

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.<sup>1</sup> 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.

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<sup>1</sup> Information from the materials provided by JICA.

Grant Limit/Actual Grant Amount	Phase 1 <sup>2</sup> : 1,570 million yen/1,092 million yen Phase 2 <sup>3</sup> : 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)

<sup>2</sup> The Project for Enhancement of Vessel Traffic System in Malacca and Singapore Straits

<sup>3</sup> 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<sup>4</sup>)

### 3.1 Relevance (Rating: ③<sup>5</sup>)

#### 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

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

<sup>5</sup> 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.<sup>6</sup> 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,”<sup>7</sup> 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<sup>8</sup> 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

<sup>6</sup> Information from the materials provided by JICA.

<sup>7</sup> 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.

<sup>8</sup> 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 <sup>2</sup>	Total floor area increased to 516 m <sup>2</sup>
Sensor Station (Hiyu Kecil, Takong Kecil, Tanjung Berakit)	Reinforced concrete, one story	Machine room, UPS room	42.25 m <sup>2</sup>	As planned
Generator House (Type A) (Hiyu Kecil, Takong Kecil, Tanjung Berakit)	Reinforced concrete, one story	Generator room	55.0 m <sup>2</sup>	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 <sup>2</sup>	As planned
Sensor Station (Tanjung Medang)	Reinforced concrete, one story	Machine room, UPS room	42.25 m <sup>2</sup>	As planned
Generator House (Type A) (Tanjung Medang)	Reinforced concrete, one story	Generator room	55.0 m <sup>2</sup>	As planned
Generator House (Type B) (Dumai)	Reinforced concrete, one story	Generator room	45.0 m <sup>2</sup>	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	
<b>Sensor Station and Repeater Station</b>							
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
<b>VTS Sub-Center</b>							
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
<b>Common Equipment for Sensor Station, Repeater Station and VTS Sub-Center</b>								
Equipment Installation Stand and Others			1					As planned
Multiplex Radio Equipment	1	1	1 Note 3	1 Note 3	1	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	Actual/Comparison
Item	
VTS basic training (classroom and hands-on training) <ul style="list-style-type: none"> <li>• VTS system overview</li> <li>• VTS trends</li> <li>• VTS facilities and equipment</li> <li>• Vessel operation management</li> <li>• Maritime knowledge (sea charts, etc.)</li> <li>• Vessel movement monitoring, emergency response</li> <li>• Field practice</li> </ul>	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<sup>9</sup> (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	2018 2 Years After Completion	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
	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
	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

<sup>9</sup> 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)

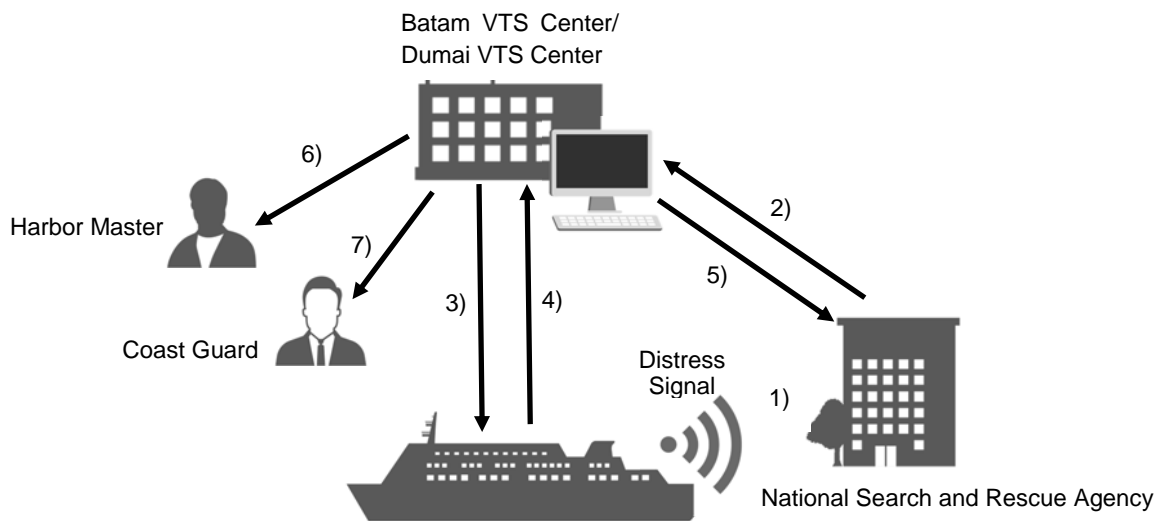


Figure 1: Collaboration with Relevant Agencies and Stakeholders by Batam VTS Center/Dumai VTS Center (Image)

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<sup>10</sup> (HK 103/2/3/DJPL 17)
- 2013: SOP for Batam VTS Center prepared in March<sup>11</sup> (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.<sup>12</sup>

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

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<sup>10</sup> 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."

<sup>11</sup> Ibid.

<sup>12</sup> 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 lightning 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 Coastal 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.<sup>13</sup>

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

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<sup>13</sup> 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.<sup>14</sup> 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

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<sup>14</sup> 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.<sup>15</sup> 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<sup>16</sup>) 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.

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<sup>15</sup> 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.

<sup>16</sup> 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

##### Necessity of early upgrade, repair and restoration of systems and technology

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