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ANALYSIS OF DRY BULK CARGO LOADING AND UNLOADING PERFORMANCE AT TANJUNG TEMBAGA PORT (CASE STUDY : PT DELTA ARTHA BAHARI NUSANTARA)

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ABSTRACT
In recent years, loading and unloading activities at ports have shown a significant increase in line with the growth in global and regional trade volumes. However, the surge in loading and unloading activities poses serious challenges, such as limited infrastructure, stacking capacity, operational efficiency, the need for more and more qualified human resources, and compliance with increasingly stringent regulations, in addition to environmental impacts and safety aspects that need to be considered. The purpose of this study is to identify and evaluate the main obstacles that arise due to the increase in dry bulk loading and unloading activities at PT DABN Port, as well as strategic solutions to overcome these challenges in order to ensure the smooth operation and sustainability of the port environment. The research method used is a quantitative approach by conducting a survey using key performance indicators such as loading and unloading time, labor productivity, equipment utilization, and damage rate. Primary data used comes from questionnaire answers with a total of 30 respondents, while secondary data is obtained from company reports and official port documents. This research uses descriptive analysis using validity and reliability tests using a used trial. The results showed that the performance of dry bulk loading and unloading at PT DABN Port was in the good category, but from these indicators there were still obstacles for service users. These obstacles will be an evaluation for PT DABN to improve loading and unloading performance from the aspects of equipment utility, loading and unloading time, labor productivity and the level of damage to goods and make improvements as a determinant of the success of dry bulk loading and unloading so as to increase loading and unloading efficiency.

KEYWORDS : loading and unloading performance, dry bulk, Tanjung Tembaga Port, PT Delta Artha Bahari Nusantara, effectiveness, efficiency.

1. INTRODUCTION.

Ports are places for the exchange of goods and are important centers of logistics activities in the global supply chain. The role of ports as an important point in logistics activities continues to evolve along with changes in international trade and transportation technology.

One of the ports located in East Java is Tanjung Tembaga Port. Tanjung Tembaga Port is a port located in Probolinggo City, East Java. With the development of trade, economy and shipping, Tanjung Tembaga Port changed its position from a coastal port to a sea port, thus opening up trade to and from abroad. The existence of Tanjung Tembaga Port will reduce the number of ships that stop at Tanjung Perak Port in Surabaya.

In Tanjung Tembaga Port Probolinggo there are 2 types of ports, namely passenger ports and freight ports managed by the Port Business Entity (BUP) PT Pelindo and PT Delta Artha Bahari Nusantara (DABN). In addition, there is a special port owned by PT Kutai Timber Indonesia (KTI) which handles ship to ship loading and unloading activities in the form of plywood.

PT Delta Artha Bahari Nusantara (DABN) is a company owned by the local government of East Java and acts as the manager of loading and unloading activities at the public terminal at Probolinggo Port. PT DABN is committed to improving services at the port, one of the steps taken is the construction of port facilities including overlay yards, causeways, and trestles. Currently, the port has two operational piers. The first

pier measures 93 meters x 18.5 meters with a depth of -5 mLWS, this pier is used for tugboats to dock. The second pier has dimensions of 214 meters x 20 meters depth with -10 mLWS, used for cargo ships that carry out loading and unloading activities at the port.

At the Port of Probolinggo, especially at PT DABN, the volume of loading and unloading operations continues to increase from year to year. This is a response to the unstable domestic and international economic turmoil and the intense competition between loading and unloading companies at the port. Providing freight transportation at PT DABN Port is closely related to the improvement of services provided by this port through its infrastructure and supporting facilities. With significant growth in loading and unloading volumes, it is necessary to assess whether the existing facilities, infrastructure and operational systems have reached an optimal level or can still be improved. It is also important to consider whether additional infrastructure and vehicles are needed to anticipate future transportation needs.

Various obstacles are often encountered during loading and unloading activities, which can further hamper loading and unloading activities. Most safety issues occur during loading and unloading, especially on vessels carrying hazardous or highly sensitive materials. During the loading and unloading process, truck delays, dockworker performance, and weather conditions can also pose obstacles. Available facilities are also thought to affect the speed of loading and unloading activities (Taufik et al., 2023).

Based on the Decree of the Director General of Hubla No. UM.002/38/18/DJPL-11 concerning Port Operational Service Performance Standards, operational service performance is a measurable work result achieved by the port in carrying out ship services, goods and utilization of facilities and equipment within a certain period of time and unit. Operational service performance standards are the standard work results of each service that must be achieved by the terminal / port operator in the implementation of port services including the provision of port facilities and equipment.

In port management, monitoring dry bulk loading and unloading activities is a factor that has a significant impact on operational efficiency. An efficient loading and unloading process plays an important role in maintaining the smooth flow of goods at Tanjung Tembaga Port. Any delays or setbacks in dry bulk loading and unloading operations can adversely affect the supply and distribution chain, and potentially impact the overall productivity of the port.

2. MATERIALS/METHODOLOGY ;EXPERIMENTAL PROCEDURE.

2.1. Types of Research

The type of research used in this study is quantitative descriptive method. This method is in line with research variables, focuses on actual ongoing problems and phenomena, and presents research results in the form of meaningful numerical data. (Sugiyono, 2019).

2.2. Data Source

The data source of this research consists of primary data and secondary data. In this study, primary data was collected by researchers through filling out questionnaires given to service users and KSOP Class IV Probolinggo employees while secondary data sources include interviews, field observations, journals, articles, and books relevant to the research topic on loading and unloading performance.

2.3 Data Collection Technique

The data collection techniques in this research are field observations and questionnaires, Field observations are very effective for obtaining detailed and contextual data. The content of the questionnaire is based on

the dry bulk loading and unloading performance variable, which consists of four indicators.

In this study, sampling used random sampling technique, which is a random sampling technique from the population without regard to population strata. The population used in this study were service users and employees of the Class IV Probolinggo KSOP Office.

2.4 Data Analysis Technique

The data analysis techniques used include data instrument tests and descriptive statistics. Data instrument test consists of validity test and reliability test. In this study, the validity of the instrument was tested by comparing the total score with the sum of the values of each element. If there is a significant correlation between the values of each strong construction variable that shows 0.3 or more than >0.3. To evaluate the reliability of the study, Cronbach's Alpha coefficient was used. The set of statements used to measure the dimensions of a variable is considered accurate and successful if its reliability coefficient is at least 0.6. The research data were processed using the SPSS program. The validity and reliability of the thesis were tested through the Used Try Out test. Data will be organized, selected, analyzed, and interpreted using words and sentences to provide relevant explanations. The research variables will be divided into various frequencies and accurate percentages.

Summary descriptive statistics include:

a. Mean: the average value of the data.
b. Maximum: the highest value of the data.
c. Minimum: the lowest value of the data.

After knowing the average, maximum and minimum values, the researcher will calculate the percentage index using the formula:

% Score Actual = Actual Score / Ideal Score x 100%

Description:

1. Actual score is the final score given by each respondent to the questionnaire.
2. The ideal score is the largest score that each respondent is expected to choose.

The percentage score assessment is categorized using the score assessment categorization theory according to Narismawati (2010).

Table 1. Interval Rating Score

No	percentage interval	Category
1	84.01-100	Very good
2	68.01-84.00	Good
3	52.01-68.00	Good enough
4	36.01-52.00	Not good enough
5	20.00-36.00	Not good

Source : (Narismawati, 2010)

3. RESULT AND DISCUSSION.

3.1 Research Results

a. Validity Test

Validity testing is applied as part of the analysis of the questionnaire data that has been conducted. This test aims to assess the precision and accuracy of the work being evaluated. A statistical process applied to assess the extent to which a measurement instrument, such as a questionnaire, actually measures what it is supposed to measure. In this study, the validity of the instrument was checked by observing the correlation between the score of each statement and the total score using SPSS software.

With the results of data calculation using SPSS software, it has a condition that if the value of calculated r is greater than table r, it is declared valid, if calculated r is not greater than table r, it is declared invalid. The acquisition of the r validity test table is 0.361. The following is the acquisition of validity test results in the table below.

Table 2. Validity Test Result

Variables	Item	Calculated r	Table r	Description
Readiness of Loading and Unloading Equipment	X1	0,680	0,361	Valid
	X2	0,772	0,361	Valid
	X3	0,843	0,361	Valid
	X4	0,824	0,361	Valid
Facilities and Infrastructure Readiness	X1	0,809	0,361	Valid
	X2	0,717	0,361	Valid
	X3	0,608	0,361	Valid
TKBM Performance	X1	0,826	0,361	Valid
	X2	0,851	0,361	Valid
	X3	0,791	0,361	Valid
	X4	0,726	0,361	Valid
Loading and Unloading Performance (seen from the timeliness of loading and unloading)	X1	0,797	0,361	Valid
	X2	0,774	0,361	Valid
	X3	0,671	0,361	Valid
	X4	0,628	0,361	Valid

Source : Data Processed (2024)

From table 2 above, it is known that the data on the results of determining the validity of each statement in the questionnaire is valid, it can be seen from calculated r greater (>) than table r. This indicates that all statement items can be used in the overall test model.

b. Reliability Test

Reliability test is a process to assess the consistency and reliability of a measurement instrument in measuring certain variables or constructs. This test aims to ensure that the instrument provides stable and repeatable results over time.

Table 3. Reliability Test Results

Variables	*Cronbach's Alpha*	Description
Readiness of Loading and Unloading Equipment	0,847	*Reliable*
Facilities and Infrastructure Readiness	0,911	*Reliable*
TKBM Performance	0,899	*Reliable*
Loading and Unloading Performance (seen from the timeliness of loading and unloading)	0,873	*Reliable*

Source : Data Processed (2024)

The results of the reliability test in table 3 above show that the loading and unloading performance variable for the loading and unloading equipment readiness component of the Cronbach Alpha coefficient for valid items is 0.847, the readiness component of facilities and infrastructure is 0.911, the TKBM performance component is 0.899 and the loading and unloading performance component seen from the timeliness of loading and unloading is 0.873. Each component of dry bulk loading and unloading performance shows results greater than 0.6. This shows that the measurement instrument provides reliable and consistent results or reliable.

c. Descriptive Statistics

Descriptive statistics are used to summarize and describe the information contained in a data set in a concise and informative manner. The information is processed using SPSS software, from the questionnaires that have been collected and then processed.

The values used are the minimum value, maximum value, average value (mean) and standard deviation for each component of dry bulk loading and unloading performance that will be known with data that has been processed using SPSS and includes components of loading and unloading equipment readiness, readiness of facilities and infrastructure, TKBM performance and loading and unloading performance. The following table displays the results of descriptive statistical analysis conducted with the help of SPSS software.

Tabel 4. Readiness of Loading and Unloading Equipment

	N	Minimum	Maximum	Mean	Std. Deviation
X1_1	30	1	5	3.46	1.041
X1_2	30	2	5	3.86	1.008
X1_3	30	2	5	4.10	.711
X1_4	30	2	5	3.93	.907
Total_X1	30	8	20	15.36	3.068
Valid N (listwise)	30				

Source : Data Processed (2024)

The statistical test results from table 4 show that the respondents from the data analysis of the readiness of loading and unloading equipment obtained the lowest score (minimum) 1, the highest score (maximum), the average (mean) 3.84 close to score 4. This shows that the assumptions given by the majority of respondents generally agree with the statements made in the questionnaire.

The results of the respondents' statistical data show that the tools used in loading and unloading activities at the Port of PT Delta Artha Bahari Nusantara are not damaged and take place efficiently and periodic maintenance of the tools.

Tabel 5. Facilities and Infrastructure Readiness

	N	Minimum	Maximum	Mean	Std. Deviation
X2_1	30	2	5	4.26	.639
X2_2	30	2	5	4.36	.668
X2_3	30	2	5	4.30	.794
Total_X2	30	6	15	12.93	1.94
Valid N (listwise)	30				

Source : Data Processed (2024)

The statistical test results of the table 5 above show that respondents from the data analysis of the readiness of facilities and infrastructure obtained the lowest score (minimum) 2, the highest score (maximum) 5, the average (mean) 4.31 and a score close to 5. This shows that the assumptions given by the majority of respondents generally agree with the statements made in the questionnaire.

The results of the respondents' statistical data show that the readiness of facilities and infrastructure is very important to support the smooth loading and unloading activities. Adequate facilities and infrastructure can speed up the loading and unloading process, increase efficiency, and reduce the risk of damage or accidents.

Tabel 6. TKBM Performance

	N	Minimum	Maximum	Mean	Std. Deviation
X3_1	30	2	5	3.96	.808
X3_2	30	2	5	4.10	.803
X3_3	30	2	5	4.36	.668
X3_4	30	2	5	4.40	.723
Total_X3	30	8	20	16.83	2.64
Valid N (listwise)	30				

Source : Data Processed (2024)

The results of statistical tests show that respondents from the analysis of TKBM labor readiness data obtained the lowest score (minimum) 2, the highest score (maximum) 5, the average (mean) 4.20 and a score close to 5. This shows that the assumptions given by the majority of respondents generally agree with the statements made in the questionnaire.

The results of the respondents' statistical data show that the performance of dry bulk TKBM (Labor Loading and Unloading) they are directly involved in the process of loading and unloading goods from ships or other means of transportation besides that TKBM can show discipline in accordance with the predetermined shift schedule. It is also important to have TKBM who are trained, experienced, and have good performance in dry bulk loading and unloading activities to ensure that the process runs smoothly, efficiently, and safely.

Tabel 6. Loading and Unloading Performance

	N	Minimum	Maximum	Mean	Std. Deviation
X4_1	30	2	5	3.73	.827
X4_2	30	2	5	3.70	.836
X4_3	30	2	5	3.73	.784
X4_4	30	2	5	3.66	.844
Total_X4	30	8	20	14.83	2.80
Valid N (listwise)	30				

Source : Data Processed (2024)

The statistical test results show that respondents from the loading and unloading performance data analysis obtained the lowest score (minimum) 2, the highest score (maximum) 5, the average (mean) 3.70 and a score close to 4. This shows that the assumptions given by the majority of respondents generally agree with the statements made in the questionnaire.

The results of the respondent's statistical data show that PT Delta Artha Bahari Nusantara has carried out dry bulk loading and unloading activities in accordance with a predetermined activity plan so that service users are satisfied with the services that have been provided in addition to the low level of damage to goods and delays rarely occur during the dry bulk loading and unloading process.

d. Precentage of Answer Score

Tabel 7. Precentage of Answer Score

No	Indikator	Actual Score	Ideal Scor	% Actual Score	Criteria
1	Readiness of Loading and Unloading Equipment	461	600	76,33%	Good
2	Facilities and Infrastructure Readiness	388	450	86,22%	Very good
3	TKBM Performance	505	600	84,17%	Very good
4	Loading and Unloading Performance	445	600	74,17%	Good
	Average	1799	2250	79,96%	Good

Source : Primary Data Processed (2024)

Based on the results of the study, each indicator is stated as follows:

1. Based on the results of the percentage of dry bulk loading and unloading performance seen from the loading and unloading equipment readiness indicator of 76.33%. According to Narismawati (2010) the percentage of 68.01-84.00% is stated that the loading and unloading performance is good. So the percentage value of dry bulk loading and unloading performance of 76.33% is included in the good category.
2. Based on the results of the percentage of dry bulk loading and unloading performance seen from the indicator of the readiness of loading and unloading facilities and infrastructure amounted to 86.22%. According to Narismawati (2010) the percentage criteria of 84.01-100% stated that the loading and unloading performance is very good. So the percentage value of dry bulk loading and unloading performance of 86.22% is included in the category of very good.
3. Based on the results of the percentage of dry bulk loading and unloading performance seen from the indicator of the readiness of loading and unloading facilities and infrastructure of 84.17%. According to Narismawati (2010) the percentage criteria of 84.01-100% stated that the loading and unloading performance is very good. So the percentage value of dry bulk loading and unloading performance of 84.17% is included in the category of very good.
4. Based on the results of the percentage of dry bulk loading and unloading performance seen from the loading and unloading performance indicators and amounted to 74.17%. According to Narismawati (2010) the percentage criteria of 68.01-84.00% are stated that the loading and unloading performance is good. So the percentage value of dry bulk loading and unloading performance of 74.17% is included in the good category.

Judging from the entire percentage of indicators, the highest percentage by respondents is the indicator of readiness of facilities and infrastructure of 86.22%. Indicators of readiness of dry bulk loading and unloading facilities and infrastructure have a high role in the smooth running of dry bulk loading and unloading activities. The indicator that has the lowest percentage is the loading and unloading performance indicator of 74.17%.

3.2 Discussion

Based on the results of the study, each indicator is stated as follows:

a. Indicator of loading and unloading equipment readiness

   Based on the results of the research conducted, the indicator of the readiness of loading and unloading equipment has a percentage value of 76.33%, therefore it is stated that the indicator of the readiness of loading and unloading equipment includes "good" criteria.

b. Indicator of readiness of facilities and infrastructure

   Based on the results of research conducted that the indicator of the readiness of facilities and infrastructure has a percentage value of 86.22%, therefore it is stated that the indicator of the readiness of loading and unloading facilities and infrastructure includes "very good" criteria

c. Performance indicators of TKBM (Unloading Labor)

   Based on the results of the research conducted, the TKBM performance indicator has a percentage value of 84.17%, therefore it is stated that the TKBM performance indicator includes "very good" criteria.

d. Loading and Unloading Performance Indicators

Based on the results of the research conducted, the TKBM performance indicator has a percentage value of 74.17%, therefore it is stated that the loading and unloading performance indicator includes the criteria "good".

The results of the calculation of the percentage of dry bulk loading and unloading performance with four indicators of loading and unloading equipment readiness, readiness of facilities and infrastructure, TKBM performance and performance in the dry bulk loading and unloading process which shows that the average percentage is in the "good" category, which indicates that the implementation of dry bulk loading and unloading performance has met or exceeded the expectations of service users.

Efforts made so that the performance of dry bulk loading and unloading can improve loading and unloading efficiency at the Port of PT Delta Artha Bahari Nusantara, all components of dry bulk loading and unloading performance at the Port of PT Delta Artha Bahari Nusantara according to respondents who showed a good category. This shows that although the loading and unloading performance is adequate and meets the standards, there is still room for improvement to identify areas that require improvement as a determinant of the success of dry bulk loading and unloading so as to increase loading and unloading efficiency, such as the addition and rejuvenation of loading and unloading facilities and equipment, continuous training for labor, and increased coordination and communication between related parties. The implementation of these recommendations is expected to improve the performance of dry bulk loading and unloading at PT DABN Port so as to support the smooth flow of goods and improve port competitiveness.

In order to achieve a more optimal or "very good" level. By evaluating the less than optimal activities of the indicator components.

4. CONCLUSION.

From all indicators of loading and unloading performance, it can be concluded that the average of all indicators includes "good" criteria as evidenced by the total percentage of the average of 79.96%. For the loading and unloading equipment readiness indicator with a percentage of 76.33%, it is included in the "good" criteria. For the indicator of the readiness of facilities and infrastructure with a percentage of 86.22% included in the "very good" criteria. For TKBM performance indicators with a percentage of 84.17% included in the "very good" criteria. For loading and unloading performance indicators with a percentage of 74.17% including the "good" category.

Efforts to improve the performance of dry bulk loading and unloading are carried out to evaluate the performance of dry bulk loading and unloading at PT Delta Artha Bahari Nusantara to improve factors that support loading and unloading activities and identify areas that require improvement as a determinant of the success of dry bulk loading and unloading so as to increase loading and unloading efficiency.

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