

THE INFLUENCE OF TRANSPORT INFRASTRUCTURE IN SUPPORTING FREIGHT TRANSPORT ACTIVITIES IN BALI

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ABSTRACT

Transportation and logistics play a crucial role in economic activities, particularly in the distribution of goods. Well-established and adequate transportation infrastructure can enhance the efficiency of cargo transportation, leading to faster delivery times and reduced logistics costs. Bali, as one of Indonesia's leading tourist destinations, also has the potential to become a hub for trade and logistics. However, Bali's transportation infrastructure is still insufficient to support cargo transportation effectively. Therefore, this research aims to evaluate the impact of transportation infrastructure on cargo transportation activities in Bali. The research methodology employed quantitative analysis with linear regression techniques and SWOT analysis. The research findings indicate that the condition of cargo transportation infrastructure in Bali is generally good, but there are still obstacles that can hinder the efficiency of goods delivery, such as traffic congestion and infrastructure damage. Using linear regression analysis, it was determined that transportation infrastructure can have an impact on logistics activities, particularly in terms of transportation infrastructure conditions, the availability of infrastructure, infrastructure quality in supporting logistics costs, and distribution challenges. From the SWOT analysis, it was found that the development of transportation infrastructure in Bali can benefit from a progressive strategy by capitalizing on strengths and opportunities. This approach aims to improve transportation infrastructure in Bali to support more effective and efficient cargo transportation.

Keywords: goods transportation linear regression analysis; SWOT analysis; transportation infrastructure

INTRODUCTION

Bali is one of the most popular tourist destinations in Indonesia, known for its natural beauty, culture, and tourism. Therefore the tourism and economic sectors in Bali have grown rapidly in recent years. This growth has resulted in an increased demand for freight transport needed to support the tourism and economic needs of Bali. As an island, Bali's infrastructure is dominated by roads and harbours. In addition, Ngurah Rai International airport is also an important access point in supporting logistics activities in Bali. However, the availability and quality of transport infrastructure in Bali is still not up to the ideal standard. In recent years, Bali's tourism and economic sectors have grown rapidly, increasing the demand for freight transport. Tourists coming to Bali bring their luggage, such as clothes, food and other equipment. In addition, entrepreneurs also require freight transport to support their business activities. For example, raw materials and finished products are needed for the industrial sector in Bali. However, this growth in demand for freight transport has not been matched by the development of adequate transport infrastructure. Some of the existing transport infrastructure constraints in Bali include inadequate roads and limited road capacity. These constraints cause traffic congestion, especially in tourism areas such as Kuta, Legian and Seminyak. This congestion can have an impact on delays in the delivery of goods, increase transport costs and reduce service quality.

In addition, there is still a lack of adequate freight transport facilities and infrastructure in Bali. This makes it difficult for entrepreneurs to transport goods effectively and efficiently. Sometimes, entrepreneurs have to rent trucks or other vehicles from other regions to send goods to Bali. This can increase transport costs and hamper business activities in Bali. Therefore, research on the influence of transport infrastructure in supporting freight transport activities in Bali is very important. By knowing the effect of transport infrastructure on Bali's freight transport activities, appropriate solutions can be found to overcome these constraints. Improvements in transport infrastructure can have a positive impact on the delivery of goods in Bali. Adequate roads and sufficient road capacity can reduce traffic congestion, so that delivery of goods can be done more quickly and efficiently.

In addition, adequate freight transport facilities and infrastructure will make it easier for entrepreneurs to send goods to and from Bali, and can increase the efficiency of shipping goods. In addition, decision makers in the industrial and tourism sectors can use the results of this study as a basis for making strategic decisions regarding freight transport in Bali. This study aims to determine the current condition of freight transport infrastructure in Bali, identify the constraints faced in shipping goods, determine the effect of transport infrastructure conditions on the efficiency of shipping goods, and plan appropriate infrastructure development strategies to support freight transport activities in Bali. In conclusion, research on the influence of transport infrastructure in supporting freight transport activities in Bali has a high urgency to be carried out. By improving transport infrastructure, it can increase the efficiency of goods delivery and support the development of the industrial and tourism sectors in Bali.

METHOD

This research will conduct data analysis techniques using a qualitative approach, conducting literature studies, preliminary surveys, preparing and distributing questionnaires (to logistics companies), processing and analysing questionnaire data and drawing conclusions. The research was conducted from March to September 2023. The data that has been obtained will be processed using linear regression analysis and SWOT. The data collection technique that will be used by the author in this study is by interview, namely by asking open and direct questions to the informants of this study, so that the data needed by the author is obtained. This method can be used to determine the relationship between the independent variable (transport infrastructure) and the dependent variable (logistics activities). Regression analysis can provide information on how much influence transport infrastructure has on logistics activities. SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis can be used to evaluate the strengths, weaknesses, opportunities, and threats of transport infrastructure and logistics activities in Bali. By doing so, researchers can determine appropriate strategies to maximise the influence of transport infrastructure in supporting logistics activities.

RESULT AND DISCUSSION

Respondent Profile

From the results of the survey conducted, 105 respondents were obtained with each criterion of a different respondent profile. The survey conducted was addressed to various practitioners in the field of transportation and logistics, such as transportation regulators (government) company owners, company leaders, staff or company employees and freight transport drivers.

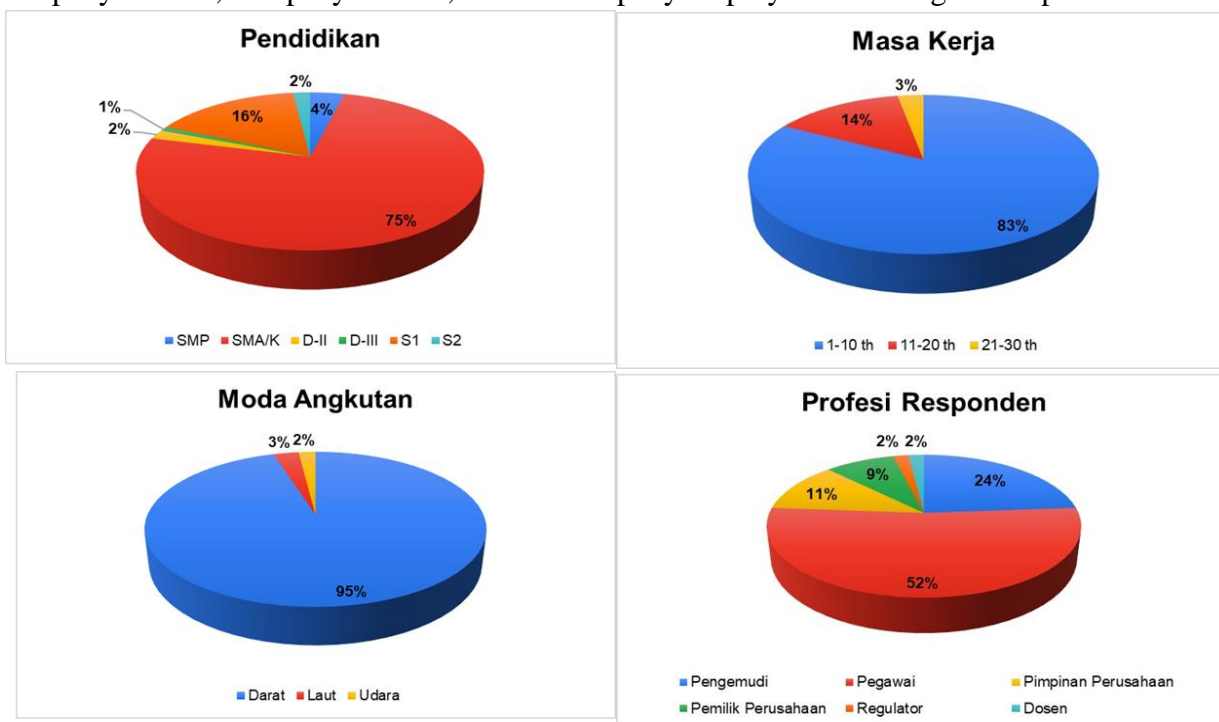


Figure 1. Respondent Profile

State of Freight Infrastructure in Bali

Freight infrastructure includes a number of components necessary to support the movement and delivery of goods from one place to another. Freight transport infrastructure is one of the most important factors to support trade, supply and mobility of goods. Improving and maintaining this infrastructure is key to maintaining a smooth supply chain and economic growth. Developments in transport and logistics will also improve the integration of freight infrastructure for better and more efficient delivery. Based on the data obtained from the distributed questionnaires, the following results were obtained:

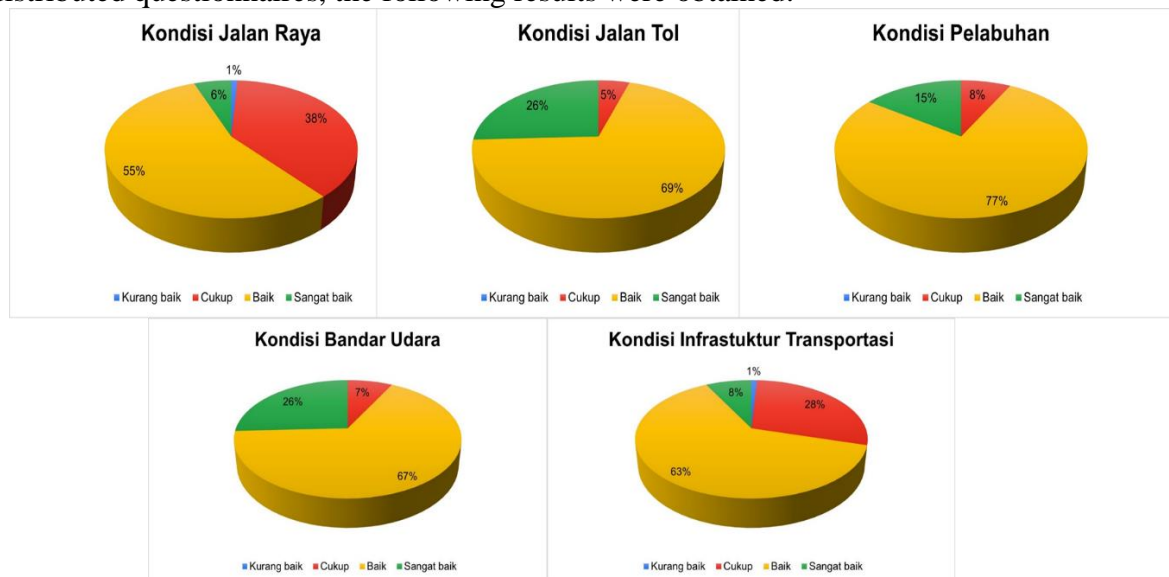


Figure 2. Transport Infrastructure in Bali Condition

The results of the questionnaire given to respondents, it can be concluded that the condition of freight transport infrastructure in the Bali region includes roads, toll roads, ports and airports that are good in supporting freight transport activities. This can also be supported by looking at Figure 2 as an assessment of each respondent, which also shows that the overall condition of the transport infrastructure in the Bali region is good and able to support freight transport activities in the Bali region.

Obstacles to Freight Forwarding in Bali

In shipping goods, there are several obstacles that generally occur so that it can cause obstruction in the process of shipping goods. These obstacles have occurred in several regions in Indonesia, including the Island of the Gods in Bali. Based on the data obtained from questionnaires filled out by a total of 105 respondents, the obstacles that occur in the delivery of goods in Bali are as follows:

a. Infrastructure Damage

One of the obstacles that occur in shipping in Bali is infrastructure damage. The damage is one of the main obstacles in the delivery of goods in Bali, in this case damaged or inadequate infrastructure can cause delays, the emergence of additional costs and obstacles in the supply chain, especially its freight transport activities. Based on data obtained from respondents, infrastructure damage that occurs in Bali is found on several damaged highways due to the presence of several freight trucks carrying large and heavy loads that affect the strength of the roads they traverse. In addition, the impact of extreme weather or natural disasters such as earthquakes also cannot be ignored as a cause of road damage. Road damage itself can slow down the movement of trucks and freight vehicles. Damage to infrastructure such as roads can cause delays in the delivery of goods, incur additional costs for repairs and maintenance and risks to safety. Therefore, in order to overcome these obstacles, it is important for the

government and the private sector to invest in the repair and maintenance of infrastructure, especially roads, while planning more efficient transport routes.

b. Congestion



Figure 3. Population and Vehicle Comparison

Congestion is one of the main obstacles in the delivery of goods in Bali. As can be seen in Figure 2, it can be visually seen that the number of vehicles in Bali is twice as many as the number of residents, proving that it can be assumed that one person in Bali can own two or more vehicles. According to the Directorate General of Population and Civil Registration (Dukcapil), in June the population in Bali Province reached 4.29 million people, while based on data released by the Central Bureau of Statistics, the number of vehicles in Bali reached 4,746,364 units. Of course, this is one of the causes of congestion on the Island of the Gods. In addition, given that Bali is a popular tourist destination and high traffic volumes such as in the tourist areas of Kuta, Seminyak and surrounding areas will cause delays and obstacles in the movement of freight transport. High traffic volumes especially during tourist seasons can cause significant congestion on various highways in Bali. The city centres in Bali such as the Sarbagita area (Denpasar, Badung, Gianyar, Tabanan), are often very congested and the main roads are often congested, so heavy traffic can impede the movement of goods that have to pass through the city centre.

Linear Regression Analysis

a. Partial T Test Based on Significant Value

Parsial Partial T test is one method to evaluate whether each independent variable (predictor variable) in a linear regression model has a significant contribution to the dependent variable, by testing the null hypothesis that the regression coefficient for that variable is equal to zero. The interpretation of the partial t test results with significance values is as follows: transportation infrastructure conditions (X1) have no effect on freight transport activity in Bali, highway conditions (X2) have no effect on freight transport activity in Bali, toll road conditions (X3) have no effect on freight transport activity in Bali, port conditions (X4) have an effect on freight transport activity in Bali, airport conditions (X5) have no effect on freight transport activity in Bali, availability of freight transport fleet (X6) has no effect on freight transport activity in Bali, the effectiveness of the use of information technology (X7) has no effect on freight transport activity in Bali, the availability of transport infrastructure (X8) has an effect on freight transport activity in Bali, the distribution process (X9) has no effect on freight

transport activity in Bali, constraints in distribution (X10) has an effect on freight transport activity in Bali, the ability of transport infrastructure to support maximum capacity (X11) has no effect on freight transport activity in Bali, The availability of transport infrastructure in supporting logistics costs (X12) has an effect on freight transport activities in Bali, the application of regulations or policies governing freight transport (X13) has no effect on freight transport activities in Bali, the cost of taxes or additional costs that must be paid in the process of transporting goods (X14) has no effect on freight transport activities in Bali, government efforts to improve transport and logistics infrastructure (X15) has no effect on freight transport activities in Bali, the quality of transport infrastructure in supporting the service level of freight transport satisfaction (X16) has no effect on freight transport activities in Bali. Based on the results of the regression analysis test that has been carried out, it can be concluded that the transport infrastructure variables have a significant influence on the efficiency of goods delivery and logistics activities in Bali. The 4 variables that most influence shipping efficiency and logistics activities include port conditions, infrastructure availability, infrastructure support for logistics costs and distribution constraints.

Table 1.
 Partial T Test Based on Significant Value
Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.976	.759		2.604	.011
	Infrastruktur Transportasi	-.150	.089	-.168	-1.694	.094
	Kondisi Jalan Raya	-.027	.081	-.031	-.335	.738
	Kondisi Jalan Tol	.180	.098	.175	1.850	.068
	Kondisi Pelabuhan	-.287	.115	-.257	-2.504	.014
	Kondisi Bandar Udara	.040	.103	.041	.384	.702
	Ketersediaan Armada	.043	.095	.047	.458	.648
	Penggunaan Teknologi	.136	.087	.148	1.558	.123
	Ketersediaan Infrastrutur	.268	.088	.303	3.056	.003
	Proses Distribusi	-.138	.090	-.149	-1.526	.131
	Kendala Distribusi	.276	.088	.328	3.121	.002
	Kemampuan Infrastruktur	-.129	.086	-.139	-1.486	.141
	Biaya logistik	.306	.089	.353	3.431	.001
	Penerapan Kebijakan	-.127	.077	-.175	-1.644	.104
	Biaya tambahan (pajak)	-.090	.055	-.164	-1.637	.105
	Upaya pemerintah	.097	.099	.099	.973	.333
	Kualitas Infrastruktur	.173	.093	.185	1.855	.067

a. Dependent Variable: Pengaruh Infrastruktur Terhadap Aktivitas Logistik

b. Simultaneous Test Based on F-Count Value and Table

The simultaneous test based on the F-count value is a statistical procedure used to test whether all independent variables (predictor variables) in the regression model together have a significant impact on the dependent variable. This simultaneous test uses the F statistic to test the null hypothesis that the regression coefficient for all independent variables in the model is zero, which means that there is no significant impact of the independent variables in explaining the variability of the dependent variable. Therefore, the simultaneous test with the F-count value

is often used in regression analysis to evaluate the meaningfulness of the entire regression model. The F-test results will provide information on whether the overall regression model is significant or not. If the F-test results are significant, it will indicate that at least one independent variable has a significant impact in explaining the variability of the dependent variable According to V. Wiratna Sujarweni. Wiratna Sujarweni (2014: 154), if the value of F count > F table, it means that the Independent variable (X) simultaneously affects the dependent variable (Y). With the formula $F_{table} = (k; n-k) = (16; 105-16) = (16; 89) = 1.758$

Table 2.
 Simultaneous Test Based on F-Count Value and Table

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	13.147	16	.822	4.504	.000 ^b
	Residual	16.053	88	.182		
	Total	29.200	104			

- a. Dependent Variable: Pengaruh Infrastruktur Terhadap Aktivitas Logistik
- b. Predictors: (Constant), Kualitas Infrastruktur, Biaya tambahan (pajak), Kemampuan Infrastruktur, Kondisi Jalan Tol, Penggunaan Teknologi, Upaya pemerintah, Ketersediaan Infrastruktur, Kondisi Jalan Raya, Proses Distribusi, Ketersediaan Armada, Infrastruktur Transportasi, Biaya logistik, Kondisi Pelabuhan, Kendala Distribusi, Penerapan Kebijakan, Kondisi Bandar Udara

Based on table 2, it can be seen that the value of F count $F_{count} (4, 504) > F_{table} (1.758)$, then all Independent variables which include Transportation Infrastructure Conditions (X1), Highway Conditions (X2), Toll Road Conditions (X3), Port Conditions (X4), Airport Conditions (X5), Availability of Goods Transportation Fleet (X6), Effectiveness of Use of information technology (X7), Availability of transportation infrastructure (X8), Distribution Process (X9), Obstacles in distribution (X10), The ability of transportation infrastructure to support maximum capacity (X11), Availability of transportation infrastructure to support logistics costs (X12), Implementation of regulations or policies governing the transportation of goods (X13), Tax or additional costs that must be paid in the process of transporting goods (X14), Government efforts to improve logistics transportation infrastructure (X15), Quality of transportation infrastructure (X16), simultaneously affect the dependent variable (Y). As can be seen in table 3 Based on the R-Square value, the effect of all independent variables (X) simultaneously on the dependent variable (Y) is 45%.

Table 3.
 R-Square Percentage Value

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.671 ^a	.450	.350	.427	2.130

- a. Predictors: (Constant), Kualitas Infrastruktur, Biaya tambahan (pajak), Kemampuan Infrastruktur, Kondisi Jalan Tol, Penggunaan Teknologi, Upaya pemerintah, Ketersediaan Infrastruktur, Kondisi Jalan Raya, Proses Distribusi, Ketersediaan Armada, Infrastruktur Transportasi, Biaya logistik, Kondisi Pelabuhan, Kendala Distribusi, Penerapan Kebijakan, Kondisi Bandar Udara
- b. Dependent Variable: Pengaruh Infrastruktur Terhadap Aktivitas Logistik

Based on the regression analysis test results, it can be concluded that the transport infrastructure variables have a significant influence on the efficiency of goods delivery and logistics activities

in Bali. The 4 variables that most influence the efficiency of shipping and logistics activities include port conditions, infrastructure availability, infrastructure support for logistics costs and distribution constraints.

Appropriate Transport Infrastructure Development Strategy in Bali

Based on the data that has been obtained from respondents, data analysis is then carried out using the SWOT (Strength, Weakness, Opportunity and Threat) method. Where several variables are grouped into each category of Strengths, Weaknesses, Opportunities and Threats. After knowing each variable included in the SWOT category, then proceed with the analysis of Internal Factor Analysis Strategy (IFAS) and External Factor Analysis Strategy (EFAS) so as to find out the external and internal factors that are an important part of this analysis (Fahmi, 2013: 260). External factors here can affect the creation of opportunities (opportunities) and threats (threats), this factor is related to conditions that exist outside the organisation or company. While internal factors can affect the creation of strengths and weaknesses, this factor is related to the conditions that occur within the organisation or company. The following below is the IFAS and EFAS table that has been obtained:

IFAS

Table 4.
IFAS

	Faktor Internal	Bobot	Rating	Skor
Strength	Kondisi Jalan Raya	0,125	3,7	0,463
	Kondisi Pelabuhan	0,05	3,8	0,19
	Kondisi Bandara	0,125	4,125	0,516
	Kondisi Jalan Tol	0,1	4,125	0,413
	Ketersediaan Armada	0,1	4	0,4
	Jumlah Strength		0,5	
Weakness	Kendala Distribusi	0,1	2,9	0,29
	Biaya Tambahan	0,1	2,41	0,241
	Kondisi Jalan Pedesaan	0,15	2,9	0,435
	Terbatasnya Prasarana	0,1	2,9	0,29
	Proses Distribusi	0,05	2,5	0,125
	Jumlah		0,5	
Selisih (S-W)/TOTAL IFAS				0,6

From the results of the IFAS table, it can be seen that the strengths include road conditions, port conditions, airport conditions, toll road conditions and fleet availability, while factors including weaknesses include: distribution constraints, additional costs, limited rural road infrastructure and distribution process. Where from each factor then further weighting is carried out on each factor, where later the total weight must be equal to 1 (one). It can be seen that the total weight of strengths and weaknesses is balanced with a total of 0.5 so that the total weight in the IFAS table becomes 1 (one). Furthermore, multiplication is carried out between the weights that have been carried out and the ratings that have been obtained from the results of the data on the respondents. The results of this multiplication will later produce a score where in each category

both strengths and weaknesses are summed up, then from the total score it is continued by calculating the total difference from strengths and weaknesses so that the IFAS score result is 0.6.

EFAS

Table 5.
IFAS

	Faktor Eksternal	Bobot	Rating	Skor
Oppurtunity	Penerapan teknologi	0,125	4	0,5
	Pengembangan kebijakan	0,1875	3,9	0,731
	Perluasan Infrastruktur	0,1875	4,41	0,827
	Jumlah Oppurtunity	0,5		2,058
Threats	Kemacetan	0,125	2,9	0,363
	Biaya Logistik	0,1875	2,5	0,469
	Kepuasan Pelanggan	0,1875	2,7	0,506
	Jumlah Threats	0,5		1,338
	Selisih O-T/Total EFAS			0,7

From the results of the EFAS table, it can be seen that the opportunity factors include the application of technology, policy development, infrastructure expansion, while factors including Threats include: congestion, logistics costs and customer satisfaction. Where from each factor then further weighting is carried out on each factor, where later the total weight must be equal to 1 (one). It can be seen that the total weight of opportunities and threats is balanced with a total amount of 0.5 so that the total weight in the EFAS table becomes 1 (one). Furthermore, multiplication is carried out between the weight that has been carried out and the rating that has been obtained from the results of the data on the respondents. The results of this multiplication will produce a score where in each category both opportunities and threats are summed up, then from the total score it is continued by calculating the total difference from opportunities (strengths) and threats (threats) so that the EFAS score result is 0.7.

Matriks SWOT

Based on the results of the SWOT Analysis Matrix that has been obtained from the calculation results in the IFAS (0.6) and EFAS (0.7) Tables, the results show that Transportation Infrastructure is in a position between the X axis (Strength) and the Y axis (Oppurtunity) which is in Quadrant 1. This can be interpreted that the Transportation Infrastructure is recommended to use a progressive strategy by relying on the strengths currently owned including port conditions, airport conditions, highway conditions, toll road conditions and the availability of a very good fleet by taking advantage of opportunities (Oppurtunity) which include the application of technology, policy development and infrastructure expansion to support freight transport activities in Bali, so that the application of this strategy is expected to increase the efficiency of shipping goods and support logistics activities in Bali.

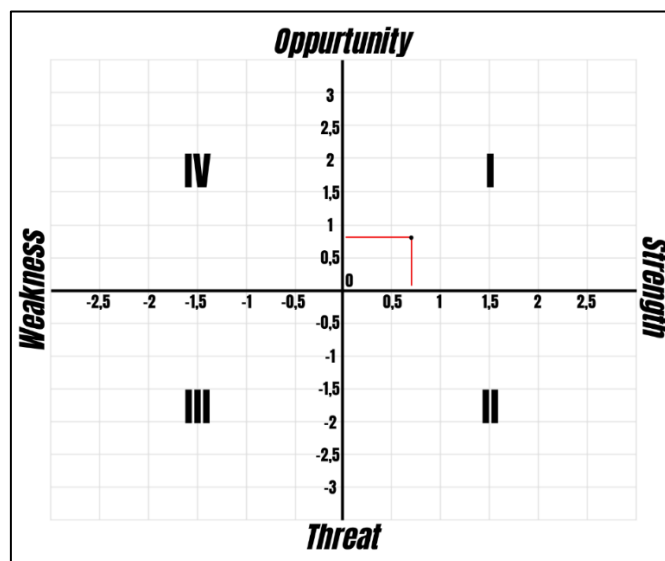


Figure 4. SWOT Analysis Result

CONCLUSION

1. The condition of freight transport infrastructure in the Bali region including roads, toll roads, ports and airports is good in supporting freight transport and logistics activities in Bali.
2. Obstacles that occur in the delivery of goods in Bali, including:
 - a. Infrastructure Damage, in this case especially road infrastructure, there are several roads that have been damaged due to the presence of several freight trucks that carry large and heavy loads that affect the strength of the road being travelled. Therefore, to overcome this obstacle, it is very important that there is cooperation between the government and the private sector to invest in the repair and maintenance of infrastructure, especially roads, as well as planning more efficient transport routes.
 - b. Congestion, Congestion is one of the main obstacles in the delivery of goods in Bali. There are 21 points located in 6 regencies in Bali that are declared prone to congestion. Therefore, to overcome this traffic congestion, logistics companies and the local government should consider various solutions, such as more efficient routing, the use of smaller and more flexible trucks, careful management of delivery times and coordination with relevant stakeholders to help overcome the traffic congestion problem.
3. Based on the regression analysis test results, it can be concluded that the transport infrastructure variables have a simultaneous influence on the efficiency of goods delivery and logistics activities in Bali. The 4 variables that most significantly affect the efficiency of shipping and logistics activities include port conditions, infrastructure availability, infrastructure support for logistics costs and distribution constraints.
4. Based on the results of the SWOT analysis that has been carried out, the right strategy to develop transportation infrastructure to support freight transport activities in Bali is a progressive strategy, which relies on the strengths currently owned including port conditions, airport conditions, highway conditions, toll road conditions and the availability of a very good fleet by utilising opportunities (Opportunity) which include the application of technology, policy development and infrastructure expansion to support freight transport activities in Bali.

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