



Evaluation of Operational Performance Standards for The Tanjung Kalian Ferry Port, Bangka Belitung Islands Province

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Abstract. The Tanjung Kalian Ferry Port is a ferry port located in the Bangka Belitung Islands province and is under the supervision of the South Sumatra Class 2 Land Transportation Regional Office. This port serves the route between Tanjung Kalian (Bangka Belitung Islands province) and Tanjung Api-Api (South Sumatra province). The operational performance of the Tanjung Kalian Ferry Port has not been evaluated in accordance with the guidelines stated in KP-DRJD 539 of 2022 concerning Planning, Development and Performance Evaluation of River, Lake and Ferry Ports. Therefore, it is deemed necessary to carry out an evaluation to assess the extent of operational performance achieved so far. Based on the research results, it is known that the Tanjung Kalian Ferry Port has been operating with an assessment score of 74,784 and the "Good" category, referring to Regulation KP-DRJD 539 of 2022 concerning Guidelines for Planning, Development and Performance Evaluation of River, Lake and Ferry Ports. This was observed from the ship maneuvering time which was recorded at 9 minutes with an assessment score of 60, the average vehicle boarding and alighting time was recorded at 42 seconds with an assessment score of 100, the queue time for vehicles to board the ship was recorded at 60 seconds with an assessment score of 100, and the dock utilization ratio recorded 1 hour 7 minutes with an assessment score of 20. Therefore, several steps are needed to improve the operational performance of the Tanjung Kalian Ferry Port, such as controlling ship traffic by LPS (Local Port Service) to implement optimal ship movement times. Apart from that, to optimize vehicle waiting times, it is necessary to urge the public to follow the rules that apply in the Tanjung Kalian Ferry Port area.

Keywords: Performance; Operational; Time; Maneuver; Loading; Unloading and loading; Vehicle.

1 Introduction

Tanjung Kalian Ferry Port is one of the ferry ports located in Bangka Belitung Province, precisely in the administrative area of West Bangka Regency, Muntok District. The presence of the Tanjung Kalian Ferry Port is very important because of its strategic role as an important gateway for population movement and economic circulation to and from Bangka Belitung Province. The impacts arising from the crossing operation are easily felt by residents in Bangka Belitung Province.

The Tanjung Kalian Ferry Port is operated by PT. ASDP Indonesia Ferry (Persero), Bangka Branch, and is under the supervision of the South Sumatra Class II Land Transportation Management Office through the Tanjung Kalian Ferry Port Service Unit.

The Tanjung Kalian Ferry Port provides ferry transportation services along the Tanjung Kalian (Bangka Belitung Province) - Tanjung Api-Api (South Sumatra Province) route, covering a sea distance of 30 nautical miles, which can usually be crossed in approximately ± 4 hours (under normal conditions). Ferry transportation operations at the Tanjung Kalian Ferry Port are carried out by five shipping companies, collectively operating a fleet of 14 vessels, offering a schedule of 9 regular trips and 1 additional trip every day.

Considering the large number of trips and operational fleets, the Tanjung Kalian Ferry Port is considered to have an important role in supporting community activities, especially in the economic realm. The implementation of Tanjung Kalian Ferry Port operations must comply with systematic and effective

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procedures to achieve optimal service levels for the community. Thus, an evaluation of the operational performance of the Tanjung Kalian Ferry Port is required in accordance with the Decree of the Directorate General of Land Transportation No.: KP-DRJD 539 of 2022 concerning Guidelines for Planning, Development and Performance Assessment of River, Lake and Ferry Ports.

2 Method

Quantitative data analysis methods are used to analyze numerical-based data and convert it into a numerical format to obtain meaningful results. In this context, descriptive statistics was chosen as a data analysis technique. Descriptive statistics is a statistical approach used to analyze data by describing or illustrating the data collected as it is, without intending to draw general conclusions or make generalizations. This analysis solely involves the accumulation of raw data in descriptive form, meaning it does not attempt to establish relationships, test hypotheses, make predictions, or draw conclusions. Therefore, descriptive statistical analysis was chosen by the author to process data related to research.

3 Results and Discussion

Tanjung Kalian Ferry Port is one of the main ports in Bangka Belitung Province. This port supports the economic activities of Bangka Belitung Province, connecting it with South Sumatra Province. The integration of the industrial area with the Tanjung Kalian Ferry Port, along with other supporting infrastructure, is expected to encourage growth in the Tanjung Kalian Ferry Port area and create jobs. Therefore, it is necessary to analyze whether port operational services have met the Port Operational Performance Standards to optimize operational performance, which is outlined in the Decree of the Director General of Land Transportation No.: KP-DRJD 539 of 2022, concerning Guidelines for Planning, Development and Evaluation of Port Performance Rivers, Lakes and Ferry Boats.

3.1 Time Maneuver Boat

Calculation of ship maneuvering time (Tmt)carried out through direct observation (field observation) of the ship's maneuvering process when it approaches the port which is evaluated during the performance evaluation survey. In this context, the calculation of ship maneuvering time at the Tanjung Kalian Ferry Port is measured from the time the ship is parallel to the breakwater until the ship opens its ramp door.

Table 1. Criteria for Evaluating Movement Processing Times

No.	Ship Maneuvering Time Assessment Criteria	Value (Ymt)
1	Less than or equal to 4 minutes ($Tmt \leq 4$ minutes)	100
2	More than 4 minutes to 7 minutes ($4 \text{ minutes} < Tmt \leq 7 \text{ minutes}$)	80
3	More than 7 minutes to 10 minutes ($7 \text{ minutes} < Tmt \leq 10 \text{ minutes}$)	60
4	More than 10 minutes to 13 minutes ($10 \text{ minutes} < Tmt \leq 13 \text{ minutes}$)	40
5	More than 13 minutes ($Tmt \geq 13 \text{ minutes}$)	20

Source: KP-DRJD 539 of 2022 concerning Guidelines for Planning, Development and Performance Evaluation of River, Lake and Ferry Ports.

The following table is data on ship maneuvering times at the Tanjung Kalian Ferry Port

Table 2. Data on Ship Maneuvering Times at Tanjung Kalian Ferry Port

Date and time	Average Maneuvering Time	Middle
Saturday, April 1, 2023	00:09	00:08
Sunday, April 2, 2023	00:09	
Monday, April 3, 2023	00:09	
Tuesday, April 4 2023	00:09	
Wednesday, April 5 2023	00:08	
Thursday, April 6 2023	00:08	
Friday, April 7, 2023	00:08	

Source: Primary data, 2023

Based on a survey conducted at Tanjung Kalian Ferry Port, it was found that the average ship maneuvering time at the port was 9 minutes. This calculation is measured from the time the ship is parallel to the breakwater until the ship opens its ramp doors.

Therefore, the assessment criteria for ship maneuvering time is included in category 3 (More than 7 minutes to 10 minutes) with an evaluation value of 60.

Researchers identified several factors that contribute to suboptimal maneuver times, including:

i. Wind, current and weather factors:

These factors can cause ships that should be able to maneuver optimally to take longer than usual. The prevailing winds at certain times can reach speeds of 5-7 knots, compared to the normal 3-4 knots, making it difficult to maneuver and dock ships. Strong winds directly affect currents in the waters of the Tanjung Kalian Ferry Harbor. The combination of current and wind can be exacerbated by unfavorable weather conditions. Researchers observed several examples of wind, current and bad weather conditions that disrupted maritime activities.

ii. Ship propulsion system factors:

The ship's propulsion system is an important factor in the maneuvering process. When the ship's propulsion system operates optimally, the maneuvering process is more efficient. Larger and more powerful ship propulsion systems result in faster docking and maneuvering. Some ships on the same route, such as KMP Jembatan Musi I with two Yanmar main engines at 2x500 HP and KMP Adhi Swadarma III with two Daihatsu main engines at 2x550 HP, were found to have relatively smaller and less powerful propulsion systems than other ships.

iii. Crew experience factor:

During anchoring maneuvers in port, optimal crew experience is essential. Crew members must prepare by taking designated positions and preparing equipment for mooring. Crew experience is gained through the accumulation of flying hours. The more experience a crew member has, the smoother and more optimal the docking process will be.

3.2 Loading Time Vehicle

The indicator for average vehicle loading time is the average time it takes vehicles to board the ship (vehicles/minute), from the time they queue until they enter the ship. The calculation of the average vehicle loading time (T_{nk}) is carried out through direct survey measurements at the port which are evaluated during the performance evaluation survey.

Surveys are carried out on ships involved in the vehicle loading process, which involves the following calculations: the total number of all vehicles loading the ship, and the time required from the time the ship is ready to serve the first vehicle until the last vehicle boards the ship.

$$T_{nk} = \frac{\text{The total number of the vehicles loading the ship}}{\text{Total time taken to load all vehicles}}$$

Table 3. Vehicle Loading Time Assessment Criteria

No.	Average Vehicle Loading Time (Tnk)	Value (Ynk)
1.	Less than or equal to 1 minute ($Tnk \leq 1$ minute)	100
2.	More than 1 minute to 2 minutes ($1 \text{ minute} < Tnk \leq 2$ minutes)	80
3.	More than 2 minutes to 3 minutes ($2 \text{ minutes} < Tnk \leq 3$ minutes)	60
4.	More than 3 minutes to 4 minutes ($3 \text{ minutes} < Tnk \leq 4$ minutes)	40
5.	More than 4 minutes ($Tnk \geq 4$ minutes)	20

Source: KP-DRJD 539 of 2022 concerning Guidelines for Planning, Development and Performance Evaluation of River, Lake and Ferry Ports.

Below is the data for vehicle loading times

Table 4. Vehicle Loading Time Data

Date and time	Average Loading Time	Middle
Saturday, April 1, 2023	42.01852311	42.3043543
Sunday, April 2, 2023	42.22286079	
Monday, April 3, 2023	46.22900715	
Tuesday, April 4 2023	40.50046684	
Wednesday, April 5 2023	39.87539719	
Thursday, April 6 2023	41.65709536	
Friday, April 7, 2023	43.62712998	

Source: Primary data, 2023

Based on observations made, the average time needed for vehicles to load ships at the Tanjung Kalian Ferry Port is around 42 seconds. Therefore, the evaluation criteria for average vehicle loading time falls into category 1 (less than or equal to 1 minute) with an evaluation value of 100. This is very appropriate and optimal, indicating that this level of efficiency should be maintained.

3.3 Vehicle Dismantling Time

The average vehicle loading and unloading time indicator is the average vehicle loading and unloading time (vehicles/minute) from the time the vehicle queues on the ship until the time the vehicle is unloaded from the ship. Calculation of the average time for vehicles to disembark from the ship (Ttk) is carried out by conducting a direct calculation survey at the port that is the target of the evaluation, during the port performance evaluation survey. The survey was carried out on ships carrying out vehicle unloading activities by calculating the total number of vehicles unloaded from the ship, and the time elapsed from when the ship was ready to unload the first vehicle, until the last vehicle was unloaded from the ship.

$$T_{tk} = \frac{\text{The total number of vehicles unloading the ship}}{\text{Total time taken to unload the vehicles}}$$

Table 5. Criteria for assessing vehicle unloading time

No.	Average Vehicle Unloading Time (Ttk)	Value (Ytk)
1.	Less than or equal to 2 minutes (Time \leq 2 minutes)	100
2.	More than 2 minutes to 3 minutes (2 minutes < Time \leq 3 minutes)	80
3.	More than 3 minutes to 4 minutes (3 minutes < Time \leq 4 minutes)	60
4.	More than 4 minutes to 5 minutes (4 minutes < Time \leq 5 minutes)	40
5.	More than 5 minutes (Time \geq 5 minutes)	20

Source: KP-DRJD 539 of 2022 concerning Guidelines for Planning, Development and Performance Evaluation of River, Lake and Ferry Ports.

Below is the data for vehicle loading times

Table 6. Vehicle Unloading Time Data

Date and Time	Average Unloading Time	Middle
Saturday, April 1, 2023	60.76383594	59.35807
Sunday, April 2, 2023	61.50934933	
Monday, April 3, 2023	53.18433548	
Tuesday, April 4 2023	62.08111997	
Wednesday, April 5 2023	59.57837468	
Thursday, April 6 2023	56.8762442	
Friday, April 7, 2023	61.51324683	

Source: Primary data, 2023

Based on observations made, the average time to unload a vehicle from a ship at the Tanjung Kalian Ferry Port is around 60 seconds. Therefore, the criteria for evaluating the average time for unloading vehicles from a ship is in category 1 (less than or equal to 2 minutes) with an evaluation value of 100. This is certainly reasonable and optimal, so it must be maintained.

3.4 Queue Time Vehicle

The queue time indicator for boarding a vehicle (Tak) is the longest queue time required for a vehicle to board a particular ship. Vehicle queuing time to board the ship (Tak) is calculated by carrying out direct calculations at the port being evaluated during the port performance evaluation survey. The survey was carried out on vehicles queuing to board the ship. Calculating the queuing time for vehicles to board a ship is done by calculating the queuing time for vehicles queuing at the front or closest to the ship they will be boarding. This calculation is carried out from the time the vehicle enters the port until the vehicle starts moving towards the ship.

The queue time indicator value for vehicles boarding the ship is denoted by Yak. The criteria for evaluating the average waiting time indicator for boarding vehicles are as follows.

Table 7. Evaluation Criteria for Vehicle Boarding Queue Time

No.	Vehicle Queuing Time (No)	Value (Yak)
1.	Less than or equal to 5 minutes (No \leq 5 minutes)	100

No.	Vehicle Queuing Time (No)	Value (Yak)
2.	More than 5 minutes to 15 minutes (5 minutes < T ak ≤ 15 minutes)	80
3.	More than 15 minutes to 20 minutes (15 minutes < T ak ≤ 20 minutes)	60
4.	More than 20 minutes to 30 minutes (20 minutes < T ak ≤ 30 minutes)	40
5.	More than 30 minutes (Not ≥ 30 minutes)	20

Source: KP-DRJD 539 of 2022 concerning Guidelines for Planning, Development and Performance Evaluation of River, Lake and Ferry Ports.

The following is data on vehicle queue times

Table 8. Boarding Queue Time Data V ehicle

Date and time	Average Queue Time	Middle
Saturday, April 1, 2023	01:02	01:31
Sunday, April 2, 2023	01:20	
Monday, April 3, 2023	01:07	
Tuesday, April 4 2023	00:59	
Wednesday, April 5 2023	01:19	
Thursday, April 6 2023	01:22	
Friday, April 7, 2023	03:28	

Source: Primary data, 2023

The average observed vehicle queue time calculated from the time the vehicle enters the port to board the ship is 1 hour 7 minutes. Based on time, the assessment criteria for vehicle queue time to the ship is in category 5 (more than 30 minutes) with an assessment value of 20. This is a record that must be revised for the benefit of the community.

The factors that cause delays in the queue of vehicles to the ship can be described as follows:

- i. Non-accommodation of a vehicle on a ship undergoing loading: This occurs when a vehicle is not accommodated on a ship undergoing loading.
- ii. Drivers choose not to board a vessel that is undergoing loading and choose to wait for the next available vessel: Some drivers may decide not to board a vessel that is in the process of loading and instead choose to wait for the next vessel.
- iii. The existence of tidal problems at the Tanjung Api-Api Ferry Port affects the sailing schedule at the Tanjung Kalian Ferry Port: Tidal problems at the Tanjung Api-Api Ferry Port can disrupt the sailing schedule at the Tanjung Kalian Ferry Port.

3.5 Berth Occupancy Ratio

The Operational Service Performance Indicator for Facility Utilization (Berth Occupancy Ratio/BOR) is a comparison between the actual usage time of the pier and the available operational time (the pier is ready for operation) in a certain time period, expressed as a percentage. The BOR value calculation is carried out using secondary data available at the ports surveyed.

The data provided includes:

- i. Duration of dock operations per day (in hours).
- ii. Number of days the pier is ready to operate per month, for one year (excluding maintenance and repair time).

The formula for calculating BOR is as follows:

$$BOR = \frac{\text{Total hours of pier usage per year}}{\text{Available duration of pier operation } \left(\frac{\text{hours}}{\text{year}}\right)} \times 100\%$$

The BOR indicator value is denoted as YBOR. The assessment criteria for BOR are as follows

Table 9. Criteria for assessing the level of pier use

NO.	BOR percentage	Value (YBOR)
1.	61% - 70%	100
2.	51% - 60%	80
3.	41% - 50%	60
4.	31% - 40%	40
5.	Less than or equal to 30%	20

Source: KP-DRJD 539 of 2022 concerning Guidelines for Planning, Development and Performance Evaluation of River, Lake and Ferry Ports.

The following is data on the Occupancy Ratio of Tanjung Kalian Port

Table 10. Data on Pier Usage at Tanjung Kalian Port

No.	Dock	Duration of Operational Time per Day (Hours)	Number of Days Ready to Operate in 1 Year
1	Moving Bridge	24	365

Source: Primary data, 2023

The Tanjung Kalian Ferry Port operates from 05:00 to 23:00 during normal hours, resulting in a dock standby time of 18 hours.

Idle time at the dock refers to the period during which the dock is not in use or empty, meaning that there are no ships docked or no loading and unloading activities taking place. Idle time can occur due to reasons such as:

- i. No ships arriving: When no ships arrive at the dock, the dock experiences idle time because there are no ships to handle.
- ii. Time between ship arrival and departure: After the ship arrives at the dock and before it departs, there is a period during which the ship waits to be serviced or for the next departure time. During this period, the dock experiences idle time.

Idle time at the dock can impact efficiency and resource utilization. Maximizing the use of dock operational time is important to optimize productivity and minimize unproductive idle time. The average idle time for a dock in one day is 8 hours.

The calculation of the BOR value is as follows:

$$BOR = \frac{\text{Total hours of pier usage per year}}{\text{Available duration of pier operation } \left(\frac{\text{hours}}{\text{year}}\right)} \times 100\%$$

$$BOR = \frac{(24 - 8)}{24 \times 365} \times 100\%$$

$$BOR = 66.67\%$$

Based on these calculations, it is known that the movable bridge pier at the Tanjung Kalian Ferry Port has a BOR percentage of 66.67%, categorizing it into category 1 (61%-70%) with an assessment value of 100.

3.6 Ferry Port Assessment Procedure

The Ferry port performance score is the total multiplication of the value of each performance indicator at the Ferry port with its respective weight. There are a total of 5 operational performance indicators at the Ferry port.

The assessment of the operational performance of the Ferry Port is as follows:

Table 11. Ship Operational Performance Assessment Criteria

No.	Indicator	Indicator Value	Mark
		(1)	(2)
1	Maneuver Time	Ymt	0.152
2	Average time for vehicles to load ships	Ynk	0.038
3	Average vehicle time to unload the ship	Yup	0.038
4	Average time for vehicles to queue to board the ship	Yes	0.076
5	<i>Berth occupancy ratio</i>	YBOR	0.152
Entire		$\sum Y$	0.456

Source: KP-DRJD 539 of 2022 concerning Guidelines for Planning, Development and Performance Evaluation of River, Lake and Ferry Ports.

Because the calculated performance weight is only for the operational performance weight of the Ferry port, adjustments have been made. The operational performance weight which was previously 0.456 has been adjusted to 1. The adjusted assessment of the operational performance of the Ferry Port is as follows:

Table 12. Adjusted Criteria for Assessing Ship Operational Performance

No.	Indicator	Indicator Value	Mark
		(1)	(2)
1	Maneuver Time	Ymt	0.2608
2	Average time for vehicles to load ships	Ynk	0.1468
3	Average vehicle time to unload the ship	Yup	0.1468
4	Average time for vehicles to queue to board the ship	Yes	0.1848
5	<i>Berth occupancy ratio</i>	YBOR	0.2608
Entire		$\sum Y$	1

Source: Primary data, 2023

Based on adapted criteria for assessing the operational performance of ships, calculations can be carried out, resulting in the following values:

Table 13. Calculation of Operational Performance Values

No.	Indicator	Indicator Value	Mark	Operational Performance Score
		(1)	(2)	(1) x (2)
1	Movement time (maneuver time)	60	0.2608	15,648
2	Average vehicle boarding time	100	0.1468	14.68
3	Average time for vehicles to disembark	100	0.1468	14.68

No.	Indicator	Indicator Value	Mark	Operational Performance Score
		(1)	(2)	(1) x (2)
4	Time to queue for vehicles to board the ship	20	0.1848	3,696
5	<i>Berth occupancy ratio</i>	100	0.2608	26.08
Entire		Σ		74,784

Source: Primary data, 2023

The operational performance score of the Tanjung Kalian Ferry Port, as calculated by the author by considering several aspects and adjustments, was obtained at 74.784. Next, these values are categorized according to their intervals in the following table.

Table 14. Operational Performance Score Interval

No.	Performance Score Interval	Group
1	0 Performance Score ≤ 20	Extremely poor
2	20 Score ≤ 40	Poor
3	40 < Score ≤ 60	Enough
4	60 < Score ≤ 80	Good
5	80 < Score ≤ 100	Very good

Source: KP-DRJD 539 of 2022 concerning Guidelines for Planning, Development and Performance Evaluation of River, Lake and Ferry Ports.

4 Closing

4.1 Conclusion

The author has carried out observations, research and analysis at the Tanjung Kalian Ferry Port. Based on KP-DRJD 539 of 2022 concerning Guidelines for Planning, Development and Performance Evaluation of River, Lake and Ferry Ports, the following conclusions were obtained:

1. Ship movement time (maneuver time) at the Tanjung Kalian Ferry Port has not been running optimally, calculated from the time the ship enters the port pool parallel to the breakwater until the ship opensrampdoor. These results are in accordance with observations made with an average time of 9 minutes. The results are in category 3 (7 minutes < Tmt \leq 10 minutes) with an assessment weight of 60.
2. The average time for vehicles to get on and off and on is 42 eachseconds and 60 seconds. Vehicle loading and unloading is in category 1 with a weight rating of 100. Meanwhile, the queue time for vehicles at the Tanjung Kalian Ferry Port is 1 hour 7 minutes, with the assessment criteria being in category 5 with a weight rating of 20. This is due to a surge in passengers at one time, so that the ship carrying out the loading cannot carry all the vehicles in the stacking yard. Additionally, it appears that some drivers who chose not to board the ship were loading of their own volition and waiting to board the next ship. This certainly has an impact on the process of loading vehicles onto the ship.
3. BOR (Berth Occupancy Ratio) at the Tanjung Kalian Ferry Port has been running optimally. Based on calculations, the drill value obtained by the movable bridge dock is 66.67% so it is included in category 1 (BOR = 61%-70%) at the level of use of the pier with a weight rating of 100.

4.2 Suggestions

Based on the conclusions above, suggestions that can be put forward by the author in an effort to improve the operational performance of the Tanjung Kalian Ferry Port are as follows:

1. Propose the construction of a Local Port Service (LPS) at the Tanjung Kalian Ferry Port. Considering that the waters around the Tanjung Kalian Ferry Port are waters that are busy with ship traffic, facilities are needed LPS or Department Local Port. Apart from improving shipping safety, the existence of LPS can help ships that want to berth/refuse at the Tanjung Kalian Ferry Port. This will have an impact in helping the ship maneuver, so that it can lean properly and optimally.

2. In improving When queuing for vehicles to go to the ship, what can be done is to provide an appeal so that prospective users of ferry services can follow the procedures at the port to create mutual comfort. If the prospective service user does not want to board a ship that is being loaded, then the service user does not need to enter the ready-to-load area and wait outside the port area. Prospective service users who have boarded the passenger yard are deemed to have complied with the directions of the officers giving directions at the port.

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