Ex-Post Project Evaluation 2019: PackageⅢ- 7

(Indonesia)

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JAPAN INTERNATIONAL COOPERATION AGENCY

Mitsubishi UFJ Research & Consulting Co., Ltd.

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Republic of Indonesia

FY2019 Ex-Post Evaluation of Japanese Grant Aid Project

"The Project for Enhancement of Vessel Traffic System in Malacca and Singapore Straits"

"The Project for Enhancement of Vessel Traffic System in Malacca and Singapore Straits (Phase 2)"

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

0. Summary

This project introduced the Vessel Traffic Service System (hereinafter referred to as "VTS system") with the aim of monitoring and assessing the movements of vessels navigating in the coastal areas of Indonesia in the Malacca and Singapore Straits (hereinafter referred to as "the Straits"). This project, which aims to improve the safety of vessels navigating in the Straits, is consistent with Indonesia's development policy, development needs and Japan's assistance policy at the time of planning and the ex-post evaluation. Therefore, the relevance of the project is high. In terms of project implementation, although the project cost was within the plan, the project period exceeded the plan. Therefore, efficiency of the project is fair. As for project effects, all quantitative indicators set at the time of planning have achieved. As for qualitative effects, it was confirmed from the interviews with local officials that monitoring and assessing the movements of vessels navigating in the Straits have achieved. Regarding impacts, it can be considered that the project has contributed to the improvement of safety of vessels navigating in the Straits and to the improvement of maritime safety conditions, based on the interviews with ferry captains and sub-captains of cargo vessels navigating in the Straits, and shipping agents, etc. In addition, development of systems necessary for ship control and training of operators are also in place. Therefore, this project has mostly achieved its objectives and thus, effectiveness and impacts of the project are high. No negative impacts on natural environment and resettlement have been reported. Regarding operation and maintenance, some minor problems have been observed in terms of the technical aspect, financial aspect and current status. Therefore, sustainability of the project effects is fair.

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

1. Project Description

Project Location

Exterior of Batam VTS Center Building

1.1 Background

The Straits, which share the straits with three coastal countries, Indonesia, Malaysia, and Singapore, are major artery for international shipping, with more than 90,000 ships passing through each year, including 14,000 cargoes under the Japanese flag.[1] However, the Straits are full of shallow water, reefs, and wrecks on narrow channels. In addition, due to the high density of large vessels and the large number of crossing vessels, the Straits have always been in danger of maritime accidents. For this reason, the introduction of the VTS system to monitor the vessels' movements was essential. In addition, securing the safety of the Straits was included in the "Singapore Statement" adopted by the three coastal countries and others in 2007 in the Cooperation Mechanism Framework (see footnote 7), making it an urgent issue not only for Indonesia, but for the international community as well. Under such circumstances, in order to ensure the safety of vessels navigating the Straits and to reduce the risk of international trade and shipping, the Government of Indonesia requested Japan's grant assistance for the development of the VTS for monitoring vessels navigating across the Traffic Separation Scheme (hereinafter referred to as "TSS"), which has not been introduced in Indonesia.

1.2 Project Outline

The objective of this project is to realize monitoring and assessing the movements of vessels navigating in the coastal areas of Indonesia in the Straits by introducing the VTS System in the area, thereby contributing to the enhancement of traffic safety in the Straits.

[1] Information from the materials provided by JICA.

Grant Limit/Actual Grant Amount	Phase 1[2]: 1,570 million yen/1,092 million yen Phase 2[3]: 1,430 million yen/1,429 million yen
Exchange of Notes Date /Grant Agreement Date	Phase 1: November 2008/N.A. Phase 2: June 2010/October 2010
Executing Agency	Directorate of Navigation, Directorate General of Sea Transportation (DGST), Ministry of Transportation
Project Completion	Phase 1: March 2011 Phase 2: June 2016
Target Area	The Indonesian side of the Straits
Main Contractors	Toyota Tsusho Corporation/Toyo Construction Co., Ltd. (JV)
Main Consultants	Oriental Consultants Global Co., Ltd./Japan Aids to Navigation Association (JV)
Preparatory Survey	- Basic Design Study: January 2007–March 2007 (First Year), April 2007–March 2008 (Second Year) - Project Formulation Study: October 2008–August 2009
Related Projects	[Technical Cooperation] - The project on Enhancing of Vessel Traffic Service System Management Capacity Phase 2 (March 2015–September 2018) - Technical Cooperation Project on Enhancing of Vessel Traffic Service System Management Capacity (January 2012–February 2015) - The Project on BAKORKAMLA (Indonesian Maritime Security Coordination Body) Structural Enhancement (May 2008–May 2011) - Dispatch of Expert to DGST on “Maritime Safety System” (May 2008–May 2011) [ODA Loan] - Maritime Telecommunication System Development Project (IV) (April 2004–March 2012) [Grant Aid] - Project for Construction of Patrol Vessels for the Prevention of Piracy, Maritime Terrorism and Proliferation of Weapons (June 2006–March 2008)

[2] The Project for Enhancement of Vessel Traffic System in Malacca and Singapore Straits
[3] The Project for Enhancement of Vessel Traffic System in Malacca and Singapore Straits (Phase 2)

2. Outline of the Evaluation Study

2.1 External Evaluator

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

2.2 Duration of Evaluation Study

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

Duration of the Study: October 2019–January 2021

Duration of the Field Study: January 6–30, 2020

3. Results of the Evaluation (Overall Rating: B[4])

3.1 Relevance (Rating: ③[5])

3.1.1 Consistency with the Development Plan of Indonesia

At the time of planning, "establishing a safe and peaceful country" was set forth as one of the agendas in *the Medium-Term National Development Plan (2004–2009)* of Indonesian Government, and the importance of 1) resolution of regional conflicts, 2) dealing with general crime and smuggling, 3) eradicating terrorism, and 4) ensuring national security was pointed out. In response to the Plan, the Ministry of Transportation has set goals in *the Transport Strategic Plan (2005–2009)* to strengthen reliability and competitiveness of transport services. In the maritime transport sector, necessity of improving soundness and safety of shipping and international cooperation was set out.

At the time of the ex-post evaluation, the Indonesian Government's *the Medium-Term National Development Plan (2015–2019)* sets out seven missions, and in them, conservation of marine resources, strengthening of identity as a maritime nation, realization of a self-reliant, advanced and strong maritime nation based on national interests are clearly stated. In addition, the Indonesian Government set out a "Concept of Maritime Nation" in 2014. In *the Global Maritime Fulcrum Strategy (2017)*, which was formulated based on the Concept, enforcement of maritime defense, security and law, ensuring navigation safety, and development of maritime governance and system/institutions are put up as priority agenda. Thus, the implementation of the project is also consistent with the development policy of Indonesia at the time of the ex-post evaluation.

3.1.2 Consistency with the Development Needs of Indonesia

At the time of planning, the Straits, which are the major artery for international shipping, were full of shallow water, reefs, and wrecks on narrow channels. In addition, large vessels

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

[5] ③: High, ②: Fair, ①: Low

such as tankers and containers have been navigating in close proximity, and they were always at a risk of marine accidents. Furthermore, about 4% to 7% of pirate cases in the world had occurred in the Straits.[6] Indonesia was the only country among the three coastal countries in the Straits without a VTS system, and it was not possible to monitor the movements of vessels navigating the Straits from within Indonesia. Therefore, establishment of the VTS was an urgent issue to enhance traffic safety of vessels navigating in the Straits.

At the time of the ex-post evaluation, the importance of securing further navigation safety in the Straits is pointed out at the Cooperation Forum, which is the meeting that forms the basis of "Cooperation Mechanism,"[7] the international framework for the purpose of "navigation safety" and "conservation of the marine environment" in the Straits. In addition, as shown in Table 1, number of vessels navigating within the Indonesian territorial waters of the Straits has been increasing significantly, and the congestion of vessels in Indonesian coastal waters has increased. Furthermore, the interview during field survey[8] indicated that improving the safety of navigation in the Straits continues to be an important issue and that the use of the VTS system is extremely important for safe navigation. From the above, the importance of the project is continued at the time of the ex-post evaluation.

Table 1: The Number of Vessels Navigating in Indonesian Waters in the Straits

	2016	2017	2018	2019
Waters Under the Jurisdiction of Batam VTS Center	14,033	13,690	32,269	33,341
Waters Under the Jurisdiction of Dumai VTS Center Note)	–	–	15,750	19,273

Source: Results from questionnaire survey of Batam VTS Center and Dumai VTS Center (Number of vessels compiled by each Center based on the vessel communication records for the collection of VTS user tariff)

Note) Dumai VTS Center became fully operational in 2018.

3.1.3 Consistency with Japan's ODA Policy

At the time of project planning, Japan's *Country Assistance Program for the Republic of Indonesia (November 2004)* placed support for "peace and stability" as one of the most important areas of assistance, with "ensuring security (anti-terrorism and anti-piracy measures and reinforcement of maritime security systems)" as the priority areas. It also stated that it

[6] Information from the materials provided by JICA.

[7] Three coastal countries, Asian and European user countries including Japan, international organizations such as the International Maritime Organization (IMO), and shipping organizations are participating in the Cooperation Mechanism.

[8] Interviews were conducted with DGST, Batam VTS Center, Dumai VTS Center, captains of ferries and sub-captains of cargo vessels operating in the Straits, and shipping agents.

would provide as much active support as possible in cooperation with other donor countries. In particular, it was pointed out that ensuring security and safety in the Straits was extremely important from the perspective of ensuring the safety of the lives and property of Japanese citizens. The project is consistent with the above policy, as it aims to improve the safety of vessels navigating the Straits.

This project has been highly relevant to the country's development plan and development needs, as well as Japan's ODA policy. Therefore, its relevance is high.

3.2 Efficiency (Rating: ②)

3.2.1 Project Outputs

This project introduced the VTS system in the coastal area of Indonesia. Comparison of planned and actual major outputs is shown in Tables 2–4 for Phase 1 and Tables 5–8 for Phase 2. After the completion of Phase 1, immediately after handover to the Indonesian Government, three sensor stations (Takong Kecil, Hiyu Kecil and Tanjung Berakit) were damaged by lightning, causing major equipment to malfunction. Thus, JICA provided follow-up cooperation (not covered by this project) and carried out repairs and lightning countermeasure work. (For more information, see "3.4.4 Status of Operation and Maintenance" under "Sustainability," below.) In Phase 2, all site facilities were strengthened in lightning protection in response to the lightning strikes of Phase 1.

Table 2: Comparison of Planned and Actual Major Outputs (Phase 1: Buildings)

Building	Plan			Actual/ Comparison
	Structure Item	Facilities	Total Floor Area	
Batam VTS Center (Batu Ampar)	Reinforced concrete, four stories	Operation room, engineer room, UPS room, staff room, meeting room, generator room, pump room, napping room, toilet, etc.	414.00 m^2	Total floor area increased to 516 m^2
Sensor Station (Hiyu Kecil, Takong Kecil, Tanjung Berakit)	Reinforced concrete, one story	Machine room, UPS room	42.25 m^2	As planned
Generator House (Type A) (Hiyu Kecil, Takong Kecil, Tanjung Berakit)	Reinforced concrete, one story	Generator room	55.0 m^2	As planned

Source: Results from questionnaire survey of Batam VTS Center

Regarding construction of buildings of Phase 1, the total floor area of Batam VTS Center increased. This change was due to the fact that the original plan did not have a manager room at the VTS Center, and thus a napping room was changed to a manager room. Therefore, more floor space was added, and a napping room and a book storage were provided. Based on interviews with Batam VTS Center and site inspection of the Center, the increase in total floor space was relevant.

Table 3: Comparison of Planned and Actual Major Outputs
(Phase 1: Steel Tower for the Radar Scanners and Multiple Transmission Parabolic Antennas)

Site	Plan (Height of the Steel Tower)		Actual/ Comparison
	Height From the Ground	Height From Sea Water Level	
Hiyu Kecil	34.0 m	62.5 m	As planned
Takong Kecil	45.5 m	61.5 m	As planned
Batu Ampar	51.9 m (32.0 m from roof slab)	116.4 m	As planned
Tanjung Berakit	66.0 m	97.5 m	As planned

Source: Results from questionnaire survey of Batam VTS Center

All the radar scanners and multiple transmissions parabolic antennas for Phase 1 were installed as planned.

Table 4: Comparison of Planned and Actual Major Outputs (Phase 1: Equipment Procured)

Equipment	Plan					Actual/ Comparison
	Quantity (Total)	Hiyu Kecil	Takong Kecil	Batu Ampar	Tanjung Berakit	
Radar System	4	1	1	1	1	As planned
VHF Marine Radio System	3	1		1	1	One more unit in Takong Kecil
AIS Base Station System	3	1		1	1	As planned
CCTV Camera System	1		1			One more unit in Batu Ampar
Meteorological Sensor Unit	2	1			1	As planned
Multi-Function Console (With VHF Radio Communication Unit)	5			5		One more unit in Batu Ampar
Tracking System	1			1		As planned
Data Base for Vessel Information	1			1		As planned
AIS Server System	1			1		As planned
CCTV Video Display System	1			1		As planned
Meteorological Monitor Console	1			1		As planned
Record and Playback System for Vessel Traffic	1			1		As planned
Resource Management System	1			1		As planned
Multiplex Radio Equipment	6	1	2	2	1	As planned

Source: Results from questionnaire survey of Batam VTS Center

As regards equipment procured for Phase 1, one unit of VHF marine radio system was added in Takong Kecil, and one unit each of CCTV camera system and multi-function console were added in Batu Ampar (Batam VTS Center). This was because after the completion of Phase 1 and Phase 2, the Standard Operation Procedures (hereinafter referred to as “SOPs”)

for Batam VTS Center and Dumai VTS Center have been prepared under JICA technical cooperation project “The Project on Enhancing of Vessel Traffic Service System Management Capacity Phase 1 and 2,” and additional equipment became necessary in line with the developed SOP. Specifically, equipment was added because the monitoring activities are divided, the need for more detailed monitoring activities during nighttime is increased, and Batam VTS Center is decided to monitor all sites of Phase 1 and 2, to improve navigation safety. It can be said that the changes were reasonable.

Table 5: Comparison of Planned and Actual Major Outputs (Phase 2: Buildings)

Building	Plan			Actual/ Comparison
	Structure Item	Facilities	Total Floor Area	
Dumai VTS Center	Reinforced concrete, one story	Operation room, engineer room, UPS room, staff room, napping room, toilet, etc.	207.36 m^2	As planned
Sensor Station (Tanjung Medang)	Reinforced concrete, one story	Machine room, UPS room	42.25 m^2	As planned
Generator House (Type A) (Tanjung Medang)	Reinforced concrete, one story	Generator room	55.0 m^2	As planned
Generator House (Type B) (Dumai)	Reinforced concrete, one story	Generator room	45.0 m^2	As planned

Source: Results from questionnaire survey of Dumai VTS Center

All Phase 2 buildings were constructed as planned.

Table 6: Comparison of Planned and Actual Major Outputs
(Phase 2: Steel Tower for the Radar Scanners and Multiple Transmission Parabolic Antennas)

Site	Plan (Height of the Steel Tower)		Actual/ Comparison
	Height From the Ground	Height From Sea Water Level	
Tanjung Medang	73.0 m	75.5 m	As planned
Tanjung Sair	85.0 m	87.5 m	As planned
Dumai Note)	50.0 m	54.0 m	As planned
Selincing Note)	50.0 m	52.0 m	As planned
Tanjung Parit	87.5 m	89.5 m	As planned
Simpang Ayam	84.5 m	87.5 m	As planned

Source: Results from questionnaire survey of Dumai VTS Center

Note) Constructed under the responsibility of the Indonesian side through the ODA loan project "Maritime Telecommunication System Development Project (IV)" (Part of the tasks to be undertaken by the Indonesian side.)

All the radar scanners and multiple transmissions parabolic antennas for Phase 2 were installed as planned. In this project, the resources of the ODA loan project "Maritime Telecommunication System Development Project (IV)," were utilized and the installation of steel towers in Dumai and Selincing, which had been the task to be undertaken by the Indonesian side, was carried out by the ODA loan project. Interviews with Dumai VTS Center and the project consultant confirmed that there were no particular problems with coordination of the two projects, including the timing of implementation.

Table 7: Comparison of Planned and Actual Major Outputs (Phase 2: Equipment Procured)

Equipment	Plan						Actual/ Comparison
	Tanjung Medang	Tanjung Sair	Dumai	Selincing	Simpang Ayam	Tanjung Parit	
Sensor Station and Repeater Station							
Radar System	1						As planned
VHF Marine Radio System	1					1	As planned
AIS Base Station System (With Base Station Control)	1					1	As planned
CCTV Camera System (With Camera Controller)	1						As planned
In-Facility Surveillance Camera		1			1		As planned
Meteorological Sensor Unit with Data Logger	1						As planned
Air Conditioner (Unmanned Station)	1						As planned
Diesel Engine Generator	1						As planned
Solar Power Generator		1			1	1	As planned
Office Building Unit (Including Accessories)		1			1	1	As planned
VTS Sub-Center							
Tracking System			1				As planned
Multi-Function Console (With VHF Radio Communication Unit)			1 Note 1				As planned
Data Base for Vessel Information			1				As planned
Record and Playback System for Vessel Traffic			1				As planned
AIS Server System			1				As planned
CCTV Video Display System			1				As planned
Meteorological Monitor Console			1				As planned

Resource Management System			1				As planned
Printer (Monochrome and Color)			1				As planned
Communication Line Unit between Batu Ampar and Dumai			1 Note 2				As planned
Common Equipment for Sensor Station, Repeater Station and VTS Sub-Center							
Equipment Installation Stand and Others			1				As planned
Multiplex Radio Equipment	1	1	1 Note 3	1 Note 3	1	1	As planned

Source: Results from questionnaire survey of Dumai VTS Center

Note 1) and Note 2) One unit installed in Batu Ampar (where Batam VTS Center is located) as planned

Note 3) ODA loan facilities (Maritime Telecommunication System Development Project (IV)) used between Dumai and Selincing. (Part of the tasks to be undertaken by the Indonesian side.)

All Phase 2 procured equipment was installed as planned.

Table 8: Comparison of Planned and Actual Major Outputs (Phase 2: Soft Component)

Plan Item	Actual/Comparison
VTS basic training (classroom and hands-on training) ・ VTS system overview ・ VTS trends ・ VTS facilities and equipment ・ Vessel operation management ・ Maritime knowledge (sea charts, etc.) ・ Vessel movement monitoring, emergency response ・ Field practice	As planned

Source: Results from questionnaire survey of Batam VTS Center and Dumai VTS Center

Soft component (VTS basic training) conducted in Phase 2 was implemented as planned.

As a result of questionnaire survey and interviews with Batam VTS Center and Dumai VTS Center, all the tasks to be undertaken by the Indonesian side have been duly completed for both Phase 1 and Phase 2.

The Operation Room at Batam VTS Center

Monitoring Screen in the Operations Room at Batam VTS Center

Exterior of Dumai VTS Center Building

Operation Room at Dumai VTS Center

Radar Scanners and Multiple Transmission Parabolic Antennas at Dumai VTS Center

Exterior of Selincing Repeater Station

3.2.2 Project Inputs

3.2.2.1 Project Cost

The project cost was planned to be 1,570 million yen on the Japanese side and 2.84 million yen on the Indonesian side for Phase 1, and 1,430 million yen on the Japanese side and 8.39 million yen on the Indonesian side for Phase 2. Of which, the actual costs borne by the Indonesian side were not available because it was not recorded solely as project costs of both Phase 1 and 2. Consequently, the project costs were evaluated by comparing the planned and actual cost borne by the Japanese side. The actual cost by the Japanese side for Phase 1 was 1,092.4 million yen, falling within the plan and that for Phase 2 was 1,429.9 million yen as planned (Phase 1: 70% of the planned cost, Phase 2: 100% of the planned cost).

3.2.2.2 Project Period

While the overall project period (from the signing of the Exchange of Notes to the completion of equipment procurement) for Phase 1 was planned from November 2008 to July 2010 (21 months), the actual period was from November 2008 to March 2011 (29 months), which exceeded the plan (138% of the initial plan). The main reasons for the delay were 1) time required for the approval of the bidding documents by the executing agency, the Directorate General of Sea Transportation (hereinafter referred to as “DGST”), 2) time required for the signing of the contractor’s contract after the completion of the bidding process, and 3) time required to investigate the ownership of the access road and project sites and to complete the procedures for land acquisition. (For more information, see “Resettlement and Land Acquisition” under “3.3.2.2 Other Positive and Negative Impacts.”)

While the overall project period (from the signing of the Grant Agreement to the completion of equipment procurement) for Phase 2 was planned from October 2010 to July 2012 (21 months), the actual period was from October 2010 to June 2016 (68 months), which was significantly longer than planned (324% of the initial plan). The main reasons for the delay were 1) delay of bidding process and 2) delay due to transportation incidents. As regards 2), a carrier transporting equipment from Dumai to Tanjung Medang overturned in Dumai Port and submerged its loaded equipment. For this reason, expiration dates of the Exchange of Notes and the Grant Agreement were extended, and equipment damaged by the accident was rebuilt and installed.

Although the project cost was within the plan (Phase 1) or as planned (Phase 2), the project period exceeded the plan. Therefore, efficiency of the project is fair.

3.3 Effectiveness and Impacts[9] (Rating: ③)

3.3.1 Effectiveness

3.3.1.1 Quantitative Effects (Operation and Effect Indicators)

At the time of planning, "operation status of the installed VTS system, implementation status of vessel traffic monitoring and aggregate monitoring hours of vessel traffic," "number of safety information provided to vessels, such as weather information," and "number of times of cooperation with the security and rescue organizations using the VTS system" were set as quantitative effects of the project. Table 9 summarizes baseline, target and actual figures between 2017 and 2019 for each indicator.

Table 9: Quantitative Effects of the Project

Indicators		Baseline FY2008	Target FY2012 1 Year After Completion	Actual 2017 1 Year After Completion	Actual 2018 2 Years After Completion	Actual 2019 3 Years After Completion
1. Operation status of the installed VTS system, implementation status of vessel traffic monitoring and aggregate monitoring hours of vessel traffic (for the waters around the VTS sensor station in the Straits)		There is no VTS system for monitoring	Monitoring activities become possible through the operation of the installed system.	Phase 1: Possible Monitoring activities are conducted 24/7	Phase 1: Possible Same as on the left	Phase 1: Possible Same as on the left
				Phase 2: Possible Monitoring activities are conducted 24/7	Phase 2: Possible Same as on the left	Phase 2: Possible Same as on the left
	(1) The number of vessels monitored by radar in the straits	0	Monitoring with radar becomes possible.	Phase 1: Possible 450 vessels per radar	Phase 1: Possible 473 vessels per radar	Phase 1: Possible 500 vessels per radar
				Phase 2: Possible 24 vessels	Phase 2: Possible 32 vessels	Phase 2: Possible 38 vessels
	(2) Number of vessels receiving information from vessels equipped with AIS	0	Information can be received, monitored and recorded. (Figures are the number of vessels per system)	Phase 1 (3 AIS Base Station Systems): Possible 1,800 vessels	Phase 1 (3 AIS Base Station Systems): Possible 1,900 vessels	Phase 1 (3 AIS Base Station Systems): Possible 2,300 vessels
				Phase 2 (2 AIS Base Station Systems): Possible 625 vessels	Phase 2 (2 AIS Base Station Systems): Possible 680 vessels	Phase 2 (2 AIS Base Station Systems): Possible 720 vessels
2. Number of safety information provided to vessels, such as weather information (for the waters around the VTS sensor station in the Straits)		0	Information can be provided.	Phase 1: Possible But there is no record of the number of safety information provided to vessels.		
				Phase 2: -	Phase 2: Possible 361	Phase 2: Possible 365

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

3. Number of times of cooperation with the security and rescue organizations using the VTS System (for the waters around the VTS sensor station in the Straits)	0	It becomes possible to quickly grasp and provide information on the location and status of the accident vessel, and to establish cooperation system with the related organization.	Phase 1: Possible But there is no record of the number of times of cooperation		
			Phase 2: -	Phase 2: Possible 2 Note 1)	Phase 2: Possible 5 Note 2)

Source: Project Formulation Study (Phase 1, Phase 2), results from questionnaire survey of Batam VTS Center and Dumai VTS Center

Note 1) Breakdown: 1. man overboard, 2. fire on vessel.

Note 2) Breakdown: 1. man overboard, 2. air force training around the sea area (dissemination of training information) x 2 times, 3. fisherman boat sinking (working with the National Search and Rescue Agency to identify the distressed location), 4. coordination with the National Search and Rescue Agency for a vessel docking in the port for rescue.

For all the indicators set at the time of planning, the actual figures have achieved the targets for both Phase 1 and Phase 2.

Regarding indicator 1: “operation status of the installed VTS system, implementation status of vessel traffic monitoring and aggregate monitoring hours of vessel traffic,” the operation of the introduced VTS system made it possible to conduct monitoring activities 24 hours a day, 365 days a year for both Phase 1 and Phase 2. The number of vessels monitored by radars for navigation in the Straits is increasing every year. In addition, the number of vessels receiving information from vessels equipped with Automatic Identification Systems (hereinafter referred to as “AIS”) has been increasing every year, enabling to receive, monitor and record information.

Regarding indicator 2: “number of safety information provided to vessels, such as weather information,” it became possible to provide safely information to vessels, including weather information for both Phase 1 and Phase 2. However, there is no record of the number of safety information provided to vessels for Batam VTS Center. The number of cases for Dumai VTS Center has been recorded since 2018, when it became fully operational, and the number has increased in 2019.

Regarding indicator 3: “number of times of cooperation with the security and rescue organizations using the VTS system,” the VTS system is utilized to collaborate with the agencies responsible for security and rescue for both Phase 1 and Phase 2. However, there is no record of the number of times of cooperation for Batam VTS Center. Dumai VTS

Center has recorded the number of cases since 2018, and the number has increased in 2019.

3.3.1.2 Qualitative Effects (Other Effects)

It is conformed that the project's qualitative effect, "monitoring and assessing the movements of vessels navigating in the Straits is realized" has been achieved for both Phase 1 and Phase 2, based on the interviews with Batam VTS Center and Dumai VTS Center, project site inspections, and interviews with local shipping agents.

As can be seen from the results in Table 9 above, the use of the VTS systems has been expanding every year, and each VTS Center serves as a focal point for relaying and providing information to vessels and relevant organizations involved. To give an example, following measures have been taken place. "1) When the National Search and Rescue Agency receives a distress signal, 2) the Agency contacts Batam VTS Center or Dumai VTS Center, and 3) the VTS Center contacts the vessel in concern to confirm the situation. 4) the VTS Center then confirms the information and 5) provides feedback to the National Search and Rescue Agency for it to take necessary actions, or the VTS Center contacts 6) Harbor Master or 7) Coast Guard, depending on the situation, to take necessary actions as well." (See Figure 1)

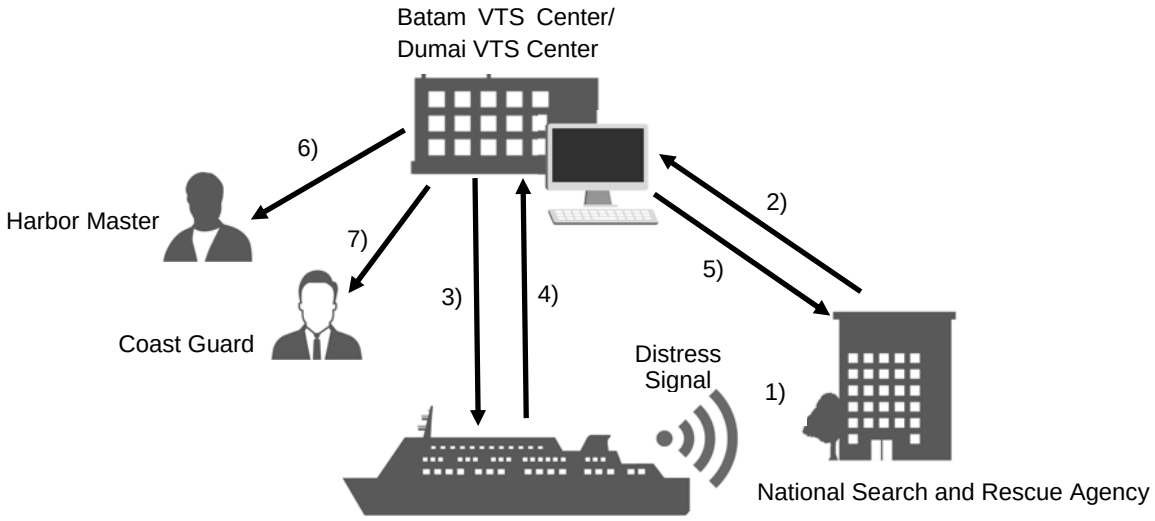

Figure 1: Collaboration with Relevant Agencies and Stakeholders by Batam VTS Center/Dumai VTS Center (Image)

Following specific cases were provided during interviews with local shipping agents. "In August 2019, a crew member was seriously injured when he fell down the stairs on board a vessel underway. The emergency contact was made through the channels of the vessel concerned ➔ Batam VTS Center ➔ shipping agent, and Batam VTS Center promptly relayed the information. This allowed the shipping agent to arrange for an

ambulance and to transport the injured crew to the hospital smoothly after the vessel's arrival in the port. In the absence of direct communication between the vessel and the shipping agent, Batam VTS Center played a relay role of information."

According to DGST, the Ministry of Transportation has concluded Memorandum of Understandings (hereinafter referred to as "MOUs") or Cooperation Agreements with the following agencies, and comprehensive cooperation and coordination system is in place, including information and data sharing in the operation of the VTS system.

- MOU on Utilization of Meteorological, Climatology and Geophysical Information in the Transportation Sector (Meteorological, Climatology and Geophysical Agency)
- MOU on Cooperation of Education, Research, Devotion, Community, Development of Resource Sector and Development of Traditional Vessel (Ministry of Research, Technology and Higher Education)
- MOU on Implementing Law Enforcement in the Shipping Sector (Indonesian National Police)
- MOU on Safety of Navigation, Maritime Environment Protection, Conservation Areas and Marine Tourism (Coordinating Ministry for Maritime and Investment Affairs, Ministry of Environment and Forestry, Ministry of Marine Affairs and Fisheries, Ministry of Tourism and Creative Economy, Indonesian National Military, and Geospatial Information Agency)
- Cooperation Agreement on Management of Marine Protected Areas and Marine Tourism (same as above)
- Cooperation Agreement on Maritime Environmental Protection and Safety (same as above)

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

3.3.2 Impacts

3.3.2.1 Intended Impacts

The impact of the project was envisioned to be "improvement of safety of vessels navigating the Straits," "improvement of maritime safety situation (e.g., improvement of search and rescue operations)," and "establishment of necessary systems for vessel control and commencement of trainings to operators with the development of VTS infrastructures." In this regard, interviews were conducted with Batam VTS Center, Dumai VTS Center and beneficiaries of the project (captains of ferries operating in the Straits, sub-captains of cargo

vessels and shipping agents).

The results confirmed that the introduction of the VTS system in this project has improved safety of vessels and maritime safety situation. For example, Batam VTS Center pointed out that "During multiple incidents of piracy in the Singapore Straits in 2015–2016, the affected vessels sent out distress signals (May Day) via channel 16 (international radio broadcast). In response, Batam VTS Center promptly relayed the information to the Navy's Quick Response Western Fleet Team for situational assessment and rescue. This allowed the Navy to take appropriate actions." Also, according to Dumai VTS Center, "In 2017, a vessel navigating in the monitored waters lost control and ran out of control. Therefore, the VTS Center promptly sent out information to alert vessels in the vicinity and prevented collisions and other incidents." Furthermore, ferry captains and sub-captains of cargo vessels navigating in the Singapore Strait, and shipping agents explained the following.

- Before the project, the VTS system was only available on the Singapore side, and information including navigation status of other vessels and weather conditions could only be obtained from the Singapore side. So, when passing through the TSS in Singapore Strait from the Indonesian territorial water side, visual inspection was conducted for navigation. After the project, safety information (such as position and speed of other vessels) and weather information can now be obtained from Batam VTS Center, allowing to navigate with confidence. Thus, the project is highly important.
- Navigating at the intersection of Indonesian territorial waters and the TSS (Batu Berharti) is always nerve-wracking due to the large number of vessels navigating through it. Whenever navigating in the area, Batam VTS Center must be contacted to obtain information on the location and speed of vessels navigating in the vicinity. Since right information is always available from Batam VTS Center, it is safe to navigate. It would be horrible without the VTS system. We do not even want to imagine such a situation.

In addition, as regards "establishment of necessary systems for vessel control and commencement of trainings to operators with the development of VTS infrastructures," following information was confirmed from interviews with Batam VTS Center and Dumai VTS Center.

Since the implementation of the project, various rules and systems have been established.

- 2019: Enactment of a regulation making it compulsory for vessels operating in Indonesian waters to carry AIS. (Transportation Ministerial Decree PM No. 7/2019 and its update PM 58/2019)
- 2018: New regulation regarding Traffic Lane (inbound and outbound)

(KP775/2018)

- 2017: SOP for Dumai VTS Center prepared in March[10] (HK 103/2/3/DJPL 17)
- 2013: SOP for Batam VTS Center prepared in March[11] (UM.008/12/16/DJPL.13)

Training of VTS operators, etc. has also begun. The operators at each VTS Center have been trained and strengthened capacity through soft component of the project (see Table 8), JICA technical cooperation project (The Project on Enhancing of Vessel Traffic Service System Management Capacity Phase 1 and 2), and dispatch of long-term experts. Japan Aids to Navigation Association has implemented both soft component of the project and the technical cooperation project described above, and the two projects have been effectively coordinated and consistent support has been provided. Furthermore, in coordination with both projects, long-term experts have provided training and guidance to VTS operators. Interviews with each VTS Center indicated that this cross-scheme support has been effective and that VTS operators have accumulated necessary experiences and knowledge. In addition to JICA, Australian Maritime Safety Authority (AMSA) and others have provided training to VTS operators. Also, VTS operators have been dispatched to VTS Centers in Japan, Australia, and Singapore for a short period of time to receive counterpart training. Furthermore, a simulation room has been set up in Batam VTS Center's premise, and the Center has gone so far as to accept trainees from all VTS Centers in Indonesia.[12]

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

3.3.2.2 Other Positive and Negative Impacts

(1) Impacts on the Natural Environment

According to DGST, the project would not have any particular negative impacts on the natural environment, and therefore submission of the Environmental Impact Assessment (EIA) was not required by the Ministry of Environment and Forestry. At the time of ex-post evaluation, no particular negative impact on natural environment has been confirmed or reported and from the results of site inspection, it is considered that there were no major environmental problems caused by the project.

(2) Resettlement and Land Acquisition

In Phase 1, land acquisition occurred for the access road in Tanjung Berakit and the project site and a pier in Takong Kecil. Both sites were acquired by DGST from local

[10] VTS SOP and user manuals were developed under JICA technical cooperation project "The Project on Enhancing of Vessel Traffic Service System Management Capacity Phase 1 and 2."
[11] Ibid.
[12] There are 22 VTS Centers in Indonesia, including Batam VTS Center and Dumai VTS Center, across the country.

owners and compensated at market rates. (There were two landowners of the access road and one owner of the project site and a pier. During land acquisition process, DGST conducted ownership investigation survey.) It was confirmed by DGST and District Navigation Office of Tanjung Pinang that land acquisition process was carried out smoothly and in accordance with the Indonesian law, and that there were no particular problems. There was no resettlement. Neither land acquisition nor resettlement occurred in Phase 2.

Based on the above, it can be considered that there was no particular problem with land acquisition.

(3) Other Impacts

In response to the lightning damages in Phase 1, restoration and enhancement of lightning protection function was carried out by JICA follow-up cooperation after project completion. In addition, lightning protection function of all site facilities has been strengthened in Phase 2 (see “Project Outputs” under “3.2 Efficiency”). According to Batam VTS Center, the enhanced lightening protection function has had unexpected negative impacts. Specifically, when lightning occurred, lightning strikes to facilities related to the project were avoided, but it became easier to strike surrounding areas of the projects (e.g. lighthouse, guard station of lighthouse, etc.), causing damages to electrical appliances, etc. However, according to Batam VTS Center, they were not serious problems that would affect the operation of the lighthouse or the safety of the guards, therefore, it is not considered to be a major problem that will lower the impact of the project.

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

3.4 Sustainability (Rating: ②)

3.4.1 Institutional/Organizational Aspects of Operation and Maintenance

Operation and maintenance of VTS related facilities and equipment developed by the project are managed by District Navigation Office of Tanjung Pinang and District Navigation Office of Dumai, both of which are under the jurisdiction of DGST, and Batam VTS Center and Dumai VTS Center, under the supervision of the respective District Navigation Office, carry out operation and maintenance work on site. Each District Navigation Office and VTS Center are in constant communication with each other, having close coordination system in place. Also, decision making process and authority are clear.

Table 10 shows responsibility and number of staff in each District Navigation Office at the time of the ex-post evaluation.

Table 10: Responsibility of Each District Navigation Office

District Navigation Office and Number of Staff	Number of Staff in Each District Navigation Office and at Each Site	
District Navigation Office in Tanjung Pinang ・Number of Staff: 290 (*) * Staff consists of staff in the same office and field staff under its jurisdiction.	Batu Ampar (Batam VTS Center)	48
	Takong Kecil	2
	Tanjung Berakit	3
District Navigation Office in Dumai ・Number of Staff: 200 (*) * Staff consists of staff in the same office and field staff under its jurisdiction.	Dumai (Dumai VTS Center)	34
	Hiyu Kecil	3
	Tanjung Medang	3
	Tanjung Sair	1
	Selincing	1
	Simpang Ayam	1
	Tanjung Parit	3

Source: Results from questionnaire survey of Batam VTS Center and Dumai VTS Center

At the time of the ex-post evaluation, Batam VTS Center (Batu Ampar) and Dumai VTS Center had 48 and 34 staff members respectively, the breakdown of which is shown in Table 11.

Table 11: Breakdown of Staff at Batam VTS Center in Batu Ampar and Dumai VTS Center

Batam VTS Center (Batu Ampar) 48	
Manager	1
VTS Senior Supervising Operator	1
VTS Supervising Operators	5
VTS Operators	24
Senior Supervising Technician	1
Technicians (electrical, IT, software, network)	4
Administration Staff	4
Security Staff	6
Office Boys	2
Dumai VTS Center 34	
Manager	1
VTS Supervising Operators	6
VTS Operators	14
Senior Supervising Technician	1
Technicians (electrical, mechanical, IT)	7
Administration Staff (including Staff in charge of VTS Tariff Collection)	2
General Administration Staff	3

Source: Results from questionnaire survey of Batam VTS Center and Dumai VTS Center

Each VTS Center has a team of VTS supervising operator and VTS operators who are divided into small groups and work three shifts a day (8am–4pm, 4pm–10pm, 10pm–8am), 24 hours a day, 365 days a year for VTS operations. According to each VTS Center, there are many things that cannot be handled with the current number of staff, in particular, there is a shortage of VTS operators and technicians (electricians and IT engineers). Although shortage of staff has not caused any major problems in the operator work so far, it is difficult to respond quickly when problems such as software failures occur.

As regards communication and cooperation system with relevant organizations, see "Qualitative Effects" under "3.3 Effectiveness and Impacts" above. Although the specifics of the MOUs and Cooperation Agreements could not be confirmed due to the inclusion of confidential information, they are considered to stipulate comprehensive cooperation between the Ministry of Transportation and organizations involved.

DGST issued a DGST Decree (KP294/DJPL/2020) on March 5, 2020 regarding maintenance of VTS and marine radio station equipment. The DGST Decree contains new provisions to improve the sustainability of marine communications equipment operations and to keep pace with technological advances. Specifically, the DGST Decree introduced a new system targeting each of the 22 VTS Centers nationwide, including Batam VTS Center and Dumai VTS Center, that their supervising District Navigation Offices can sign maintenance contract ("full support maintenance" contract) valid for one year with the equipment vendor, who can then provide support on maintenance activities and the renewal and replacement of spare parts.

So far, maintenance of equipment related to the VTS system has been directly managed by each VTS Center, and after-sales service could not be expected (legally or institutionally) after the expiration of vendor's warranty period. However, with the introduction of the DGST Decree, "full support maintenance" services from vendors will be available based on the contracts. This allows each VTS Center to quickly replace spare parts in a timely manner and recover from unexpected system failure or damage. According to DGST, it will spend the next year explaining and disseminating the DGST Decree to vendors and other stakeholders and is negotiating budget with the Ministry of Finance for full implementation in fiscal year 2021.

Based on the above, there are some problems with the shortage of staff at each VTS Center regarding institutional/organizational aspect of operation and maintenance of the project. However, the DGST Decree regarding maintenance of VTS and marine radio station equipment has been issued to allow vendors to carry out maintenance activities and upgrade and replace spare parts. This is significant progress towards strengthening sustainability of the project.

3.4.2 Technical Aspects of Operation and Maintenance

The staff in charge of operations and maintenance are graduates of a bachelor's degree in IT, electronics, mechanical, etc., or vocational schools, etc., and staff holding the DGST's National Certificate, "Technician for Costal Telecommunication" are also assigned to the project. Also, VTS operators are required to hold a license (V103/1) certified by the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA).

At the time of delivery of the equipment, the vendor provided basic guidance on operation and repair of the telecommunication equipment, and after the handover of the project, Batam VTS Center and Dumai VTS Center have been directly operating and maintaining the equipment including system management. However, according to each VTS Center, they were not well versed in the detailed handling of individual equipment and spare parts and could not always recover quickly in the event of a sudden system failure, malfunction or damage. Specifically, when system failures or malfunctions occurred, they were often unable to resolve or recover within a single shift, and often carried over from one shift to the next. When these issues arise, each VTS Center, with the approval of each District Navigation Office that oversees it, deals with them in consultation with vendors.[13]

Basic VTS training has been conducted in the soft component of the project, and its contents have been shared and utilized through on-the-job training in each VTS Center, including those newly hired after the completion of the project. According to each VTS Center, the VTS training in the soft component was well understood and helpful in the daily operations. The training was conducted in both English (with interpretation) and Indonesian, and there were no language problems. Prior to the training, English training on maritime terminology, etc. and basic training on VTS skills were conducted, and the participants were able to deepen their understanding of the training program. (See "3.3.2 Impacts" above for more information on capacity building and training of VTS operators.)

In addition, the SOPs and user manuals for each VTS Center have been prepared as part of JICA technical cooperation project "The Project on Enhancing of Vessel Traffic Service System Management Capacity Phase 1 and 2" which have been shared with the staff in charge of operation and maintenance at each Center and utilized in their daily work. However, it has been 7 years since the SOP was developed for Batam VTS Center and 3 years for Dumai VTS Center, and in that time, new rules, institutions, etc. have been enacted (see "3.3.2 Impacts" above), and according to each VTS Center, the SOPs need to be updated.

From the above, as regards technical aspect of operation and maintenance, staff in charge

[13] According to the interview with the vendor, the vendor has been providing advice to the extent possible although the project had been completed and the warranty period had already expired.

of maintenance may not be able to fully respond to sudden system failures, breakdowns, or damages when they occur.

3.4.3 Financial Aspects of Operation and Maintenance

As regards operation and maintenance cost of the VTS system developed by this project, each VTS Center submits the required items to the District Navigation Office that oversees it, and the District Navigation Offices estimate the cost of items and other expenses, and then request budget to DGST. The budget is then allocated to each District Navigation Office after scrutiny and approval by DGST.

The actual allocations and actual expenditures for operation and maintenance costs for each VTS Center are shown in Tables 12 and 13. According to each VTS Center, actual allocation has been 70–80% of the required budget, which is not sufficient to carry out proper operations and maintenance work, including procurement of spare parts.

Table 12: Operation and Maintenance Cost of Batam VTS Center

(Unit: million IDR)

	2017	2018	2019
Budget (Requested Amount)	N.A.	N.A.	N.A.
Actual Allocation	1,601.3	3,115.9	1,658.9
Actual Expenditure	1,600.6	1,846.9	1,658.6

Source: Results from questionnaire survey of Batam VTS Center

Note) The significant increase in the actual allocation in 2018 is due to the inclusion of maintenance costs for the Marine Electronic Highway (MEH) Project located in Batam VTS Center compartment (the budget for this project was approved in January 2017, the previous year). However, the budget was returned to DGST in 2018 when the decision was made to terminate the project and maintenance costs were no longer required. As a result, the actual expenditure for the same year was only part of the actual allocation.

Table 13: Operation and Maintenance Cost of Dumai VTS Center

(Unit: million IDR)

	2018	2019
Budget (Requested Amount)	N.A.	N.A.
Actual Allocation	N.A.	981.0
Actual Expenditure	N.A.	934.0

Source: Results from questionnaire survey of Dumai VTS Center

The Indonesian Government has introduced a system to collect VTS user tariff from vessels

that communicate with VTS Centers.[14] The VTS user tariff collected by each VTS Center is shown in Tables 14 and 15. While both of these increases are steady, all user tariff collected becomes state revenue and do not contribute to VTS Center's revenue (e.g., operations and maintenance budget).

Table 14: VTS User Tariff Collected by Batam VTS Center

(Unit: million IDR)

2016	2017	2018	2019
4,616.7	9,108.2	9,962.7	10,593.7

Source: Results from questionnaire survey of Batam VTS Center

Table 15: VTS User Tariff Collected by Dumai VTS Center

(Unit: million IDR)

2018	2019
1,522.7	1,559.9

Source: Results from questionnaire survey of Dumai VTS Center

Each VTS Center has plans to upgrade systems and technology, repair and restoration, and expand the area to be monitored, but prospects of securing specific budget is still undecided. (See "3.4.4 Status of Operation and Maintenance.")

Based on the above, there are some problems with financial aspect of operation and maintenance due to the lack of budget.

3.4.4 Status of Operation and Maintenance

Facilities and equipment developed by the project are properly utilized in accordance with the original plan. Phase 1 was completed in March 2011, and four sensor stations were installed. Immediately after the hand-over to the Government, three of them (Takong Kecil, Hiyu Kecil and Tanjung Berakit) were damaged by lightning, causing major equipment such as radar, AIS, and IP converters to malfunction. Thus, repairs and lightning countermeasures were carried out in JICA follow-up cooperation after the completion of the project. According to Batam VTS Center, the cooperation was completed in April 2016 and the VTS system had been restored to its original function and there have been no significant issues since then up to the point of ex-post evaluation.

About 10 years have passed since completion of Phase 1, and the systems and technology

[14] Payment of the VTS user tariff is one of the procedures required for vessels to obtain permission to leave the ports of Batam and Dumai.

have become outdated, with breakdowns and malfunctions that have prevented it from adequately meeting the current needs. For example, Batam VTS Center uses Windows XP (support period has already ended) and the system needs to be upgraded. It is also feared that the radar signal processors (radar CPUs) are outdated and will be discontinued in the near future, making it impossible to upgrade the product. Furthermore, since DVDs are still used as backup media, they are not recoverable if they are damaged, so VTS Centers are expecting to introduce cloud storage system. For Phase 2, systems and technology also need to be upgraded, repaired and restored, and some equipment is not functioning. For example, Dumai VTS Center is using Windows 7 and the system needs to be upgraded. In addition, the AIS message (a device that automatically sends weather and other information) is not functioning, so wireless is used as an alternative. Furthermore, as CCTV is not functioning, only AIS is used to identify and locate vessels.

Spare parts have been inspected in accordance with the user manual for both Phase 1 and Phase 2, and consumables (magnetron, microwave integrated circuits, UPS batteries, etc.) have been regularly renewed. However, magnetrons installed on the radar, for example, which need to be replaced every 5,000 operating hours, take three to six months to procure and are difficult to secure in a timely manner due to budget shortages.[15] In addition, the deteriorating VHF, AIS, GPS, etc. need to be replaced and timely budget needs to be secured. On the other hand, as stated in "3.4.1 Institutional/Organizational Aspect of Operation and Maintenance" above, it is expected that maintenance situation will improve if maintenance contracts with vendors are executed in accordance with the DGST Decree regarding maintenance of VTS and marine radio station equipment.

Dumai VTS Center plans to expand the area to be monitored (installation of new equipment and facilities[16]) in 2021 or 2022, but there is no prospect of securing budget at the time of the ex-post evaluation.

Based on the above, as regards status of operation and maintenance, systems and technology need to be upgraded, repaired and restored at the time of the ex-post evaluation.

Some minor problems have been observed in terms of the technical aspect, financial aspect and current status. Therefore, sustainability of the project effects is fair.

[15] Batam VTS Center and Dumai VTS Center are considering the replacement of the magnetron with solid state device, as there is a strong demand for the introduction of solid state radars to replace the magnetron, which has a longer life.

[16] According to Dumai VTS Centre, the proposed locations are envisaged to be Jemur Island (AIS+ radar), Bagan Siapi-Api Island, Sei Pakning, Selatpanjang (AIS + radar), Pekanbaru, Tembilahan and Rengat.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

This project introduced the VTS system with the aim of monitoring and assessing the movements of vessels navigating in the coastal areas of Indonesia in the Straits. This project, which aims to improve the safety of vessels navigating in the Straits, is consistent with Indonesia's development policy, development needs and Japan's assistance policy at the time of planning and the ex-post evaluation. Therefore, the relevance of the project is high. In terms of project implementation, although the project cost was within the plan, the project period exceeded the plan. Therefore, efficiency of the project is fair. As for project effects, all quantitative indicators set at the time of planning have achieved. As for qualitative effects, it was confirmed from the interviews with local officials that monitoring and assessing the movements of vessels navigating in the Straits have achieved. Regarding impacts, it can be considered that the project has contributed to the improvement of safety of vessels navigating in the Straits and to the improvement of maritime safety conditions, based on the interviews with ferry captains and sub-captains of cargo vessels navigating in the Straits, and shipping agents, etc. In addition, development of systems necessary for ship control and training of operators are also in place. Therefore, this project has mostly achieved its objectives and thus, effectiveness and impacts of the project are high. No negative impacts on natural environment and resettlement have been reported. Regarding operation and maintenance, some minor problems have been observed in terms of the technical aspect, financial aspect and current status. Therefore, sustainability of the project effects is fair.

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

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

<u>Necessity of early upgrade, repair and restoration of systems and technology</u>

About 10 years have passed since completion of Phase 1, and the systems and technology have become outdated, with breakdowns and malfunctions that have prevented it from adequately meeting the current needs. Systems and technology also need to be upgraded, repaired and restored for Phase 2. While Batam VTS Center and Dumai VTS Center have plans to update and upgrade systems and specifications and to expand the area to be monitored, but there is no prospect of securing concrete budget at the time of the ex-post evaluation. Therefore, it is important for each VTS Center to work with the District Navigation Office in charge to secure budgets and to upgrade, repair and restore systems and technology as early as possible.

Necessity of updating the SOPs

SOPs for Batam VTS Center and Dumai VTS Center were prepared in March 2013 and March 2017, respectively, under JICA technical cooperation project “The Project on Enhancing of Vessel Traffic Service System Management Capacity Phase 1 and 2.” Since then, necessary institutional improvements for vessel control have been made, such as introduction of the regulation making it compulsory for vessels operating in Indonesian territorial waters to be equipped with AIS and the enactment of new regulations on traffic lane (inbound and outbound), and thus the current SOPs have not been able to accommodate these changes. Therefore, each District Navigation Office should work with DGST to promptly update SOPs to accurately reflect the situation as the VTS system operations expand and change.

Necessity of strengthening communication and cooperation with relevant organizations

The Ministry of Transportation is systematically undertaking cooperation and coordination with organizations involved in monitoring and assessing the movements of vessels navigating in the Straits by concluding comprehensive MOUs or Cooperation Agreements with them. The content of the MOUs and Cooperation Agreements could not be confirmed due to the inclusion of confidential information, but since they are comprehensive agreements, it is assumed that they do not include details based on specific activities at the field level. Therefore, based on awareness of the issues in day-to-day vessel monitoring and assessing activities, such as what exactly each VTS Center needs from the organizations involved, what information and data need to be shared, and what kind of coordination framework should be developed with the organizations involved, it is desirable to include these details in the SOPs that are expected to be updated in the future, for example.

4.2.2 Recommendations to JICA

None.

4.3 Lessons Learned

The importance of maintenance contracts to receive after-sales support after the project completion.

Maintenance of equipment and facilities related to the VTS system in this project has been directly managed by each VTS Center, and after-sales service could not be expected legally or institutionally after the expiration of vendor’s warranty period. However, each VTS Center was not well versed in the detailed handling of individual devices, equipment, and spare parts, and thus could not always recover quickly in the event of unexpected system failures, breakdowns, or damages. Under such circumstances, DGST has issued the DGST Decree enabling each VTS

Center to receive “full support maintenance” services from the vendor even after the completion of the project. The introduction of such system is expected to make significant progress in improving sustainability of this project. From this, when introducing a new system in the project and the recipient country has constraints on operation and maintenance capacity for the equipment and facilities of the system, it is considered effective for ensuring sustainability of the project to prepare a structure in the form of maintenance contracts with vendors or agents to receive after-sales support after completion of the project.

End

Republic of Indonesia

FY2019 Ex-Post Evaluation of Japanese Grant Aid Project

"The Project for Construction of Bridges in the Province of Nusa Tenggara Barat"

"The Project for Construction of Bridges in the Province of Nusa Tenggara Barat, Phase II"

"The Project for Construction of Bridges in the Province of Nusa Tenggara Barat, Phase III"

External Evaluator: Takayuki Ishikawa, Mitsubishi UFJ Research and Consulting Co., Ltd.

0. Summary

The objective of this project[1] is to improve a function of the South Ring Road as an arterial road in the southern region of Sumbawa Island by constructing and rehabilitating bridges, thereby contributing to the improvement in living standard of the neighbouring residents and the economic development of that area. The project is highly relevant to Indonesia's development plan, development needs and Japan's ODA policy at the time of the project planning and ex-post evaluation. Therefore, its relevance is high. Although the project cost was as planned or within the plan in each project phase, the project period exceeded the plan in the Phase III project. Part of the road and small bridge constructions planned to be handled by Nusa Tenggara Barat (hereinafter referred to as "NTB") is yet to be completed. Therefore, efficiency of the project is fair. As a result of the project implementation, the targeted sectors became always passable and the transit time significantly reduced, resulting in improved access to public services and markets, as well as improved living standards of the neighbouring residents. This project has mostly achieved its objectives. Therefore, effectiveness and impacts of the project are high. No negative impacts on the natural environment or land acquisition have been observed. Some minor problems have been observed in terms of the technical aspect and current status of operation and maintenance. Therefore, sustainability of the project effects is fair.

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

[1] In this ex-post evaluation, the project, which consists of three phases, is evaluated as a whole. When the analysis is made dividing into each individual phase, a specific phase is indicated. When the analysis is made as a whole, then the project is stated in a singular form.

1. Project Description

Project Location

Project Bridge

1.1 Background

NTB in Indonesia is one of the least developed regions in the country[2] where the correction of economic disparities is an issue to be tackled. The southern region of Sumbawa Island in NTB has a high development potential in mining, but the lack of transportation infrastructure has been a constraint to economic development. On a ring road which connects the major cities of the region's east and west (Tano and Sumbawa Besar) (hereinafter referred to as the "South Ring Road"), a smooth traffic was hampered because bridges were simple and temporary ones, so became impassable when the water level of river rose, or because they were already destroyed or washed away, so the users needed to detour. Under these circumstances, the Government of Indonesia has been developing the South Ring Road in order to improve the traffic situation in that area. Of these, in the Sejorong–Tongoloka sector (hereinafter referred to as the "Phase I sector/project"), the Tongoloka–Tatar sector (hereinafter referred to as the "Phase II sector/project") and the Tatar–Lunyuk sector (hereinafter referred to as the "Phase III sector/project"), the Government of Indonesia requested the Government of Japan to provide assistances for the construction of bridges which were technically and financially difficult to build.

1.2 Project Outline

The objective of this project is to improve a function of the South Ring Road as an arterial road in the southern region of Sumbawa Island by constructing eight new bridges as well as by rehabilitating one existing bridge (Phase I project), and four new bridges which are technically

[2] The gross regional domestic product per capita in NTB is lower than most of the other provinces, according to *"Statistical Yearbook of Indonesia 2020."*

difficult to build (Phase II project), and 10 new bridges which are equal to or longer than 20 meters in length and technically difficult to build (Phase III project), thereby contributing to the improvement in living standard of the neighbouring residents and the economic development of that area.

Grant Limit/Actual Grant Amount	Phase I: 794 million yen/793 million yen Phase II: 492 million yen/299 million yen Phase III: 961 million yen/843 million yen
Exchange of Notes Date /Grant Agreement Date	Phase I: July 2006/N.A. Phase II: December 2009/January 2010 Phase III: March 2013/March 2014
Executing Agencies	Ministry of Public Works and Housing, Directorate General of Highways West Nusa Tenggara Province Sumbawa Regency West Sumbawa Regency
Project Completion	Phase I: March 2009 Phase II: December 2011 Phase III: December 2016
Target Area	Sumbawa Island, West Nusa Tenggara Province
Main Contractors	Phase I and II: Hazama Corporation Phase III: Takenaka Civil Engineering & Construction Co., Ltd.
Main Consultants	Katahira & Engineers International
Procurement Agency	N.A.
Basic Design/Preparatory Survey	Phase I: June 2004–February 2005 Phase II: May 2010–December 2010 Phase III: November 2011–March 2012
Related Projects	<u>ODA Loan</u> - "Road Maintenance Improvement Project (2)" (December 1996–December 2001) <u>Grant Aid</u> - "The Project for Bridge Construction in the Province of NUSA TENGGARA TIMUR" (August 2005–April 2008) <u>Others</u> - "Eastern Indonesia Region Transport Project-1" (IBRD, November 2001–June 2006) - "Eastern Indonesia Region Transport Project-2" (IBRD, June 2004–September 2011)

2. Outline of the Evaluation Study

2.1 External Evaluator

Takayuki Ishikawa, Mitsubishi UFJ Research and Consulting Co., Ltd.

2.2 Duration of Evaluation Study

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

Duration of the Study: October 2019–January 2021

Duration of the Field Study: January 9, 2020–January 29, 2020

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

3.1 Relevance (Rating: ③[4])

3.1.1 Consistency with the Development Plan of Indonesia

The National Medium-Term Development Plans (2000–2004, 2005–2009, 2010–2014), developed by the Government of Indonesia at the time of the project planning for each phase, continuously identified the poverty alleviation and the reduction of economic disparities between cities and rural areas as one of the key issues, and emphasized the importance of infrastructure development in the rural areas to resolve these issues. In response to *the National Medium-Term Development Plans*, the Ministry of Public Works and Housing has developed a series of *the Strategic Plans (2000–2004, 2005–2009, 2010–2014)* and, as a policy for the road sector, has facilitated the improvement and development of the road networks in the rural, isolated and remote areas to support economic activities.

In *the National Medium-Term Development Plan (2015–2019)* at the time of the ex-post evaluation, the Government of Indonesia indicates that it continues to tackle the issues of poverty and economic disparity as before. The government tackles the improvement of connectivity in rural areas for the purpose of connecting remote sites to nearby economic cities by developing infrastructures such as road to support economic activities in those areas. The connectivity improvement in the rural areas is also stipulated in *the Strategic Plan (2015–2019)* by the Ministry of Public Works and Housing, which emphasizes, *inter alia*, the significance of project implementation in geographically disadvantaged and remote sites to aim for a balanced development across regions. Therefore, even at the time of the ex-post evaluation, the implementation of this project is consistent with the development plan of Indonesia.

3.1.2 Consistency with the Development Needs of Indonesia

At the time of the project planning, the eastern region of Indonesia, including NTB, was one

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

[4] ③: High, ②: Fair, ①: Low

of the least developed regions, with the NTB's gross regional domestic product (GRDP) per capita being about a half of the national average. At the time of the ex-post evaluation, the economic performance of the province compared to the national average does not improve, where a large disparity still exists.

Table 1: Transition of GRDP per Capita (in Thousand IDR)

Province	At the Time of the Project Planning		At the Time of the Ex-Post Evaluation	
	2005	2006	2018	2019
DKI Jakarta	33,205	34,838	165,872	174,137
NTB	3,660	3,697	18,029	18,542
National Average	7,688	7,982	39,722	41,231

Source: Statistical Yearbook of Indonesia 2009 (at the time of the project planning) and 2020 (at the time of the ex-post evaluation)
Note: Values of GRDP per capita are in constant market price of 2000 (at the time of the project planning) and 2010 (at the time of the ex-post evaluation)

At the time of the project planning, in Sumbawa Island, NTB, which is the target area of the project, the national road passing through the northern end of Sumbawa Island (from Tano Port to Sumbawa Besar and further to eastern part of the island) played a major role in logistics of the island, but the South Ring Road was also being developed as an access road to the southern region. The South Ring Road was once fully opened in 2002, but it was difficult for vehicles to pass the road except for some flat sections, since the constructed bridges were simple and temporary ones at that time, having made it difficult to cross these bridges when the water level of river rose, and moreover, some of the bridges had already been destroyed or washed away. Therefore, the movement of neighbouring residents and logistics in the east-west direction in the southern region of Sumbawa Island was not functioning well, which was one of the factors that hindered the development of the region. In addition, we have confirmed the importance of the South Ring Road in socio-economic perspectives through the field study during the ex-post evaluation.[5] The executing agencies pointed out that the connectivity of the South Ring Road would have been still poor without the contributions from this project, so the region would have fallen further behind in terms of the economic development, and as a result, the economic gap might have been wider than it was. Therefore, even at the time of the ex-post evaluation, the importance of this project is still high, and the project is consistent with the development needs of Indonesia.

[5] The evaluator interviewed National Road Implementation Agency (BPJN) and Technical Road Planning Section, General Highways Division, Public Works and Spatial Planning Agency, NTB Province.

3.1.3 Consistency with Japan's ODA Policy

The Japan's *Country Assistance Program for the Republic of Indonesia (November 2004)* at the time of the project planning of Phase I and II projects stated that Japan would assist Indonesia in the development of public services necessary from the viewpoint of rural or regional development (e.g., water and sanitation, roads, electricity, etc.) and the improvement in the system for operation and maintenance of such services, for creating democratic and fair society. In addition, at the time of the ex-ante evaluation for Phase III project, the subsequent Japan's *Country Assistance Program for the Republic of Indonesia (April 2012)* also stipulated the correction of imbalances and the creation of a safe society as a priority area in the assistance, stating that Japan would support Indonesia for the development of major transportation and logistics networks and for the improvement of connectivity in rural areas. This project is also in line with the above-mentioned principles because it aims to improve the function of the South Ring Road as an arterial road in the southern region of Sumbawa Island by constructing and rehabilitating bridges, thereby contributing to the improvement in living standard of the neighbouring residents and the economic development of that area. Therefore, the project is consistent with the Japan's ODA Policy.

As stated above, this project has been highly relevant to Indonesia's development plan and development needs, as well as Japan's ODA policy. Therefore, its relevance is high.

3.2 Efficiency (Rating: ②)

3.2.1 Project Outputs

There was no significant change between planned and actual project outputs. The project was mostly implemented as planned. The only major change was that the Japanese side built seven bridges excluding Puna I bridge, as the Indonesian side had built it by the time of detailed design though the original plan of the Phase I project was to build eight bridges including the Puna I. Although there were some other minor changes in bridge substructure and approach road length throughout the Phase I to III projects, it can be said that the changes were appropriate to meet actual conditions of the ground during construction.[6] A comparison between the planned and actual project outputs by the Japanese side is shown in Table 2 to Table 4.

[6] In the Phase III project, in order to change the designs of bridge substructure and the height, the executing agency sought approvals by JICA on the changes through the consultant in line with the *"Procurement Guidelines for the Japanese Grants (Type I)"* and received approval letters issued by JICA.

Table 2: Comparison between Planned and Actual Project Output by the Japanese Side
(Phase I: Sejorong–Tongoloka Sector)

Bridge	Item	Project Output	
		Originally Planned	Actual
Tanaman I	Superstructure	Single-span PC-T Girder	As Planned
	Bridge Length	35.0 m	
	Road Width	6.0 m	
	Substructure	2 Abutments (Spread Footing)	
	Approach Road Length	145.0 m	
Puna I	Superstructure	Single-span RC-T Girder	Excluded
	Bridge Length	11.2 m	
	Road Width	6.0 m	
	Substructure	2 Abutments (Spread Footing)	
	Approach Road Length	88.0 m	
Puna III	Superstructure	Single-span PC-I Girder	As Planned
	Bridge Length	23.0 m	
	Road Width	6.0 m	
	Substructure	2 Abutments (Spread Footing)	
	Approach Road Length	77.0 m	100.0 m
Tabisu I	Superstructure	Single-span PC-I Girder	As Planned
	Bridge Length	24.0 m	
	Road Width	6.0 m	
	Substructure	2 Abutments (Spread Footing)	
	Approach Road Length	116.0 m	156.0 m
Tabisu III	Superstructure	Single-span RC-T Girder	As Planned
	Bridge Length	20.0 m	
	Road Width	6.0 m	
	Substructure	2 Abutments (Spread Footing)	
	Approach Road Length	130.0 m	
Tabisu IV	Superstructure	Single-span RC-T Girder	As Planned
	Bridge Length	22.0 m	
	Road Width	6.0 m	
	Substructure	2 Abutments (Spread Footing)	
	Approach Road Length	98.0 m	108.0 m
Tabisu V	Superstructure	Single-span RC-T Girder	As Planned
	Bridge Length	22.0 m	
	Road Width	6.0 m	
	Substructure	2 Abutments (Spread Footing)	
	Approach Road Length	88.0 m	100.0 m
Tongoloka	Superstructure	2-span Connected PC-I Girder	As Planned
	Bridge Length	48.0 m	
	Road Width	6.0 m	
	Substructure	2 Abutments and 1 Pier (Spread Footing)	
	Approach Road Length	147.0 m	
Tabisu II	Superstructure	Single-span RC-T Girder	As Planned

(Replacement of superstructure)	Bridge Length	15.6 m	
	Road Width	6.0 m	
	Substructure	Existing Foundation	
	Approach Road Length	350.0 m	400.0 m

Source: Documents provided by JICA and interviews with the consultant

Table 3: Comparison between Planned and Actual Project Output by the Japanese Side (Phase II: Tongoloka–Tatar Sector)

Bridge	Item	Project Output	
		Originally Planned	Actual
Air Keruh I	Superstructure	RC Girder	As Planned
	Bridge Length	20.0 m	
	Road Width	4.5 m	
	Substructure	2 Abutments (Spread Footing)	
	Approach Road Length	130.0 m	
Air Keruh II	Superstructure	RC Girder	As Planned
	Bridge Length	20.0 m	
	Road Width	4.5 m	
	Substructure	2 Abutments (Spread Footing)	
	Approach Road Length	90.0 m	
Negene	Superstructure	Plate Girder	As Planned
	Bridge Length	35.0 m	
	Road Width	4.5 m	
	Substructure	2 Abutments (Spread Footing)	
	Approach Road Length	104.4 m	
Tatar Loka	Superstructure	Plate Girder	As Planned
	Bridge Length	55.0 m	
	Road Width	4.5 m	
	Substructure	2 Abutments and 1 Pier (Steel Tubular Pile + Shallow Caisson)	Additional Tubular Piles Used[7]
	Approach Road Length	125.0 m	As Planned

Source: Documents provided by JICA and interviews with the consultant

Table 4: Comparison between Planned and Actual Project Output by the Japanese Side (Phase III: Tatar–Lunyuk Sector)

Bridge	Item	Project Output	
		Originally Planned	Actual
Mone I	Superstructure	RC Girder	As Planned
	Bridge Length	20.0 m	
	Road Width	4.5 m	
	Substructure	2 Abutments (Spread Footing)	
	Approach Road Length	109.5 m	
Telonang I	Superstructure	Plate Girder	As Planned
	Bridge Length	50.0 m	
	Road Width	4.5 m	
	Substructure	2 Abutments and 1 Pier (Steel	Additional

[7] Additional tubular piles were used, as the condition of the ground differed from predictions.

Bridge	Item	Project Output	
		Originally Planned	Actual
		Tubular Pile)	Tubular Piles Used
	Approach Road Length	119.5 m	119.6 m
Sepang	Superstructure	Plate Girder	Bridge Height Increased[8]
	Bridge Length	40.0 m	As Planned
	Road Width	4.5 m	
	Substructure	2 Abutments (Steel Tubular Pile)	Additional Tubular Piles Used
	Approach Road Length	148.0 m	145.0 m
Bontong	Superstructure	RC Girder	As Planned
	Bridge Length	20.0 m	
	Road Width	4.5 m	
	Substructure	2 Abutments (Spread Footing)	
	Approach Road Length	130.0 m	
Blengkon (Tebil)[9]	Superstructure	RC Girder	As Planned
	Bridge Length	20.0 m	
	Road Width	4.5 m	
	Substructure	2 Abutments (Spread Footing)	
	Approach Road Length	120.0 m	
Lamar	Superstructure	Plate Girder	As Planned
	Bridge Length	55.0 m	
	Road Width	6.0 m	
	Substructure	2 Abutments and 1 Pier (Steel Tubular Pile + Shallow Caisson)	Shallow Caisson Changed into Steel Tubular Pile[10] Additional Tubular Piles Used
	Approach Road Length	149.7 m	As Planned
Petain III	Superstructure	RC Girder	As Planned
	Bridge Length	20.0 m	
	Road Width	6.0 m	
	Substructure	2 Abutments (Spread Footing)	Base Concrete Placed[11]
	Approach Road Length	108.9 m	As Planned
Molong	Superstructure	RC Girder	As Planned
	Bridge Length	20.0 m	
	Road Width	6.0 m	

[8] The bridge height increased, as the estimated water level of the river at the time of flood rose compared to the prediction. This was because the water of the river was hampered to flow into the sea by sand deposited in the estuary.

[9] The plate showing the name of the bridge is marked as "Tebil Bridge." It is estimated that the name has been swapped from the time of the project planning.

[10] Due to the lack of ground hardness, the shallow caisson foundation was changed into steel tubular pile to ensure the stability of the pier.

[11] Due to the lack of ground hardness, the base concrete was used instead of spread footing on the unstabilized ground.

Bridge	Item	Project Output	
		Originally Planned	Actual
	Substructure	2 Abutments (Spread Footing)	Base Concrete Placed
	Approach Road Length	140.0 m	As Planned
Emang	Superstructure	Plate Girder	As Planned
	Bridge Length	45.0 m	
	Road Width	6.0 m	
	Substructure	2 Abutments and 1 Pier (Steel Tubular Pile)	Additional Tubular Piles Used
	Approach Road Length	97.8 m	As Planned
Kalbir	Superstructure	Plate Girder	As Planned
	Bridge Length	25.0 m	
	Road Width	6.0 m	
	Substructure	2 Abutments (Steel Tubular Pile)	Additional Tubular Piles Used
	Approach Road Length	97.3 m	97.4 m

Source: Documents provided by JICA and interviews with the consultant

Project Bridges (Left: Lamar Bridge; Right: Emang Bridge)

On the other hand, some of the construction works by the Indonesian side are yet to be completed at the time of the ex-post evaluation. During the field study, we have confirmed that the pavement of roads and construction of small bridges, which should be borne by NTB, have generally been completed, but there are still some unpaved roads and temporary bridges in the Phase II and III sectors. In detail, there are one unpaved section between Negene and Tatar Loka bridges in the Phase II sector and another unpaved section near the end of the Phase II sector (on the Tatar side), and two sites in the Phase II sectors and three sites in the Phase III sector where permanent small bridges are to be constructed. According to NTB, to complete a construction at these sites, tenders for the construction are to open in 2020 and the construction work is expected to be completed in 2022. With regard to land acquisition by Sumbawa Regency and West Sumbawa Regency, we have been unable to obtain direct

testimonies or documents that prove the land acquisition was carried out at the right timing through interviews with the two regencies during the field study. However, through interviews with some of the landowners who provided their lands, we have confirmed that the land acquisition for the bridge, temporary detour and base camp was carried out appropriately. Also, no problems related to the land acquisition have been heard from the consultant. Therefore, it can be considered that the land acquisition was carried out without particular problems.


Unpaved Sector and Small Bridge Construction Site

3.2.2 Project Inputs

3.2.2.1 Project Cost

At the time of the project planning, the project cost of each phase was planned as 794 million yen (Phase I), 492 million yen (Phase II) and 961 million yen (Phase III) for the Japanese side, and 6 million yen (Phase I), 500 million yen (Phase II) and 190 million yen (Phase III) for the Indonesian side. The actual costs are 793.1 million yen (Phase I), 299.7 million yen (Phase II), and 843.8 million yen (Phase III) for the Japanese side, each of which is 100% (Phase I), 61% (Phase II), and 88% (Phase III) of the plan, respectively; therefore, the project cost is as planned or within the plan. It is not possible to evaluate actual project costs of the Indonesian side because necessary data are not available, since the cost spent only in this project is not recorded and administered separately from the entire costs spent in the South Ring Road.

Table 5: Comparison between Planned and Actual Project Cost (in Million JPY)

Phase	Side	Planned	Actual
Phase I	Japanese Side	794	793.1
	Indonesian Side	6	N.A.
Phase II	Japanese Side	492	299.7
	Indonesian Side	500	N.A.
Phase III	Japanese Side	961	843.8
	Indonesian Side	190	N.A.

Source: Documents provided by JICA

3.2.2.2 Project Period

The project period of each phase was planned as 32 months (Phase I), 38 months (Phase II) and 26 months (Phase III). The actual period for each is 32 months (Phase I), 24 months (Phase II), and 34 months (Phase III), each of which was 100% (Phase I), 63% (Phase II), and 131% (Phase III) of the plan, respectively; therefore, the project periods of Phase I and II projects are as planned or within the plan while that of the Phase III project exceeds the plan. When we asked the consultant about reasons for the increase and decrease in the actual project periods in the Phase II and III projects, they pointed out a possibility that the actual period of the Phase II project became shorter than the plan since the overall schedule of the Phase II project may have been set up with a certain degree of margin. Regarding the Phase III project, it was pointed out that it took longer period than expected to start the detailed design after the signing on the Grant Agreement (hereinafter referred to as “G/A”), as the Indonesian side requested a review on disclaimer clauses of the agreement for all grant aid projects, which pushed back the entire schedule.

Table 6: Comparison between Planned and Actual Project Period

Phase	Item	Planned	Actual
Phase I	Total	32 months	32 months (August 2006–March 2009)
	D/D and Tendering	6 months	5 months (August 2006–December 2006)
	Construction	26 months	26 months (February 2007–March 2009)
Phase II	Total	38 months	24 months (January 2010–December 2011)
	G/A	N.A.	1 month (January 2010)
	D/D and Tendering	N.A.	7 months (January 2010–July 2010)
	Construction	N.A.	17 months (August 2010–December 2011)
Phase III	Total	26 months	34 months (March 2014–December 2016)
	G/A	N.A.	9 months (March 2014–November 2014)
	D/D and Tendering	N.A.	4 months (November 2014–February 2015)
	Construction	N.A.	23 months (February 2015–December 2016)

Source: Documents provided by JICA and interviews with the consultant
Note: D/D denotes "Detailed Design." The start of the project period is set to "starting month of D/D" (Phase I) or "contracting month of G/A" (Phase II and III), and the end of the project period to "completing month of construction."

As stated above, although the project cost was as planned or within the plan in each project phase, the project period exceeded the plan in Phase III. Therefore, efficiency of the project is fair.

3.3 Effectiveness and Impacts[12] (Rating: ③)

3.3.1 Effectiveness

3.3.1.1 Quantitative Effects (Operation and Effect Indicators)

The quantitative effects of the project were set at the time of the project planning as "impassable period for common vehicles (2-wheels vehicles) (unit: month/year)" and "transit time for 4-wheels vehicles on Tongoloka–Lunyuk sector (60 km) (unit: hour)." The baseline, target and actual values for each indicator are shown in Table 7. The actual values have been collected at the time of the ex-post evaluation through interviews with residents (for the impassable period) and by actual measurements (for the transit time) during the field study,

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

since monitored data by the executing agency could not be obtained.

Table 7: Quantitative Effects of the Project

Indicator	Baseline	Target	Actual
	2011	2019	2020
		3 Years After Completion	4 Years After Completion
Impassable Period for Common Vehicle (2-Wheels Vehicle) [month/year]	12 months/year	0 months/year	0 months/year
Transit Time for 4-Wheels Vehicle on Tongoloka–Lunyuk Sector [hour]	Approximately 4.5 hours (When Passable)	Approximately 3 hours (Anytime)	Approximately 1.75 hours
Reference (Transit Time on the Phase I Sector)			
Transit Time for 4-Wheels Vehicle on Sejorong–Tongoloka Sector [hour]	N.A.	N.A.	Approximately 0.25 hour

Source: Ex-ante evaluation report, interviews with residents, and actual measurement
Note: Regarding the transit time, a targeted sector on the ex-ante evaluation report of the Phase II project (Tongoloka–Labi sector) is included in a sector set out on the ex-ante evaluation report of the Phase III project (Tongoloka–Lunyuk). In order to find a quantitative effect of this project as a whole, the effectiveness of the project was assessed focusing on the wider sector, Tongoloka–Lunyuk.
Additionally, neither indicators nor their baseline and target values were set out on the ex-ante evaluation report of the Phase I project. Therefore, the transit time on Sejorong–Tongoloka sector was treated as a reference record and was not considered in the scope of the ex-post evaluation for effectiveness.

Regarding the impassable period for 2-wheels vehicle, we have confirmed through the interviews with residents that they can cross rivers regardless of weathers and seasons, which means the sectors are always passable. In other words, the impassable period is 0 months per year, so the target has been achieved at 100%. However, it was also pointed out through the interview that in the Phase I and II sectors, which are located in mountainous terrain, the road becomes temporarily impassable in the event that landslides occur due to heavy rainfall.[13]

Regarding the transit time for 4-wheels vehicle, we have confirmed through the actual measurements during the field study that the transit time on Tongoloka–Lunyuk sector (Phase II and III sectors) is about 1 hour and 45 minutes, much faster than the target. It takes about 45 minutes to pass the Tongoloka–Tatar (Phase II sector) and about 1 hour on the Tatar–Lunyuk (Phase III sector). As a reference, it takes about 15 minutes to pass from Sejolong to Tongoloka (Phase I sector). We have also confirmed through the interviews with those living in villages near the starting point of the Phase I sector (Tatar and Aekangkung villages) that the transit time from the villages to Lunyuk is about 2 hours[14], which is a similar scale to our measurement result. The

[13] An avoidance of landslide is out of scope of this project. Hence, the impassable period attributed to the landslides was not considered in the scope of the ex-post evaluation for effectiveness.
[14] This is the transit time for 2-wheels vehicle, not 4-wheels.

weather condition was fine at the time of our self-measurement, but there is a possibility that it may take longer time to pass the Phase II sector when it rains, because a steep unpaved sector exists in the Phase II sector.

3.3.2 Impacts

3.3.2.1 Intended Impacts

There were three elements set out as an impact of this project: “improve an access to public services and markets,” “serve as a detour in case of disasters” and “improve a living standard of residents.” We have conducted an evaluation on these elements by interviewing residents living near the project sites.[15]

(1) Improve an access to public services and markets

We have confirmed through the interviews with residents that roads and bridges had been in a poor state before the implementation of this project, having made it difficult for the residents to use motorcycles and cross rivers when the water level rose in rainy weather. On the other hand, the roads and bridges were greatly improved after the completion of this project, allowing them to use the motorcycles and cross the river regardless of the seasons as well as weathers, thereby improving an access to schools, health centers and agricultural markets. Especially, the impact on those living near the end of the Phase II sector (Tatar side), surrounded by the rivers, is significant. We have confirmed some cases that whereas it used to take school children five to six hours to get to their schools by foot, the transit time dropped to one to two hours since they became able to be picked up and dropped off by their families using motorcycles thanks to the improved road and bridge conditions.

(2) Serve as a detour in case of disasters

Through interviews with the National Road Implementation Agency (hereinafter referred to as the “BPJN”) and NTB, we have confirmed that there has never been a situation where the South Ring Road served as a detour when a disaster occurred on the North Ring Road. The reasons are that there has never been a major disaster that would make the North Ring Road impassable for a long period of time, and also a detour is likely to be built and landslides to be removed immediately in the event of the landslide on the North Ring Road, the main road in Sumbawa Island.

[15] We conducted the interviews in the following villages: Tatar and Aekangkung villages located before the beginning of the Phase I sector (on the Sejolong side); Talonang and Lemar Lempu villages located near the end of the Phase II sector and near the beginning of the Phase III sector (on the Tatar side); and Sempar Bontong and Emang villages located in the Phase III sector. 21 people were interviewed in total, including farmers, fishermen, mining workers, landowners, village heads and other village officials in each village.

(3) Improve a living standard of residents

Through the interviews with the residents, we have confirmed some cases that the sales volume of agricultural produces became almost twofold. One of the reasons is that the farmers became able to access new agricultural markets thanks to the improved road and bridge conditions by this project. We have also confirmed other cases that this project brought positive impacts on living standards of the residents; for instance, gasoline could be purchased at 60% of the previous price, and the quality of crops advanced and their sales price increased by one and a half to two times thanks to improved opportunities to purchase fertilizers, both of which are partly attributed to the improved logistics network by the project.

3.3.2.2 Other Positive and Negative Impacts

(1) Impacts on the Natural Environment

It was judged that this project did not fall in large-scale ones in road sector in line with the *Guidelines for Environmental and Social Considerations* of Japan International Cooperation Agency (published in April 2004) and would have no significant negative impact on natural environment, and also that this project did not fall in ones implemented with sensitive characteristics or in sensitive areas. Therefore, this project was classified as Category B in terms of environmental and social considerations. In the implementation of the project, the Initial Environmental Examination (IEE) was conducted for the Phase I project, and the Environmental Management and Monitoring Efforts (UKL/UPL) was developed for the Phase II and III projects, where it was confirmed that the negative impacts on the environment were minor. As a result, Environmental Research Agency (Badan Lingkungan Hidup dan Penelitian) of NTB approved the UKL/UPL and issued recommendations on the monitoring. We have confirmed by referring to some of the monitoring reports submitted during the project that no negative impacts such as air and water pollutions occurred and that appropriate countermeasures[16] were taken place during the construction. In addition, we interviewed the residents regarding the occurrence of negative environmental impacts, but their answers were that no such impacts had been found during the construction.

(2) Resettlement and Land Acquisition

At the time of the project planning, Sumbawa Regency and West Sumbawa Regency were to be in charge of acquiring necessary lands, removing stuffs and clearing the lands, and securing lands for temporary construction (e.g., lands for detours, base camps, and material storages). At the time of the ex-post evaluation, we have tried to interview Sumbawa Regency and West Sumbawa Regency on these matters, but could not obtain relevant information on the land

[16] Air pollution (dust) control measures included sprinkling water on unpaved road and limiting traffic speed, water and soil pollution control measures included the installation of sewage treatment tanks at the base camp and the installation of protective concrete base around fuel tanks.

acquisition and resettlement, as well as information whether a series of processes related to the land acquisition were properly implemented in accordance with national laws and regulations, since a key person in charge of the project had already been transferred and the related information had not been handed over to his successor. On the other hand, when we interviewed two landowners who had provided their lands for this project, we have confirmed that they had provided a land of about 100 m^2 for free of charge in each case and that no resettlement had occurred in these two cases. In addition, we have heard from them that a stakeholder consultation meeting was held regarding the land acquisition, where a head of the Emang village, in which the lands subject to the land acquisition are located, asked to provide the lands for this project free of charge, and they agreed on his request without complaint considering the benefits of the project.

As stated above, this project has mostly achieved its objectives. Therefore, effectiveness and impacts of the project are high.

3.4 Sustainability (Rating: ②)

3.4.1 Institutional/Organizational Aspects of Operation and Maintenance

Since the South Ring Road is a provincial road, an operation and maintenance of the road is carried out by NTB. Main departments involved are the Technical Road Planning Section, General Highways Division, and the Implementation of Maintenance Section, Balai of Provincial Road Maintenance of Sumbawa Island Region, both of which are under the Public Works and Spatial Planning Agency of NTB Province. At the time of the ex-post evaluation, four of the nine staff members working in the Technical Road Planning Section are responsible for the maintenance of the bridges. The Implementation of Maintenance Section has an office in Sumbawa Besar, where 22 staff members are in charge of the maintenance of the South Ring Road. Considering the frequency of routine maintenance is once a year, the number of staffs can be deemed adequate.

When a bridge needs to be repaired, the Technical Road Planning Section submits to the head of General Highways Division a report outlining planned repairs and expected costs. From there, the report is further forwarded to the governor of NTB for his/her final approval. In case the governor approves the repairs and the work is carried out, a contractor is selected through bidding process. By the time of the ex-post evaluation, this decision-making process had never been taken on the project bridges since no major maintenance issues had arisen. However, considering that the above decision-making process are used for all bridges managed by NTB and that issues from the past regarding this process are not heard from the Technical Road Planning Section, it can be deemed that this process is functioning without problems. Based on the above, there are no major problems in the institutional or

organizational aspect of operation and maintenance.

3.4.2 Technical Aspects of Operation and Maintenance

This project was implemented in a remote area with limited accessibility, so maintenance-free structures were adopted for the constructed bridges in order to eliminate the need for maintenance as much as possible.[17] Therefore, it is not necessary to carry out major repair works frequently or to always have highly skilled personnel on duty.

On the other hand, the personnel should have technical skills at a level necessary to carry out routine maintenance, such as bridge inspection and cleaning. However, we are concerned that the staff members, particularly working in the Technical Road Planning Section and in charge of inspection and assessment of bridge conditions, are not skilled enough since we have confirmed some cases through the field study that they seemed to overlook bridges in high need for repairs. According to the Technical Road Planning Section, criteria for assessing the condition of the bridges and items to be inspected are left to the subjectivity of the staff in charge. Hence, we have seen the needs for capacity building, such as the establishment of an inspection and assessment manual.

3.4.3 Financial Aspects of Operation and Maintenance

Through interviews with the Technical Road Planning Section, we have found that the actual allocation and expenditure of road and bridge related budgets, including this project, are as shown in Table 8. These are provincial-wide budgets, and a cost of the routine and periodic maintenance for the project only is not separately administered. There are three sources for the road and bridge related budgets: provincial budget, national budget, and aid from other donors. The table below shows the total amount combining these sources. In the year of 2019, the actual allocation and expenditure significantly decreased because most of the provincial budget was spent on recovery from earthquake damage happened that year, so the allocation to road and bridge related budget was reduced.

[17] Examples of the maintenance-free structures include the omission of expansion and contraction devices and bearings that require regular maintenance, the galvanizing of steel girders, and the adoption of measures to prevent clogging of drains (making slopes to prevent the accumulation of debris on the bridge surface) and measures to prevent salt damage (enlarging concrete covers).

Table 8: Allocation and Expenditure of Road and Bridge Related Budgets (in Million IDR)

	2016	2017	2018	2019
Allocation				
Total	404,410	576,951	417,392	112,198
New Construction, Rehabilitation and Replacement	281,842	491,093	395,809	99,075
Routine and Periodic Maintenance	122,568	85,858	21,583	13,123
Expenditure				
Total	401,222	575,767	416,000	111,393
New Construction, Rehabilitation and Replacement	278,705	489,909	394,417	98,269
Routine and Periodic Maintenance	122,517	85,858	21,583	13,123

Source: Interviews with the Technical Road Planning Section

At the time of the project planning, the annual cost to be needed for the maintenance of the project bridges was estimated about 234 million IDR (55 million IDR for the bridges in the Phase I project, and 179 million IDR in the Phase II and III projects). This is an amount that can be adequately covered by the budget related to roads and bridges at the time of the ex-post evaluation. Therefore, there are no major problems in the financial aspects of operation and maintenance. On the other hand, it should be noted that the amount of budget allocated to routine and periodic maintenance has been in decreasing trend, and there is a possibility that a necessary budget for maintenance could not be secured in future years. According to the Technical Road Planning Section, a large part of the budget is directed to the new construction, rehabilitation and replacement because their priority is a construction of new bridges and an expansion of road network, and this trend will likely continue.[18] Therefore, they pointed out that it would be difficult to secure a full budget for the maintenance from provincial budget in future, and a shortfall may be supplemented by national budget or cooperative funds from other donors. Based on the above, there may be challenges in securing a stable maintenance budget in the long term.

3.4.4 Status of Operation and Maintenance

Through interviews with the Technical Road Planning Section, we have heard that no major problems had happened in the project bridges by the time of the ex-post evaluation, and accordingly, there were no plans to repair the bridges. In contrast, we have checked the condition of each project bridge through the field study and found abutment protections

[18] In fact, it seems that the budget allocation to “new construction” is prioritized among the new construction, renovation, replacement budget in the table.

collapsed and road surface deteriorated in some of the bridges. We then asked back the Technical Road Planning Section about these matters, and they answered that they had not been aware of the problems but would carry out repair works on the said bridges within the scope of the FY2020 budget. One of the reasons for their overlooking could be attributed to a lack of bridge inspection/assessment manual. The criteria for assessing the condition of bridges and the items to be inspected are not clearly defined, so even if a bridge was in a condition that an inspector should report as “repairs required,” it might have been overlooked by the inspector due to his/her subjective judgment. Additionally, inspection results are not necessarily recorded on paper or electronic media, suggesting there is a need for improving the way of information management. The Technical Road Planning Section is also aware of the need to develop the bridge inspection/assessment manual and seeks a support for establishing such manual.

Collapsed Abutment Protection (Mone I)

Deteriorated Road Surface (Telonang I)

Regarding routine maintenance, the Technical Road Planning Section and the Implementation of Maintenance Section conduct an inspection and cleaning once a year. During the inspection by the Technical Road Planning Section, they assess the conditions of all bridges and grade them on a 5-point scale (0 = excellent, 1 = good, 2 = fair, 3 = damaged but can easily be repaired, 4 = severely damaged, 5 = collapsed). For bridges graded with 3 to 5, the Technical Road Planning Section prepares a report outlining planned repairs and expected costs, but as mentioned above, such reports have never been prepared as for the

project bridges by the time of the ex-post evaluation. The Implementation of Maintenance Section located in the Sumbawa Island cleans the bridges, briefly checks their conditions and reports to the Technical Road Planning Section if any problems are found. The frequency of inspection and cleaning was assumed to be once a year at the time of the project planning, so they are carried out as planned. On the other hand, repairs such as sealing of pavement cracks and patching of pavement pot holes were expected to be carried out twice a year at the time of the project planning, but they do not seem to be carried out as planned, judging from the deteriorated road surface of some bridges confirmed through the field study.

As stated above, some minor problems have been observed in terms of the technical aspect and current status. Therefore, sustainability of the project effects is fair.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

The objective of this project is to improve a function of the South Ring Road as an arterial road in the southern region of Sumbawa Island by constructing and rehabilitating bridges, thereby contributing to the improvement in living standard of the neighbouring residents and the economic development of that area. The project is highly relevant to Indonesia's development plan, development needs and Japan's ODA policy at the time of the project planning and ex-post evaluation. Therefore, its relevance is high. Although the project cost was as planned or within the plan in each project phase, the project period exceeded the plan in the Phase III project. Part of the road and small bridge constructions planned to be handled by NTB is yet to be completed. Therefore, efficiency of the project is fair. As a result of the project implementation, the targeted sectors became always passable and the transit time significantly reduced, resulting in improved access to public services and markets, as well as improved living standards of the neighbouring residents. This project have mostly achieved its objectives. Therefore, effectiveness and impacts of the project are high. No negative impacts on the natural environment or land acquisition have been observed. Some minor problems have been observed in terms of the technical aspect and current status of operation and maintenance. Therefore, sustainability of the project effects is fair.

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

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

(1) Complete the construction works by NTB

In the Phase II and III sectors, there are still sections of road and small bridges for which NTB were in charge of construction but has not yet paved or constructed by the time of the ex-post evaluation. NTB aims to complete the constructions by the end of 2022, which will further reduce the transit time. Therefore, NTB should proceed with the work as planned.

(2) Establish the bridge inspection/assessment manual

As for the maintenance of bridges, criteria for assessing conditions of the bridges and items to be inspected are not clearly defined and are largely left to the subjectivity of individual inspectors. As a result, bridges in a condition that the inspector should report as “repairs required” may be overlooked due to his/her subjective judgment. Therefore, NTB should establish a bridge inspection/assessment manual and have objective criteria for the assessment, and then conduct such inspections/assessments. It is also important to secure every year a budget for the maintenance of roads and bridges so as to ensure that the inspections and repairs are carried out steadily.

(3) Establish the information management system

Records of bridge inspections and cleanings carried out by NTB are not created or stored on paper or electronic media. In addition, important evidence that would affect the effectiveness and impact of the project, such as operation and effect indicators, and a series of documents related to land acquisition and resettlement, is not recorded and stored, which implies an information management is not appropriately carried out. Therefore, NTB should establish an information management system so that information will not be lost due to personnel changes in projects which have a long implementation period and require long-term maintenance in future years.

4.2.2 Recommendations to JICA

None

4.3 Lessons Learned

<u>Technology transfers on bridge construction and maintenance</u>

Through interviews with the executing agencies, we heard many comments about the importance of technology transfer through the project. They emphasized their needs for the technology transfers and capacity buildings, from Japanese contractor and consultant to executing agencies and employees of local contractor, on construction of maintenance-free

bridges, maintenance methods, project management and safety management methods, etc. In particular, the transfer of technology from the Japanese side regarding the maintenance of bridges is considered the most important. There are two problems in the current maintenance by the Indonesian side other than financial issues: “unclear assessment criteria on bridge conditions” and “lack of uniformity in inspection method among the persons in charge.” Therefore, it is important for the Japanese side to provide supports for the capacity building on maintenance in parallel with construction work, in order for the Indonesian side, together with the Japanese side, to establish a common understanding of the assessment of bridge condition and inspection items, and then, to unify them into common inspection/assessment manuals among the staffs in charge. Therefore, as a lesson for similar projects in future, it is recommended that the technology transfers and capacity buildings also be implemented together with infrastructure development, where the Japanese side gives supports for the creation of maintenance manuals and trainings for staffs in charge.