Ex-Post Project Evaluation 2017 : Package III-2

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Republic of Kiribati

FY2017 Ex-Post Evaluation of Japanese Grant Aid Project

"The Project for Expansion of Betio Port"

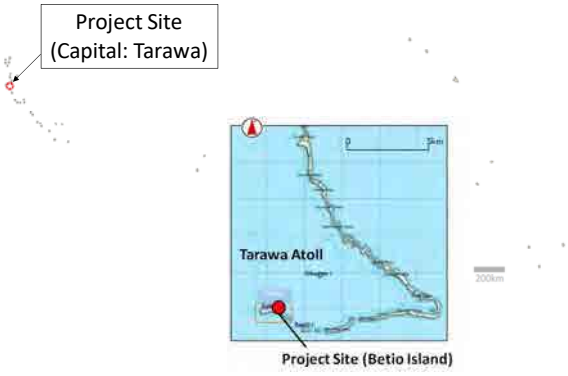
External Evaluator: Keisuke Nishikawa, Japan Economic Research Institute Inc.

0. Summary

In this project, a wharf where container ships can berth was developed and stevedoring equipment was procured to enhance port functions of Betio Port, which was the most important port in Kiribati. The relevance of this project is high as it was consistent with the development plans and development needs of Kiribati at the time of both planning and ex-post evaluation in terms of developing a major economic infrastructural facility to realize stable supplies of goods through safe stevedoring operations and as it was also consistent with Japan's ODA policy at the time of planning to support the development of economic and transport infrastructure. As for implementation of the project, the project outputs were mostly as planned, and the project cost and period were also within the plan. Therefore, the efficiency is high. With regard to project effects, all quantitative indicators related to improvements of stevedoring efficiency were achieved and qualitative effects that were to ensure safety in stevedoring operations and shipping navigation were also generated. While the information on the reduction of transportation costs and prices through implementing this project was not sufficiently captured, some impacts such as the generation of a more competitive environment and a stable supply of goods were observed. Therefore, the effectiveness and impact of this project are high. Regarding operation and maintenance, while the financial aspects were largely sound, there were issues seen in terms of institutional and technical aspects as well as operation and maintenance conditions. Therefore, the sustainability can be judged to be fair as a whole.

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

1. Project Description



Project Location

Wharf and Access Trestle Developed in This Project

1.1 Background

Betio Port is the only full-scale international port in Kiribati handling foreign trade goods, and has been playing an important role as a hub for domestic sea transport connecting scattered islands. At the port, a wharf, container yard and related facilities and equipment were developed in 2000 through Japan's grant aid project. These port facilities are being utilized as a logistics base for internationally and domestically traded goods and as a wharf and a processing factory for seafood unloaded from fishing vessels. However, due to further advancement of containerization of international goods, 90% or more of the goods handled at Betio Port had been in containers at the time of planning and the sizes of container ships in the Pacific region had become larger. Those regular international container ships could not berth at the wharf developed in the grant aid in 2000 because of the shortage of the depth of water and the length of the wharf, forcing container handling to be done offshore through linking with barges. Offshore container handling was an issue in terms of safety and efficiency and a factor pushing up transportation costs. Moreover, among ports including nearby countries, it was one of the few international ports where container ships could not berth at the wharf, and it was an urgent matter to develop a wharf that would enable berthing operations by container ships.

1.2 Project Outline

The objective of this project was to enhance port functions by developing facilities and equipment at Betio Port, thereby contributing to the reduction of transportation costs.

Grant Limit / Actual Grant Amount	(Detailed design) 52 million yen / 51 million yen (Construction) 3,052 million yen / 3,026 million yen
Exchange of Notes Date / Grant Agreement Date	(Detailed design) November, 2010 / November, 2010 (Construction) June, 2011 / June, 2011
Executing Agency	Kiribati Ports Authority (KPA)
Project Completion	May, 2014
Main Contractors	The Consortium of Dai Nippon Construction and Toa Corporation
Main Consultant	Ecoh Corporation
Basic Design	June 2008 – January 2009 (Implementation Review Study: June 2009 – September 2010)
Related Projects	[Grant Aid] The Project for Improvement of Betio Port (1997)

	The Project for Rehabilitation of the Betio Port (2005)

2. Outline of the Evaluation Study

2.1 External Evaluator

Keisuke Nishikawa, Japan Economic Research Institute Inc.

2.2 Duration of Evaluation Study

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

Duration of the Study: October, 2017 – December, 2018

Duration of the Field Study: December 4 – 16, 2017, and May 14 – 23, 2018

3. Results of the Evaluation (Overall Rating: A[1])

3.1 Relevance (Rating: ③[2])

3.1.1 Consistency with the Development Plan of Kiribati

Kiribati's development plan at the time of planning of this project was the *Eighth Kiribati Development Plan* (2008-2011), in which 'Economic Growth and Poverty Reduction' and 'Infrastructure Development' were the two areas set among the six major development strategies. In these two areas, an importance was placed on the development and improvement of economic infrastructure including ports and on the development of efficient and effective maritime transport. In addition, the *Mid to Long-term Corporate Plan* (2004-2007) of the Kiribati Ports Authority (hereinafter referred to as 'KPA') in charge of operating international port facilities in Kiribati, had the target of improving cargo handling efficiency at Betio Port by 50% and set out a strategy to keep expanding the port area and paving the container yard.

In the *Tenth Kiribati Development Plan* (2016-2019), which was the development plan at the time of ex-post evaluation, 'Economic Growth and Poverty Reduction' and 'Infrastructure Development' were the two areas set among the six major development strategies, as those in the *Eighth Kiribati Development Plan*, emphasizing the formulation and execution of a comprehensive maintenance plan of major infrastructure facilities. As a sector-level plan, the *Statement of Intent*, positioned as the strategic plan of the KPA, continued to set efficient cargo handling through provision of safe and reliable port facilities as a key item.

Therefore, this project can be said to be consistent with these development plans as it was

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

[2] ③: High, ②: Fair, ①: Low

a project to develop port facilities at Betio Port, which was the most important port in Kiribati, to realize efficient maritime transport thereby contributing to economic growth of Kiribati.

3.1.2 Consistency with the Development Needs of Kiribati

At the time of planning of this project, deadweight tonnages of container ships providing regular services in the Pacific were between 10,000 and 20,000 tons. Among the ports called at by those container ships, Betio Port was one of the few international ports they could not be berthed directly due to the shortage of the depth of water and the length of the wharf, forcing container handling to be done offshore[3]. Consequently, container handling operations had been an issue in terms of safety and efficiency, and berthing hours of container ships had been longer, becoming a factor in pushing up transportation costs.

This project was implemented under such development needs. Betio Port was a port catering for the majority of exports and imports of Kiribati at the time of both planning and ex-post evaluation, whose concrete values of exports and imports are shown in Table 1.

Table 1: Export/Import Values and Proportion of Betio Port

	Export			Import		
	Export value (thousand Australian dollars)		Proportion of Betio Port	Import value (thousand Australian dollars)		Proportion of Betio Port
	Whole of Kiribati	Betio Port		Whole of Kiribati	Betio Port	
2012	6,783	5,518	81.4%	104,825	103,439	98.7%
2013	6,919	4,727	68.3%	111,088	107,000	96.3%
2014	11,254	8,985	79.8%	118,990	117,825	99.0%
2015	13,299	11,531	86.7%	137,462	136,293	99.1%
2016	14,123	12,047	85.3%	147,401	144,004	97.7%

Source: Document provided by Kiribati National Statistics Office

Kiribati has a trade structure in which import values are more than 10 times greater than export values, and Betio Port particularly functions as a port catering for 96% - 99% of the imports of all Kiribati and occupies 95% - 98% of all export values[4]. The main import commodities (2016) were food (32.2%), machinery/transport equipment (20.1%), manufactured goods (10.5%) and beverages & tobacco (10.1%), and the main export commodities were coconut oil (36.0%) and fish (29.5%).

[3] A cargo handling method in which cargoes are unloaded onto a barge from a ship anchored offshore; then the barge is carried to the wharf

[4] Kiribati has one more international port in Kiritimati Island. The rest of export/import values are those by exporting and importing at Kiritimati Island.

At Betio Port, while it was necessary to conduct offshore handling operations before implementing this project, handling operations have been realized with cargo ships berthed at the wharf after project implementation, which shows that the port has a very essential position as the largest port of the country in realizing exports and imports of commodities in a safe and efficient manner. The executing agency commented at the time of ex-post evaluation that Betio Port as a window to supply various commodities especially in the country had a very significant role and that efficient cargo handling led to a stable supply of goods.

This project can be said to have been one that solved cargo handling problems at the time of planning and performed the function as the most important port, underpinning the country's exports and imports also at the time of ex-post evaluation. Therefore, this project was consistent with the development needs of Kiribati at the time of both planning and ex-post evaluation.

3.1.3 Consistency with Japan's ODA Policy

At the time of planning of this project, Japan had set out 'Infrastructure development' as one of the key areas of assistance for Kiribati, in which a focus was placed on the assistance for economic and social infrastructure development such as electrical power, roads, ports, fishing ports, and so on, and the human resource development conducive to improvements in maintenance capacities of those facilities. Moreover, in the Annex 2 *Action Plan* of the *Islanders' Hokkaido Declaration* adopted at the Fifth Pacific Islands Leaders Meeting[5] held in 2009, Japan expressed its intention to support the development of transport infrastructure in each Pacific island country[6].

Therefore, this project, which supported economic and transport infrastructure such as a port, can be said to be consistent with the direction of Japan's assistance for the Pacific and Kiribati at the time of planning.

In light of the above, the implementation of this project was consistent with the development and sector plans as well as the development needs of Kiribati at the time of both planning and ex-post evaluation, and with Japan's ODA policy for Kiribati at the time of planning. Therefore, the relevance of this project is judged to be high.

[5] A summit-level meeting held every three years since 1997 to establish closer cooperative relationships and to enhance ties between Japan and Pacific island nations through exchanging opinions at the leadership level regarding various issues that both the Pacific island countries and the region have been facing

[6] In the *Action Plan*, in the *(2) Development of infrastructure* of *1. Economic Growth*, providing financial cooperation for transport infrastructure and support the improvement in infrastructure maintenance capacities through technical cooperation was proposed.

3.2 Efficiency (Rating:③)

3.2.1 Project Outputs

In this project, a wharf which large vessels can berth and an access trestle were developed, navigation aids were installed and stevedoring equipment was procured at Betio Port.

Details of the planned and actual outputs are shown in Table 2.

Table 2: Planned and Actual Outputs of This Project

Components	Plan	Actual	Remarks
Wharf	200m	200m	Width: 18m, steel pipe pile structure
Access trestle	261m	262m	Width: 6.5m, steel pipe pile structure
Port handling equipment			
Forklift	1 unit	1 unit	30.5 tons
Tractor & Trailer	3 units	3 units	For 20 feet container use: 2 units For 20 – 40 feet container multi-use: 1 unit
Navigation aids			
Buoy	11 units	11 units	Channel entrance and access channel: 8 units Anchoring area: 1 unit, Ship wreck area: 2 units
Beacon	2 units	2 units	Wharf: 2 units

Source: Implementation Review Study Report, document provided by JICA

Wharf

Forklift in handling operations

Additionally, an agreement between the two countries had been made to carry out the following items as the ones to be borne by Kiribati.

- Obtaining of an environmental license
- Lending of the temporary yard
- Exemption of port handling charges
- Grooming of the project site (as necessary)
- Removal of unexploded bombs (as necessary)
- Exemption of taxes and duties
- Payment of banking commission fees

- Issuance of visas to those concerned with the project
- Installation of pipelines
- Free lending of a barge and a tugboat owned by the KPA

Items borne by Japan were executed mostly as planned, as shown in Table 2. It was confirmed at the time of ex-post evaluation that the items borne by Kiribati except for the installation of the pipelines were also executed[7]. Moreover, although there was wreckage near the vessel rotating area, it was removed (not included as a component of the project) by the Kiribati side in 2015.

As for the installation of the pipelines, a project to install more tanks in the oil tank yard located next to the KPA premises was carried out with the assistance of Taiwan, which was completed and commissioned in mid-2017. Based on the plan of Kiribati Oil Company Ltd. to conduct designing for the installation of the pipelines after these tanks came into operation, a designing work to switch the pipelines from the old wharf (fishery wharf) to the new wharf was underway at the time of ex-post evaluation. If it was to progress smoothly, the pipe installation work was expected to commence by the end of 2018.

In this project, spaces for the pipelines would only be secured on the access trestle and the wharf, and the actual installation was planned to be done by the Kiribati Oil Company Ltd. and some other entities, meaning that the pipelines would not be installed during the period of this project, according to the agreement between the two countries at the time of planning. Also, while there was a delay in the installation of the pipelines, unloading of oil to the old wharf was handled without a hitch as in the past, and thus not causing any significant effects on economic or social activities even without the pipelines installed on the new wharf[8]. Therefore, non-installation of the pipelines does not have a negative impact on the generation of project effects at the time of ex-post evaluation. As the installation of the pipelines was affected by the progress of a different project and was seen as a component outside the scope of this project, it was judged that the actual output had not decreased compared to the planned output.

The KPA did not have a tugboat at the time of both planning and ex-post evaluation. While the purchase of a tugboat was one of the priorities of the KPA, it was commented that its priority level was not necessarily high compared to other items under budget constraints. As the port is inside the lagoon, waves are relatively gentle. However, considering further safety of vessels, it is thought desirable to procure a tugboat as the international port.

[7] As the KPA does not have a tugboat, only the barge was provided for free of charge.
[8] However, the facility is dilapidated and it is necessary to install pipelines on the new wharf in the near future to carry out unloading operations from larger oil tankers.

3.2.2 Project Inputs

3.2.2.1 Project Cost

This project was planned at a total cost of 3,125 million yen composed of Japan's project cost of 3,104 million yen (52 million yen for the detailed design + 3,052 million yen for the main works) and Kiribati's project cost of 21 million yen.

The actual project cost borne by Japan was 3,077 million yen, as shown in Table 3, while the amount of input by Kiribati was unknown.

Table 3: Breakdown of Actual Project Cost by Japan

(Unit: million yen)

Breakdown	Project cost
Detailed design	51
Construction	2,792
Direct construction	2,039
Other construction	753
Equipment	120
Design and supervision	114
Total	3,077

Source: Information provided by JICA

As the cost borne by Kiribati could not be captured, only that by Japan was compared. The actual cost was 99% of the plan, showing that it was within the plan.

3.2.2.2 Project Period

The planned project period[9] of this project was 45 months, including the detailed design and tender periods. The actual project period was 42 months from December 2010 till May 2014. All the construction and equipment procurement were completed within the planned period, showing that the actual period[10] was within the plan (93% of the plan).

The outputs of this project were largely as planned and the project costs and periods were both within the plan. Therefore, the efficiency is high.

[9] As the ex-ante project evaluation summary did not have a specific commencement date, the work schedule indicated in the implementation review survey report was adopted. However, in the work schedule, the Exchange of Notes date and the Grant Agreement date were not included as the planned period of this project. The commencement of the project period was considered to have started from the detailed design phase (contract signing date for consultants). Therefore, the start of the detailed design phase was regarded as the commencement of the project in this ex-post evaluation study for the planned and the actual periods.

[10] Non-installation of pipelines is not regarded as a delay in the project period.

3.3 Effectiveness and Impacts[11] (Rating:③)

3.3.1 Effectiveness

3.3.1.1 Quantitative Effects (Operation and Effect Indicators)

At the time of planning of this project, the distance required for transporting containers in handling operations was set as an operation indicator, and a length of time for a vessel to stay at port and the number of vehicles unloaded and containers handled per hour were set as effect indicators. Table 4 shows the actual values of these indicators captured in the ex-post evaluation.

Table 4: Operation and Effect Indicators of This Project

	Baseline	Target	Actual
	2010	2017	2017
		3 Years After Completion	3 Years After Completion
Distance required for transporting containers from vessels Note 1	1,500m at sea + 200m on land	600m on land	Within 600m on land
Length of time for a vessel to stay at port Note2	109.8 hours	39.9 hours	Maximum of 36 hours
Number of vehicles unloaded from a vessel per hour	5.1	30	30
Number of containers handled per hour	5.7 (loaded) 8.0 (empty)	18.5 (loaded and empty)	20 (loaded and empty)

Source: Ex-ante Evaluation Summary Sheet, Implementation Review Survey Report, document provided by the executing agency

Note 1: Distance from container vessels to the container yard

Note 2: Length of time staying at the port to handle 300 loaded containers and 300 empty containers

In addition to the results in Table 4, the following items of a total of six vessels which called at Betio Port between late January and the beginning of March 2018 were measured in the ex-post evaluation to capture the latest situations of the number of containers handled per hour: (1) Berthing time, (2) Starting and ending time of container handling, (3) Number of containers handled and (4) Departure time of the vessels. As a result, an average of 18.7 containers was handled per hour, ranging from 10.0 to 23.3 containers. It was heard that when the vessel with 10.0 containers efficiency berthed, more time was required as the loading work for containers to be transported from Betio Port to Kiritimati Island in Kiribati was added to the normal container handling operations.

Therefore, the reduction of container transporting distance, an operation indicator, was

[11] Sub-rating for Effectiveness is to be put with consideration of Impact.

achieved through constructing the wharf and the access trestle. Regarding the effect indicators, it was confirmed that all of them achieved their target values. The original measurement under the ex-post evaluation revealed that the target figure for the number of containers handled per hour has been achieved. As a whole, it can be said that handling efficiency improved significantly.

The number of vessels calling at port in 2006 (container ships with deadweight tonnage of 10,000 tons or more occupying the wharf of Betio Port), before executing this project, was 23, which increased substantially after the completion of this project, reaching 62 in 2015, 60 in 2016 and 80 in 2017. The main factor for this was the number of shipping companies operating vessels calling at Betio Port, which was two before project implementation but increased to four at the time of ex-post evaluation.

3.3.1.2 Qualitative Effects (Other Effects)

At the time of planning of this project, the following qualitative effects were expected after implementing the project:

(1) The elimination of offshore cargo handling will improve operational safety.
(2) Impacts of bad weather on berthing operations will be reduced, which will increase opportunities for cargo handling.
(3) The safety of vessels going through access channels will improve.
(4) Arrivals and departures of vessels during the nighttime will become possible.

According to the executing agency, as a result of developing a new wharf through this project,

(1) As the depth of the sea at the wharf became deeper compared to that before the project, berthing of larger vessels such as container ships became possible. Consequently, offshore cargo handling was completely eliminated, enabling safe handling operations.
(2) Export and import values of cargoes through Betio Port have been consistently increasing (Table 1) and handling operations increased. Hindrance of handling operations due to bad weather was reduced substantially.
(3) Navigating safety of vessels improved by installing buoys and beacons.
(4) Arrivals and departures of all vessels during the nighttime became possible by installing buoys and beacons.

It was confirmed through the site survey, trade statistics and interviews with shipping companies that items (1) – (4) were actually realized. In the interviews with shipping agents (two agents) and a shipping company (1 company) using Betio Port, safer handling operations through berthing of container ships and the realization of port arrivals and departures regardless of the time slot were largely highly valued.

Therefore, it can be judged that the qualitative objectives of this project have been achieved as a whole.

3.3.2 Impacts

3.3.2.1 Intended Impacts

Through the execution of this project, it was expected as quantitative impacts that transportation costs composed of the prices of imported goods distributed in the country would be reduced through more efficient cargo handling which would lead to price reductions of imported goods. As for qualitative impacts, it was expected that (1) as an impact on shipping companies, the number of days required for one voyage can be shortened, improving maritime transportation services such as increased vessel assignment frequencies, and (2) a stable supply of goods would contribute to the improvement in people's lives.

In the interviews with shipping agents and major retailers (five companies in total) [12] in the ex-post evaluation, it was heard that whether prices had dropped through more efficient cargo handling was not clear, but that increases in imported goods and a stable supply of goods were realized with more vessels calling at port. While the changes in retail price index in Table 5 do not clearly show the effects of price increase control through this project, no price soaring has occurred, implying that a stable supply of goods have underpinned it. In the interview survey, there was an opinion heard that there was more competition among shops because of increased goods, inferring that a certain level of consumer benefits was generated.

Table 5: Rate of Changes of Retail Price Index

	2012	2013	2014	2015	2016
Rate of changes of retail price index	-3.0%	-1.5%	2.1%	0.6%	1.9%

Source: Document provided by Kiribati National Statistics Office

Regarding qualitative impacts, according to the shipping company, the number of days required for calling at port by the vessel was three before project implementation, but it was shortened to one to two days after project implementation. Moreover, some opinions were heard from the shipping company and retail businesses that goods are supplied more stably, suggesting that this project contributed to the stable supply of goods and the improvement in the living environment of residents.

[12] There were two agents for the ships calling at Betio Port, both of whom were interviewed. Also, major retailers were the three major companies importing goods through Betio Port.

3.3.2.2 Other Positive and Negative Impacts

(1) Impacts on the Natural Environment

At the time of planning of this project, it had been judged that undesired impacts on the environment through project implementation would not be serious and there would be no problem because this project was not regarded as a large-scale project in the port sector in light of JICA's Guidelines for Environmental and Social Considerations (2004). Preparation of the environmental impact assessment report of this project was not required by the domestic law of Kiribati, and development permission of this project was issued in October 2008 by the Ministry of Environment, Lands and Agricultural Development. When executing the project, it was planned that, to avoid negative impacts on the natural environment, (1) as a measure against marine pollution, a pile-driving method which would not scatter oil would be adopted to avoid impacts on marine species caused by oil spillage during construction, and (2) for oil spillage caused by other factors, marine pollution due to unforeseen circumstances would be minimized by always having an oil fence available and collect it instantaneously with an absorption mat. Monitoring activities of water quality and air quality were to be conducted by the Ministry of Environment, Lands and Agricultural Development.

In the ex-post evaluation, the actual performance of these items was checked with the executing agency and the project consultant, revealing that there were neither activities that generated muddiness such as dredging and so on nor oil spillage cases that would require oil fences since the barge was not used and the construction work was done from the land. Also, no circumstances were created that would pollute the sea during or after project implementation.

Construction wastes were disposed of at a landfill of the town council in Betio where this project was implemented, and no muddy water from the concrete plant was discharged directly into the sea. It was heard that the piling work for the construction of the wharf and the access trestle was done by adopting a method called a vibro-hammer method to minimize noise.

It was confirmed that no impacts on the natural environment were caused either during or after project implementation and the Environment and Conservation Division of the Ministry of Environment, Lands and Agricultural Development commented that no issues were found as there were no negative environmental impacts in particular. In fact, there were no complaints from fishermen or residents, showing that there were no problems as a whole.

(2) Resettlement and Land Acquisition

Since this project was an expansion of the existing port facilities toward the sea, it was considered that no new land acquisition or resettlement of residents would occur. Checked at the time of ex-post evaluation, this project was executed as planned and neither new land acquisition nor resident resettlement occurred. Therefore, it can be concluded that there were no problems.

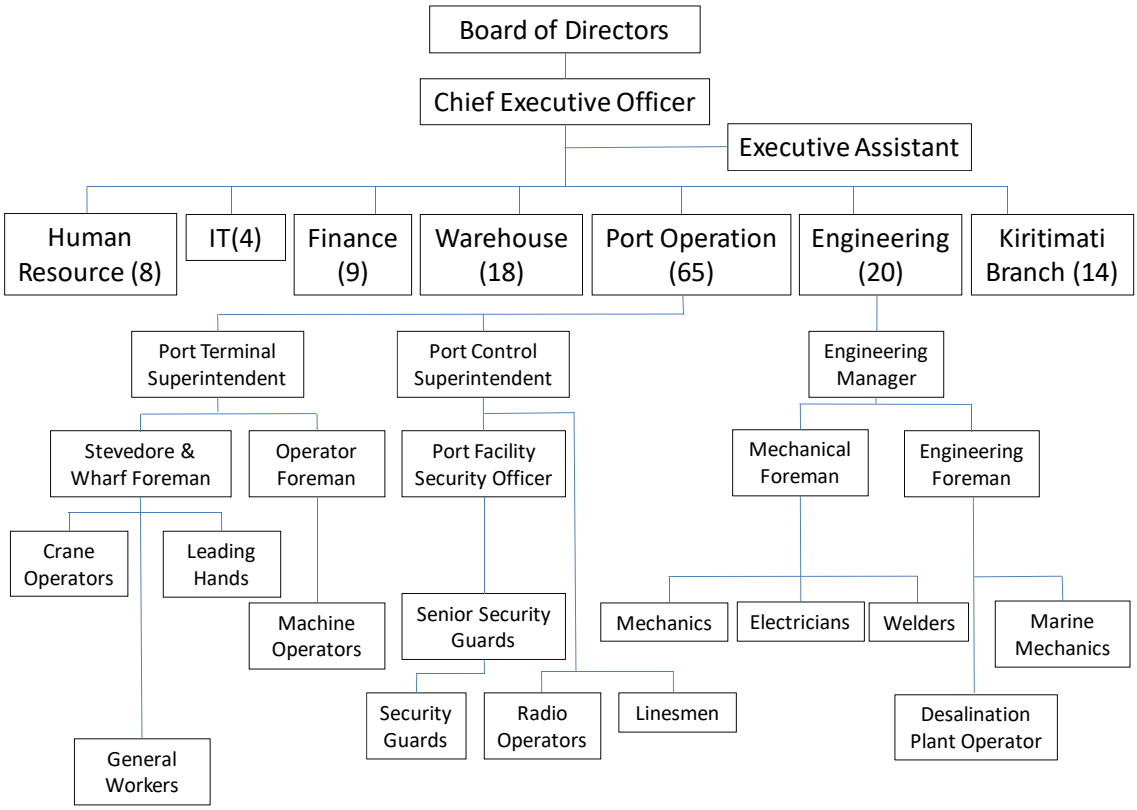
All the operation and effect indicators expected in this project were achieved and it can be said that cargo handling efficiency improved substantially. Moreover, qualitative effects were also sufficiently generated such as securing the safety of handling operations and navigating routes of vessels. While the reduction of transportation costs and price levels through implementing this project could not be sufficiently indicated in a quantitative manner, certain impacts were observed such as the generation of a more competitive environment and a smooth supply of goods. Additionally, there were neither negative impacts on the natural environment nor resident resettlement nor land acquisition cases.

In light of the above, the generation of project effects was seen largely as planned through project implementation. Therefore, the effectiveness and impacts are high.

3.4 Sustainability (Rating: ②)

3.4.1 Institutional / Organizational Aspect of Operation and Maintenance

The executing agency of this project is the KPA, consisting of seven departments; human resources, finance, IT, warehouse, port operation, engineering and the Kiritimati branch under the chief executive officer. The operation and maintenance of the facilities and equipment developed in this project are under the charge of the port operation and engineering departments. As there is no more need to use the barge as a result of this project, the number of staff members has been gradually reduced, with the total number of staff members at 156 in 2017, eight members fewer than 164 in 2016. In 2018, the number of staff members was planned to be further reduced by not filling the posts of retirees, reaching 140 by the end of the year. Judgment that the KPA had had an excessive number of staff members is the reason behind it after the completion of this project, and it was considered from the viewpoint of efficient management that the reduction in staff numbers would not have negative impacts on operation and maintenance.



Source: Information provided by the executing agency

Figure 1: Organization Chart of the KPA (simplified version)

With regard to qualifications held by the staff members, each department had from one to several members with qualifications, including those in mechanical and maritime fields, showing that the KPA had a structure that did not have issues with performing fundamental items. However, a civil engineer necessary for the maintenance of the wharf has not been secured, which has hindered the judgment of the structural durability as well as sufficient formulation and implementation of a maintenance plan for the wharf and the access trestle. In this sense, there seems to have been some issues.

3.4.2 Technical Aspect of Operation and Maintenance

According to the executing agency, out of the facilities and equipment developed in this project, (1) capacities to formulate a maintenance plan of the wharf structure were lacking, (2) technical skills to maintain the upper surface was not sufficient, and (3) there were some issues as to the skills needed for repairing heavy equipment for handling operations. In fact, diagnosis of the structural durability and so on had been outsourced, and it was thought that the technical skills for continuously diagnosing internally were lacking[13]. Therefore, while

[13] At the time of planning of this project, the KPA was maintaining the old wharf, which had a reclamation structure

there was a plan to formulate a maintenance manual for facilities such as the wharf, the actual formulation of the manual had not begun.

In contrast, one of the reasons for insufficient repairs of heavy equipment for handling operations was the lack of mechanics' technical skills, however, delays in the budget process and procedures to procure spare parts seemed to be a larger factor.

At the KPA, the *Three-Year Human Resource Development Plan 2017-2019* had been formulated to improve the skills of internal staff members, which specified necessary external training programs including the ones for mechanics and electricians. However, it was not certain if they could be definitely conducted as the budget had not been necessarily secured[14].

Based on the above, while there were certain technical skills to undertake usual operation and maintenance, some insufficient maintenance of wharf and heavy equipment was observed. Therefore, it is considered that there are some issues.

3.4.3 Financial Aspect of Operation and Maintenance

The KPA's financial balance in recent years is shown in Table 6.

Table 6: Operating Balance of the KPA

(Unit: thousand Australian dollars)

	2014	2015	2016	2017
Revenue	8,068	7,690	8,485	8,016
Betio Port	6,856	6,879	7,950	6,973
Kiritimati Port	1,211	812	535	1,043
Expenditure	7,718	7,366	8,068	7,996
Employment-related costs	2,801	2,678	3,269	3,099
Other costs	1,816	1,898	1,798	1,771
Depreciation	3,101	2,789	3,001	3,126
Operating balance	350	324	418	20

Source: Information provided by the executing agency

Cargo handling-related revenues account for a large proportion of the KPA's revenues, in which Betio Port accounts for 85% - 94% of the entire revenue of the KPA. Since 2014, when this project was completed, the operating balances of the KPA have been on a profitable trend. The major factor influencing the lower operating balance in 2017 was a revision of a port tariff table in September 2016, when some of the handling charges were

while the new wharf constructed in this project had a piling structure requiring higher skills for maintenance. In the plan, the new wharf was designed with an expected service life of 50 years without a need for routine maintenance. However, there were cracks on the upper surface of the wharf caused by collisions of calling vessels, requiring regular inspections of the condition of the wharf.

[14] The costs for internal training were planned to be catered for by the KPA's budget.

lowered[15].

The expenditures for repairs and maintenance were 394 thousand Australian dollars (AUD) in 2014, 333 thousand AUD in 2015, 529 thousand AUD in 2016 and 437 thousand AUD in 2017, accounting for 20% - 32% of 'Other costs' of Betio Port, the largest expenditure item. However, it was heard that this level could not be said to be sufficient to possess spare parts with a focus on consumables always in stock and that there were some instances in which the procurement of spare parts sometimes got delayed. Other major items of expenditure were fuel, utility charges, overseas travels and so forth.

Therefore, while the financial condition in relation to operation and maintenance can be judged to be largely sound, there are some issues observed in procuring spare parts. Hence, it is desirable to raise the level of surpluses, increase the budget for maintenance, and improve inventory management.

3.4.4 Status of Operation and Maintenance

At the time of planning of this project, the KPA was judged to have been properly managing the wharf and the container yard of that time. However, recommendations by the project consultants were made in the defect inspection conducted one year after the completion of port facilities developed in this project that stated 'as berthing and handling operations are executed even during severe weather conditions, it is necessary to formulate a port usage standards, understand the wharf design and berthing conditions, and continue education for the improvement of safety awareness'. Some improvements were seen that berthing operations during stormy weathers with wind velocities over 10m/second were discontinued after the defect inspection and a usage standard limiting the container weight to 25 tons or less was established. Nevertheless, the KPA has not installed any equipment (such as a wind gauge and a wave gauge) on the wharf to measure wind velocity and wave conditions, and the all meteorological data are captured from the information provided by the Kiribati Meteorological Service.

The facilities and equipment developed in this project were all being utilized. Their maintenance conditions, checked in the ex-post evaluation, were mainly as follows.

While the wharf and the access trestle were being used without any problems, a number of damaged spots on the concrete pavement of the upper surface of the wharf (connecting points) were identified. In addition to a structural diagnosis independently conducted by the KPA in 2017, JICA executed a site survey in 2018 as Follow-up Cooperation of this project, which revealed that there were no damages to the structure of the wharf itself and the

[15] As the costs could be saved compared to the period of offshore handling, for example, the unloading fee of FCL (full container load) converted to a 40-foot container (FEU), which used to be 600 AUD, was reduced to 300 AUD.

damages could be repaired through thorough maintenance of the upper concrete pavement[16]. Also, regarding the structures on the upper surface of the wharf, there were damages to lighting poles and a beacon light guard wall due to collisions during the handling operations in the first year of operation, which left them still slightly tilted at the time of ex-post evaluation. In addition, though it was confirmed that major damages were repaired accordingly, damages which had not necessarily been appropriately repaired were occasionally seen. According to the executing agency, no collisions with port facilities have occurred after the first year of operation.

Damages to the Upper Surface of the Wharf

Container Yard (outside the scope of this project)

While it was confirmed that a simple maintenance plan had been formulated and records were taken, it was not shared within the entire organization. In addition, as described above, there were some occasions where the materials and spare parts necessary for maintenance could not be procured promptly because of delays in ordering procedures and the budget shortage. At the time of ex-post evaluation, the KPA had just started establishing an inventory management system, and it was seen that frequently-used materials and spare parts were gradually purchased and equipped in the warehouse.

The weight limit of the wharf during handling operations is 30 tons per container, but it has been restricted to 25 tons since September 2016 as the pavement of the container yard, outside of the scope of this project, is deteriorated. This means that the maximum weight of the containers unloaded at Betio Port has been reduced by 17%, and an immediate redevelopment of the container yard has been requested by port users[17].

[16] At the time of planning, it was deemed necessary to have cooperation from the Ministry of Public Works and Utility. However, repairs of the wharf were all conducted by the KPA and no particular cooperation was observed.
[17] The KPA has a plan to develop the container yard in 2018 and 2019, and the necessary budgetary measures have been taken. At the time of ex-post evaluation, the designing stage was completed.

Based on the above, it can be judged that there were some issues in terms of operation and maintenance conditions.

In light of the above, while the financial aspect seemed to be largely sound, some issues were observed in each of the institutional and technical aspects and the operation and maintenance conditions, indicating that there were some issues as a whole. Therefore, the sustainability of the project effects generated in this project is fair.

4. Conclusion, Recommendations and Lessons Learned

4.1 Conclusion

In this project, a wharf where container ships can berth was developed and stevedoring equipment was procured to enhance port functions of Betio Port, which was the most important port in Kiribati. The relevance of this project is high as it was consistent with the development plans and development needs of Kiribati at the time of both planning and ex-post evaluation in terms of developing a major economic infrastructural facility to realize stable supplies of goods through safe stevedoring operations and as it was also consistent with Japan's ODA policy at the time of planning to support the development of economic and transport infrastructure. As for implementation of the project, the project outputs were mostly as planned, and the project cost and period were also within the plan. Therefore, the efficiency is high. With regard to project effects, all quantitative indicators related to improvements of stevedoring efficiency were achieved and qualitative effects that were to ensure safety in stevedoring operations and shipping navigation were also generated. While the information on the reduction of transportation costs and prices through implementing this project was not sufficiently captured, some impacts such as the generation of a more competitive environment and a stable supply of goods were observed. Therefore, the effectiveness and impact of this project are high. Regarding operation and maintenance, while the financial aspects were largely sound, there were issues seen in terms of institutional and technical aspects as well as operation and maintenance conditions. Therefore, the sustainability can be judged to be fair as a whole.

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

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

In the ex-post evaluation, it was confirmed that the wharf, developed through this project, was damaged as berthing operations were made under adverse weather conditions and as the way the handling equipment was handled was not appropriate soon after the facilities of this project were put into use. Therefore, it is important that the executing agency install the

necessary equipment such as wind and wave gauges and regularly conduct training sessions targeting the workers operating the handling equipment so that berthing and unberthing operations of vessels can be conducted safely and damages to vessels or the wharf can be avoided. Moreover, it is thought to be necessary to completely repair the damages to the wharf as soon as possible by securing a sufficient budget through JICA's Follow-up Cooperation and to promptly secure a sufficient budget for repairing and developing the container yard, which has become the cause of container weight restrictions, though the executing agency has already embarked on it.

4.2.2 Recommendations to JICA

None

4.3 Lessons Learned

Strengthening of instructions to ensure appropriate operation and maintenance of facilities and equipment

One of the causes of damages to the wharf developed through this project was the inappropriate usage of the handling equipment by workers. The workers had been engaged in offshore handling through the use of a barge prior to the completion of this project. In this project, as the wharf was developed to conduct all container handling operations on land at Betio Port, it is considered that strengthening operation instructions in conjunction with the provision of handling equipment would have been effective to avoid damages to the wharf so that the wharf would be operated adequately.

In the future, when a wharf is to be developed at a port where offshore handling operations are conducted, it is necessary to incorporate a soft-component (technical assistance) and provide operation instructions especially to handling operators as necessary so that the facilities and equipment can be utilized in good condition in the long run.

(End)

Republic of Palau

FY2017 Ex-Post Evaluation of Japanese Grant Aid Project

"The Project for Enhancing Power Generation Capacity in the Urban Area in the Republic of Palau"

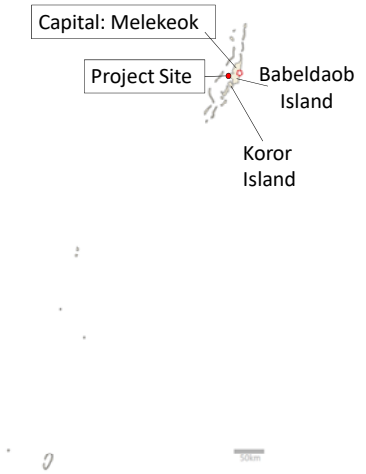
External Evaluator: Keisuke Nishikawa, Japan Economic Research Institute Inc.

0. Summary

In this project, diesel-operated generation facilities and equipment were developed to alleviate power shortages in the urban areas of Palau. The relevance of this project is high as it was both consistent with the development plan and development needs of Palau at the time of both planning and ex-post evaluation and was also consistent with Japan's ODA policy at the time of planning. As for implementation of the project, the project outputs were largely as planned, and the project costs and periods were within the plan. Therefore, the efficiency is high. With regard to project effects, reserve power supply capacities were sufficiently secured, and the occurrences of power supply restrictions caused by power generation equipment were eliminated, leading to stable power supply in the urban areas of Palau. It was also heard that the reduction of business costs and the expansion of businesses were realized because of stable power supply, confirming that economic activities, including tourism, had been underpinned. Furthermore, there were no issues in terms of negative impacts on the natural environment as well as resettlement and land acquisition. As a whole, the effectiveness and impact of this project are high. Regarding operation and maintenance, there were no major problems in terms of all institutional, technical, financial aspects as well as the operation and maintenance status. Therefore, sustainability is judged to be high.

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

1. Project Description



Project Location

Generator Installed in this Project

1.1 Background

The power demand in Palau recorded an average annual growth rate of 7.3% in the nine-year period from 1997 to 2005 because of the development of tourism as the main industry, population growth of 2% a year, increased power consumption per capita, and so forth. Also, it was estimated in the 'Strategic Action Plan for the Energy Sector', established in October 2009, that power demand would increase at around 5% per annum till 2019. However, while electric power was being supplied by Aimeliik and Malakal Power Plants as the power supply system for Palau's urban areas (Babeldaob Island, where the capital of Melekeok is located, and Koror Island, which is the economic center), power generators could not be stopped because of the shortage of reserve supply capacities, and a stable power supply was difficult because of deterioration and insufficient maintenance of the equipment.

The supply capacity of generation facilities in Palau was 14.4MW at that time and the peak power demand was already in a tight condition at 12.5MW. However, a fire occurred at Aimeliik Power Plant in November 2011, reducing the outputs to 6.6MW temporarily. Because of this fire, the president issued a state of emergency, and planned outages were implemented by alternating blackout areas every four hours in Koror and Babeldaob islands. Subsequently, the planned outages and the state of emergency were lifted by resuming operation of the power generators that had not been in use at the time of the fire and by operating the urgently-procured 2MW diesel generator. However, even by adding another 0.5MW/generator x 4 generators procured by the Japanese government as an emergency grant after the fire, stabilization of the power supply remained an immediate challenge as the existing equipment had deteriorated and a shortage of reserve supply for maintenance had not been eliminated.

1.2 Project Outline

The objective of the project was to alleviate power supply shortages in the urban areas of Palau by providing diesel power generators at Aimeliik Power Plant in Babeldaob Island thereby contributing to economic development, industrial promotion, and improvements of the lives of residents.

Grant Limit/ Actual Grant Amount	1,729 million yen / 1,578 million yen
Exchange of Notes Date / Grant Agreement Date	June, 2012 / June, 2012
Executing Agency	Palau Public Utilities Corporation: PPUC
Project Completion	May, 2014
Main Contractors	(Construction) Toshiba Plant Systems & Services Corporation

	(Equipment) Marubeni Corporation
Main Consultant	Yachiyo Engineering Co., Ltd.
Basic Design	October, 2011 ~ April 2012
Related Projects	[Grant Aid] Babelthuap Electrical Transmission and Distribution Lines Project in the Republic of Palau (1985) The Project for Improvement and Development of Power System (1993) The Project for Upgrading of Electric Power Supply (1996) The Project for Introduction of Clean Energy by Solar Electricity Generation System (2009) Emergency Grant Aid for Power Crisis (2011) [Technical Cooperation for Development Planning] The Project for Study on Upgrading and Maintenance Improvement of National Power Grid (2017-2018) [Other International and Aid Organizations] EU: Installation of Solar Power Generating Equipment with Grid Connection for the Capitol of Palau (2008) Taiwan: Installation of Solar Power Generating Equipment with Grid Connection for Belau National Hospital (2008), Installation of Solar Power Generating Equipment with Grid Connection for Ministry of Education (2010)

2. Outline of the Evaluation Study

2.1 External Evaluator

Keisuke Nishikawa, Japan Economic Research Institute Inc.

2.2 Duration of Evaluation Study

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

Duration of the Study: October, 2017 – December, 2018

Duration of the Field Study: February 12, 2018 – February 24, 2018, and April 27, 2018 – May 4, 2018

3. Results of the Evaluation (Overall Rating: A[1])

3.1 Relevance (Rating: ③[2])

3.1.1 Consistency with the Development Plan of Palau

In Palau, which became independent in 1994, a long-term national development plan called *Palau 2020 National Master Development Plan* (hereinafter referred to as 'PNMDP') was formulated in 1996 and economic development measures were promoted. Successively, the *Medium-term Development Plan* (2009-2014) was formulated, which had a focus on profits for Palau Public Utilities Corporation (hereinafter referred to as 'PPUC') as well as on the capacities of its power generation, transmission and distribution to be sufficiently secured. Also, the *Strategic Action Plan for the Energy Sector*, formulated in 2009, had a target of abandoning PPUC's dilapidated base-load generators and to newly install 5MW/generator x 4 generators. Furthermore, in the *Palau National Energy Policy* (hereinafter referred to as 'PNEP') formulated in 2010, it was indicated that the introduction of renewable energy would be promoted. However, power generation based on fossil fuel remained positioned as the base source.

The above gives the details of national development plans and sector plans at the time of project planning. With regard to the national development plans, the PNMDP remained in effect at the time of ex-post evaluation, setting out (1) 'economic growth leading to income increases through sustainable methods' and (2) 'equal spreading of the benefits of economic growth to each field of the private sector' as its vision to improve the quality of life of Palauan people toward the future. As a sector-level plan, the PNEP has remained in effect, even at the time of ex-post evaluation. In August 2017, a policy goal was set where the power generation ratio through renewable energy sources would be raised to 45% by 2025. At the time of ex-post evaluation, a policy called the *Palau Energy Roadmap* was being drafted with assistance from the International Renewable Energy Agency.

Based on the above, the long-term national development plan has remained unchanged, with the version drafted at the time of planning being in effect also at the time of ex-post evaluation. At the sector level, while the introduction of renewable energy was promoted, fossil fuel-based power generation was positioned as the base-load source, showing the validity of the plan at the time of both planning and ex-post evaluation. Therefore, this project was consistent with the national plan and the energy sector plan of Palau at the time of both planning and ex-post evaluation.

[1] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory
[2] ③: High, ②: Fair, ①: Low

3.1.2 Consistency with the Development Needs of Palau

At the time of project planning, it was projected that the electricity demand would increase at a rate of approximately 5% a year from 2009 to 2019, but it had become difficult to supply electricity stably as the electricity supply capacity had been reduced because of dilapidation and a lack of maintenance of equipment. Palau also suffered a substantial reduction of power outputs temporarily due to the fire at Aimeliik Power Plant that occurred in November, 2011. While generators with a combined 2.0MW capacity (0.5MW/unit x 4 units) were provided through Japan's Emergency Grant Aid immediately after the fire, the supply capacity of the power plant remained at one-fourth operating capacity of the pre-fire period, making the stabilization of the power supply an urgent issue.

By implementing this project, Aimeliik Power Plant generates the amount of electricity in recent years as shown in Table 1. Aimeliik Power Plant only houses and operates two diesel generators, which were procured in this project, and has been an important facility catering for 44% - 51% of the power for the urban areas of Palau since this project was completed.

Table 1: Power Generated for the Urban Area of Palau and at Aimeliik Power Plant

FY	2014/15	2015/16	2016/17
Power generated for the urban area of Palau (MWh)	82,909	85,508	85,829
Power generated at Aimeliik Power Plant (MWh)	42,573	37,749	41,546
Proportion of power generated at Aimeliik Power Plant of the entire amount (%)	51%	44%	48%

Source: Data provided by the executing agency

Note: The Financial Year (FY) is from October to September of the following year

Also, according to the executing agency, it is set out as a policy to raise the share of renewable energy; nevertheless, diesel generation will play a vital role as a base load power source (the proportion of diesel generation in 2017 was 98.67%). While this project secured the generating capacity without supply restrictions caused by generation-related troubles, it is a crucial challenge to develop transmission and distribution networks to stably supply it to various locations.

Therefore, this project can be said to be in line with Palau's development needs in terms of securing the sufficient amount of electricity needed for economic and social activities at the time of both planning and ex-post evaluation.

3.1.3 Consistency with Japan's ODA Policy

Japan's Rolling Plan for Palau placed 'Vitalization of Island Economy' as a focused development challenge at the time of planning of this project, which was positioned in the

'Program for economic and social infrastructure development and maintenance capacity development'. Also, in the Annex 2 *Action Plan* of the *Islanders' Hokkaido Declaration*, adopted at the 5th Pacific Islands Leaders Meeting[3] in 2009, Japan adopted a stance that was to extend support for an increase in the energy supply in each of the Pacific island countries.

Therefore, this project can be said to have been consistent with Japan's ODA directions for the Pacific and Palau on power infrastructure development at the time of planning.

It was confirmed that this project was consistent with the development and sector plans as well as the development needs of Palau at the time of both planning and ex-post evaluation and with Japan's ODA policy at the time of planning.

Therefore, the relevance of this project is high.

3.2 Efficiency (Rating: ③)

3.2.1 Project Outputs

In this project, it was planned at Aimeliik Power Plant, one of the two power plants supplying electricity to Palau's urban areas, to develop two diesel generators and related equipment and construct buildings to house the generating equipment.

Details of the planned outputs are shown in Table 2.

Table 2: Planned Outputs of This Project

Japan Side	Procurement and Installation of Equipment	・ Diesel engine generator (5MW/unit x 2 units) ・ A set of mechanical equipment for generating equipment (fuel supply system, lube oil system, cooling water system, etc.) ・ A set of electrical equipment for generating equipment (control panel, transformer, power board, etc.) ・ 13.8kV high-voltage switchboard ・ A set of maintenance tools, replacement parts, and emergency spare items for power generation
	Construction of Facilities	・ Power house (approximately 1,190m^2) ・ Switchboard house (approximately 90m^2)

[3] A summit-level meeting held every three years since 1997 to establish closer cooperative relationships and to enhance ties between Japan and Pacific island nations through exchanging opinions at the leadership level regarding various issues that both the Pacific island countries and the region have been facing

Palau Side	・ Securing of land for the project and clearing of existing buildings and facilities within the project site ・ Installation of permanent fences and a gate ・ Construction of an access road to the project site ・ Water supply works (leading and connecting works) ・ Drainage works (outside the project site) ・ Securing of land (temporarily used for materials and equipment, and car parking) ・ Provision of disposal site for surplus soil and discharged water from construction works ・ Final connection to the existing equipment (such as the power system)

Source: Preparatory survey report of this project

These components to be borne by both Japan and Palau were implemented mostly as planned. According to the document provided by JICA, there were only three minor changes; it was confirmed that they were not the changes that had negative influences on generating the effects of this project. They included:

- Changing specifications of the floor in the engine room
- Changing specifications of cable installation between the switchboard house and the existing substation
- Changing the pipe connecting with existing fuel tanks.

Panoramic View of the Power House

Control Panel

3.2.2 Project Inputs

3.2.2.1 Project Cost

This project was planned at a total cost of 1,775 million yen composed of Japan's project cost of 1,729 million yen and Palau's project cost of 46 million yen.

The actual project cost borne by Japan was 1,578 million yen, as shown in Table 3, while the amount of input by Palau was unknown.

Table 3: Breakdown of Actual Project Cost by Japan

(Unit: million yen)

Breakdown		Project Cost
Construction		324.5
	Direct construction	282.9
	Other construction	41.6
Equipment		1,171.5
Design and supervision		82.5
Total		1,578.5

Source: Information provided by JICA

As the cost borne by Palau could not be captured, only those by Japan were compared. The actual cost was 91% of the plan, showing that it was within the plan.

3.2.2.2 Project Period

The planned implementation period[4] of this project was 25 months, including the detailed design period. The actual project period was 23 months from July 2012 till May 2014. All the construction and equipment procurement were completed within the planned period, showing that the actual period was within the plan (92% of the plan).

The outputs of this project were implemented largely as planned and minor changes were made based on the necessity for more efficient operation of the power plant. The project costs and periods were also within the plan. Therefore, the efficiency is high.

3.3 Effectiveness and Impacts[5] (Rating: ③)

3.3.1 Effectiveness

3.3.1.1 Quantitative Effects (Operational Effects)

At the time of planning of this project, the reserve supply capacity and the days of restricted power supply were set as an operation indicator and effect indicator respectively. In addition to these indicators, the number of outages and the hours of outages in Palau's urban areas were captured in the ex-post evaluation.

[4] As the ex-ante project evaluation summary did not have a specific commencement date for the planned period, the work schedule indicated in the preparatory survey report was adopted. In the work schedule, the Exchange of Notes date and the Grant Agreement date were not included as the planned period of this project. The commencement of the project period was considered to have started from the detailed design phase (contract signing date for consultants). Therefore, the start of the detailed design phase was regarded as the commencement of the project in this ex-post evaluation study for the planned and the actual periods.

[5] Sub-rating for Effectiveness is to be put with consideration of Impact.

Table 4: Operation and Effect Indicators of This Project

	Baseline	Target	Actual			
	2011	2017	2014	2015	2016	2017
		3 Years After Completion	Completion Year	1 Year After Completion	2 Years After Completion	3 Years After Completion
Reserve Supply Capacity [Note 1] (MW)	0	10.49	18.0	18.0	18.0	17.5
Days of Restricted Power Supply (day/year)	15 [Note 2]	0	0	0	0	0
Number of Outages	-	-	33	50	40	60
Total Hours of Outages (hour)	-	-	22	40	7	25

Source: Data provided by JICA and the executing agency

Note 1: Reserve Supply Capacity = Equipment Capacity – Maximum Output

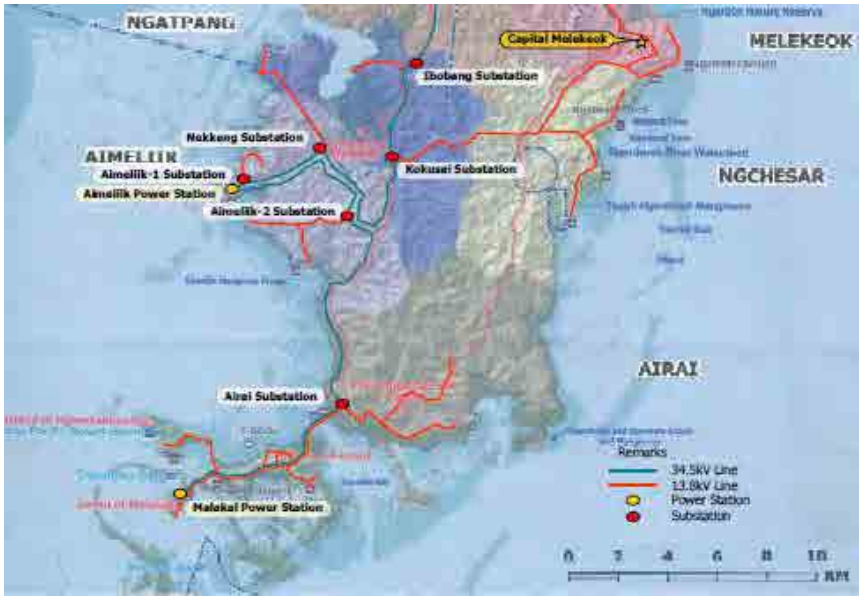
Note 2: Estimate for 2011. The figure is a sum of the days when supplies were restricted because of troubles with generation equipment

While the generating capacity of Aimeliik Power Plant, where this project was implemented, became zero after the occurrence of the fire in 2011, it has become 10MW (5MW/unit x 2 units) after project implementation. The maximum output of Malakal Power Plant, the other power plant, was 20MW at the time of ex-post evaluation, making the combined maximum total output of the power plants supplying power to Palau's urban areas 30MW. As the actual maximum power consumption (peak demand) was approximately 12.5MW, the reserve supply capacity at the time of ex-post evaluation was 17.5MW. The target can be said to have been achieved as it has far exceeded the target of 10.49MW. As for the days of restricted power supply, the target was achieved as no supply restrictions due to a shortage of generating capacity have occurred since this project was implemented.

In contrast, the number of outages occurred 60 times a year (an average of 5 times per month) comprising a total of 25 hours (an average of 25 minutes per outage) in 2017. However, all causes of these outages were due to the vulnerability of transmission and distribution networks to strong winds, contact of trees with power lines, and collision of cars with power poles, causing troubles to transmission and distribution lines. It was confirmed that the outages were not due to any factors caused by insufficient power generation related to this project[6].

In light of the above, quantitative targets are judged to have been achieved as a whole.

[6] JICA has been executing Technical Cooperation for Development Planning: 'The Project for Study on Upgrading and Maintenance Improvement of National Power Grid' in 2017-2018 in Palau, in which a development plan on the renewal of transmission and distribution systems has been formulated and techniques on the operation and maintenance of transmission and distribution lines have been transferred.



Source: Extracted from the Preparatory Survey Report

Figure 1: Transmission and Distribution System in Koror Island and Babeldaob Island (southern half)

3.3.1.2 Qualitative Effects (Other Effects)

At the time of planning of this project, the following qualitative effects were expected after implementing the project:

- Periodic overhauls of generation facilities would become possible, obviating serious accidents;
- By securing reserve capacities of generation facilities, reductions in generation outputs can be supplemented by reserve generators in case of sudden accidents.

Through these effects, it was anticipated that power supply restrictions would be avoided.

According to the executing agency, a sufficient reserve supply capacity has been secured after implementing this project, enabling maintenance activities, including overhauls of power generators by turns. No serious accidents at facilities have occurred and power supply restrictions have been avoided.

Aimeliik and Malakal Power Plants have generators, as shown in Table 5, and two generators at Malakal Power Plant, located closer to Koror Island which is a center of economic activities and where power demand is high, and one generator at Aimeliik Power Plant are regularly operated. When one of the generators at Malakal Power Plant undergoes maintenance, both generators at Aimeliik Power Plant are operated. Malakal Power Plant has six other generators making it possible to sufficiently meet the demand

when the four main ones (two at Aimeliik Power Plant and two at Malakal Power Plant) have sudden failures or accidents, even though the six other generators are not suitable for continuous operation because of low output and dilapidation.

Table 5: Power Generators at Aimeliik Power Plant and Malakal Power Plant

Breakdown	Output (KW)	Remarks
Aimeliik Power Plant		
Mitsubishi No. 6	5,000	Continuous operation (procured through this project)
Mitsubishi No. 7	5,000	Continuous operation (procured through this project)
Malakal Power Plant		
Niigata No.14	5,000	Continuous operation
Niigata No. 15	5,000	Continuous operation
Mitsubishi No.12	2,500	Procured in The Project for Upgrading of Electric Power Supply (1996)
Mitsubishi No.13	2,800	Procured in The Project for Upgrading of Electric Power Supply (1996)
Wartsila	1,200	
CAT#1	1,200	
CAT#2	1,200	
Mitsubishi (small units)	1,800 (450 x 4 units)	Procured with Emergency Grant Aid (2011)
Total	30,700	

Source: Compiled from the document provided by the executing agency

Based on the above, three out of four generators for continuous operation have been operated after implementing this project and it is therefore possible to periodically overhaul one of them by turns. No serious accidents have occurred, and it was confirmed that the generators were stably operated at the time of ex-post evaluation.

While the maximum combined output of Aimeliik and Malakal Power Plants is nominally a total of 30MW, a supply capacity of 20MW is practicable under normal operation. Among the generators shown in Table 5, the generators at Malakal Power Plant except for the 5MW generators have low individual outputs and are only used for emergency purposes, while the old ones are not suitable for continuous operation. Therefore, two generators (Niigata No.14 and No.15) purchased by the PPUC immediately after the fire at Aimeliik Power Plant have been in continuous operation at Malakal Power Plant. With the generators at Aimeliik Power Plant procured through this project, there are four generators in total, each with 5MW generating capacities, and one of them can always be inspected and repaired. By procuring generators with 10MW generating capacities through this project, it can be said that stable power supply has been

realized.

3.3.2 Impacts

3.3.2.1 Intended Impacts

It was expected as an impact that implementing this project would 'contribute to economic development, industrial promotion, and the improvements of the lives of residents through a stable power supply'. As it is a very broad macro-level impact, GDP growth rates were checked and the indicators related to tourism (a key industry of Palau) were grasped.

Table 6: GDP Growth Rates and Tourism-related Indicators

	2012	2013	2014	2015	2016
GDP growth rate	2.6%	-4.5%	6.9%	10.6%	1.6%
GDP growth rate per capita	4.5%	-3.9%	7.0%	9.6%	0.0%
Growth rate of accommodation and food service activities	11.3%	-3.4%	14.7%	25.7%	-9.9%
Number of tourists (persons)	118,928	110,823	125,674	168,767	146,634

Source: *2016 Statistical Yearbook*

The growth rates of Palau's accommodation and food service activities have fluctuated substantially in recent years, affecting the overall GDP growth rates significantly. However, the number of tourists has largely been increasing. With the increase in the number of tourists, the number of hotels in the urban areas of Palau at the time of ex-post evaluation was 79 with 2,028 rooms in total. This project caters much of power supply to those hotels.

In the ex-post evaluation, an interview survey[7] with a total of 12 companies including hotels, shops, a clinic, an airline, a communication company and so on was conducted, in which all the respondents commented that power outages had decreased and the power supply had been stabilized though it was not necessarily at a sufficient level. As to the impacts to their businesses, a number of positive impacts were raised, such as a reduction in cases of having to run backup generators, enabling of installations of ATMs, and an increased number of refrigerating equipment in shops owing to sufficient power supply. On the other hand, there were comments pointing out that communication and refrigerating equipment had been damaged because of voltage fluctuations and power

[7] An interview survey conducted in Koror and Airai states with 12 businesses (owners or managers of their maintenance, 5 males and 7 females) who cooperated in this survey, among which were hotels having 100 rooms or more, a communication company, a clinic, large wholesalers, and shops along the main street.

outages.

Based on the above, this project can be said to be contributing as a whole to economic development and industrial promotion through stable power supply, underpinning economic activities in the urban areas of Palau. Also, it was confirmed in the interviews with businesses that there were impacts leading to business cost reductions and business expansions through stabilization of power supply.

3.3.2.2 Other Positive and Negative Impacts

(1) Impacts on the Natural Environment

At the time of planning of this project, it was judged that undesirable impacts to environment through project implementation would not be serious, and there were no issues in relation to the JICA Guidelines for Environmental and Social Considerations. In fact, an environmental approval, necessary for implementing this project, was issued by the Palau Environmental Quality Protection Board (hereinafter referred to as 'EQPB') during the preparatory survey of this project in February 2012. In addition, it was expected that environmental standards[8] employed for projects in Japan and by World Bank would be met after the completion of this project by taking measures such as appropriate designing of chimneys, installation of shutters to the power house and so forth.

According to the executing agency, EQPB and project consultants, no negative environmental impacts had been observed both during and after the project[9]. With regard to air pollution and noise, while no monitoring activities using measuring equipment were conducted, the EQPB observed them at the site and collected information on whether there were any complaints. The judgment of no negative impacts has been made based on such results. Regarding the quality of water, the water discharged from Aimeliik Power Plant has been collected and tested every month through the monitoring of EQPB's officer in charge; there have been no particular problems pointed out[10].

Moreover, the generators procured through this project have better fuel efficiency compared to the ones installed previously, and a result was obtained from the executing agency showing that the amount of fuel consumption improved from that of the previous generators by an average of approximately 15.5%.

[8] In this project, it was planned to adopt a measure that NOx emission standards in exhaust gas would be O_2: 13%, 950ppm or less, and the noise level of generating facilities would be 55dB or less in the daytime and 45dB or less at nighttime in nearby residential areas.

[9] It was heard that the executing agency and project consultants were always checking whether there were any negative impacts on the natural environment during the project. Upon project completion, it was confirmed through the executing agency and EQPB that there had been no particular issues pointed out.

[10] At Aimeliik Power Plant, the existing oil-water separator was replaced in order to separate the waste oil and water of the generators installed through this project.

Based on the above, it is considered that there are no problems as no negative impacts on environment have occurred through project implementation and there have been no impacts on residents.

(2) Resettlement and Land Acquisition

As this project was implemented within the existing premises of Aimeliik Power Plant, no land acquisition or resettlement cases were expected at the time of planning. It was confirmed in the ex-post evaluation survey that power generating facilities were actually constructed within the premises of the existing power plant, and neither resettlement nor land acquisition occurred because of project implementation. Therefore, it can be said that there were no problems.

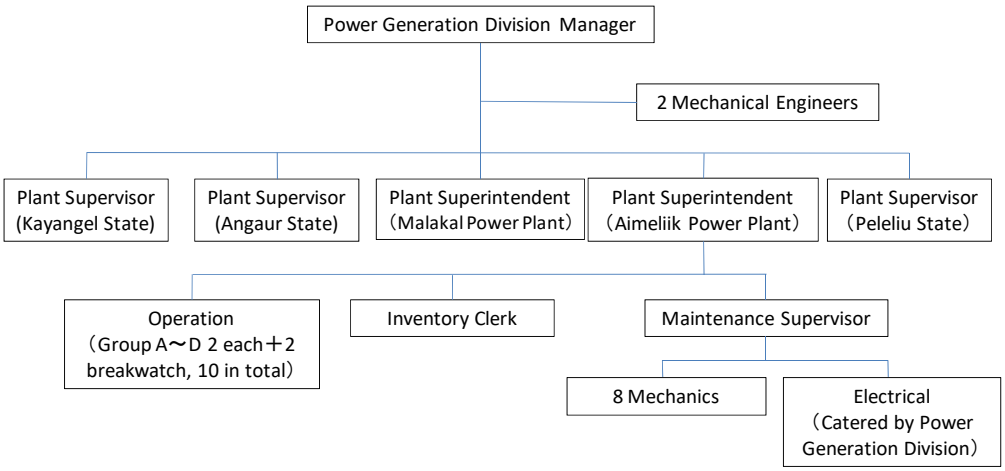
The quantitative indicators expected in this project were both achieved, and sequential overhauling of generators and a stable supply at the time of sudden breakdowns became possible by securing sufficient reserve supply capacities. Also, while it was difficult to indicate quantitatively, it can be said that this project has played a role in underpinning economic activities in the sense that this project has been supplying power stably to the urban areas of Palau. In fact, it was heard from businesses that cost reductions and business expansions became possible. There were no environmental or social problems observed as there were no negative impacts on the natural environment or resettlement / land acquisition cases observed.

In light of the above, it is judged that the effectiveness and impacts of this project are high.

3.4 Sustainability (Rating: ③)

3.4.1 Institutional Aspects of Operation and Maintenance

Including the areas targeted in this project, the power supply in Palau is all catered by the PPUC (staff number: 291). The PPUC formerly served as a corporation to supply electric power only. However, it integrated water supply and sewerage works in June 2013 and became the newly formed PPUC. The PPUC is comprised of eight divisions, in which there are the Power Generation Division and the Transmission and Distribution Division as the divisions specializing in power. Aimeliik Power Plant belongs to the Power Generation Division, where 21 staff members oversee operation and maintenance. Among them, 10 staff members in charge of operation are divided into four groups, undertaking continuous operations of the power plant in three shifts (eight hours each).



Source: Document provided by the executing agency

Figure 2: Organization Chart of Power Generation Division and Aimeliik Power Plant

The Power Generation Division is headed by a manager who is an engineer from the Philippines with long-time experiences in the power sector[11]. While the majority of the mechanical staff members at Aimeliik Power Plant do not have technical academic degrees, the supervisor is an engineer with an academic degree, and it is considered that the engineers needed for operation and maintenance of the power plant have been secured. In recent years, it was heard that a focus of employment practice is placed on the graduates from the electricity and mechanical courses at Palau Community College.

Therefore, there are no issues in terms of operation and maintenance of the generation facilities and equipment developed through this project.

3.4.2 Technical Aspects of Operation and Maintenance

From the time of project planning, the PPUC had sufficient experience in operation and maintenance of diesel generators, and there were no technical issues in terms of operation and maintenance of the generation equipment procured through this project. According to the PPUC, while there are few staff members with specialized academic qualifications, they had enough skilled mechanics and electricians able to undertake emergency measures and overhauls working under the engineers of manufacturers. At the time of ex-post evaluation, comments were obtained from JICA's senior volunteer providing instructions to improve operations at the PPUC's power plant that there were no problems as to the skills for routine operation and maintenance.

On the other hand, skills development of PPUC staff members was mostly done through

[11] Among the 21 staff members at Aimeliik Power Plant, 3 members, including the superintendent, were from the Philippines.

OJT as a part of daily operations, and no systematic structure of training was observed. They occasionally have opportunities to send technicians to training programs offered by JICA. In addition, as there is no organization in Palau to develop technicians with professional knowledge, it has become essential to receive education overseas for obtaining a degree higher than the undergraduate level in specialized fields.

As described above, while it is difficult to secure academic degree holders in Palau, it is thought that there is a certain level of technical sustainability as there are no items that cannot be technically dealt with and a situation in which technicians cannot be secured has not developed.

3.4.3 Financial Aspects of Operation and Maintenance

The PPUC's financial balance in recent years (only for electricity) is shown in Table 7.

Table 7: Operating Balance of the PPUC

(Unit: thousand US dollars)

	2014	2015	2016
Operating Revenue	27,650	21,829	20,642
Electricity Generation	27,308	21,057	19,807
Other	634	772	908
Uncollected Electricity Charges	-292	0	-73
Operating Expenditures	26,801	23,385	18,340
Fuel for Generation	18,732	14,555	10,135
Other Expenses for Generation	3,503	3,830	2,436
Transmission and Distribution	813	935	1,251
General Administration	920	856	973
Engineering Services	554	496	335
Depreciation	2,187	2,615	2,672
Renewable Energy	92	98	538
Operating Balance	849	-1,556	2,302
Non-operating Revenue	152	-163	1,012
Government Contributions	13,131	-	92
Net Profit	14,132	-1,720	3,406

Source: Document provided by the executing agency

The PPUC's operating balance recorded a deficit on a net profit basis in 2015, but recorded surpluses in 2014 and 2016. Also, much of depreciation is from the facilities and equipment of grant aid projects, and it was confirmed that the cash flow of the PPUC did not reveal problems[12]. The large amount of surplus in 2014 is due to the capital contribution from the government, which is due to the cost of this project being partly allocated, which is

[12] While the PPUC occasionally purchases power generators by themselves, large-scale projects were mainly implemented with support from Japan. The PPUC has not made large-scale investments by themselves.

to be gradually depreciated. While there are no government subsidies injected into the PPUC, the 'Uncollected Electricity Charge' is the unpaid amount mainly by government agencies. Despite significant improvements in recent years, it was heard that accumulated unpaid amounts owned by the water supply and sewerage works division still remained[13].

While the electricity tariff accounts for the majority of the PPUC's revenues, the PPUC is not authorized to determine the tariff. The electricity tariff is periodically revised in line with fuel prices. For example, the tariff for residences (in the case of 0-150KWh), which had been US 21.1 cents per 1KWh, was reduced to US 19.7 cents in January 2018. As fuel prices can fluctuate significantly depending on the international market, it appears important to revise the electricity tariff without delay in response to price changes to maintain operations without making losses.

The maintenance costs of the facilities and equipment for power generation are included in the 'Other Expenses for Generation' of the operating balance of the PPUC, whose recent trend is shown in Table 8. According to the PPUC, the maintenance costs necessary for stable power generation, including overhauls, have been disbursed.

Table 8: Maintenance Costs of Facilities and Equipment for Power Generation

(Unit: thousand US dollars)

	2013	2014	2015	2016
Maintenance costs of power generation facilities and equipment	2,205	2,868	2,600	1,682

Source: Document provided by the executing agency

Based on the above, as for the financial situation, it is necessary to strengthen the collecting on accumulated unpaid bills. However, it has been judged that there were no particular issues at the time of ex-post evaluation as the maintenance costs for generation facilities and equipment have largely been sufficiently disbursed.

3.4.4 Current Status of Operation and Maintenance

The power generators and facilities at Aimeliik Power Plant developed through this project were all operating in good condition at the time of ex-post evaluation with smooth procurement of spare parts. It was confirmed that the operating data were recorded every hour and the items to be inspected and maintained periodically were also recorded.

With regard to the overhauls, which are large-scale maintenance activities, it was

[13] The Water Supply and Sewerage Works Division began paying the accumulated unpaid charges in 2014, after the Electricity Division and the Water Supply and Sewerage Works Division merged in 2013 to become the newly formed PPUC. However, 70% of the accumulated unpaid charges by customers recorded by the PPUC are those of the Water Supply and Sewerage Works Division.

considered desirable to conduct them every 4,000 hours for the upper part of the generator and every 8,000 hours for the entire generator. However, the overhauls were not necessarily conducted precisely within those intervals and tended to be delayed. But those delays were not the ones which could cause serious problems for operation in the future. Operating hours were recorded, and the preparation works for the next overhaul were in progress[14].

Therefore, there were no issues in terms of operation and maintenance conditions of the facilities and equipment of this project, and requisite power was being supplied. There were also no problems in procuring the spare parts that could affect the operation of the generators, and the generators as a whole were managed in good condition.

In light of the above, while the efforts on the improvement of staff capacities were not necessarily sufficient, there were no problems in terms of organizational and financial aspects as well as operation and maintenance status as a whole. It was observed that the technical aspects had a certain degree of continuity and it can be said that operation and maintenance is sufficiently conducted. Therefore, it can be judged that the sustainability of the effects generated in this project is high.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

In this project, diesel-operated generation facilities and equipment were developed to alleviate power shortages in the urban areas of Palau. The relevance of this project is high as it was both consistent with the development plan and development needs of Palau at the time of both planning and ex-post evaluation and was also consistent with Japan's ODA policy at the time of planning. As for implementation of the project, the project outputs were largely as planned, and the project costs and periods were within the plan. Therefore, the efficiency is high. With regard to project effects, reserve power supply capacities were sufficiently secured, and the occurrences of power supply restrictions caused by power generation equipment were eliminated, leading to stable power supply in the urban areas of Palau. It was also heard that the reduction of business costs and the expansion of businesses were realized because of stable power supply, confirming that economic activities, including tourism, had been underpinned. Furthermore, there were no issues in terms of negative impacts on the natural environment as well as resettlement and land acquisition. As a whole, the effectiveness and impact of this project are high. Regarding operation and maintenance, there were no major problems in terms of all institutional, technical, financial aspects as well as the operation and maintenance status.

[14] The generators installed in this project were scheduled to undergo overhauls by turns in July and August 2018. It was expected that the overhaul would take 1 month each.

Therefore, sustainability is judged to be high.

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

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

In the ex-post evaluation, it was seen that the efforts on the improvement of staff capacities were not necessarily sufficient, while no particular problems were seen in terms of technical aspects of operation and maintenance of PPUC power plants. In order to accumulate the technical knowledge within the corporation for the future, it is considered important to establish a training structure for the staff with a central focus on the technicians on power generation at Aimeliik Power Plant and Malakal Power Plant. Among the training programs, some can be acquired only overseas, while others can be implemented in country. Therefore, for the programs that can be implemented domestically, it is desirable to immediately establish and carry out a training program on the skills considered necessary for PPUC technicians.

4.2.2 Recommendations to JICA

While there were no problems with the conditions of power generation by the PPUC, it was confirmed in the ex-post evaluation that power outages caused by the vulnerability of transmission and distribution networks for supplying generated power to users were occasionally occurring. Although some opinions were heard from businesses in the urban areas of Palau that instances of power outages generally improved compared to previous years, it is considered important for generating the effects of this project to provide support on strengthening transmission and distribution networks in consideration of the introduction status of renewable energy so that a stable power supply can be realized for a long term. In this sense, the Technical Cooperation for Development Planning: 'The Project for Study on Upgrading and Maintenance Improvement of National Power Grid', commenced in FY2017, is a timely project.

4.3 Lessons Learned

<u>The need to develop human resources through a region-wide scheme</u>

In this project, it was confirmed that the executing agency did not necessarily have a sufficient structure to develop human resources. As Palau is a country with an approximate resident population of 20,000 and there is no tertiary institute offering undergraduate academic degrees, it is difficult to develop and secure technicians in various fields independently, and one of the means to solve such issues is the utilization of foreign technicians. However, it is

desirable from the perspective of accumulating technical capacities for the long-term to develop sufficient key technicians among the Palauan nationals. In the neighboring countries, the Federated States of Micronesia and the Marshall Islands have small-scale populations, similar to Palau, making it difficult to establish systematic structures independently. Therefore, it is considered effective in specific sectors such as electric power, to provide regular support separately for improving their capacities regionally by utilizing the experiences of vocational cooperation in such neighboring countries. In this way, a certain size as a project can be secured and knowledge and skills can be accumulated within the organization. In such cases, it would be effective to provide the support not only as a project supported solely by JICA but also as a project in cooperation with the Pacific Power Association, which is a regional energy organization in the Pacific islands region. Through such efforts, it is considered that the sustainability of the effects of grant aid projects implemented by JICA will be secured in a more stable manner.

(End)

The Republic of Tajikistan

FY2017 Ex-Post Evaluation of Japanese ODA Grant Aid Project

"**The Project for Improvement of Equipment for Road Maintenance in Khatlon Region and Districts of Republican Subordination**"

External Evaluator: Hisae Takahashi, Ernst & Young ShinNihon LLC.

0. Summary

This project aims to ensure proper maintenance of trunk roads in the Khatlon region and districts under republican subordination of Tajikistan by supporting the development of road maintenance equipment to State Enterprise of Transport Management (SETMs) managing the target area, thereby contributing efficient freight and passenger transportation. Its purpose is consistent with national development strategy emphasizing road development as a means of economic development, national development needs with roads damaged due to the civil war and progressive aging. Furthermore, it has high coherence with Japanese ODA policy, hence its relevance is high. Although the project cost was within the plan, the project period exceeded the plan due to the extended bidding period in response to changes in the country's regulations on provision of equipment. Accordingly, the project efficiency is fair. Implementing this project allowed road repairs using hot asphalt having high-strength, helping improve strength and durability for part of the repaired road. It also helped boost efficiency in terms of achieving time, cost and labour savings otherwise required for winter snowfall and repair work. In this section, road development projects were also undertaken with the support of Japan, which helped significantly shorten transportation and travel time, thanks to improved road conditions combined with the contribution of this project. However, because the repaired area was limited due to lack of budget, the effectiveness/impact of this project is fair. Minor problems of Operation and Maintenance (O&M) for the plants and equipment provided in this project were confirmed in the institutional and financial aspects of the executing agency and O&M condition, thus the project sustainability is considered fair.

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

1. Project Description

Project Locations

Asphalt Plant

1.1 Background

Tajikistan is an inland country and most of its domestic freight and passenger transportation relies on roads. Accordingly, domestic trunk roads constitute the key component in the main economic infrastructure; supporting not only national logistics but also trade with surrounding countries. Most of the 30,000 km or so of road network developed in Tajikistan was constructed during the Soviet era and it has since been subject to serious age-related damage and dilapidation as well as the civil war occurring after independence in 1991, which, in turn, pushed up transportation costs even further. In 2011, the Tajikistan Government developed the *National Target Development Strategy for Transport Sector* to solve the abovementioned issue by prioritizing the tasks of constructing, repairing and maintaining trunk roads. In Tajikistan, the Ministry of Transport controls about 14,198km of the international and domestic trunk road network, while the SETMs and State Enterprise on Highway Maintenance (SEHMs) operate and maintain the roads. SETMs manage and supervise SEHMS under their control, while the SEHMs check and repair road pavements, bridges and facilities. However, roads were not properly maintained due to a lack of the necessary equipment and aging, spawning factors that have progressed damage to and degradation of the road.

Under such circumstances, the Tajikistan Government requested assistance from the Government of Japan to procure equipment required to maintain roads in the Khatlon Region and Districts of Republican Subordination, whereupon the current Project was implemented to contribute to proper road maintenance and efficient freight and passenger transportation by developing road operation and maintenance.

1.2 Project Outline

The objective of this project was to achieve an appropriate operation and maintenance of the road by providing the road maintenance equipment[1] to SETMs and SEHMs, those responsible for the trunk roads to connecting Dushanbe suburb, Kurgan-Tyube[2] and Nizhniy Pyandzh, thereby contributing to the improvement of efficiency of the freight and passenger transportations.

Grant Limit / Actual Grant Amount	1,344 million yen / 1,339 million yen
Exchange of Notes Date/Grant Agreement Date	March 2013 / March 2013
Executing Agency	Ministry of Transport
Project Completion	October 2014
Main Contractor	Katahira & Engineers International

[1] Including asphalt plant and crush plant, 118 facilities and equipment comprising 29 types which are necessary for road maintenance were provided. For details of the equipment, see "Table 1 Planned and actual outputs".
[2] Kurgan-Tyube was rename for Bokhtar in February 2017. In this report, former name, Kurgan-Tyube, is unified to be used.

Main Consultant	ITOCHU Corporation
Basic Design	July 2012 - Feburary 2013
Related Projects	Technical Cooperation ・The Project for Improvement of Road Maintenance (2013～2016) ・Country Specific Trainings (2016, 2017) "Training for Road Maintenance Equipment" Grant aid ・The Project for the Improvement of Dusty-Nizhniy Pyandzh Road (Phase 1 : 2006) (Phase2 : 2009) ・The Project for Rehabilitation of Kurgan Tyube - Dusti Road (Phase 1: 2008) (Phase II: 2011) ・The Project for Improvement of Equipment for Road Maintenance in Sughd Region and the Eastern Part of Khatlon Region (2016) Asian Development Bank ・Dushanbe-Uzbekistan Border Improvement Project (2011～2014) ・Dushanbe-Kirgizstan Border Road Rehabilitation Project (2007～2009) ・Dushanbe－Kurgan-Tyube－Danghara－Kulyaba Road Improvement Project (2001～2005) Chinese Government ・Dushanbe－Danghara Road Improvement Project (2009～2012) ・Dushanbe－Chanak (Border with Uzbekistan) Road Improvement Project (2006～2011)

2. Outline of the Evaluation Study

2.1 External Evaluator

Hisae Takahashi, Ernst & Young ShinNihon LLC

2.2 Duration of Evaluation Study

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

Duration of the Study: October, 2017 – December, 2018

Duration of the Field Study: December 10th, 2017 – December 22nd, 2017,

April 4th, 2018 – April 10th, 2018

3. Results of the Evaluation (Overall Rating: C[3])

3.1 Relevance (Rating: ③[4])

3.1.1 Consistency with the Development Plan of Tajikistan

At the time of project planning, the *National Development Strategy (NDS)*, prepared in 2007, defined the long-term target for socioeconomic development, priority level and directions to improve the level of citizen's living. This strategy underlined prioritized issues for infrastructure, telecommunication, energy and industrial development and showed the importance of improving the international trunk road from a sustainable economic development perspective[5]. In the transportation sector program, *the National Target Development Strategy for Transport Sector of the Republic of Tajikistan to the Year 2025*, announced in 2011, which aimed to establish a transportation network infrastructure, meeting citizens' needs, has identified the following short-, mid- and long-term objectives to be attained[6]:

Short-term objectives (2010-2014): 712 km rehabilitation, 5,291 km maintenance

Mid-term objectives (2015-2019): 1,312km rehabilitation, 5,291km maintenance

Long-term objectives (2020-2025): 2,141km rehabilitation, 5,291km maintenance

In *NDS 2016 to 2030* (2016) at the time of ex-post evaluation, the draft of the *Mid-Term Development Plan 2016 to 2020*, targeted for the first five years, was formulated and expected results, "Improvement of transportation which encourages active economic circulation, reduced transportation cost and improved safety" are included[7]. The sector plan as of the project planning, *Tajikistan National Republic of National Transport Development Special Program until 2025*, is also effective at the time of ex-post evaluation. The program continues to emphasize the need to develop transportation infrastructure as a cornerstone of economic growth, such as aged roads that were developed during the former Soviet era and roads that were ruined and destroyed in the civil war.

As mentioned above, Tajikistan's development strategy has underlined the importance of improving people's lives and developing infrastructure to boost economic development, particularly trunk roads and improving traffic transportation until the time of ex-post evaluation since planning. The transportation sector plan has also stressed the needs for road operation and maintenance. This project procured the required equipment to SETMs operating and maintaining important trunk roads in the country and is thus consistent with Tajikistan's development strategy.

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[3] A: Highly satisfactory, B: Satisfactory, C/Partially satisfactory, D: Unsatisfactory

[4] ③: High, ②: Fair, ①: Low

[5] Source: document provided by JICA, ODA data book 2008.

[6] Source：*Preparatory Survey Report on the Project for improvement of equipment for road maintenance in Khalton region and districts of republican subordination in the Republic of Tajikistan (2013)* (JICA) in Japanese version, p19. provided by JICA

[7] National Development Strategy of the Republic of Tajikistan for the Period up to 2030, p.8, pp.22-23, p.76

3.1.2 Consistency with the Development Needs of Tajikistan

In Tajikistan, a landlocked country, a road network of approximately 30,000 km has been established, on which domestic logistics and passenger transportation are heavily dependent. Conversely, at the time of planning, most roads were damaged due to the civil war after independence and aging, while progressive deterioration, increased transportation time due to transportation bottlenecks and insufficient maintenance have hindered economic development. SETMs are handled by the Ministry of Transport, which is responsible for maintaining and managing roads, including supervisory guidance of the SEHMs, which undertake inspection and repair of road pavements, bridges and facilities. However, at the time of planning, road maintenance and management was insufficient due to shortage and aging of the required equipment, which resulted in progressive breakage and aging of the road[8]. At the time, the above *Special Program on National Transportation Development in the Republic of Tajikistan until 2025* cited the "capital city of Dushanbe - Kurgan-Tyube - Nizhniy Pyandzh" as important road section. This section was managed by the SETMs where the project procured the equipment, whereupon its maintenance and management needs were also emphasized.

Even at the time of ex-post evaluation, 65% of domestic cargo transport and 99% of passenger transport depended on road traffic[9], while domestic arterial roads were considered key transportation infrastructure within the country's economy and society. Meanwhile, most national roads were still built during the former Soviet era and are ever-more prone to damage and aging. The section where Kurgan-Tyube and Hissar SETMs provided equipment and oversaw maintenance and management includes the most important international highway connecting the capital Dushanbe and a border town of Afghanistan. In particular, the Khatlon region borders with Afghanistan and as well as being affected by the volatile situation in Afghanistan, is also considered to be the area worse affected by the domestic civil war. Around nearly half of the population are living below poverty line and there is an urgent need to address the socioeconomic stability of the region. One solution is thought to be improving the road network connecting the state and Dushanbe, the capital[10].

Accordingly, in countries, where both cargo and passengers mostly depend on road traffic, maintenance and management of roads subject to progressive deterioration and aging can be considered high, even at the time of ex-post evaluation since the planning. Furthermore, this project targeted the region containing the international route leading to Afghanistan, where the poverty ratio was high, a decision to target this region can be justified by the fact that the project could boost the economic development of such a region. 3.1.3 Consistency with Japan's ODA/Policy

[8] Source: document provided by JICA
[9] Source: document provided by Ministry of Transport
[10] Source: interviews with Ministry of Transportation and documents provided by JICA.

The *Country Assistance Program* (2009) of Japan for Tajikistan at the time of planning designated transportation (road improvement and maintenance) as priority areas and the *Country Assistance Policy* (December 2012) also defined regional and economic infrastructure development as priority fields, where the economic infrastructure development also included developing the transport sector[11]. In addition, the action plan (2006) of the "Central Asia + Japan" dialogue[12] also mentioned that it would support efforts to improve the transport route between South and North regions in Tajikistan[13]. Therefore implementing this project, which aimed to ensure proper operation and maintenance by providing road maintenance equipment, is fully consistent with Tajikistan's development policy, development needs, Japan's ODA Policy and its relevance is high.

3.2 Efficiency (Rating: ②)

3.2.1 Project Outputs

[Japanese portion]

Table 1 shows the planned and actual outputs of this project. During this project, road maintenance equipment, including the installation of Asphalt Plants (hereinafter referred to as "A/P") and Crushing Plants (hereinafter referred to as "C/P"), was developed in the Kurgan-Tyube (Khatlon) region and the Hissar (Republican subordination) SETMs and 22 SEHMs, which oversee the main road between the capital Dushanbe and the Kurgan-Tyube - Nizhniy Pyandzh.

All equipment was procured as planned. According to the consulting company involved in this project and the Ministry of Transportation, the installation site for A/P and C/P have been changed (details are as follows), with the site situation and plant operation efficiency in mind. There is no influence on generating the effect and the change could be concluded as reasonable.

Table 1 Planned and actual outputs

Equipment	Planned			Actual
	Kurgan-Tyube	Hissar	Total	
Asphalt Cutter	6	4	10	As planned
Vibration Compactor	6	4	10	
Hand Breaker	6	4	10	Except, the relocation of A/P and C/P location.
Air Compressor	3	2	5	
Asphalt Sprayer	3	2	5	

[11] Source: ODA Data Book (2012), p. 218

[12] It indicates the second Foreign Minister Meeting of "Central Asia + Japan" dialogue held at Tokyo in June 5th of 2006, attended by ministers of Foreign Affairs from Japan, Kirgizstan, Tajikistan and Uzbekistan as well as an envoy from the Kazakhstan government. During this meeting, the progress of cooperation under the new framework, which was launched during the first Foreign Minister Meeting as of August 2004, was reviewed and efforts to promote future cooperation, particularly within the region, were discussed.

[13] Source: documents provided by JICA

Hand Guide Roller	3	2	5	
Asphalt Distributer	1	1	2	
Asphalt Finisher	1	1	2	
Road Roller	1	1	2	
Tire Roller	1	1	2	
Water Tank Truck	1	1	2	
Motor Grader	6	4	10	
Crawler Excavator	3	3	6	
Wheel Loader	2	1	3	
Bulldozer	1	1	2	
Dump Truck	8	6	14	
A/P	1	1	2	
C/P	1	1	2	
Multi-purpose Vehicle	1	1	2	
Snow Plough	1	1	2	
Rotary Blower	1	1	2	
Salt Spreader	1	1	2	
Truck with Crane	1	1	2	
Truck trailer	1	1	2	
Pickup Truck	2	2	4	
Line Marker	0	1	1	
Mobile Workshop	1	1	2	
Maintenance Equipment	2	2	4	
Axis Load and Overall Weight Meter	1	0	1	

Source: documents provided by IJCA and response of questionnaire to Ministry of Transport

Changes of output: A/P and C/P re-location

①Khatlon Region

The site was relocated, mainly because the government of Khatlon intended to reuse the airport site in future, part of which overlapped the A/P location, thus the Ministry of Transport requested the change[14]. In addition, the plan to utilize the plant site used in past projects ("Dusty - Nizhniy Pyandzh Road Improvement Plan") was also suggested, but the long distance of the stone quarry was a concern. Considering the need to carry stones from a distance and amid concerns over cost and efficiency, it was decided to relocate to a more efficient place near the stone quarry[15].

② District of Republican Subordination

The major reason was the fact that the Ministry of Transport requested that the installation site be changed to reduce the A/P and C/P[16] operating and maintenance costs. Initially, it was expected to install at the existing Chinese plant site but they did not move out as scheduled, hence the need to consider plant relocation. Consequently, the decision was made to relocate the plant to the geographical center of the region with efficiency usage in mind[17].

[14] Source : document provided by JICA and Kurgan-Tyube SETMs
[15] Source: interview survey with the staff of Kurgan-Tyube SETMs and the consulting company
[16] Source: document provided by JICA
[17] Source : interview survey with the staff of Hissar SETMs and the consulting company

[Tajikistan portion]

The following eleven items were implemented as Tajikistan's portions as planned:

1) Implementing EIA or equivalent procedures for the installation of C/P and A/P and acquiring installation permission.

2) Securing location for A/P and C/P, removing existing structures and levelling grounds.

3) Providing electric wiring, water supply, drainage for A/P and C/P operation.

4) Securing location for axis load and gross weight meter, electricity wiring for Axis load and gross weight meter and building facilities for workers

5)Issuing B/A and Authorization to Pay

6) Following B/A, commission payment to Japanese bank

7) Tajikistan side should clear immigration and site visiting procedures and make appointment with governmental organisations for Japanese experts dispatched for this project

8) Japanese experts and companies were from taxes, duties or other obligations within the country

9) Preparation of documents required for customs duties of procured equipment and tax exemptions related to this project

10) Dispatching required number of personnel for start-up operation guidance and covering their daily needs.

11) All other expenses, that are not covered by Japanese Grant Fund related to this project

Crushing Plant (C/P)

Donor Roller

Donor Grader

3.2.2 Project Inputs

3.2.2.1 Project Cost

The total project cost was 1,342 million yen against the planned 1,346 million yen, hence remained within the planned budget at 99.7%. The project cost to be borne by Japan was planned as 1,334 million yen (E/N limit), while the actual project cost, namely 1,339 million yen, exceeded the planned amount. The amount borne by the Tajikistan side, namely 2.9 million yen, exceeded the planned amount by about 2 million yen. Due to mainly foreign

exchange fluctuations, Tajikistan's burden borne exceeded the planned share[18].

3.2.2.2 Project Period

Although the planned project period[19] was 19 months, 20 months were actually required from March 2013 to October 2014 to complete the activities, which slightly exceeded the plan (107% to the planned period). The one-month delay was attributable to an extension of the bidding period. Specifically, it occurred in response to regulatory changes for local exhaust gas. However, such regulatory changes were not planned during the initial project planning stage, but suddenly determined at the bidding stage. In response to the change in the exhaust gas regulation value, the need arose to prepare and adapt documents in accordance with the specifications, so the bidder requested that the bidding period be extended and the project responded to this request[20]. This is a necessary response to arrange equipment conforming to national regulations and shortening the period was difficult.

As stated above, although the project cost was within the plan, the project period exceeded the plan. Therefore, efficiency of the project is fair.

3.3 Effectiveness and Impacts[21] (Rating: ②)

3.3.1 Effectiveness

3.3.1.1 Quantitative Effects (Operation and Effect Indicators):

Annual area of pothole repairs and overlay repair length by hot asphalt mix

Before this project, Kurgan-Tyube and Hissar SETMs did not own their plants, so they were normally repaired using cold asphalt[22]. Such repairs meant insufficient strength and durability and could only be considered provisional. Under circumstances where high-strength hot asphalt is required, purchase of the same from a private contractor was inevitable.

After the project, despite fluidity within the Kurgan-Tyube SETM, the repaired pothole works using hot asphalt manufactured in the installed plant were implemented and exceeded the target value. In Hissar, it remained at about 50% of the target. The failure of actual results to meet the planned values in the Hissar region was mainly attributed to budget shortfalls. According to Hissar SETM officials, hot asphalt was about twice as expensive[23] as cold

[18] 1 Tajikistan Somoni was equal to 17.037 yen at the time of appraisal (2012) and had fluctuated to 21.46 yen by the time of ex-post evaluation. Meanwhile, when calculating the actual cost, the IFS of the IMF rate (average between 2011 and 2014, 1 Tajikistan Somoni＝19.02 yen) was used to convert Somoni into yen.

[19] The project period is defined as from G/A month to the month of handing over of equipment (including both month of beginning and ending.).

[20] Documents provided by JICA and interview surveys with Consulting company

[21] Sub-rating for Effectiveness is to be put with consideration of Impacts.

[22] At that time, when preparing the cold asphalt, it was manufactured as crude oil with high asphalt content was mixed with gravel or sand with equipment such as motor grader with yard at the time of high temperature in summer, it was manufactured.

[23] For example, cold asphalt will cost approximately 220 to 240 Tajikistan Sonomi per ton while hot asphalt costs

asphalt, hence the explained need to limit usage. The overlay construction distance using hot asphalt failed to meet the target in both areas managed by Kurgan-Tyube and Hissar SETM and the main factor limiting the overlay distance was a budget shortfall.

Table 2 Annual area of pothole repairs and overlay repair length by hot asphalt mix

	Baseline	Target	Actual			
	2012	2017	2014	2015	2016	2017
		2 Years After Completion	Completion Year	1 Year After Completion	2 Years After Completion	3 Years After Completion
Annual repair area of pot hole using hot asphalt (m^2)						
Kurgan-Tyube SETM	0	13,000	1,927	10,920	7,500	28,000
Hissar SETM	0	6,000	826	2,067	3,000	2,757
Overlay annual construction distance (Km)						
Kurgan-Tyube SETM	0	10.0	0.3	1.5	1.5	0.5
Hissar SETM	0	10.0	2.3	10.6	9.3	4.2

Source: documents provided by JICA, Kurgan-Tyube SETM and Hissar SETM

As explained above, the lack of budget meant the repair area using hot asphalt and the overlay construction distance did not reach their targets. However, given the inability to manufacture hot asphalt before the project, it could be concluded that this project has elicited certain effects.

3.3.1.2 Qualitative Effects (Other Effects)

At the time of planning this project, equipment shortages were highlighted as the main problem when maintaining and managing the targeted SETMs and SEHMs[24]. In this project, as well as installing A/P and C/P, maintenance equipment crucial for road repair work and equipment necessary for snow removal work in winter were all procured. The operation and maintenance work was confirmed as having improved, thanks to the allocation of equipment to each of the offices as follows:

(1) Stronger and more durable repair spots

The installation of the plants, SETMs and SEHMs in the target area means repairs of the road using hot asphalt are underway. Although budget shortfalls limited the scope of repair, after the project was implemented, it boosted strength and durability at repair spots using hot asphalt. Despite the expense compared to cold asphalt, in durability terms, it may have almost

around double, 460 – 480 Tajikistan somoni.

[24] Source: Preparatory Survey Report URL: http: //open_jicareport.jica.go.jp/614/614/614_156_12113452.html (Access as of June 14, 2018)

20 years additional life expectancy[25]. Accordingly, hot asphalt is used in the sections where the traffic volume is high.

(2) Increasing efficiency of snow clearing, melting and spreading non-slip agents works

According to the Ministry of Transport, SETMs and other stakeholders, implementing this project also helped streamline work, including mechanization of work to clear snow, melting and spreading non-slip agents works during the winter season. Although it was difficult to identify a specific period because the shortening of the work period depends on snowfall, it boosted the efficiency of the activities. For instance, before the project, traffic was cut off for 5 to 6 hours pending snow removal work after heavy snowfall and at the time of ex-post evaluation, the use of bulldozers and multipurpose vehicles procured in the project enabled 1 to 2 hours of operation. As another example of boosting work efficiency (labor force) before snowfall, about 20 workers carried out work which involved spraying non-slip sand (40 tons) by hand before the project, by switching to mechanization work using equipment provided in this project. At the time of ex-post evaluation, there was scope to handle this using only the driver and several supporting staff.

(3) Boosted repair work efficiency (in time and cost terms)

Prior to this project, when the repair of roads, removal of snow in winter and spraying of non-slip agents (sand etc.) was required, the necessary equipment was rented from private companies as well as outsourcing asphalt production, whereupon the work was carried out. Providing the equipment and establishing the plants in this project eliminated the need to pay the rental fee to the private companies. It also freed up time which would have been taken on administrative work for equipment rental and asphalt purchase as well as waiting time, all of which accelerated the repair work period.

For example, the cost of the hot asphalt used to repair roads was reduced from 750 Tajikistan somoni (about 9,400 yen) per ton, as ordered by the private sector to 400 somoni (about 5,000 yen) when produced in the own plant. More than 10 days was required for overlay work to repair the road over a stretch of about 200 meters, but it could be handled in about two days at the time of ex-post evaluation[26].

[25] Source: interview survey with the staffs of each SETM
[26] Source: interview survey with the staffs of each SETM

3.3.2 Impacts[27]

3.3.2.1 Intended Impacts

(1) Contributed to streamline passenger and freight transport

Passenger and freight transportation time has been shortened by improved trunk road condition thanks to improved road development and maintenance. According to the private transport company interviewed, the fuel cost is saved as the required time is shortened (see Table 3 below).

Table 3 Time shortening of passenger and freight transportation

Section	Before project	After project
Yavan－Nizhniy Pyandzh	one round trip in two days	one round trip in a day
Kurgan-Tyube－Nizhniy Pyandzh	one round trip in a day	two round trips in a day

Source: interview surveys with transport companies

However, it is considered that the transport company that responded and others did not distinguish the changes between periods before and after the implementation of the grant aid road development project and this project. During the site visit, some sections where road conditions such as irregularities on the road surface and potholes were deteriorating frequently emerged in trunk roads other than those which were developed in the grant project. Respondents who answered the interview surveys also reported the same issue and feedback suggesting some scope to improve maintenance was partially evidenced.

3.3.2.2 Other Positive and Negative Impacts

(1) Impacts on the Natural Environment

As this project included A/P and C/P, environmental impact assessment prescribed by the law of the country was implemented when installing these plants. In accordance with the assessed plan, noise, air quality and etc. during the plant installation work were monitored. There is no negative impact on the environment and society caused by this project implementation.

(2) Resettlement and Land Acquisition

The plant was installed on the land owned by the country and the equipment was procured to each SETMs and SEHMs and no resettlement of residents or land acquisition due to the implementation of this project has occurred.

[27] It can be said that improved freight and passenger transportation was the overall effect; generated not only from this project but also from a grant aid project conducted prior to this project and technical cooperation “The project for improvement of road maintenance” conducted after this project. Given the difficulty in confirming the contribution of each respective project, the impact of the project will be treated as an indirect effect generated from support for road development, procurement of road maintenance equipment and capacity improvement of operation and maintenance.

(3) Other Impacts

- Increase in cargo volume and number of passengers

According to the Ministry of Transport (Cargo/Passenger Transportation Department), the cargo volume and passenger numbers increased with shorter transportation and travel time. Table 4 shows the traffic volume in the Dushanbe - Nizhniy Pyandzh section. This was attributable to the increased number of round trips per day such as buses and trucks, which helped reduce the time required. In the above area, many areas mainly involved the agricultural industry and despite the absence of any formal data, transportation of agricultural products in particular increased. Conversely, feedback also suggested that transport companies dealing with construction materials did not cause the cargo volume to increase as much due to the deterioration of security in Afghanistan.

Table 4 Cargo volume and number of passengers of Dushanbe - Nizhniy Pyandzh

	2012	2013	2014	2015	2016	2017
Cargo volume (ton)	56,870	66,120	15,000	179,450	211,970	242,100
Number of passengers (person)	741,959	837,300	1,628,200	2,947,640	3,506,710	4,128,200

Source: documents provided by Ministry of Transport

- Decreased number of traffic accidents and declining victims

Table 5 shows the number of traffic accidents having occurred at Kurgan-Tyube. The Ministry of Transport considered that improving road conditions also helped reduce the number of traffic accidents and victims. The surface was also more even, i.e. with fewer potholes, which explained more stable travel for drivers. There is, however, the possibility of other factors such as traffic rules explaining some of the improvement and this project is thought to contribute indirectly.

Table 5 Number of traffic accidents in Kurgan-Tyube

	2012	2013	2014	2015	2016
Number of traffic accidents	142	92	93	79	69
Number of traffic victims	84	91	100	72	56

Source: document provided by Ministry of Transport

By providing the plants and equipment required for road maintenance in this project, repair work using hot asphalt became possible. Moreover, it is far stronger and more durable compared with repairing spots with cold asphalt, as was done conventionally. However, budget shortfalls meant the actual repair area did not reach the planned target and remained within a certain range. In addition, each SETM and SEHM is now able to mechanize the spraying work of non-slip sand in winter and use their own equipment/asphalt necessary for repair work previously purchased and rented from the private companies, helping save on office working hours and purchase cost. Through a series of Japanese assistance (grant: road improvement,

grant: equipment provided under this project, technical cooperation: improved maintenance capacity), the main road conditions improved in the target area. Although some sections still require repair, positive impacts, such as shortening the passenger and freight transportation time from the capital Dushanbe to the area connected to the neighboring town of Afghanistan, an increased transportation volume and a decreased number of accidents were also confirmed.

Based on the above, this project implementation has achieved its objectives to some extent. Therefore effectiveness and impacts of the project are fair.

3.4 Sustainability (Rating: ②)

3.4.1 Institutional / Organizational Aspect of Operation and Maintenance

Six SETMs[28] under the Ministry of Transport have maintained the national trunk roads. Kurgan-Tyube and Hissar SETMs oversee the operation and maintenance (O&M) of the plants and equipment provided in this project. There are 13 SEHMs and nine SEHMs respectively under the jurisdiction of each of the SETMs, while the SEHMs oversee small- and medium-scale repairs supervised by SETMs. Large-scale repairs (over 10,000 Somoni) and spare parts required for a fixed amount (2,000 Somoni) or more have been requested to the Ministry of Transport to respond[29]. Although the necessary communication systems are laid between each of the SEHMs, SETMs and the Ministry of Transport, it was confirmed that basic information was not shared, for example, disparities in the methods used by each party and a lack of uniformity concerning the amount and costs incurred for obtaining spare parts among them.

SETMs basically secured the number of O&M personnel for plants and equipment that was assumed at the time of this project plan (see Table 6). However, the interview survey revealed an insufficient number of personnel required for both SETMs and imposed a burden on each person. The reasons were basically a budget shortfall and similar trends were also observed in Tajikistan.

[28] Six SETMs, including Hissar, Kulob, Rashut, Kurgan-Tyube, Sughd and Pamir
[29] Source: interview surveys with each SETMs

Table 6 Plans and achievements of O&M staff number of plant and equipment

No. of O&M	Baseline		Actual	
	Kurgan-Tyube	Hissar	Kurgan-Tyube	Hissar
Small construction machine operator	18	12	18	11
Construction machinery operator	17	14	17	14
Plant operator	6	6	2	6
Vehicle operator (driver)	14	13	12	13
Mechanic	4	4	2	4
Shaft weight / load meter operator	9	-	-*	-
Total	68	49	51	48

Source: document provided by JICA and each SETMs

Note: An axle weight / load meter is installed along the trunk road near the border with Afghanistan. Employees allocated in the area need special permission to work in and out, between Tajikistan and Afghanistan. Accordingly, officials of the Ministry of Transport, rather than staff of SETMs, have been assigned and the number is indicated as "-". Since there were no plans to place the equipment along the border at the time of planning, it was planned to allocate personnel from the SETMs (nine people). Actually staff from Ministry of Transport have been assigned and no concerns of O&M has arose.

3.4.2 Technical Aspect of Operation and Maintenance

Each SETM and SEHM has required employed degree and certificate holders in each field, each with the basic technical skills necessary for O&M. Regarding the newly provided equipment, basic trainings for the initial operations and operators were provided, whereupon staff overseeing O&M in SETMs and SEHMs have acquired the necessary knowledge and experiences. In addition, on completion of this project, technical cooperation in the form of the "road maintenance management improvement project" – a means of technical assistance - was conducted; aiming to help enhance the management capacity within an area including Kurgan-Tyube and Hissar and training was provided, including SEHMs. In this project, each of the staff utilized the provided plants and equipment in actual repair work on the roads at each site. Training was conducted involving most of the SEHMs staff by areas, helping obtain the necessary knowledge and experience and successfully boosting their self-esteem.

On completion of the project, the staff having acquired the O&M method for plants and equipment in this project and technical cooperation project became leaders and oversaw asphalt quality tests in the laboratory, O&M of A/P, C/P and various equipment, while maintenance and management of actual roads continued on a daily basis. It was confirmed that distributed manuals and guidelines were utilized on sites during the site surveys of each SETMs. As mentioned above, from the technical aspect, it can be confirmed that there are no serious concerns that impede O&M.

3.4.3 Financial Aspect of Operation and Maintenance

At the time of planning, the annual cost required for O&M of procured equipment was estimated at 4,740 thousand somoni (about 80.28 million yen). This amount is equivalent to about 10% of the road maintenance and management budget in the Ministry of Transport in

FY2012. Considering the past budget growth rate (15% in 2011, 20% in 2012), it was judged that the necessary budget could be secured. The Ministry of Transport budget at the time of ex-post evaluation and the trends and breakdown of the SETMs are as shown in Tables 7 and 8. Although it was considered difficult to determine the amount for only the provided equipment, the O&M budget of the Ministry of Transport has been almost the flat since planning. Also, at the time of ex-post evaluation, the O&M budget comprised only 4 to 6% or so of the budget of the Ministry of Transport, which was slightly below the plan.

Table 7 Budget of Ministry of Transport and it's road maintenance/repair cost

(Unit: thousands Somoni)

	2015	2016	2017
Budget of Ministry of Transport	964,200	864,400	1,399,600
Road O&M cost	59,600	57,000	60,200

Source: documents provided by Ministry of Transport

Table 8 Breakdown of the each SETM's budget

(Unit: thousands Somoni)

Kurgan-Tyube	2013	2014	2015	2016	2017
Road maintenance cost	5,191	4,460	4,976	4,339	4,931
Contingency	433	589	433	438	341
Personnel cost	2,470	2,866	2,832	3,117	3,002
TOTAL	8,094	7,915	8,241	7,893	8,274

Hissar	2013	2014	2015	2016	2017
Road maintenance cost	2,999	3,362	3,697	3,318	3,311
Contingency	498	537	592	563	563
Personnel cost	3,583	4,010	4,010	4,542	4,769
TOTAL	7,080	7,909	8,299	8,423	8,643

Source: Kurgan-Tyube and Hissar SETMs

When each SETM and SEHMs was interviewed, it was reported that the necessary budget to implement O&M on the road and operate and maintain the equipment was not sufficiently secured. Despite scope to gain income irregularly by selling part of the asphalt manufactured at the plants, unlike a budget where a certain amount is distributed periodically, it is difficult to incorporate it into the plan, thus securing a budget for consumables, spare parts and others is the challenge of each office.

3.4.4 Status of Operation and Maintenance

It was confirmed at the site visit that the provided plants and equipment were fully utilized and the maintenance situation was also generally positive. Conversely, nearly all SETMs and SEHMs pointed the procurement of spare parts as a serious problem. For instance, the lack of any agency dealing with genuine spare parts in Tajikistan means they are not distributed to the local market. Even if available, they are expensive and difficult to purchase on the budget side.

At the time of ex-post evaluation, the budgeting and procurement schedules and

stockpiling of spare parts suggested at the planning stage had not been fully realized and a system to purchase them on an as-required basis existed. Regarding spare parts for which genuine products could not be obtained, the measures taken were as follows:

- Filters necessary for various vehicles (for engine oil and fuel):
  Purchase made in China products by SEHMs at the local market or those provided by the Ministry of Transport (made in China)[30].
- Cone crusher (part of the crash plant):
  Utilize substitute Chinese products or those available in other markets. In addition, Kurgan-Tyube SETMs is experimentally using a crusher that was independently improved.
- Belt band-carrying asphalt (part of the asphalt plant facility):
  Maintenance staff in charge of O&M has repaired and being in used.

As mentioned above, although not genuine, spare parts were obtained and individual responses were made, so none of the equipment was non-operational due to a lack of spare parts. Meanwhile, the effect on the equipment lifetime by using substitute parts is felt and despite the low cost, such parts have a short service life, requiring frequent replacement, and prompting a concern in O&M.

Therefore, some minor problems have been observed in terms of the institutional aspect, financial aspect and O&M status, the sustainability of the project effects is fair.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

This project aims to ensure proper maintenance of trunk roads in the Khatlon region and districts under republican subordination of Tajikistan by supporting the development of road maintenance equipment to SETMs managing the target area, thereby contributing efficient freight and passenger transportation. Its purpose is consistent with national development strategy emphasizing road development as a means of economic development, national development needs with roads damaged due to the civil war and progressive aging. Furthermore, it has high coherence with Japanese ODA policy, hence its relevance is high. Although the project cost was within the plan, the project period exceeded the plan due to the extended bidding period in response to changes in the country's regulations on planned providing

[30]On the procurement system, expensive equipment and spare parts otherwise difficult to obtain were purchased centrally (by the Ministry of Transport). In that case, bidding is necessary and there are many cases involving bidding on Chinese goods in price. This is impossible for local SETMs and SEHMs to handle, hence the need to share information and understanding between the Ministry of Transport and SETMs and SEHMs, including future plans.

equipment. Accordingly, the project efficiency is fair. Implementing this project allowed road repairs using hot asphalt having high-strength, helping improve strength and durability for part of the repaired road. It also helped boost efficiency in terms of achieving time, cost and labour savings otherwise required for winter snowfall and repair work. In this section, road development projects were also undertaken with the support of Japan, which helped significantly shorten transportation and travel time, thanks to improved road conditions combined with the contribution of this project. However, because the repaired area was limited due to lack of budget, the effectiveness/impact of this project is fair. Minor problems of O&M for the plants and equipment provided in this project were confirmed in the institutional and financial aspects of the executing agency and O&M condition, thus the project sustainability is considered fair.

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

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

On the site using the provided equipment, given the expense of the amount and the inability to purchase it in the local market, obtaining genuine or appropriate spare parts is the key concern with maintenance. There is a need for the Ministry of Transport to urgently inform to all SETMs and SEHMs about how to obtain spare parts and improve its maintenance and system. In doing so, each of the SETMs and SEHMs must prepare a procurement plan for spare parts according to the equipment operation and the Ministry of Transport must understand the necessary budget beforehand, so budget/time concerns for purchasing genuine spare parts can be taken into consideration. Moreover, it is desirable to formulate an efficient procurement plan by clarifying equipment which can use spare parts that are not necessarily genuine but do not impede the proper operation of the equipment and equipment for which genuine spare parts should be used, then share the information among SETMs and SEHMs.

4.2.2 Recommendations to JICA

In the grant aid project underway at the time of ex-post evaluation, “The Project for Improvement of Equipment for Road Maintenance in Sughd Region and the Eastern Part of Khatlon Region”, road maintenance equipment will be provided as in this project. To prevent similar problems occurring in this project with respect to the spare parts obtained after completing the project, it is recommended to support and follow up on means of obtaining spare parts in detail among all stakeholders before the project completion.

4.3 Lessons Learned

Implement comprehensive and strategic support considering project sustainability

On the main international trunk road of the country, Japan developed the road, provided equipment to maintain it and provided technical support for road maintenance by actually utilizing the equipment provided. In the country, which was affected by the civil war (not only in terms of infrastructure damage but also technical human resources drained out of the country), the effect/impact could not have been fully utilized if any support for infrastructure development, procurement of equipment or technical support was lacking. Under the circumstances, there is reason to believe that the project is a good practice that developed comprehensive and strategic support, while taking effect and sustainability fully into consideration. As part of future support, particularly in areas affected by civil war etc., stakeholders involved in the project planning must identify the scope of damage sustained in each area at the time of project planning and provide long-term support for lacking infrastructure, equipment, human resources and others. Accordingly, it can be said that following support programmatically by using multiple target area schemes will help generate effectiveness and boost the sustainability of the project.