

The Mbay Kiri and Lamasi subprojects are examples of subprojects that experienced a major increase or decrease in terms of the areas benefiting from the project. In the case of the Mbay Kiri subproject, land was allocated to a salt farm, which resulted in a reduction of the area benefiting from the project.<sup>7</sup> In addition, in certain areas (mainly downstream), construction was stopped as negotiations with the local community did not go well with regard to the acquisition of land for the construction of the main and secondary canals. Initially, 1,638 ha was planned to benefit from this project. However, due to land allocation to the salt farm and troubled land acquisition, the area expected to benefit from the project decreased to 388 ha. Regarding the Lamasi subproject, although the initial plan was that 3,332 ha would benefit from the project, as a result of the re-examination of the water use balance calculation at the headworks facility during the detailed design stage, the function of the irrigation facility was found to be higher, and it was expected that 7,150 ha would benefit from the project.

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<sup>5</sup> The subprojects selected at this stage are Wawotobi Phase II and Paguyaman Phase II, as shown in Table 2.

<sup>6</sup> In 2012, JICA approved the Indonesian side's request to change the subproject.

<sup>7</sup> The allocation of salt farm land is shown below: (a) In 2009, a briefing session was held at the Mbay Kiri subproject, which was attended by the local government (Nagekeo Regency), the DGWR, local community leaders, residents—a total of 170 people—all of whom agreed to the extension of the irrigation facility. (b) In 2010, the DGWR sent a letter to the local government (Nagekeo Regency) to request smooth progress regarding the land acquisition procedure for the irrigation facility extension. Within the same year, a meeting of those involved in the project was held, as well as a briefing session for the local residents. The local residents' demands for land acquisition were met, and a ceremony was held prior to starting construction. (c) An Australian salt manufacturing company and a local government organization (Nagekeo Regency) cooperated on a salt farm improvement project (development of 2,100 ha) around the irrigation facility extension area, in accordance with the Indonesian Ministry of Industry's plan to increase domestic salt production. The salt manufacturing company and the local government had signed an MoU in 2010. In April 2011, a meeting of the concerned parties (executives from multiple regencies, the salt manufacturing company, the Ministry of Industry, BBWS, East Nusa Tenggara provincial government, etc.) was held, and at the discretion of the Nagekeo Regency, an agreement was reached with the salt manufacturing company to prepare approximately 1,000 ha of land for the development of a salt mill. Based on this, the DGWR issued a document (letter) to the governor of the regency, stating that 864 ha of the estimated beneficiary area in the Mbay Kiri subproject could be utilized for the salt farm project. Points (a)–(c) were agreed upon as it was deemed to be more profitable for farmers to use the land for the salt-production project than to use it for agriculture. (The landowners agreed, and it is possible that the DGWR had to forgo some of the irrigation projects at that time).

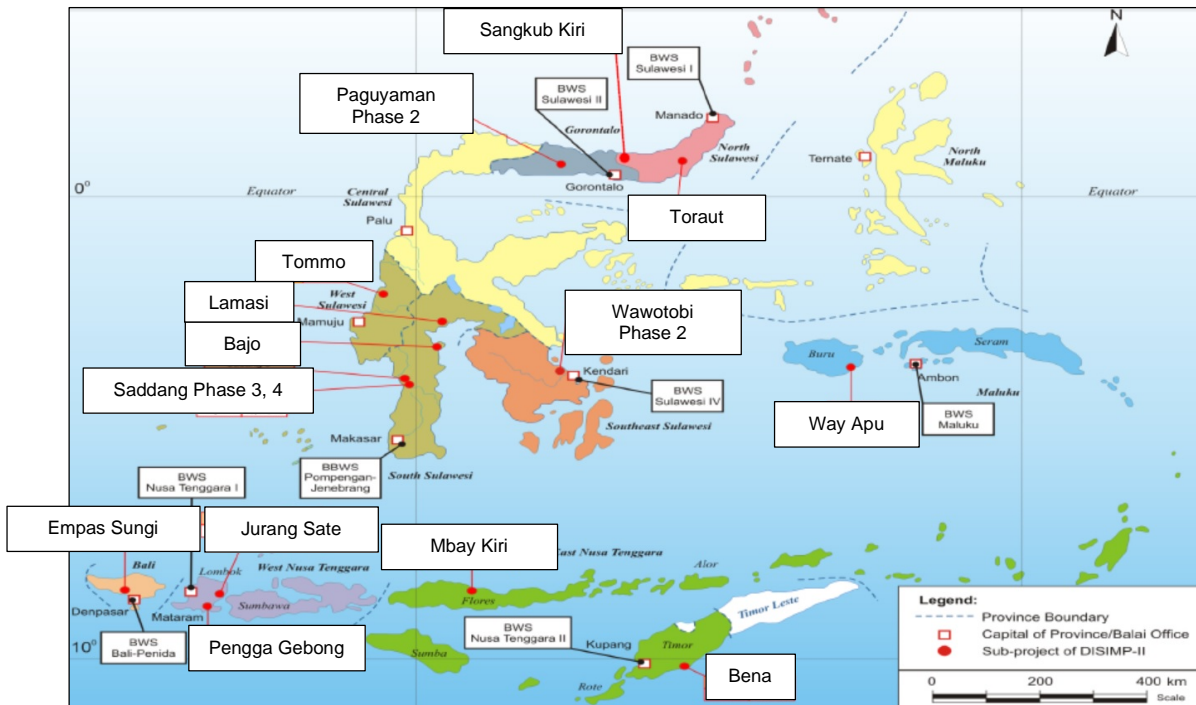
As a result of these changes and increases/decreases of the subprojects and the increase/decrease of the area benefiting from the project, the actual area increased to 94,933 ha, as opposed to the initial plan of 81,600 ha.

## 2) Consulting Services

This was mostly implemented as planned. As mentioned above, the service period was extended because the Sangkub Kiri subproject was implemented as an additional subproject and because the consulting service was provided for the works associated with the expansion of the project area.

## 3) Strengthening of WUAs, Water Management, Asset Management

This was mostly implemented as planned. From 2011 to 2014, the staff of the River Basin Organization for basins under the Central Government or Balai Besar Wilayah Sungai (hereinafter referred to as “BBWS”) and the River Basin Organization or Balai Wilayah Sungai (hereinafter referred to as “BWS”), which are the local agencies of the DGWR, attended training on improving the maintenance of irrigation facilities and strengthening irrigation water management and asset management. This was implemented as part of the consulting services.



Source: Project Completion Report

Figure 1: Locations of the Project Sites

### 3.2.2 Project Inputs

#### 3.2.2.1 Project Cost

At the time of the appraisal, a total project cost of 18,200 million yen (of which the ODA loan was 8,967 million yen) was planned. On the other hand, the actual total cost was 13,961 million yen (of which the ODA loan was 8,591 million yen), which was lower than planned (approximately 77% of the plan). The main reason for this was the fluctuation of exchange rates (strong Japanese yen/US dollar, weak rupiah) during the expenditure period (2009–2016) for land acquisition, consulting services and civil engineering works over the course of the project implementation.

#### 3.2.2.2 Project Period

Table 3 shows the initial plan and the actual project period. At the time of the appraisal, the project was planned from March 2008 to March 2013, a duration of five years and one month (61 months).<sup>8</sup> However, the actual period was from March 2008 to June 2016, a duration of eight years and four months (100 months), approximately 164% of the initial plan. The main reasons for this were as follows: 1) it became necessary to review the plan at the detailed design stage, which required extra time; 2) in some subprojects, negotiations with the landowners took more time with regard to land acquisition;<sup>9</sup> 3) during the project implementation, many subprojects were affected by heavy rain and floods, which delayed the construction periods, etc.

Table 3: Initial Plan and Actual Project Period

	Initial Plan	Actual Project Period
(Whole Project)	March 2008–March 2013 (61 months)	March 2008–June 2016 (100 months)
1) Consulting Services (including the selection period)	April 2008–March 2013 (60 months)	November 2008–June 2016 (92 months)
2) Land Acquisition	January 2009–March 2010 (15 months)	January 2009–October 2015 (82 months)
3) Tendering and Contracting	December 2008–June 2010 (19 months)	March 2009–February 2012 (36 months)
4) Civil Engineering Work	September 2009–September 2012 (35 months)	September 2009–February 2016 (78 months)
5) Strengthening of WUAs, Water Management and Asset Management	January 2009–March 2013 (51 months)	July 2010–December 2015 (66 months)

<sup>8</sup> At the time of the appraisal, the completion time of this project was set as “the end of the warranty period.”

<sup>9</sup> Especially regarding the Way Apu subproject, which encompasses areas where Indigenous people reside, significant time was spent confirming and negotiating land ownership. The land acquisition relating to other subprojects will be explained in 2) Resettlement and Land Acquisition in 3.3.2.2. under Impact section.

6) Warranty Period	March 2012–March 2013 (13 months)	December 2010–June 2016 (67 months)
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Source: Documents provided by JICA (initial plan), Project Completion Report (and answers to the questionnaire (actual))

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

#### Economic Internal Rate of Return (EIRR)

At the time of the appraisal, the EIRR was calculated to be 15.4%, setting the increase in terms of net agricultural income as a “benefit,” and the project cost and operation and maintenance cost as “costs,” with a project life of 30 years. This study attempted to recalculate the EIRR at the time of the ex-post evaluation, applying the same conditions as at the time of the appraisal, however, an accurate rate could not be derived. The reasons are: 1) the basis for the EIRR calculation relating to the 14 subprojects at the time of appraisal could not be confirmed and 2) the “benefit (increase in net agricultural income)” was not calculated when changes were made to certain subprojects during the project implementation. On the other hand, the actual project cost, which accounts for a large proportion of the “cost,” was within the initial plan and the targets for the cropping intensity and rice production, as will be explained in 3.3.1.1 Quantitative Effects (Operation and Effect Indicators), were either mostly achieved or exceeded. Considering this, it is possible that the EIRR is higher than 15.4%, the rate calculated at the time of the appraisal.

#### <Summary of Efficiency>

As discussed above, the outputs of this project were almost as planned and the project cost was within the plan. However, the project period significantly exceeded the plan, therefore, efficiency of the project is moderately low.



Branch Point of the Primary and the Secondary Canal  
(Mbay Kiri Subproject)



Developed Intake Weir  
(Way Apu Subproject)

### 3.3 Effectiveness and Impacts<sup>10</sup> (Rating: ③)

#### 3.3.1 Effectiveness

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

Table 4 shows the quantitative effect indicators (baseline, target, actual values) related to this project.

Table 4: Quantitative Effect Indicators of This Project (Baseline, Target, Actual Values)

Indicator *Note 1	Baseline value 2007			Target value 2018 [5 Years After Completion]			Actual value 2021 [5 Years After Completion]		
1) Area benefiting from the project (unit: ha)	70,255			81,600			94,933		
2) Cropping intensity *Note 2 (unit: %/year)	161			210			206.41 *Note 4		
3) Rice production (unit: ton/year)	464,946			660,306			897,117 *Note 5		
4) Rice yield (unit: ton/ha/season)	Renovation	Extension	New	Renovation	Extension	New	Renovation	Extension	New
	Wet season	Wet season	Wet season	Wet season	Wet season	Wet season	4.7 *Note 6	4.2 *Note 6	2.7 *Note 6
	Dry season	Dry season	Dry season	Dry season	Dry season	Dry season			
	4.2	3.0	2.9	4.7	4.5	4.5			
	3.9	3.0	2.9	4.6	4.5	4.5			
5) Rate of WUA presence *Note 3 (unit: %)	63 (Existing irrigation facilities)			100 (Renovation, extension, new construction)			80.5 (Renovation, extension, new construction) *Note 7		

Source: documents provided by JICA (baseline, target), questionnaire answers and the Project Completion Report (actual)

Note 1: The total values of the renovation, extension and new construction are shown for the (1) area benefiting from the project and (3) rice production in terms of the quantitative effect indicators. The values for the (2) cropping intensity, (4) rice yield and (5) rate of WUA presence are averages.

Note 2: Cropping intensity becomes 100% or higher if more than one single cropping is realized in the irrigated area.

Note 3: This indicator is for ensuring good operation and maintenance.

Note 4: In this survey, a questionnaire was sent to the personnel involved in each subproject through the DGWR headquarters and the numbers in the answers were summarized. Of the 15 sites, 13 sites provided responses. The actual value represents the average of the numbers collated. Two sites, the Pengga Gebong and the Jurang Sate subprojects (both were renovations) did not send replies.

Note 5: Similarly, 13 of the 15 sites sent replies. The actual value represents the sum.

Note 6: Similarly, 13 of the 15 sites sent replies. The actual value represents the average. New construction was at one location, the Tommo subproject. The landslide which occurred near this subproject in 2016 affected the primary and secondary canal facilities. As a result, the actual value was low at 2.7 ha. However, repair works are expected to be completed by the end of 2022.

Note 7: Ten of the 15 sites sent replies. The rate of each irrigation subproject was calculated by dividing the number of

<sup>10</sup> Sub-rating for Effectiveness is to be put with consideration of Impacts.

organized WUAs by the number of planned WUAs. The average of the 10 sites is listed as the actual value. (The Pengga Gebong, Jurang Sate and Toraut subprojects did not send replies. The Bena and Mbay Kiri subprojects were excluded as they replied before the project began, therefore, accurate data at that time were unclear and impossible to calculate).

Five indicators were established to measure the effect at the time of the appraisal, as shown in Table 4. In addition, the target year was set five years after completion.<sup>11</sup> As the actual completion was in 2016, five years later, the actual data for 2021 were collected. Analyses of each indicator are shown below:

#### 1) Area Benefiting from the Project<sup>12</sup>

As discussed in 3.2.1 Project Outputs under Efficiency, the actual area benefiting from the project was 94,933 ha, which exceeded the target, as a result of the changes made to the subprojects and the increase/decrease in the area benefiting from the project. (However, as this is the result of the changes and the corresponding increase/decrease, a comparison and verification of the project effect are not necessarily accurate).

#### 2) Cropping Intensity

The actual value was almost as per the target, showing that rice is grown twice a year (or even three times a year depending on the subproject/field) in many subprojects.

#### 3) Rice Production

The actual value exceeded the target. The reasons for this include the expansion of the area benefiting from the project due to the renovation, extension and new construction of the irrigation facilities, and the increase in cropping intensity. According to the DGWR, the other factor is that the quality of the fertilizer, etc., has improved.

#### 4) Rice Yield

The actual values are above the baselines and are mostly close to the targets. Although sufficient data were not available by season (dry or wet), it was confirmed through interviews with subproject personnel that the yield did not change significantly from the dry season to the wet season and that it had been increasing. Apart from the increase in cropping intensity, the improvement in quality of the fertilizer, etc., can also be a factor. The reason why new construction (Tommo subproject) became a low value at 2.7 ha is that a landslide occurred near this subproject in 2016 affected the primary and secondary canals. As a result, this region was still in the process of recovery at the time of the ex-post evaluation, although restoration work is progressing. The restoration work is expected to be completed by the end of 2022 and the yield is expected to increase thereafter.

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<sup>11</sup> A time of “5 years after the completion” was set probably because a build-up period after the construction of the irrigation facility was anticipated. In other words, it was considered that expanding the cultivated area and securing yields would require a certain period of time.

<sup>12</sup> The definition of an “area benefiting from the project” is an area where the effects of irrigation development and renovation have been effective and can be regarded as an area based on the design. (Reference information: “cultivated area” is the area where planting is actually carried out).



## 5) Rate of WUA Presence

This indicator shows that with functioning WUAs, daily maintenance work is expected to be performed systematically, rice fields are expected to be maintained and expanded, cropping is expected to be well managed and problems are expected to be solved. Although the actual value did not reach the target, it is above the baseline and accounts for around 80% of the target. The support from the consulting services of this project (strengthening the capacity to operate and maintain irrigation facilities, strengthening WUAs, water management and asset management) is deemed to have assisted in this matter. In fact, some WUAs were institutionalized (incorporated) during the project implementation, while others are still in the process of institutionalizing. In other words, even though institutionalization is taking time, the rate of WUA will be even higher in the future once the process is completed.

### 3.3.1.2 Qualitative Effects (Other Effects)

(Stable Supply of Irrigation Water, Increase in Agricultural Income with a Focus on Rice)

As a result of interviews with the WUA staff (farmers) of the Lamasi, Saddang, Tommo, Way Apu, Bena and Mbay Kiri subprojects visited during this field survey, the following comments were received.

(Common Comments from Many Subprojects)

“Due to the development and renovation of the irrigation facilities, the working hours required for water intake, cultivation and harvesting have been reduced and the labor force has decreased;”  
“The quality of the irrigation water is good;” “Rice yield has increased. It used to be 4.0 ton/ha/season and has increased to 5 to 7 tons/ha/season;” “The volume of distributed water and cultivation has been stabilized and production of rice is increasing.”

(Way Apu Subproject)

“Revenue from the rice harvest has increased. Previously, the gold mining industry was more profitable than rice cultivation. However, as mining is declining and after hearing that water distribution is stable, due to the development of irrigation facilities, many people are returning to rice cultivation;” “It became possible to grow rice twice or three times a year. No more trouble with water distribution in the dry season.”

(Bena Subproject)

“While stable cultivation on terminal agricultural land requires further improvement of water management skills under the stable water distribution condition, yields are currently doubling by comparison with previous yields;” “Cultivation based on the agricultural calendar has been possible over the last two years;” “Farmers became able to access irrigation water easily and we think that labor has also been reduced;” “Revenue from the sales of rice increased.”

(Mbay Kiri Subproject)

“Before the start of this project, there were cases where farmers carried water themselves and sprinkled water on the fields, so you can say that the working hours were long. Now, the irrigation canal provides stable water distribution to the field;” “Farmers have easier access to irrigation water. Planting twice a year has been stable.”

(Lamasi and Saddang Subprojects)

“Profits depend on the production cost. As the selling price of rice in the market is fluid, the profit is not necessarily large.”

Based on the above comments, it can be inferred that irrigation water is stably supplied and it has become possible to grow rice twice a year; yields have increased and productivity has improved in the target subprojects. On the other hand, in some cases, the situation concerning agricultural incomes depend on the subproject.<sup>13</sup>



Drainage Canal  
(Tommo Subproject)



Secondary Canal  
(Saddang Subproject)



Status of the Field  
(Bena Subproject)

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<sup>13</sup> Many farmers in the Bena and Mbay Kiri subprojects in East Nusa Tenggara Province have a tendency of selling rice directly to customers. (This is not limited to the two subprojects but many farmers in East Nusa Tenggara Province polish harvested rice and sell it to customers. On the other hand, in other areas (e.g., Sulawesi Province), it is common for farmers to take paddy rice to the market and sell it to middlemen). Relatively high profits can be obtained by eliminating middlemen and market commissions. Farmers in both subprojects confirmed when asked that rice was traded for 7,500–10,000 rupiah per kg. It was also confirmed that many farmers were increasing their profits compared with the period before the start of the project. On the other hand, it was also confirmed that farmers are affected by the market price at the time of rice sales and that profits did not necessarily increase in some subprojects. In the Lamasi subproject, for example, the purchase price in the market in one instance was 3,800 rupiah per kg (the price after deducting the commissions of dealers and buyers; the actual payment is in kind—rice), while the production cost was 4,200 rupiah per kg. As mentioned above, although the quality of fertilizers has improved, these input costs have been on the rise in recent years along with other types of inflation, putting pressure on farmers’ profits and sometimes unintentionally reducing profits. A similar case was confirmed in the Saddang subproject. In the Lamasi subproject, however, it is unlikely that profits are constantly declining, as some farmers there maintained that they earned an average profit of 1 million rupiah per month. In addition, farmers working in this subproject region also have the opportunity to receive a production cost subsidy of 6 million rupiah per hectare annually. (Subsidies are only available if the farmer purchases fertilizer, therefore, not all farmers receive this annually).

### 3.3.2 Impacts

#### 3.3.2.1 Intended Impacts

(Improvement in the Living Environment of Farmers in the Project Areas and Contribution to Poverty Alleviation)

This project was expected to contribute to the improvement in the living environment of farmers and poverty reduction, by realizing a stable supply of irrigation water and increased agricultural incomes mainly from rice. In this survey, BBWS/BWS and WUA staff (farmers) of the Lamasi, Saddang, Tommo, Way Apu, Bena and Mbay Kiri subprojects, which were visited during this field survey, were interviewed and the following comments were received: “My income increased, and I was able to utilize it to repair my home. I was able to secure savings to send my children to school and to cover the cost of going to a pilgrimage site (Mecca)” (Saddang subproject); “I was able to buy a moped bike, a four-wheeled vehicle and the latest farm equipment. I could secure the money to repair my home. I was able to save up to send my child to college” (Way Apu subproject); “The agricultural land area has expanded and rice production has increased. In the future, diversity of agricultural land use can also be expected<sup>14</sup>” (Lamasi subproject); “Local people are employed as maintenance staff for the irrigation projects. I think the improvement of rice productivity and locals obtaining jobs lead to the revitalization of the region” (Bena subproject); “Due to the land issue related to the salt production business, some development was postponed. However, the stable distribution of irrigation water, I think, is leading to improved yield and productivity, increased profits and regional revitalization” (Mbay Kiri subproject). Based on these comments, it is possible that many farmers have financial margins and are changing their livelihoods. It can be said that this project has contributed to an improvement in the living standards of farmers.<sup>15</sup>

For reference, Table 5 shows the Food Security Index (FSI)<sup>16</sup> by province, including the eastern Indonesia region, and Table 6 shows the Global Food Security Index (GFSI) of Indonesia (nationwide). Although the indexes of both tables cannot be simply compared because they are affected by the characteristics of the local communities,<sup>17</sup> the indexes of the provinces in the

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<sup>14</sup> While rice cultivation is the main focus currently, considering the stable water distribution situation, it is probable that such comments were made with the expectation of cultivating other highly cashable crops.

<sup>15</sup> Although no specific comments were obtained regarding poverty reduction, based on the above comments, it is highly possible that farm households with low incomes before the start of this project, have also been given the opportunity to increase their incomes.

<sup>16</sup> The level of food security is calculated by accumulating the points of each item based on 59 indicators that fall into the following four categories: “affordability,” “availability,” “quality and safety,” “resources and resilience.” (The maximum score is 100 points). The Economist magazine, commissioned by the agricultural research company, Corteva (USA), is coordinating it. In terms of world ranking, Indonesia in 2020 was 65th out of 113 countries. Western countries and Japan dominate the top ranks.

Source: <http://ekonomi.uma.ac.id/2021/03/16/indonesias-global-food-security-index/> (accessed on January 26, 2022)

<sup>17</sup> Based on nine indicators in the regions, “ratio of per capita normative consumption to net availability,” “ratio of

eastern Indonesia region are generally rising and are also higher than the national index. It is inferred that the role of this project, which aimed to increase food (rice) production by renovating, extending and constructing irrigation facilities on agricultural land of 90,000 ha or more, is not small.

(Reference) Table 5: Food Security Index (FSI) by Province

Province (Subproject Within the Province)	2019	2020
Bali (Empas Sungai)	85.15	84.54
West Nusa Tenggara (Pengga Gebong, Jurang Sate)	62.43	75.60
East Nusa Tenggara (Bena, Mbay Kiri)	50.69	66.92
North Sulawesi (Toraut, Sangkub Kiri)	81.44	77.79
South Sulawesi (Saddang Phase 3, Saddang Phase 4, Lamasi, Bajo)	78.69	81.81
Southeast Sulawesi (Wawotobi Phase 2)	76.99	77.06
Gorontalo (Paguyaman Phase 2)	69.06	80.40
West Sulawesi (Tommo)	60.37	76.36
Maluku (Way Apu)	52.35	58.15

Source: Ministry of Agriculture of Indonesia (Indeks Ketahanan Pangan (FSI), Indonesia)

Note: Only 2019 and 2022 data were available.

(Reference) Table 6: Global Food Security Index (GFSI) of Indonesia (Nationwide)

2012	2013	2014	2015	2016	2017	2018	2019	2020
46.8	45.6	46.5	46.7	50.6	51.3	54.8	62.6	59.5

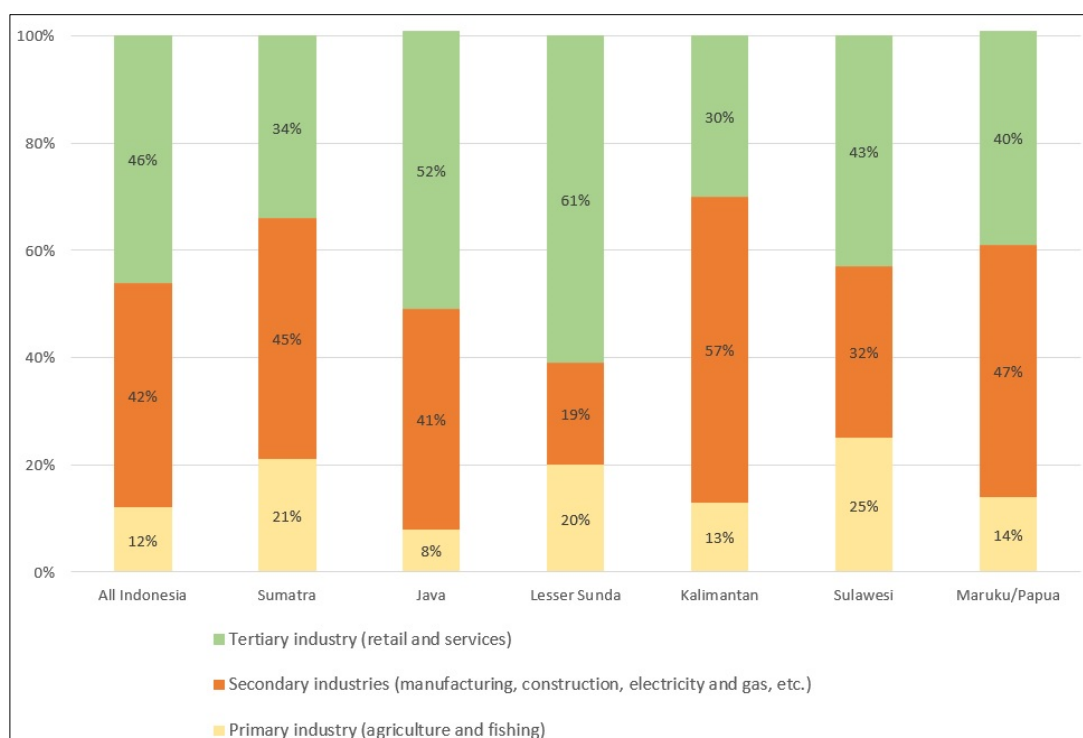
Source: Economist Intelligence Unit

(Reference: Composition of Industries in Indonesia)

Figure 2 shows the most recent (2018) industry composition (primary, secondary and tertiary industry). The Lesser Sundas (East and West Tenggara Provinces, etc.), Sulawesi and Maluku in the figure are located in the eastern Indonesia region. In the region, the composition share of primary industry is higher than the national average, suggesting that most recently, the proportion of agriculture is higher in this region than the national average.

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population living below the poverty line,” “ratio of households with food expenditure of 65% or more of total expenditure,” “ratio of households with no access to electricity,” “average school education period for women over 15 years old,” “ratio of households without access to safe water,” “ratio of total population per health worker to the population density level,” “ratio of infants below standard height” (stunting), “life expectancy at birth,” an index has been calculated based on the sensitivity level when measuring food and nutritional status, etc., while considering the data for a specific period (regularly available annually), including data from all local governments.



Source: *Investment Environment of Indonesia*, Japan Bank for International Cooperation (JBIC) (2018 data)

Figure 2: Industrial Structures in Each Region

In addition, Table 7 shows the Gross Regional Product (GRDP) of each province in the eastern region of Indonesia. The changes are shown from immediately after the start of this project (2010) and immediately before completion (2015), up until the time of the ex-post evaluation (2020). While simple comparisons are not possible, the GRDP is increasing in all provinces. Based on the comments obtained in the above interviews, it can be said that this project contributes to improving the living standards of farmers, and at the same time, supports the economic revitalization of the surrounding areas.

(Reference) Table 7: Gross Regional Product (Nominal GRDP)

(unit: 1 billion rupiah)

Province (Subproject Within the Province)	2010	2015	2020	Growth Rate over 11 Years
Bali (Empas Sungai)	93,749	176,413	224,214	239.16%
West Nusa Tenggara (Pengga Gebong, Jurang Sate)	70,123	105,665	133,522	190.41%
East Nusa Tenggara (Bena, Mbay Kiri)	43,847	76,121	106,506	242.91%
North Sulawesi (Toraut, Sangkub Kiri)	51,721	91,146	132,299	255.79%

South Sulawesi (Saddang Phase 3, Saddang Phase 4, Lamasi, Bajo)	171,741	340,390	504,479	293.74%
Southeast Sulawesi (Wawotobi Phase 2)	48,401	87,714	130,184	268.97%
Gorontalo (Paguyaman Phase 2)	15,476	28,493	41,726	269.62%
West Sulawesi (Tommo)	17,184	32,988	45,909	267.16%
Maluku (Way Apu)	18,429	34,346	46,264	251.04%
(Reference) Whole of Indonesia	1,643,267	2,790,273	4,014,112	244.28%

Source: Statistics Indonesia (BPS), Federal Reserve Economic Data<sup>18</sup>

### 3.3.2.2 Other Positive and Negative Impacts

#### 1) Impacts on the Natural Environment

According to the *Japan Bank for International Cooperation Guidelines for Confirmation of Environmental and Social Considerations* (established in April 2002), this project was classified as Category B because its characteristics were unlikely to affect the environment and its areas were unlikely to be affected. Furthermore, when implementing the subprojects (each irrigation area), the Environmental Impact Assessment (EIA) and the environmental management monitoring and management method (UKL/UPL) were conducted and approved in accordance with Indonesian domestic law before construction began.

The questionnaire, site visits, interviews with the DGWR and the personnel involved in each subproject visited showed that no major problems have occurred in terms of the impact on the natural environment (air pollution, noise/vibration, impact on the ecosystem, etc.) in each subproject at the time of the ex-post evaluation. In each subproject, the environmental management department of each local government called Bapedal/Bandal is responsible for and implements environmental monitoring. It was also confirmed that no problems relating to air pollution, noise, vibration or water quality, etc., have been reported to date when carrying out environmental monitoring.

#### 2) Resettlement and Land Acquisition

In this project, land acquisition occurred in four subprojects (the Pengga Gebong, Bajo, Tommo and Way Apu subprojects). The acquisition process was smooth in the Pengga Gebong and Bajo subprojects and was completed by the end of 2009. The area subject to land acquisition was 10 ha in each subproject. The status of the land acquisition in the Tommo and Way Apu subprojects are explained below. In both subprojects, the land acquisition process was lengthy and the construction period was delayed, thus, it can be said that there were certain problems.<sup>19</sup> However,

<sup>18</sup> Source: <https://fred.stlouisfed.org> (accessed on January 26, 2022)

<sup>19</sup> As discussed in 3.2.1 Project Outputs under Efficiency, although the Mbay Kiri subproject was subject to land acquisition in the initial plan, negotiations with the landowners terminated. Considering the reduction in the irrigation area, one cannot exclude the possibility that communication and coordination between the project and stakeholders were not thorough from the time of the project formulation to the period after the start of the project.

the issues were resolved by the time of the ex-post evaluation.

- Tommo subproject: although the land acquisition was expected to proceed in line with the Indonesian government budget, it was not completed before construction of the main and secondary canals began. At the stage of a detailed design review (2010-2011), the location of the main canal was changed to avoid swamps and areas requiring deep dredging; this affected the land acquisition plan.<sup>20</sup> It took time for the DGWR to discuss the land acquisition budget with the provincial government and procedures within the provincial government were also delayed. As a result, construction started late (in December 2012). The total area that became subject to the land acquisition was 94.09 ha.

- Way Apu subproject: this is an area where many Indigenous people live. In 2015, there were tough negotiations over land in the lower reaches of certain secondary canals,<sup>21</sup> which required extra time. As a result, construction was delayed, as it was affected by the fact that many landowners were against the land acquisition. The local government negotiated with the indigenous tribal chief and an agreement was finally reached. The total area that became subject to the land acquisition was 10.25 ha.

According to the DGWR, “with the cooperation of the project related personnel, the land acquisition was carried out in accordance with Indonesian law and the procedure included the identification of the people to be affected and the scheduling of a briefing session for them. There have been no complaints or incidents relating to the compensation since the completion of this project. Necessary compensation for all areas subject to land acquisition was paid before the start of construction. Most of the records of the landowners are kept by the local governments but the exact numbers were often not recorded. The process did not involve the relocation of any houses. No livelihood recovery support measures were implemented primarily because the land acquisition did not result in the loss of employment opportunities and it was not anticipated to lead to poverty in the case of those affected.” It was also confirmed that no relocation of residents was anticipated or took place in any of the subprojects implemented by this overall project.

### 3) Gender Equality, Vulnerable Groups/Human Rights, Social System Norms, People’s Well-being

It can be said that this project contributes to agricultural productivity and farm incomes in the eastern region of Indonesia and helps establish food security for the entire nation. While cases in which this project had a direct impact have not been confirmed and while the country is faced

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<sup>20</sup> Specific information was not available as to how the land acquisition was finally agreed upon or in which area land could not be acquired in the Tommo subproject. This is because the local government’s building was destroyed by an earthquake in January 2021 and the relevant documents are missing.

<sup>21</sup> The exact location is Way Lo Barah.

with population growth and economic revitalization, with food security being highlighted as an urgent issue, this project is playing a role in benefiting farmers who are beneficiaries (including the vulnerable) both extensively and equally, generating more choices in farmers' lives and creating events that lead to happiness. Considering the impacts that contribute to improving the living environment of farmers, no particular negative impacts on gender equality, vulnerable groups/human rights, social system norms and people's well-being are in evidence.

#### <Summary of Effectiveness and Impacts>

Comprehensively considering the above, the outcomes and impacts expected from the implementation of this project have been achieved almost as planned. In addition, it can be concluded that there are hardly any negative impacts, on a long-term basis, from social (gender equality, vulnerable groups/human rights, social system norms, people's well-being), environmental or economic perspective. Therefore, effectiveness and impacts of the project are high.

### 3.4 Sustainability (Rating: ②)

#### 3.4.1 Policy and System

According to the *National Medium Term Development Plan (RPJMN)* developed by the government of Indonesia, the government lists improving agricultural productivity, agricultural access and agricultural quality as priorities. In addition, the *2020-2024 Agricultural Strategic Policy* aims to improve agricultural productivity nationwide, while reelected President Joko Widodo published the *Food Estate Program*, aiming to secure food supply and to break the dependence on food imports. This project contributes to the improvement in agricultural productivity and food security, therefore, it can be said that the project is consistent with the policy and direction of the Indonesian government still at the time of the ex-post evaluation.

#### 3.4.2 Institutional/Organizational Aspect

The executing agency is the DGWR (headquartered in Jakarta). The DGWR is responsible for flood control, water resource development and the planning and implementation of irrigation projects, as well as operation and maintenance.

Concerning the operation and maintenance of the irrigation facilities developed and renovated by this project (weirs, headworks, primary canals, secondary canals, tertiary canals, etc.), this may differ depending on the situation faced by each province and subproject. Nevertheless, in principle, the DGWR is responsible for irrigation facilities with 3,000 ha or more in a beneficiary area (i.e., other than the terminal irrigation facilities), while provincial governments are in charge of irrigation facilities with more than 1,000 ha and less than 3,000 ha (i.e., other than the terminal



irrigation facilities). Regencies are responsible for facilities of 1,000 ha or less. As for the financial source of operations and maintenance, each institution covers the cost. Many of the subprojects within this project have a beneficiary area of 3,000 ha or more, therefore, they are under the DGWR. However, its local branches, the BBWS/BWS, carry out the operation and maintenance under the supervision of the DGWR headquarters. The BBWS/BWS has established a system of cooperating with the provincial governments under which each subproject exists. In addition, the WUAs operate and maintain the terminal irrigation facilities that are tertiary canals or smaller, with the support of the DGWR and the local governments.<sup>22</sup> Regular maintenance works include repairing waterways and sluices where water leakage occurs, the painting of structures such as irrigation canals and weirs and daily maintenance work such as weeding (multiple times a month), cleaning and dredging of waterways.

When visiting the Lamasi, Saddang, Tommo, Way Apu, Bena and Mbay Kiri subprojects, some BBWS/BWS members commented that the number of the operation and maintenance staff was insufficient.<sup>23</sup> On the other hand, it was reported that the number of staff in the WUAs was generally sufficient. There was no particular case of outsourcing the operation and maintenance work to private companies. However, cases were confirmed whereby certain BBWS/BBS hired local residents for maintenance works.<sup>24</sup>

From the above, no serious problems have been observed in the operation and maintenance system/organization at the time of the ex-post evaluation, however, it is considered necessary to steadily respond to operation/maintenance needs, by increasing the number of BBWS/BWS staff in certain subprojects.

### 3.4.3 Technical Aspect

Regarding the technical aspects of operation and maintenance, the operation and maintenance staff seemed to have sufficient skills, knowledge and experiences in the view of the BBWS/BWS, which has jurisdiction over the Lamasi and Way Apu subprojects that were visited in this field survey. On the other hand, it was observed that management skills were not necessarily adequate in the Tommo, Saddang, Bena and Mbay Kiri subprojects. Specifically, comments were received that knowledge and skills, for water flow calculation and water distribution management were lacking and that training in such fields was necessary.<sup>25</sup>

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<sup>22</sup> Of the actual values explained in 5) Rate of WUA Presence under 3.3.1.1 Quantitative Effects (Operation and Effect Indicators), in areas where WUAs have not been established (i.e., not yet been formed or in the process of being established), the BBWS/BWS is carrying out the work in principle.

<sup>23</sup> For example, various answers were received such as, “there are not enough staff for the required maintenance work. There is a shortage of water gate guards (gate keepers), but the number is expected to increase by the end of 2022.”

<sup>24</sup> Local residents are employed when irrigation canals need to be maintained quickly (intensively).

<sup>25</sup> For example, a comment was received from an individual involved in the Tommo subproject, “proper water management is required to distribute the required amount of water to the field via the irrigation canal without waste.

Although no specific answers were obtained regarding the years of work experience of the BBWS/BWS staff, it seemed that the average was 5 to 10 years. The situation appeared to be different among the WUAs, however, it was confirmed that due to the nature of the operation and maintenance work, a high degree of specialization was not particularly required.<sup>26</sup>

On-the-job training (OJT) for newly hired recruits at the BBWS/BWS and WUAs is provided in some cases but not all. This is also true with regard to the training of general staff. Training conducted in recent years relate to the “operation and management of irrigation facilities,” “on-site technical training for irrigation canal managers” and “headwork O&M training,” etc., attended by BBWS/BWS staff. In many subprojects, the BBWS/BWS have meetings with WUA members before they start planting every year to discuss operations and maintenance and the planting policy. The BBWS/BWS also provide WUA members with operation and maintenance-related training as required.

Based on the above, there are no serious problems on a technical level concerning operations and maintenance, however, there appear to be some issues in certain subprojects.<sup>27</sup>

#### 3.4.4 Financial Aspect

The financial resource for the DGWR’s operation and maintenance budget is part of the government budget. The operation and maintenance budget for the BBWS/BWS in various parts of Indonesia is allocated by the DGWR headquarters. Table 8–13 show the operation and maintenance budget and actual cost (latest three years) of the subprojects visited during this field survey.

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However, the amount of water for distribution and cultivation management is considered to vary, depending on the characteristics of the subproject. By having an understanding of the amount of water, it is possible to ascertain the accurate agricultural management status, in particular, the actual situation regarding the terminal agricultural land below the tertiary canal becomes clearer. In this subproject, we wish to acquire such knowledge and will work to understand the field.” However, such training had not been carried out at the time of the ex-post evaluation.

<sup>26</sup> Regarding the educational background of the staff, in almost all subprojects, the BBWS/BWS staff have a university degree or higher and WUA staff are mostly high school graduates.

<sup>27</sup> In this project, as part of the consulting services, which is one of the project components, “strengthening of WUAs, water management and asset management” was implemented in order to strengthen irrigation facility maintenance and irrigation water management. With the recruitment and selection of on-site staff, the formation of organizations and systems, training and OJT for on-site staff and asset management, as well as training for office work, techniques, systems, water distribution management and the maintenance of irrigated water distribution networks was conducted. Although the situation may vary depending on the subproject, based on the information gathered from interviews held within the subprojects, it appears that staff retention and skill/knowledge improvement were not necessarily sufficient at the time of the ex-post evaluation.

Table 8: Operation and Maintenance Budget and Actual Cost of the Bena Subproject  
(unit: 1,000 rupiah)

	2018	2019	2020
Operation and Maintenance Budget	2,320,250	1,108,879	1,347,841
Actual O&M Cost	2,310,617	1,088,409	1,339,700

Source: Answers to the questionnaire and interview responses

Table 9: Operation and Maintenance Budget and Actual Cost of the Mbay Kiri Subproject  
(unit: 1,000 rupiah)

	2018	2019	2020
Operation and Maintenance Budget <sup>28</sup>	1,866,332	1,985,000	295,080
Actual O&M Cost	1,861,900	1,858,625	287,997

Source: Answers to the questionnaire and interview responses

Table 10: Operation and Maintenance Budget and Actual Cost of the Tommo Subproject  
(unit: 1,000 rupiah)

	2018	2019	2020
Operation Budget	5,290	60,000	50,000
Actual Operation Cost	5,290	59,928	49,986
Maintenance Budget	N/A	111,970	126,556
Actual Maintenance Cost	N/A	111,970	126,472

Source: Answers to the questionnaire and interview responses

Table 11: Operation and Maintenance Budget and Actual Cost of the Lamasi Subproject  
(unit: 1,000 rupiah)

	2018	2019	2020
Operation Budget	976,581	974,099	1,023,764
Actual Operation Cost	937,235	933,225	990,312
Maintenance Budget	2,703,183	2,831,000	1,959,499
Actual Maintenance Cost	2,272,287	2,631,902	1,923,474

Source: Answers to the questionnaire and interview responses

Table 12: Operation and Maintenance Budget and Actual Cost of the Saddang Subproject  
(unit: 1,000 rupiah)

	2018	2019	2020
Operation Budget	5,906,907	6,044,947	6,354,092
Actual Operation Cost	5,612,743	5,716,286	6,267,374
Maintenance Budget	10,942,679	12,585,791	12,712,054
Actual Maintenance Cost	10,254,950	11,675,634	11,502,794

Source: Answers to the questionnaire and interview responses

<sup>28</sup> In both the Bena and Mbay Kiri subprojects, the operation budget, maintenance budget and the actual costs are the sum of the accounting expenses.

Table 13: Operation and Maintenance Budget and Actual Cost of the Way Apu Subproject  
(unit: 1,000 rupiah)

	2018	2019	2020
Operation Budget	129,600	129,600	216,000
Actual Operation Cost	129,600	129,600	216,000
Maintenance Budget	240,705	240,800	54,720
Actual Maintenance Cost	240,705	240,800	54,720

Source: Answers to the questionnaire and interview responses

Bena subproject and Mbay Kiri subproject: it was reported that the necessary budget was allocated. On the other hand, it was also shared that COVID-19 measures have been given priority in the budget allocation for public projects in recent years, and there has been a trend of budget cuts in other areas.

Tommo subproject: it was reported that the necessary budget was generally allocated and that the minimum maintenance work necessary was being conducted. However, it was mentioned that the amount of work was not necessarily substantial.

Lamasi subproject and Saddang subproject: it was reported that, in general, a sufficient budget was allocated. The maintenance budget and the actual cost decreased slightly from 2019 to 2020 because there was a budget cut for public works due to COVID-19. It was shared that “planned staff training was canceled” as a consequence.

Way Apu subproject: the operating budget and the actual cost increased from 2019 to 2020, due to measures taken in response to the rise in wage levels of the local community. The maintenance budget and actual cost decreased from 2019 to 2020 because the regular maintenance of other irrigation areas (other than the area covered by this project) required more of the budget than expected, which altered the budget allocation. According to personnel involved in the subproject, “although the operation and maintenance budget has generally been sufficient for the required work, sometimes the budget is reduced in the middle of the fiscal year. Therefore, staff members are trying to use the budget appropriately and carefully.” Regarding COVID-19, there has been virtually no effect.<sup>29</sup>

From the above, the mechanism is in place to ensure the necessary operation and maintenance budget is allocated, and the actual results were observed. However, certain subprojects have

<sup>29</sup> (Reference information). Regarding COVID-19 and the government budget for 2020, there were many cases of budget cuts other than in the Ministry of Health and the Ministry of Education and Culture in Indonesia. Most of the budget, whether it is allocated to the central or local government, tended to be earmarked for COVID-19 measures. While the situation is similar in 2021, the Indonesian government seems to be focusing on economic recovery, as well as on measures against COVID-19.

recently faced budget cuts due to COVID-19. Therefore, it can be said that there are some issues with the current financial outlook.

#### 3.4.5 Environmental and Social Aspect

Other than the fact that the land acquisition required time, the questionnaire and interviews conducted during site visits have confirmed that no special environmental or social mitigation measures were taken at the time of the ex-post evaluation, therefore, no impact is expected for the time being. As discussed in 3.3.2.2 Other Positive and Negative Impacts, it is believed that there had been no significant negative impacts up until the time of the ex-post evaluation.

#### 3.4.6 Preventative Measures to Risk

At the time of the ex-post evaluation, no deterioration in the political situation or security in the eastern region of Indonesia had been reported. There have been no major changes in the central government's national development plan, agricultural sector plans or policies regarding the direction of irrigation facilities. As discussed in 3.1.1.2 Consistency with the Development Needs of Indonesia, the Indonesian government is developing and improving existing agricultural infrastructure facilities nationwide in order to strengthen the food security sector. In the *Food Estate Program*, apart from the North Sumatra province and South Sumatra province in the western region, the East Nusa Tenggara province and Papua province, etc., in the eastern region are listed as regions that are expected to become centers for agriculture, which is evidence that there is no change in the policies related to the agricultural sector and the development of irrigation facilities. In addition, no particular risks, external conditions or events that need to be controlled were observed, including at the present time and in the future.

#### 3.4.7 Status of Operation and Maintenance

It was confirmed that no major problems have occurred within the developed and renovated irrigation facilities (weirs, headworks, primary canals, secondary canals, tertiary canals, etc.). Necessary operation and maintenance works are being carried out (implemented according to the budget and the number of staff) in the Lamasi, Saddang, Tommo, Way Apu, Bena and Mbay Kiri subprojects that were visited in this survey.

As mentioned earlier, a landslide occurred near the Tommo subproject in 2016, which affected the primary and secondary canals. At the time of the ex-post evaluation, the restoration work was on-going, financed by the government budget.

Regarding spare parts, it was observed that there were different procurement and storage responses depending on the subproject. In one case, a certain number of parts were stored in a warehouse and used when needed, while in another, parts were purchased immediately from a

local vendor or market when the supply was low (since purchasing and procuring parts is easy and not time consuming). It was confirmed that in any case there was no international procurement or any particular barriers/problems in the procurement process. It was also confirmed that in no case was maintenance compromised due to a lack of parts.

#### <Summary of Sustainability>

Based on the above, there seems to be no major concern regarding the sustainability of the effects generated by this project. On the other hand, the organizational structure (mainly personnel system), technology and financing of the operation and maintenance is not necessarily problem-free. Therefore, sustainability of the project effects is moderately low.



Water Diversion Point from the Intake Weir  
(Way Apu Subproject)



Group Interviews with BWS and WUA Members  
(Mbay Kiri Subproject)

## 4. Conclusion, Lessons Learned and Recommendations

### 4.1 Conclusion

This project aimed to increase food production, such as rice, in the nine eastern provinces of Indonesia, by renovating, extending and newly constructing irrigation facilities and by assisting the development of operation and maintenance systems, thereby improving food security and the incomes of farmers in the target region. This project has “consistency with the development plan” and “consistency with the development needs.” As for coherence, “consistency with Japan’s ODA Policy” can be confirmed. On the other hand, no concrete cooperation was expected in relation to “internal coherence” at the time of the appraisal and “external coherence” has not been confirmed as there is no cooperation, due to the fact that the target areas of this project are different from those of other donors. Therefore, its relevance and coherence are high. Regarding efficiency, the outputs were mostly as planned, and the project cost was within the plan. However, the project period significantly exceeded the initial plan, due to land acquisition procedures and heavy rains

and floods that delayed the construction process. Therefore, efficiency of the project is moderately low. Regarding effectiveness and quantitative effect indicators, the “area benefiting from the project” and “rice production” exceeded the targets, while “cropping intensity,” “rice yield” and the “rate of WUA presence” almost reached the targets or exceeded the targets. It was confirmed during the interviews that this project has resulted in an increase in rice production and frequency of planting, and depending on the subproject, farm incomes have increased and labor (agricultural work) has been reduced, owing to the supply of more efficient irrigation water. Similarly, regarding impacts, it was observed that the living environment of farmers has improved. As the food security index of each province is high, in which the subprojects targeted by this project are located, it can be inferred that this project has contributed to the stable supply of rice and to the improvement of self-sufficiency. Therefore, effectiveness and impacts of the project are high. Regarding sustainability, while no major concerns have been observed, it has been noted that certain issues exist in the institutional/organizational (mainly personnel system), technical and financial aspects of operation and maintenance. Therefore, the sustainability of the project is moderately low.

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

## 4.2 Recommendations

### 4.2.1 Recommendations to the Executing Agency

None.

### 4.2.2 Recommendations to JICA

None.

## 4.3 Lessons Learned

### Importance of Coordination from an Early Stage for Land Acquisition, Need for Information Sharing, Mutual Confirmation and Thorough Coordination among Project Personnel and Stakeholders

In the Tommo and Way Apu subprojects, the construction of irrigation canals was delayed as a result of the land acquisition problem. Perhaps the executing agency should have handled the negotiations by initiating discussions with the residents prior to the start of the project, identifying the coordinating ability and influence of the local governments and the local community leaders at an early stage, working closely with them, and taking the necessary measures (e.g., encouraging local governments to exercise patience when holding discussions with residents). When formulating similar projects in the future, if any difficulty is expected in terms of land acquisition at an early stage following the start of the project, the relevant organizations should implement

coordination and forecasting measures as soon as possible prior to negotiation. In the Mbay Kiri subproject, the land acquisition negotiation was terminated and the irrigation area shrank. From the time of the project formation to the period after the start of the project, it was necessary to confirm the status of the project site with the project personnel and the stakeholders, demonstrating effective communication and coordination. When formulating similar projects in the future, it would be desirable to consider significant information sharing, mutual confirmation and thorough coordination for a smooth project implementation.

#### Usefulness of Examining the Timing of the Realization of Project Effects with a Focus on the Ex-Post Evaluation and Establishing a System Suitable for Measuring the Effects at the Time of Project Planning

Regarding the effectiveness and quantitative effect indicators (area benefiting from the project, cropping intensity, rice production, rice yield and extent of WUA presence), the timing of measuring the effects was expected to be five years after the completion of the project. Usually, ex-post evaluations are conducted two to three years after completion, however, in this case a slightly longer time period was set, that is five years after the completion of the project. Consideration may have been given to the fact that it would take a certain period of time to expand the cultivated land area and to secure additional yield through the development and renovation of the irrigation facilities. In other words, a build-up period was assumed at the appraisal stage. In this way, a series of changes—the stable supply of water, an increase in the frequency of planting, the expansion of the cultivated land area and the securing of a stable yield—can be determined within the timeframe of five years, which can lead to a more accurate evaluation of the project effects. On the other hand, there can also be an adverse effect with regard to postponing the measurement and confirmation of the project effects. For example, (within five years after completion) the number of times that rice is grown in a year and the corresponding yield may decrease, due to natural and meteorological conditions or sudden disasters such as landslides, as in the case of the Tommo subproject. Due to factors other than this project, it may become difficult to determine the effects of the project. When formulating similar projects in the future, it would be realistic and necessary to set indicators appropriately and measure the effects at appropriate times, based on the actual situation of the irrigation area. While this should be the basic approach, it is also considered meaningful to consider the advantages and disadvantages of the timing of project effect measurement and confirmation at the project planning stage. It is worth considering the establishment of a system in which the effects are measured and monitored two to three years after completion of the project if possible, thereafter measuring the effects again when the timing is deemed appropriate, and whether the project has been affected by any external factors, etc.



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

### 5.1 Performance

#### 5.1.1 Objective Perspective

When dealing with multiple subprojects, those involved in the project (DGWR, BWS/BBWS) took measures to ensure that the process of land acquisition and tendering for contractors would proceed without delays, so that the construction period would not be extended. Nevertheless, the land acquisition procedure and negotiations were lengthy and delayed the project period; in some sites there was a reduction in the area benefiting from this project (reduction in the project scope) as discussed above. However, there were no major faults in the project supervision system of the DGWR or JICA, and no particular problems were reported in terms of communication between the two parties.

### 5.2 Additionality

None.

(end)

Comparison of the Original and Actual Scope of the Project

Item	Plan	Actual
1. Project Outputs	<p>1) Civil Engineering Work, etc. Renovation, extension, new construction of irrigation facilities (weirs, headworks, primary canals, secondary canals, tertiary canals, etc.) → 14 sites: the total area benefiting from the project is 81,600 ha</p> <p>2) Consulting Services Tendering assistance, construction supervision, support for strengthening irrigation facility operation and maintenance capacity (strengthening government-affiliated organizations and WUAs, water management (including farming support), asset management, etc.), project evaluation and monitoring, project implementation assistance, etc.</p> <p>3) Strengthening of WUAs, Water Management and Asset Management The executing agency and local government lead the strengthening of irrigation facility maintenance and irrigation water management. The ODA loan consultants assist and supervise.</p>	<p>1) Civil Engineering Work, etc. Renovation, extension, new construction of irrigation facilities (weirs, headworks, primary canals, secondary canals, tertiary canals, etc.) → <u>Implemented almost as planned (15 sites, the total area benefiting from the project is 94,933 ha. (Breakdown: new construction 2,500 ha, renovation 80,390 ha, extension 12,043 ha, total 94,933 ha))</u></p> <p>2) Consulting Services → <u>Implemented almost as planned (however the service period was extended)</u></p> <p>3) Strengthening of WUAs, Water Management and Asset Management → <u>Implemented almost as planned</u></p>
2. Project Period	March 2008–March 2013 (61 months)	March 2008–June 2016 (100 months)
3. Project Cost Amount Paid in Foreign Currency	185 million yen	260 million yen
Amount Paid in Local Currency	18,015 million yen	13,701 million yen
Total	18,200 million yen	13,961 million yen

(ODA Loan Portion)	(8,967 million yen)	(8,591 million yen)
Exchange Rate	1 USD = 122 yen, 1 rupiah = 0.0133 yen (As of September 2007)	1 USD = 96.79 yen, 1 rupiah = 0.00894 yen Average of the International Financial Statistics (IFS) of the IMF (Average value during the project implementation period)
4. Final Disbursement	July 2016	