

Analysis of Kendal Ferry Terminal Performace

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Analysis of Kendal Ferry Terminal Performance

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1. Introduction

Indonesia is famously recognized as one of the largest archipelagic countries with its body of waters reaching two-thirds of the country's total area with diverse geographical conditions. With these conditions, Indonesia needs various modes of transportation, such as land, water, and air transportation. Water transportation seems to be the suitable mode of transportation for areas that are often traversed by water such as Indonesia, in the form of rivers, lakes, and seas. Kendal Regency becomes one of the regencies/cities in Central Java Province that began to develop water transportation by developing a port that called Kendal Ferry Terminal. Although, there is still one DLkr (Regional Work ³ Area) and DLkp (Regional Interest Area) of Tanjung Emas Port, Semarang that is in accordance with ³ Minister of Transportation Regulation Number PM 18 of 2013 concerning the Master Plan of the Tanjung Emas Port in Semarang [1]. Thus, the operation is still under the Tanjung Emas Port.

Kendal Ferry Terminal began to operate in 2016, and since then, the demand for passenger increased significantly, about a 50% increase in second-year operation [2]. This increase indicated a very good achievement considering that Tanjung Emas Port will be focused as a commercial port. With the large goal to divert Semarang–Kumai passengers and freight transports at Tanjung Emas Port

to Kendal–Kumai route at the Kendal Ferry Terminal, and based on Master Plan of the Tanjung Emas Port, the Transportation Agency as the operator of Kendal Ferry Terminal needs to measure its performance to prepare more demands. In accordance with Perdana, 2018 [3], it was stated that in addition to develop the economic growth of Kendal Regency, Kendal Ferry Terminal also aimed to support Tanjung Emas Port.

Supported by the potential of location which is positioned on one path with two Semarang industrial areas, such as Candi Industrial Zone and Wijayakusuma Industrial Zone, and adjacent to the Kendal Industrial Area (KIK), the readiness to accept more crossing loads is required from Kendal Ferry Terminal. In addition to the location, the support from a major land transportation path (Semarang-Kendal Pantura arterial road) is also a great potential for the Kendal Ferry Terminal. Coupled with the construction of the Semarang–Batang toll way, which is expected to increase the crossing load of the Kendal Ferry Terminal and assuming 30% Semarang–Kumai passenger and freight transport will divert into Kendal–Kumai route, it is justifiable that there is a demand in the increase of Kendal Ferry Terminal’s performance.

This study aims to analyze the existing performance of Kendal Ferry Terminal and to predict the demand level of the Kendal Ferry Terminal in ten years to reach the 30% assumption of Semarang–Kumai passenger which will be diverted.

2. Methods

The methodology of the Analysis of Kendal Ferry Terminals Performance is carried out through descriptive - quantitative approach. This method emphasized field observations with natural conditions to describe the facts in a systematic way. With a quantitative approach, the research was carried out by focusing on the numbers associated with natural phenomena captured at the time of observation, with a framework as seen in **Figure 1**:

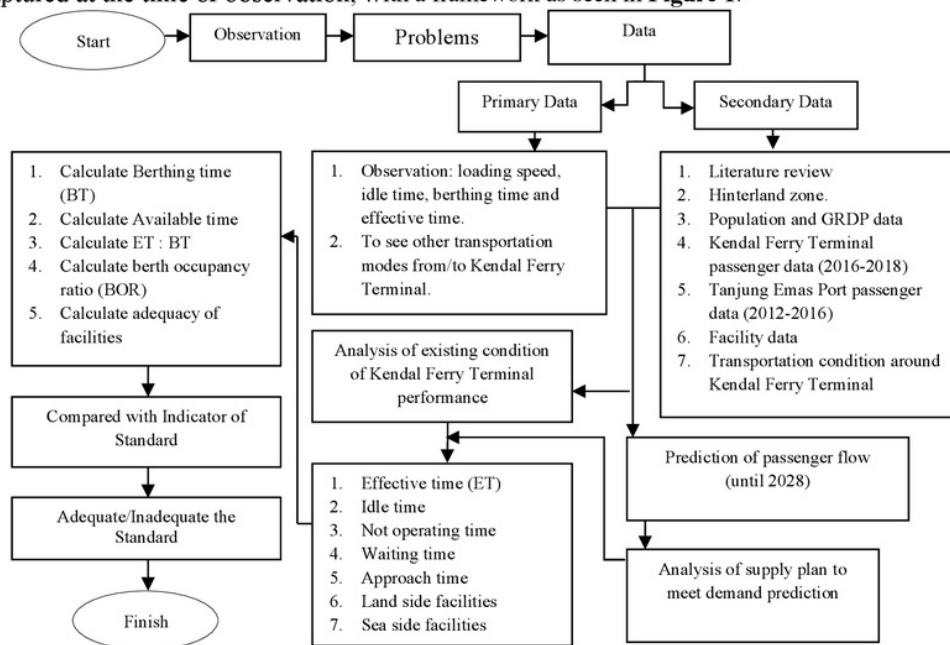


Figure 1. The Framework

Existing data were analyzed to determine the existing performance and then are compared with service performance indicator standards according to Director General of Sea Transportation

regulation Number UM.002/38/18/DJPL.1/2011 Dated on December 5th, 2011 concerning Port Operational Service Performance Standards [4].

3. Results and Discussions

3.1. Analysis of Demand and Supply Existing

The existing demand of Kendal Ferry Terminal (from 2016 to October 2018) is depicted in the **Table 1**:

Table 1. Kendal Ferry Terminal Existing Demand

No	Year	Departure		Arrival	
		Passenger	Freight Transport	Passenger	Freight Transport
1.	2016	3.262	707	2.019	353
2.	2017	6.419	1.988	3.077	518
3.	2018	5.042	1.446	1.799	313

Source: Kendal Transportation Agency, 2018

With this level of demand, Kendal Ferry Terminal only has one dock, port pool and one Ro-Ro ship with a capacity for 390 passengers and 25 freight transportations as a supply. **Table 1** indicates the level of departure demand which is $\pm 50\%$ higher than arrival demand. This means that Kendal Ferry Terminal needs to improve its supply and performance. Based on passenger perceptions of the existing facilities and services through the questionnaire, it is apparent that passengers demand an increase in service and additional facilities despite the good current operation.

3.2. Analysis of Demand Prediction for Ten Years

The analysis will be calculated by using Compounding Interest method. First, passenger data is compiled by predicting the empty months because of docking and by predicting normal passenger's conditions during Eidul Fitri, which will be different from the existing data in **Table 1**. The data is presented in the **Table 2**:

Table 2. Processed Demand Data of Kendal Ferry Terminal

No	Year	Departure		Arrival	
		Passenger	Freight Transport	Passenger	Freight Transport
1.	2016	2.079	764	664	369
2.	2017	2.787	2.034	1.365	533
3.	2018	3.450	1.920	952	374

Source: Kendal Transportation Agency 2018, processed

The formula is

$$Y_n = Y_o \times (1 + r)^{N[5]} \quad (1)$$

Y_n : Planning year's data

Y_o : This year's data

r : Growth rate, with formula : $r = \frac{\Delta Y}{\Delta Y_o} \times 100\% = \frac{Y_1 - Y_o}{Y_o} \times 100\%$;

N : Planning year

1) Departure

a. Passenger

Growth rate levels are obtained from the three districts with the most passengers based on questionnaire results, which are Tegal^[6] district, Banjarnegara^[7] district, and Temanggung^[8] district. The level of population growth rates is $r = 2,31\%$, with $Y_o = 3.450$ where the prediction result is depicted in **Figure 2**:

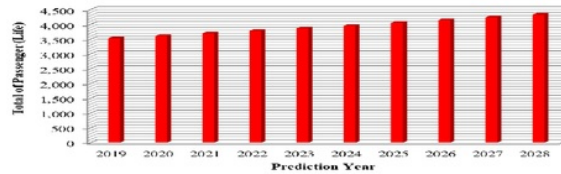


Figure 2. Departure Passenger Prediction Chart

b. Freight Transport

For freight transport, the level of GRDP growth rates used are from Tegal district, Temanggung district, and Semarang city^[9]. The level of GRDP growth rates is $r = 6,12\%$, with $Y_0 = 1.920$ where the prediction result is illustrated in Figure 3:

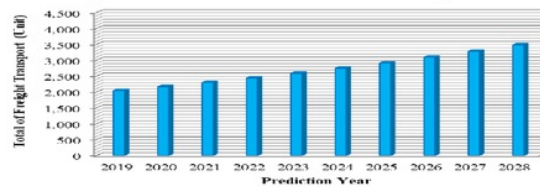


Figure 3. Departure Freight Transport Prediction Chart

2) Arrival

a. Passenger

Similar to departure, the analysis used population growth data from Tegal district, Banjarnegara district, and Temanggung district. The level of population growth rates is $r = 2,31\%$, with $Y_0 = 952$ where the prediction result is indicated in Figure 4:

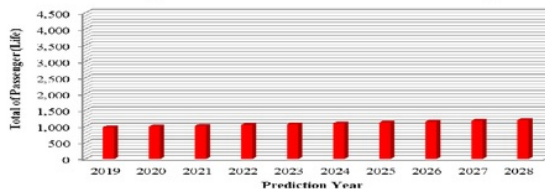


Figure 4. Arrival Passenger Prediction Chart

b. Freight Transport

The level of GRDP growth rates used in the freight transport arrival prediction are from Tegal district, Temanggung district, and Semarang city. The level of GRDP growth rates is $r = 6,12\%$, with $Y_0 = 374$ where the prediction result is illustrated in Figure 5:

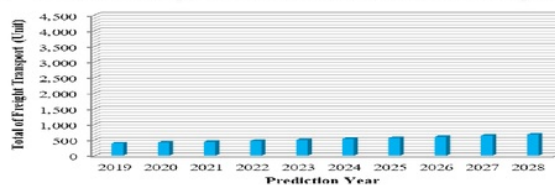


Figure 5. Arrival Freight Transport Prediction Chart

If the prediction result is compared with assumption where 30% passenger of Semarang–Kumai route in Tanjung Emas Port (first, Semarang-Kumai passenger will be predicted also), it will be diverted to Kendal Ferry Terminal. Thus, the result is presented in **Table 3**:

Table 3. Comparison of Demand Prediction with 30% Semarang–Kumai Passenger

Year	Departure					Arrival					
	30% Assumption Semarang-Kumai will Distract		Year	Kendal Ferry Terminal		Year	30% Assumption Semarang-Kumai will Distract		Year	Kendal Ferry Terminal	
	P	FT		P	FT		P	FT		P	FT
2019	16.103	1.963	2019	3.530	2.038	2019	17.675	2.080	2019	974	397
2020	16.540	1.917	2020	3.611	2.162	2020	18.186	2.288	2020	996	422
2021	16.989	1.873	2021	3.695	2.295	2021	18.712	2.517	2021	1.020	442
2022	17.451	1.828	2022	3.780	2.436	2022	19.253	2.769	2022	1.043	474
2023	17.925	1.785	2023	3.868	2.585	2023	19.810	3.045	2023	1.067	503

Source: Tanjung Emas Port 2018, processed

Table 3 informs that:

- 1) On departure, the total freight transport demand in Kendal Ferry Terminal can achieve the assumption. If the diversion occurs, Kendal Ferry Terminal must immediately prepare itself to receive that demand by adding supply, alike large capacity ships.
- 2) On arrival, the prediction of demand level in Kendal Ferry Terminal is still far from the assumption that 30% of Semarang–Kumai will be diverted. This is caused by the fact that demand level in Kendal Ferry Terminal was already low from the beginning and probably interrupted by another factor in Kumai Port.
- 3) For the passengers, the demand level on departure and arrival is still low. It was caused by the excess of the Kendal Ferry Terminal which made the low freight transport operation cost if it passes Kendal Ferry Terminal rather than from Tanjung Emas Port Semarang, which was not likely felt by passengers. Therefore, the number of passenger demand is still low.

3.3. Analysis of Kendal Ferry Terminal Existing Performance

The calculation of the existing performance will follow the port’s operational performance indicators and calculation of the facilities area.

For facilities, the calculation resume is presented in **Table 4**:

Table 4. Resume of Kendal Ferry Terminal Facilities Analysis

No.	Facilities	Calculation Standard for Kendal Ferry Terminal	The Existing Condition in Kendal Ferry Terminal	Explanation	Action Plan
Land Side Facilities					
1.	Office Area	$A = a1 + a2 + a3 + a4 + a5 = 1.500,8 \text{ m}^2$	1.000 m ²	Inadequate	Adding the terminal building area up to 3.900 m ² in accordance with the Medium Term Plan of the Kendal Ferry Terminal in the Tanjung Emas Masterplan Attachment.
2.	Parking Area	For freight transport: $A = a * n * N * x * y$ For passenger pick up: $A = a * n1 * N * x * y * z * 1/2$ $A = 3.139 \text{ m}^2$	20.000 m ²	Adequate	-
3.	Prayer Facility Area	60 m ²	56,25 m ²	Inadequate	a. Adding equipment such as prayer mats. b. Routine cleaning and maintenance. c. Although it is sufficiently extensive, the prayer area at the Kendal Ferry Terminal is

No.	Facilities	Calculation Standard for Kendal Ferry Terminal	The Existing Condition in Kendal Ferry Terminal	Explanation	Action Plan
Land Side Facilities					
4.	Health Facility Area	60 m ²	24 m ²	Inadequate	planned to be developed up to 270 m ² . a. Placement of health workers who are always stationary in the health room. b. Additional stock of medicines, minimum first aid c. Increase the area of health facilities up to 176 m ² in accordance with the Tanjung Emas Masterplan Attachment.
5.	Generator Area	150 m ²	36 m ²	Inadequate	Increase the generator area to 850 m ² in accordance with the Tanjung Emas Masterplan Attachment.
Sea Side Facilities					
1.	Dock Length	$A \geq 1,3L$ $A = 84,83$	110 m	Adequate	a. Still needs an addition of one dock for Ro-Ro ship in preparing for additional ships or new routes. b. In accordance with the Tanjung Emas Masterplan Attachment, an additional 139 m for the new dock will be built.
2.	Berthing Area	$A = 1,8L * 1,5L$ $= 11.496 \text{ m}^2$	1.595 m ²	Inadequate	Area development needed to meet the standards are as planned.

Table 5. Resume of Kendal Ferry Terminal Facilities Analysis (Sequel)

No.	Facilities	Calculation Standard for Kendal Ferry Terminal	The Existing Condition in Kendal Ferry Terminal	Explanation	Action Plan
3.	Port Pool Area	Available	Available	Adequate	a. Deepen of the port pool, from -5 LWS to -6 LWS to -10 LWS based on the results of total passenger and freight transport prediction, and the assumption of the diversion of 30% of Tanjung Emas Port passengers. b. Conduct environmental assessment before deepening the port pool to find out whether the characteristics of the waters in the Kendal Ferry Terminal allow for -10 LWS depths.
4.	Shipping Line Width	$W = 9B + 30 \text{ m}$ $= 156 \text{ m}$	90 m	Inadequate	Increase the width of the shipping channel up to 176 m according to the Tanjung Emas Masterplan Attachment.
5.	Ship Landing Area	$A = N * \Pi * R^2$ $= 49.259 \text{ m}^2$	150.000 m ²	Adequate	-

Source: *Analysis, 2018*

For performance matter, it consists of several aspects, including:

- A. Waiting Time/WT
Kendal Ferry Terminal waiting time is around 30 (thirty) minutes. It is adequate according to the standard which is 1 (one) hour.
- B. Approach Time/AT
Kendal Ferry Terminal does not offer this service, Kalibodri ship captain that lead the Kendal-Kumai route always moves the ship on his own without ship guide helps where the process needs ± 15 minutes.
- C. Effective Time compared with Berth Time (ET:BT).
Berthing Time is total time of ship mooring, with variables consisting of:

1) Effective time, based on observation and second data from 2016 to 2018 is presented in the **Table 6**:

Table 6. Effective Time of Kendal Ferry Terminal

No	Year	Effective Time
1.	2016	122 Hours
2.	2017	210 Hours
3.	2018	146 Hours

2) Idle time of Kendal Ferry Terminal is between 0,5–1 hour and it is adequate.
 3) Nonoperation time of Kendal Ferry Terminal in 2016–2018 is presented in the **Table 6**:

Table 7. Nonoperating Time of Kendal Ferry Terminal

No	Year	Not Operating Time
1.	2016	2469 Hours
2.	2017	3467 Hours
3.	2018	3417 Hours

Therefore, the berthing time of Kendal Ferry Terminal is presented in the **Table 8**:

Table 8. Kendal Ferry Terminal Berthing Time

No	Tahun	Berthing Time
1.	2016	2591 Hours
2.	2017	3677 Hours
3.	2018	3563 Hours

From that data, the Effective Time compared by the Berth Time (ET:BT) is presented in the **Table 9**:

Table 9. ET : BT of Kendal Ferry Terminal

No	Year	Effective Time	Berthing Time	ET : BT
1	2016	122	2,591	$\frac{122}{2591} \times 100 = 4.69\%$

Table 10. ET : BT of Kendal Ferry Terminal (Sequel)

No	Year	Effective Time	Berthing Time	ET : BT
2	2017	210	3,677	$\frac{210}{3677} \times 100 = 5.71\%$
3	2018	146	3,563	$\frac{146}{3563} \times 100 = 4.08\%$

D. Berth Occupancy Ratio/BOR

BOR calculation is adapted to the type of pier of the Kendal Ferry Terminal, divided into one/several anchored vessels [10]. With available time in **Table 11**, the BOR is presented in **Table 12**:

Table 11. Kendal Ferry Terminal Available Time

No	Year	Available Time
1.	2016	1982 Hours
2.	2017	4014 Hours
3.	2018	2935 Hours

Table 12. Kendal Ferry Terminal BOR

No	Year	BOR
1.	2016	$BOR = \frac{2591}{1982} \times 100\% = 130,7\%$
2.	2017	$BOR = \frac{3677}{4014} \times 100\% = 91,6\%$
3.	2018	$BOR = \frac{3563}{2935} \times 100\% = 121,4\%$

E. Operation Tools Readiness

Based from the observation, Kendal Ferry Terminal did not use tools to assist the operation. Therefore, this indicator cannot be calculated.

The analysis of the existing performance of Kendal Ferry Terminal is depicted in the **Table 13**:

Table 13. Existing Performance Based on Several Indicators

No.	Indicators	Standard	Kendal Ferry Terminal	Explanation	Action Plan
1.	Waiting Time	Maximum 1 Hour	0,5 Hour	Adequate	To maintain a good waiting time, in line with increasing the number of ships and routes, the terminal required facilities such as: - Procurement of guiding ships. - Additional docks to reduce ship queues.
2.	Approach Time	Maximum 1 Hour	(None)	Inadequate	Add a guiding ship as a navigation tool to support the safety, efficiency, and comfort of ship service.
3.	Effective Time/Berthing Time	Minimum 70%	4,08 – 5,71%	Inadequate	a. Increase the depth of the port pool so that the ship does not need to wait for the tide in order to depart. b. Add departure schedule from 1 time per week to 2 times per week so that the ship does not wait too long in the mooring. It will increase non-operating time and berthing time. For the long term by looking at the prediction results, the schedule is planned to be 3-4 times per week.
4.	BOR To the post that has 2 piers: According to UNCTAD According to Director General of Sea Transportation regulation	Maximum 50% Maximum 70%	91,6 – 130,7%	Inadequate	The BOR value is influenced by the available time which is greater than the spent time. This can be reduced by: - Adding supply of ships that operate in Kendal Ferry Terminal is added along with predictions of additional passengers and freight transport. It can be the same route or new route ships. - Repairing supply, port pool depth.

Table 14. Existing Performance Based on Several Indicators (Sequel)

No.	Indicators	Standard	Kendal Ferry Terminal	Explanation	Action Plan
5.	Tools Operation	Minimum 70%	(None)	Inadequate	a. Medium-term plan consist of, procurement of guiding ships. b. Long-term plan consist of, procurement of waiting vessels.

Source: Analysis, 2018

4. Conclusion

In the end, the result of this study indicates that the demand prediction of Kendal Ferry Terminal reaches the assumption that 30% of Semarang–Kumai passengers at Tanjung Emas Port will divert to Kendal Ferry Terminal, especially on the departure side. The result of the study is still far away from the assumption, but for the freight transport, this effort is achievable. This is due to the potentials of Kendal Ferry Terminal’s location, which is near the Pantura line, Semarang-Batang toll road, and Kendal and Semarang industrial area.

Kendal Ferry Terminal must improve its performance to receive diverted passengers and freight transports from Tanjung Emas Port in Semarang. This is due to the calculation of performance based on the indicators and facilities area, in which Kendal Ferry Terminal performance is still below the standard. It can be achieved by adding facilities that can support Kendal Ferry Terminal’s performance including the passenger lounge, the depth of the pool, the new dock structure, and in order to attract

passengers, Kendal Transportation Agency must be objective by connecting it with other transportation modes, such as Kedungsepur BRT line and Damri bus.

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