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The Effect of Loading and Unloading Activities on the Comfort of Surrounding Communities Through the Environmental Impact (Air) of Tanjung Priok Port

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Abstract: This study aims to determine the impact of container loading and unloading activities on the community around Tanjung Priok Port, especially the impact of environmental pollution caused by loading and unloading activities that cause various negative impacts that have an impact on the level of comfort and public health. This research also aims to be a study material for central and regional planning between industrial activities, especially ports and community settlements. In this study, the method used is quantitative research method using SEM Path analysis research technique with a total of 100 respondents. The results showed that loading and unloading activities at Tanjung Priok port disrupted behavior patterns and community comfort. The central and local governments must have careful planning in regulating regional spatial planning and be firm in enforcing regulations related to the environmental impact of industrial activities, especially ports to minimize the impact caused.

Keywords: Impact of air pollution, Air Environment, Loading and Unloading, Community Comfort, Tanjung Priok Port.

INTRODUCTION

A port is a facility at the end of an ocean, river, or lake that is usually used to receive ships and move cargo and passengers into them. Inside the port is equipment specifically designed for loading and unloading ships at anchor. There is also the term port, which is related to implementing port functions to support smooth-running security and as a place for intra and intermodal movement. The port is also a symbol of sea transportation, which is a facility with other areas for carrying out trade activities. Apart from that, there are also several activities at the port,including handling loading and unloading.

As reported on the TransTrack website, loading and unloading is a term often used in the shipping and logistics industry to describe the process of loading and unloading

cargo from ships, planes, or other transportation vehicles. This is an important stage in moving goods from one location to another.

The high level of economic activity is also in line with support for infrastructure development so that the process of distributing goods throughout indonesia can be affordable, including the construction of ports. According to (PP No. 69 of 2001,2001) concerning Ports Article 3 paragraph (1), "in preparing the national port order as intended in article 2 paragraph (2) is carried out by taking into account the regional spatial layout, The national transportation system, economic growth, national and international maritime transportation service patterns/routes, environmental sustainability, shipping safety, national standardization, criteria and norms".

The regulations state what things must be considered before building a port. However, there are still ports that are considered to be quite close to residential areas so there are negative impacts in carrying out activities at these ports. This is one of the negative impacts of the loading and unloading activity itself, such as the discomfort felt by people living around the port due to polution that occurs when the loading and unloading activity takes places, for example, as pollution produced by exhaust emissions used by container vehicles and dust from these loads also flies into residential areas which can cause negative impacts on the health of residents such as ISPA, coughing and dust allergies. This is also a factor in environmental pollution and air pollution.

Literature Review

Loading and Unloading activities

According to (Khaldun et al., n.d.) Decree of the Minister of Transportation No. KM 33 (2001) loading and unloading activities are activities of loading and unloading goods from and onto a ship, including the activity of unloading goods from the ship's hold onto the dock in the ship's hull or conversely (stevedoring), the activity of moving goods from the dock in the ship's hull to the warehouse/stacking yard or conversely (cargodoring) and the activity of picking up goods from the warehouse/field on a truck or conversely (receiving/delivery).

According to (*Lasse, 2014*, n.d.) loading and unloading is the activity of loading and unloading goods on a ship. Cargo unloading can be done directly from the ship (direct delivery) to the owner of the goods waiting to collect it. Also loading of goods can be direct delivery or indirect delivery.

According to (Subandi 1998:27 & Widyaningrum, 2014) The container handling process is a transportation system using containers from the time the goods are on board the ship to the container holding area or until they leave terminal.

According to (Subandi 1998:27 & Widyaningrum, 2014)loading an unloading activities are the activities of unloading or loading from and onto ships. Then R.P Suyono (2000:188) stated that loading and unloading consist of 4 parts of loading and unloading activities, namely :

1. 1.*Stevedoring* is the work of unloading goods from the ship to the dock or loading goods from the dock onto the ship until they are arranged in the ship's hold
2. 2.*Cargodoring* is the activity of transporting containers from the dock to the container stacking yard and then arranged them in the container stacking yard
3. Storage Operation is an effort to arrange and store containers in a warehouse or stacking yard available at a container terminal
4. *Receiving/delivery* is the work of moving containers from the container stacking yard and handling them over until they are arranged on the truck.

The loading and unloading speed indicators, according to (Brata Wuntara Umagapi, 2014) in the document Service Quality journal and general cargo loading and unloading speed are:

1. service
2. Readiness of loading and unloading equipment

3. Service users

Environmental (Air) Impact

There are many impacts resulting from air pollution, including: disrupting the health of living things, environmental damage to ecosystems, and acid rain. Human health will be disrupted due to polluted air, which can lead to diseases such as respiratory tract infections, lungs, heart and also as a trigger for cancer, which is very dangerous. Furthermore, the effects of pollutants in fossil fuels and nitrogen in the air that reacts with nitrogen in the air that reacts with oxygen. These pollutants come from car exhaust and industries that use fuel oil and coal

Air polluted with particulaate matter and gases can cause health problems that mainly affect the immune function of organs such as the lungs and blood vessels or cause irritation to the eyes and skin. Particle and dust pollution usually causes chronic respiratory diseases such as chronic bronchitis,pulmonary emphysema, bronchial asthma, and lung cancer. Gaseous pollutants dissolved in the air can enter the body directly into the lungs eventually absorbed by the vascular system (Mukono, n.d., p. 1997)

Air pollution can cause harm to humans and the environment. Increased air pollution affects agricultural productivity, damages materials, negatively impacts ecosystems, and causes aesthetic disturbances. Of all these impacts, the impact on human health and well-being is the dominant one, contributing approximately 90% of the total damage caused by air pollution (Sihotang, n.d.2010)

As for environmental indicators, according to (Wahyuningsih, n.d.2020) adalah:

1. Equipment and machines
2. Water usage
3. Land and buildings
4. Electricity and fuel usage

Factors that affect air quality

Factors that affect air quality are as follows:

Emission Sources

According to (Soedomo, n.d.2001) the types of pollutant sources are distinguished based on their behavior in the atmosphere in two groups, namely:

Primary air pollutants, the composition will not undergo atmospheric changes either chemically or physically in a relatively long period (daily to yearly and will remain as its composition as when the source emits it. These pollutants include CO, CO2, NO2, N20, TSP, SO2, menata,halogen compounds, metal particles and others. These pollutants have a long time in atmospheric physical-chemical reactions.

Secondary Air Pollutants form in the atmosphere due to atmospheric reactions such as hydraulic, oxidation, and photochemical reactions.

Wind Direction and speed

Wind speed is determined by the difference in air pressure between the place of origin and the wind direction as a driving facto. In general, air pollutants are dispersed in two ways:Wind speed and atmospheric turbulence. Turbulence causes airflow in two ways: thermal vortex and mechanical vortex. (Zendako, n.d.2010)

Air Humidity and Temperature

(Sastrawijaya, n.d.2009) States that the concentration of pollutants in the air depends on weather conditions. Wind speed and direction, Vertical temperature distribution, and humidity play role in these weather changes. Temperature change is also a big modifying factor. The upward movement will carry pollutants to areas with lower temperatures. At high humidity, the vapor content in the air can react with air pollutants, becoming other harmless

substances or becoming secondary pollutants. ((Departemen Kesehatan dalam Faudzi, n.d.2012)).

Light Intensity, The stability grade of the atmosphere, must be known to estimate the ability of the atmosphere to disperse pollutants. Wind speed and solar radiation intensity are factors used in determining the stability class. (Rahmawati, n.d.1999).

Social Impact

Loading and unloading activities at the port are one of the efforts to meet the logistical needs of a country. Companies and residential areas are two components that affect each other. From the company's side, they also need the community to build the company, and the community also requires the company to make the economy. Therefore, with the loading and unloading activities at the port adjacent to residential areas, it cannot be denied that there is a social impact on the surrounding community. Based on the results of our interviewes and observations with related parties who handle this problem, we concluded that there are several social impacts caused,namely:

1. Decreased quality of public health due to dust from container fuels: this decrease in health quality can be witnessed by the frequent occurrence of skin itching, coughing, and other respiratory diseases.
2. The emergence of conflicts between the community and the company regarding the environmental impacts caused. Disputes in the community arise in the form of demonstrations because of the disruption of their living environment with dust and pollution from the effects of container unloading activities at Tanjung Priok port, the low number of local people who are accepted to work at Tanjung Priok Port.
3. Changes in people's mindset in daily life. Because of the coexistence of dust and sand from loading and unloading activities, the community cleans their environment of dust and sand scattered, making innovations to reduce the intensity of the spread of pollution by making filters from nets installed around the corridors of houses affected by dust and sand.
4. The company's presence also affects fishermen's activities in the area. Where previously, the fishermen could look for fish not far from the mainland, the presence of a port near their settlement made the position of the fish population move farther from the mainland. So that the fuel needed becomes more and with the condition of expensive fuel oil prices, making their income decrease.
5. Changes in the mindset of people who share the same vision of the coal pollution problem have created a forum. The forum is intended as a place to aspire against the impact that has been felt by the effects of pollution resulting from container fuel. From the conference, they demanded that companies active with loading and unloading containers pay more attention to the AMDAL directions that the DKI Jakarta Environmental Agency has given.
6. The existence of elements of society that help and support awareness of the threat of dust activities from loading and unloading results that help educate the public about the rights given as citizens.

Community Convenience

According to (Ns. Kadek Cahya Utami, n.d.2016) There are several forms of comfort: Physical, Psychospiritual, Sociocultural, and environmental comfort. Physical comfort includes decreasing the body's ability to respond to a disease or invasive procedure. Psychospiritual comfort is related to feelings of peace of mind and soul. Like psychospiritual comfort, sociocultural comfort is related to interpersonal,family, and finally, there is environmental comfort, which relates to maintaining the tidiness and cleanliness of the surrounding environment.

From the results of the research that the authors conducted on the transportation system regarding comfort when passing or being in one lane together with the transport car (Container), Most of the people around Tanjung Priok Port stated that they did not feel comfortable with the activities of the transport car (Container) on the highway, not conducive to the highway and road conditions that are a lot of dust and sand that cause pollution.

Most of the people around the port stated that their life activities were quite disturbed during rest hours, namely at night. Tanjung Priok Port activities are increasing day by day with loading and unloading and the acitvity of transport cars (containers) that go back and forth sending and receiving goods from various regions and countries. So with the increase in port activities it causes the environment around the Port to experience environmental damage, one example is the air environment that experiences pollution (dust).

Associated with the presence of residential housing that is not far from the port, environmental comfort can make the health felt by the surrounding community negative. This is because vehicles in the harbor emit exhaust fumes containing harmful substances such as carbon monoxide (CO), sulfur dioxide (SO2), carbon dioxide (CO2), hydrocarbons (HC) and other substances. In addition to transportation exhaust fumes, it also has dust that contains particulates and bacteria. The indicators of comfort, according to
(Ns. Kadek Cahya Utami, n.d.2016) such as:

1. Physical comfort
2. Psychospiritual comfort
3. Environmental comfort harmony between environment and individual

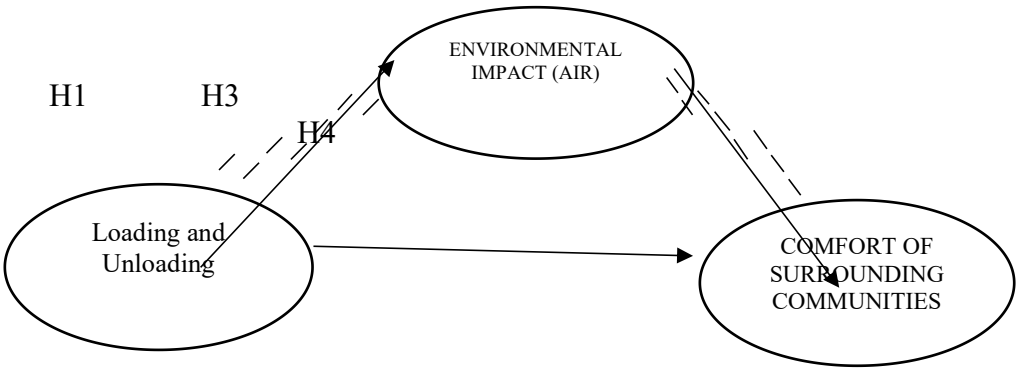

Figure 1. Framework

HYPOTHESIS

H1 = It is suspected that loading and unloading activities influence environmental impacts (air) at Tanjung Priok Port.
H2 = It is suspected that loading and unloading activities influence the comfort of the surrounding community at Tanjung Priok Port.
H3 = It is suspected that environmental impact (air) influences the comfort of the surrounding community at Tanjung Priok Port.
H4 = It is suspected that loading and unloading activities and environmental impacts (air) influence the comfort of the surrounding community at Tanjung Priok Port.

METHOD

The research method is a method or procedure used to research so that it can answer the formulation of problems and research objectives. In this study, a quantitative research preparation was used. Quantitative research methods are defined as research methods used to examine specific populations or samples later. Data collection is carried out using research instruments and quantitative or statistical data analysis with the aim of testing predetermined hypotheses. This study uses the distribution of questionnaires as a data collection instrument

with an infinite population and a sample of 100 respondents, which will later be distributed to people living around Tanjung Priok port. To determine the model in this study using SmartPLS 4 software and based on the calculation formula using the Slovin formula with the following calculation limits.

SmartPLS is a graphical user interface software for Partial Least Square-SEM. The software builds on amodern Java-based programming environment (Memon et al., 2021). SmartPLS is a scientifically grounded software. At the same time, the software is designed to ensure high usability and user-friendliness to support both beginners and experts in developing scientifically sound and state-of-the-art PLS-SEM analyses In con trast, PLS-SEM generally makes no assumptions about the data distribu tions. However, for reasons discussed in later chapters, it is nevertheless worthwhile to consider the distribution when working with PLS-SEM (Hair et al., n.d.).

RESULTS AND DISCUSSION

Validity and Reability Testing

Reability Testing

Outer loadings are primarily associated with the results for the relationships in reflective measure ment models, and outer weights are associated with the results for the relationships in formative measurement models (Hair et al., n.d.)

Outer model testing is also carried out by looking at the composite reliability value which aims to determine the level of reliability of the research variables. Convergent validity of the measurement model can be seen from the correlation between the item/dimension score and the construct score. Smart PLS Output for the loading factor in table 1 shows that all indicators have a loading factor > 0.70 (Handayani et al., 2023)

Table 1. Realibility Indicator

Variable	Composite Reability	Cronbach's Aplha	Result
Environmental (Air) impact	0.876	0.875	Reliable
Loading and Unloading Activities	0.817	0.815	Reliable
Community Convenience	0.881	0.880	Reliable

Concluded then that the construct had good realibilty as the value obtained was >0.70. From this study, it can be said that the results of this study are declared reliable because the value obtained on the composite reliability is 0.876 and Cronbach's alpha is 0.875.

Validity testing

Based on the convergent validity testing results as presented in table 2, all of the indicators mesuring the construct were declared valid for having outer loading factor of > 0.60.

Table 2. Outer Loading

	Environmental (Air) Impact	Loading and unloading Activities	Community Convenience
DLU1	0.834		
DLU2	0.833		
DLU3	0.869		
DLU4	0.876		
KBM1		0.797	
KBM2		0.804	
KBM3		0.779	
KBM4		0.827	

KMS1			0.889
KMS2			0.889
KMS3			0.917

Based on the table above, shows that the correlation value of variables to indicators is higher than the correlation value with other variables, so it can be said that all variables have a good level of validity testing.

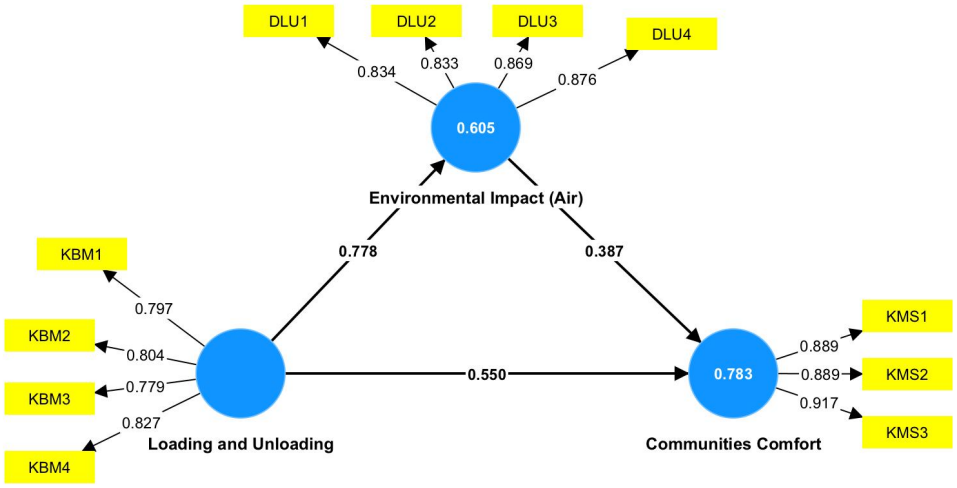

Figure 2. Initial Model

Direct Effect

Path models are diagrams used to visually display the hypotheses and variable relationships that are examined when SEM is applied Path models are developed based on theory. Theory is a set of systematically related hypotheses developed following the scientific method that can be used to explain and predict outcomes. Thus, hypotheses are individual conjectures, whereas theories are multiple hypotheses that are logically linked together and can be tested empiri cally.

In Table 3 there is a unidirectional relationship between variables. Hypothesis testing is carried out at the 5% significance level, accepted if T count> 1.79 (T table) and p < 0.5. The results of hypothesis testing obtained by bootstrapping smart pls are presented in Table 3

Table 3. Path Coefficients and T-Values

Path	Original Sample (O)	T Statistics	P Values	Result
Environmental (Air) Impact -> Community Convenience	0.387	2.216	0.027	Accepted
Loading and unloading Activities-> Environmental (Air) Impact	0.778	14.008	0.000	Accepted
Loading and Unloading Activities -> Community Convenience	0.550	3.208	0.001	Accepted

In the table presented in table 3, Environmental Impact (Air) affects the comfort of the surrounding community with a T count of 2,216> 1.79. It also shows that loading and unloading activities directly affect air's environmental impact by 14.008. Price loading and unloading activities affect the comfort of the surrounding community with a T count of 7.925> 1.79. Price loading and unloading activities also directly affect the convenience of the surrounding community of 3,208. Comfort affects purchasing preferences with a T count of 4.242> 1.79. This shows that convenience has a direct influence on buying interest of 0.435. It can be concluded that the fifth hypothesis is accepted.

Inderect effect

Table 4 shows that there is an indirect relationship between location and price fairness on purchase intention through convenience as an intervention variable.

Table 4. Indirect Effect

Effect	Original sample	T Statistic	P Value	Result
Loading and unloading activities -> Community Convenience	0.301	2.034	0.042	Significant

Basically, convenience has an indirect effect on purchase intention with T count of 2.034>1.79 obtained from the sobel test at the 5% significance level and P Values of 0.042.
Goodness of Fit Test

The most commonly used measure to evaluate the structural model is the coefficient of determination (R^2 value). This coefficient is a measure of the model's predictive power and is calculated as the squared correlation between a specific endogenous construct's actual and predicted values (Ketchen, 2023) The R^2 value ranges from 0 to 1, with higher levels indicating higher levels of predictive accuracy. It is difficult to provide rules of thumb for acceptable R^2 values as this depends on the model complexity and the research discipline.
Table 5 shows the criteria for R-squared values, with 0,75 being strong, 0.50 moderate, and 0.25 weak.

Table 5. R-Square

Variables	R2	Result
Environmental (air) impact	0.605	Moderate
Community convenience	0.783	Strong

Based on the data above, it can be concluded that the Environmental Impact (air) variable can be explained or can be influenced by the loading and unloading activity variable by 60.5% and is influenced by other variables from outside this study by 39.5%. The Community Comfort variable can be influenced or explained by the loading and unloading activities, and Air Environmental Impact variable by 78.3% and is influenced by variables outside this study by 21.7%.

CONCLUSION

This research aims to identify the impact of container loading and unloading activities on the community around Tanjung Priok Port, especially environmental impacts. Pollution generated from loading and unloading activities causes various negative effects that affect the level of comfort and public health. This research also aims to be a study material by the central and local governments in regulating the arrangement of areas between industrial activities, especially ports and community settlements. Based on complaints from the community around Tanjung Priok Port, there are several impacts caused by dust from loading and unloading activities at Tanjung Priok Port, especially on the environment and health

sector. The results of this study are based on questionnaires, observation, and documentation with parties related to the problem, including local residents. The research shows that loading and unloading activities at Tanjung Priok Port have a negative impact on behavior patterns and community comfort. This research uses the distribution of questionnaires as a data collection instrument with an infinite population and a sample of 100 respondents, which will be distributed to people living around Tanjung Priok Port.. The main problem is dust from exhaust emissions from containers that still use diesel, and these particles become dust that flies into residential areas and surrounding roads. Although very small in size, these particles must be considered. Because if it continues to be inhaled by humans, it will have a significant impact on people's lives. However, this impact does not only affect the community, all elements of society around the port, fishermen, and government officials but all aspects around the area are also affected. Therefore, it is necessary to have control and support from the central government and local government or other aligned concepts to minimize these impacts.

Implication

Emission Monitoring: Install an emissions monitoring system to monitor and control exhaust gases from vehicles and loading and unloading equipment. Ensure that vehicles used at the port comply with established emission standards.

Low Emissions: Switch to more environmentally friendly fuels such as alternative fuels or low-emission fuels. This can reduce the negative impact on air quality around the port.

Waste Management System: Implement an effective system to manage and dispose of waste responsibly. Ensure that all waste generated from loading and unloading activities, including solid and liquid waste, is treated and disposed of in accordance with applicable environmental regulations.

Water Quality Monitoring: Conduct regular monitoring of water quality around the port to ensure that loading and unloading activities do not pollute seawater. Ensure that the use of chemicals and solvents is limited and in accordance with environmental regulations.

Dust Management: Use effective dust control systems, such as water sprinkling or dust covers, to reduce the spread of dust generated during loading and unloading activities. This can help reduce the impact of air pollution around the port.

Research Limitations

This study has several limitations that can be used as benchmarks and as encouragement for future researchers to get better research results and advance knowledge in the field, as follows:

1) This study onlu uses two independent variables, namely loading and unloading activities and environmental impacts (air) and the dependent variable, the comfort of the surrounding community.
2) Researchers only examined 100 respondents who live around Tanjung Priok Port.
3) Researchers conducted research at the time of implementation from June 2023 to October 2023

Tables and Figures

Tables are presented in the following:

Table 6. List of Indicators Measurement of variables

Variable	Operational definition	Source
Loading and Unloading Activities	Service Readiness of loading and unloading equipment Service users	Brata Wuntara Umagapi, Siska Amonalisa, Lies Lesmini 2016
Environmental Impact (Air)	Equipment and machinery Water users Land and buildings Electricity and fuel usage	Hapsari Wahyuningsih, 2020
Community Convenience	Physical convenience Psychospiritual Environmental comfort harmony between environment and individual	Ns. Kadek Cahya Utami,S.Kep , 2016

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