Modeling Study Of Generating-Trip Transportation In The Border Zone Area Based On Conditions Of Transportation's Infrastructure A Case Study In The Central Java Province-Indonesia

Juang Akbardin, Danang Parikesit, Bambang Riyanto, Agus Taufik Mulyono

Abstract: The modeling of generating-trip transportation of freight was very important to estimate the needs of infrastructure capacity much better which was based on the development of the border zone area. Variable model utilized in the study was a combination of socio-demographic conditions of the border areas, infrastructures and transportation facilities in the border zone. A border-regions zone required accelerating of potential growth in that region to reduce the margin level of development of the region which was closer to the center of the economy. Commodity production zone of the border areas required high accessibility to raise the level of the economic-products which was produced by the border region so that the producing commodities were able to enhance the growth of the border region based on their products. The results of the modeling of generating-trip transportation in the zone of border region with the equation : Ln Y = 1.85 + Ln 0.982 x1 + 0.140 Ln x2 + 0.00048 x3 - 0.00007 x4 - 0.000034 x5+ 0.000031 x6 - 0.000363 x7 - 0.000115 x8 - 0.000979 x9.The significances value of model was stated by determination coefficient about 0.87. The dominant variables which influenced were demographic factors, the total length of national roads and the conditions of the level of roads damage from small to wide conditions.

Keywords: Generating-Trip, Freights Transportation, Border Zone

1. INTRODUCTION

A border region zone has a strategic role in maintaining the sovereignty of a territory role in the development implementation. Zone of border region in developing the territory in desperate need of accelerating the accessibility and the development of regional growth based on infrastructure capacity in the zone of the border area [1, 2, 3]. Central Java province has an important role in Indonesia's national development strategy. Research in the development generating-trip transportation modeling of freights in the border-zone area have an important role in predicting the direction of sustainable development, especially in the direction strategy development in the direction of territorial insight. The estimation of generating-trip transportation modeling of freights was able to increase and to escalate the growth rate of region is based on products which were generated by the region [3, 4].A border-zone area which is far from the central region's economic growth is difficult to distribute the potential of its products and obtain the required supply of commodities in the commodity demand capacity needs in the area. Transportation infrastructures' conditions with high levels of service are less based on its capacity increasingly inhibited the growth generating-trip of freights in the border region [2, 3].

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Characteristics of the potential of the border region is strongly influenced zone the geographical conditions of border areas in developing regional development. Estimated trip generation modeling the transport of freights is very important necessary to predict the growth of regional development based on the ease in obtaining a commodity in accordance with the needs of the zone border region. Factors socio-economic and demographic factors are used in the modeling as one of the variables in the analysis. Transportation infrastructure is indicated by the level of service and capacity was used as a variable which is defined based on the level of damage and the long road in the zone border region. Means of transport owned in a zone greatly affects the magnitude of trip transportation of freights is assigned as a variable in modeling. With the trip generation modeling the transport of freights within the zone of predicted development of border areas of sustainable transport of freights can be predicted according to the needs of the region [3, 4].

GENERATING-TRIP MODEL

Generating-Trip Model generally estimated the number of trips for any purpose of travel by land use characteristics and socio-economic characteristics in each zones. The purpose of planning generating-trip is to estimate as accurately as possible the traffic generation at present, which will be used to predict the future [3, 4, 6, 7].

Regression Analysis Model

In this study, the discussion focuses only on regression analysis model. By utilizing multiple-linear regression, the value of b_0, b_1, b_2 and b_3 calculated utilizing linear regression analysis. Values of b_0, b_1, b_2 and b_3 can be obtained with four simultaneous equations (1) - (4) as follow [5]:

$$Nb_0 + b_1\sum_{i=1}^{N} X_{1i} + b_2\sum_{i=1}^{N} X_{2i} + b_2\sum_{i=1}^{N} X_{3i} = \sum_{i=1}^{N} Y_i$$

(1)

$$b_0\sum_{i=1}^{N}X_{1i}+b_1\sum_{i=1}^{N}(X_{1i}.X_{2i})+b_2\sum_{i=1}^{N}(X_{1i}.X_{2i})+b_3\sum_{i=1}^{N}(X_{1i}.X_{3i})=\sum_{i=1}^{N}(X_{1i}.Y_i)$$

(2)

$$b_0\sum_{i=1}^{N}X_{2i}+b_1\sum_{i=1}^{N}(X_{1i}.X_{2i})+b_2\sum_{i=1}^{N}(X_{2i})^2+b_3\sum_{i=1}^{N}(X_{2i}.X_{3i})=\sum_{i=1}^{N}(X_{2i}.Y_i)$$

(3)

$$b_0\sum_{i=1}^{N}X_{3i}+b_1\sum_{i=1}^{N}(X_{1i}.X_{3i})+b_2\sum_{i=1}^{N}(X_{2i}.X_{3i})+b_3\sum_{i=1}^{N}(X_{3i})^2=\sum_{i=1}^{N}(X_{3i}.Y_i)$$

(4)

The Correlation Analysis

In determining the extent to which the precision of a regression function, it can be seen from the value the coefficient of determination (r^2) obtained by squaring the correlation coefficient value. The correlation coefficient was calculated using the following equation [5]:

$$r=\frac{n\sum xiyi-\sum xi\sum yi}{\sqrt{\left\{n\sum xi^2-\left(\sum xi\right)^2\right\}\left\{n\sum yi^2-(yi)^2\right\}}} \quad (5)$$

Determination Test

$$R^2=1-\frac{\sum_{i=1}^{N}\sum_{d=1}^{N}(\hat{T}_{id}-T_{id})^2}{\sum_{i=1}^{N}\sum_{d=1}^{N}(\hat{T}_{id}-T_1)^2} \quad (6)$$

$i \neq d$

RESEARCH METHODOLOGY

Approaches to study the distribution model of the movement of a vast area that heavily influenced the factors of land use on each-in the requires a lot of data and information that is very complex for accuracy. In this research study the distribution transportation modeling using secondary data movement so as to simplify of using development in the border zone or in the city of Central Java province with its development [1].

Determining Variable Model Generated and Traction

Research sites

Fig.1. *Research Sites*

Dependent variables

Y1 = Oi = Generated Movement of Freights Trip Transportation in the border zone area.

Independent variables

X1 = Variable of population

X2 = Variable of GRDP (Gross Regional Domestic Product)

X3 = independent variable of IO Commodities Freights in border-zone area

X4 = independent variable length of national roads in the district or city in Central Java

X5 = independent variable length of provincial roads in the county and the city in Central Java

X6 = independent variable length of local roads in the District and City in Central Java

X7 = independent variable road conditions in both the District and the City in Central Java

X8 = independent variable road conditions were in the District and City in Central Java

X9 = independent variable condition of roads damaged in the District and City in Central Java

X10 = independent variable road conditions severely damaged in the District and City in Central Java

X11 = independent variable number of goods vehicles in the county and the City of Central Java

X12 = independent variable number of goods vehicles with individual ownership status

X13 = independent variable number of goods vehicles to the ownership status of the company

b0 = constants.

Data source: [1-7]

RESULTS AND DISCUSSIONS

Estimation and Modeling Generated Journey

Socio-economic variables, the condition of the infrastructure (infrastructure) and facility conditions (modes) used in this study, namely: Projections based on the tendency (trend), which is based on historical trends in the development of the independent variable parameters defined. Projections based on the pattern you want to target, which is based on the direction of development to be achieved, generally these predictions are associated with their own spatial planning and economic development strategy in the RTRW (Spatial Plan) provinces of Central Java and draft MP3EI (Master Plan Development Acceleration of Indonesian Economic Growth) [4, 6, 7].

Model Trip Generation:

Figure 2: Validity and Multiple Regression Test assumptions Generated Journey Transportation of the border area zone based transportation infrastructure.

The regression equation is

Ln Y = 1.85 + 0.982 Ln x1 + 0.140 Ln x2 + 0.00048 x3 - 0.00007 x4 - 0.000034 x5 + 0.000031 x6 - 0.000363 x7 - 0.000115 x8 - 0.000979 x9

Predictor	Coef	SE Coef	T	P	VIF
Constant	1.850	2.213	0.84	0.411	
x1	0.98249	0.09982	9.84	0.000	3.304
x2	0.14021	0.09137	1.53	0.137	1.831
x3	0.000481	0.001190	-0.40	0.690	1.724

x4	-0.000074	0.001064	-0.07	0.945	2.677
x5	-0.0000345	0.0001647	-0.21	0.836	2.101
x6	0.0000312	0.0002390	-0.13	0.897	2.526
x7	-0.0003625	0.0006194	-0.59	0.564	6.654
x8	-0.0001148	0.0009063	-0.13	0.900	6.432
x9	-0.0009789	0.0004788	-2.04	0.052	1.642

S = 0.194639 R-Sq = 90.2% R-Sq(adj) = 86.7%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	9	8.74530	0.97170	25.65	0.000
Residual Error	25	0.94710	0.03788		
Total	34	9.69240			

Source: Result of Analysis Data

From the results of mathematical modeling showed that the dominant variable influencing the increase generating-trip of freights is the demographic factors showed with high coefficients of the mathematical model equations. The infrastructure conditions indicate the need increases with length of national roads indicated by the value of the variable positive coefficient national road and pavement conditions of service levels that better encourage the increase generating-trip of freights is higher.

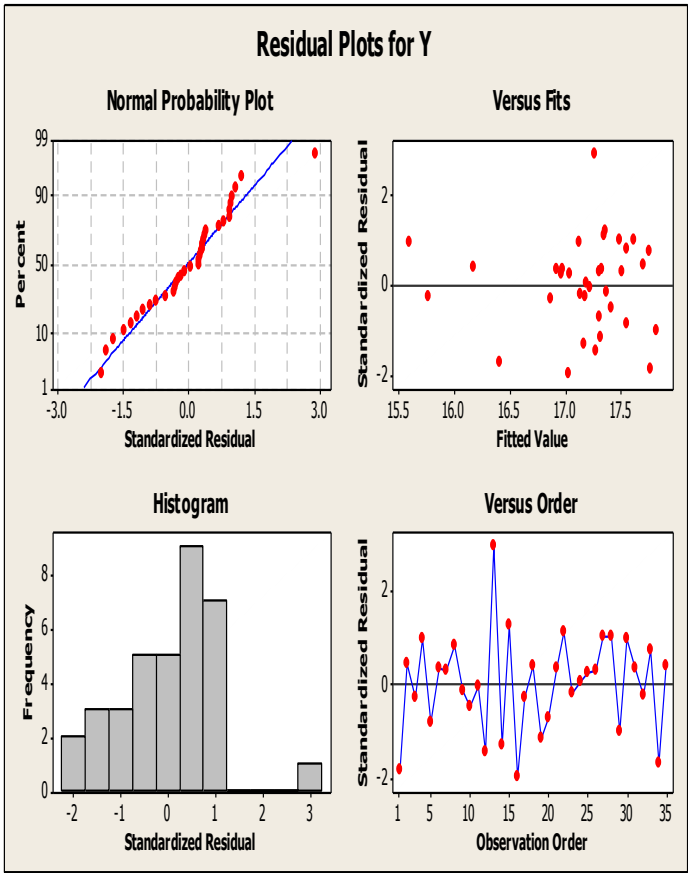

Fig.2. *Result of Multiple Regression Model*

From equation generation models produced it can be determined the value of seizures in the each-border zone areas in accordance with internal geographic region of Central Java province. Based on the results of the mathematical equation generating-trip transportation modeling of freights is based by conditions of border area of transport infrastructure. Furthermore, the mathematical model is simulated in a computational method to determine generating-trip that occurs from the border zone into a zone around or on the purpose of travel is generated.

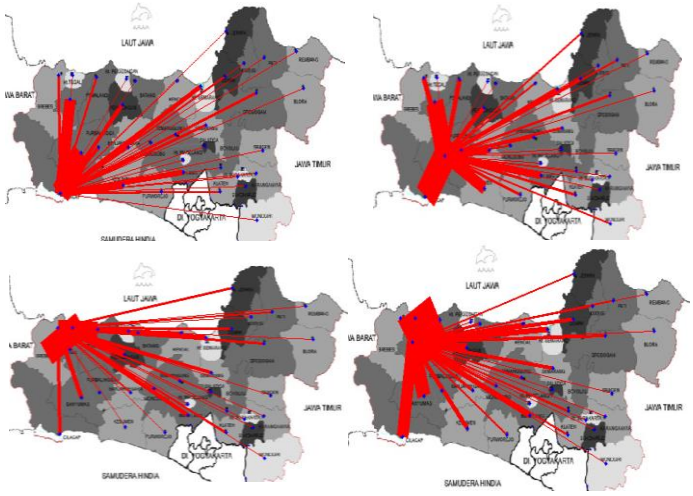

Fig.3*. Travel Generated Simulation Results in the Western Border Zone Area*

Fig.4*. Travel Generated Simulation Results Eastern Border ZoneArea*

From the results of simulation transportation modeling shows that the movement of freights generating-trip in the western border of the zone is greater than the generating-trip transport freights eastern part of border zone.

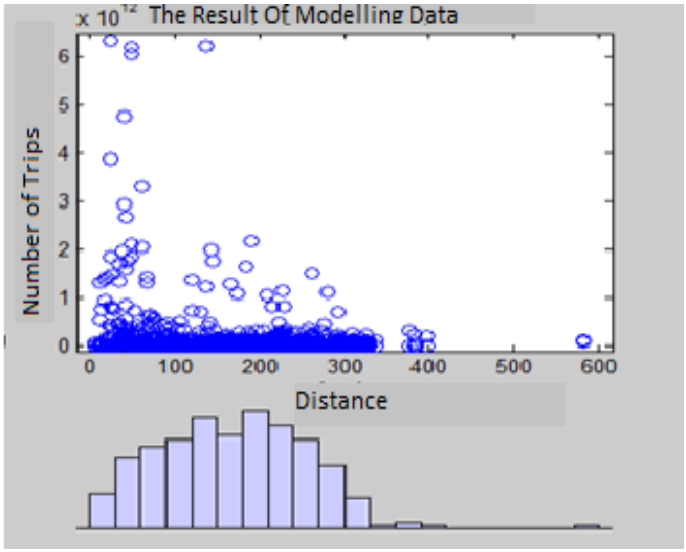

Fig.6*. Simulation Results Travel Distance from the order-Zone Areas*

Travel distance from in the of origin to destination in the based on the level of travel volume indicates that the high frequency occur at distances of travel 100-300 km with the highest volume of freight capacity at a distance of 100 km.

CONCLUSIONS

Based on the results of data analysis, modeling studies of trip generation and zone border transport of freights are by internal regional transportation infrastructure in Central Java province that demographic factors as the dominant variable increasing freights transportation trip generation border zone because of the need for commodities needed. Factors total length of national roads in the region awoke increasing border zone passes the border area zone for traffic so high that the national transport freight transportation trip generation of border areas will increase in accordance with the increase in traffic growth nationwide. Factors transportation infrastructure eligibility conditions indicated by road with good pavement conditions or steady push the ease of accessibility of travel, so the trip generation freight transportation border zone region also increased.

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