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Regression analysis of transportation infrastructure development using Transit Oriented Development concept

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Abstract

The aim of the study is to analyzetransportation infrastructure development in Banda Aceh city of Indonesia using Transit Oriented Development (TOD) concept. The type of research applied is quantitative by using path analysis. The data used to model the development of transportation infrastructure and the spatial structure with the concept of TOD. From the model obtained by Banda Aceh city which is a region of homogeneous region type is characterized by the existence of the relative similarity in the region and has not yet characterized the layout with the transit oriented development (TOD) concept.

Keywords: TOD, transportation, infrastructure; regression, development.

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Análisis de regresión del desarrollo de infraestructura de transporte utilizando el concepto Desarrollo Orientado al Transporte

Resumen

El objetivo del estudio es analizar el desarrollo de la infraestructura de transporte en la ciudad de Banda Aceh, Indonesia, utilizando el concepto de Desarrollo Orientado al Transporte (DOT). El tipo de investigación aplicada es cuantitativa mediante el uso de análisis de ruta. Los datos utilizados para modelar el desarrollo de la infraestructura de transporte y la estructura espacial con el concepto de DOT. Del modelo obtenido por la ciudad de Banda Aceh, que es una región de tipo homogéneo, se caracteriza por la existencia de similitudes relativas en la región y aún no ha caracterizado el diseño con el concepto de desarrollo orientado al tránsito (TOD).

Palabras clave: DOT, transporte, infraestructura; regresión, desarrollo

1. INTRODUCTION

One of the infrastructures that has an important role in supporting people to be able to carry out their activities is the transportation infrastructure. Transportation infrastructure is a form of service provision of transportation facilities, both facilities (moda) and infrastructure (roads) that will allow humans to make movements in conducting activities. The development of transportation infrastructure is very influential in determining the progressof regional development, so that a city can be viewed as a place where the activities occur or as a pattern of land use. The location where the activity takes place will affect the location where the activity is going on. Man and goods moving from one place to another are caused by three conditions: (1) complementarily, relative attraction between two or more destinations; (2) transferability, the desire to overcome the distance constraints, measured by the time and money needed, and the technology to achieve them; and (3) competition between multiple locations to meet the demand and the supply (Black, 1981).

The development of transportation infrastructure in Banda Aceh city isuneven in every sub-districts, this can be seen from the construction of the road network of city and village, where there are still subdistrict which are not passed by city road, which is Jaya Baru subdistrict and Lueng Bata and Kuta Raja subdistricts. The city and village roads have the shortest percentage of 8%, and 9% of the total city street 552,789 km, and 9% of the village road length of 56.65 km, the district that has the percentage of the longest city street are Kuta Alam 17% And 14% of village roads, Meuraxa 16% of urban roads and 14% of village roads, Syiah Kuala subdistrict 13.55% city roads and 1.62% village roads and UleeKarengsubdistrict14% city roads and 1.09% (Pemerintah Kota Banda Aceh. 2009). This caused in being disintegrated between existing neither sub-districts nor the centers of activity, resulting in downward road network performance, causing congestion in some sub-districts during rush hour, i.e. at KutaAlam sub-district with thelevel of service (LOS) E-F (V/C Ratio = 0.98) with the meaning of unstable current and dominant stop, and the unstable current started until at Banda Raya, Jaya Baru, Baiturrahman, Lueng Bata with LOS D (V/C ratio = 0.8 - 0.9) (Blundenand Black,1984).

Space structure is one of the major determinants in performing the movement and activity (trip generation), which determines the transport facilities that will be required to perform the movement. When the additional facilities within the system are available, the accessibility level will automatically increase. The change of accessibility will determine the change, the land value and this change will affect the use of the land (Jotin and Kent, 2003).

2. THEORETICAL FRAMEWORK

2.1 Transportation Infrastructure Development

Adji (2012), infrastructure is defined as a means to be built or provided in advance, which will then be used to serve the facilities. Transportation is defined as the act of carrying and moving the loads (goods and people/people). The travel carrying the cargo from the origin to the destination is called Origin-Destination Travel.

Mishra et al. (2011) geographical distribution between spatial layers as well as the capacity and the location of transport facilities are combined together to obtain traffic volume and pattern. The volume and pattern of traffic flows in the transport network will have feedback effects on the new spatial and it is necessary the improved transportation facilities. In that connection, the mutual relationship between layouts-transports, can be presented as follows:

a) Spatial structure determines the location of activities.

b) Distribution of indoor activities requires/creates spatial interactions in the transportation system.

c) The distribution of the infrastructure of the transportation system creates a degree of spatial connectivity from a site (considered as the level of accessibility.

d) The distribution of accessibility in space determines the selection of locations that creates changes in the spatial system.

2.2 Transit Oriented Development (TOD)

Lund et al. (2004), TOD is a mixed land in the form of house properties or commercial land intended to maximize the access of public transport and often other activities to encourage the use of *moda*public transportation. Ngo (2012)the TOD development is influenced by the ideal social and physical dimensions, to synergize them there are 4 factors to be considered:

a. Mixed-use;

b. High Density;

c. Non-Motorized Vehicle Access;

d. Close to MRT / BRT Station.

Bourne (1983), TOD can be defined by the following characteristics:

a. Land use density;

b. Pedestrian and eco-friendly cycles;

c. Public facilities close to the station;

d. Stations as community liaison.

The characteristics of TOD's spatial feature are it is reachable by public and social facilities by walking or cycling. Some important features in the development of TOD are:

a. The use of mixed space consisting of settlements, offices, and supporting facilities;

b. The high population density;

c. The availability of shopping facilities;

d. The availability of health facilities;

e. The availability of education facilities;

f. The availability of entertainment facilities;

g. The availability of sports facilities;

h. The availability of banking facilities.

The TOD concept is a concept to overcome the transportation problems, especially in overcoming the movement of traffic. This concept is more emphasis on the arrangement of the environment with a mixed land use pattern which is centered on one transit point to maximize the transportation access of carryingsystem(TRB, 2004).Basically, TOD is aimed at accommodating the movement by building communities where the land use and the transportation support each other so that people can live and work in interconnected locations (Greater Cleveland RTA, 2007). The relationship between the land use and the transportation systems to accommodate the movement is designed to produce efficient spatial forms which will further form spatial imprints in the form of spatial structures. In Ghani's (2013) research, mentioned that the determinant elementsof the successful implementation of TOD include the land use and the transportation systems where both are the building blocks of space structure.

Transport infrastructure requires comprehensive and sustainable planning. To ensure the optimal movement requirements or achievement of the provision of infrastructure objectives in accordance with the ability of resources owned (Toding and Jinca, 2013). One important aspect of transportation planning is the prediction of future transportation needs. The two main objectives of the relationship between transport planning and land use are:

a. Improving the efficiency of existing systems;

b. Planningthe future improvement and growth.

The scope of transportation planning with TOD concept covers the aspects related to regional development plan. Transport planning is divided into 3 major groups, Setijowarno and Frazila (2001), namely:

a. Study of transportation infrastructure planning

- Master plan;

- Trace determination;

- Development of road network;

- Transportation infrastructure for a residential area.

b. Study of operational policy

- Traffic circulation system;

- Development strategy of public transport service level.

c. Study of comprehensive transportation planning

- Study the needs of the infrastructure and transportation facilities of a new regional development plan;

- Study of development of a regional transportation system;

- Study of the development of a national transport system.

2.3 City Space Structure of Banda Aceh

In accordance with the development strategy of Banda Aceh cityRTRW 2009-2029 which combines the development of "multi-center" and "linear-growth", the structure of service center of city activity is schematically described as follows:

- **Main Center (BWK central city)** with a city and regional service scale located in Pasar Aceh and Peunayong area which is administratively located in the district of Baiturrahman and KutaAlam.

- **West BWK, East BWK and South cityBWK** with their respective centers at UleeLheue, UleeKareng and Mibo with BWK service scale.

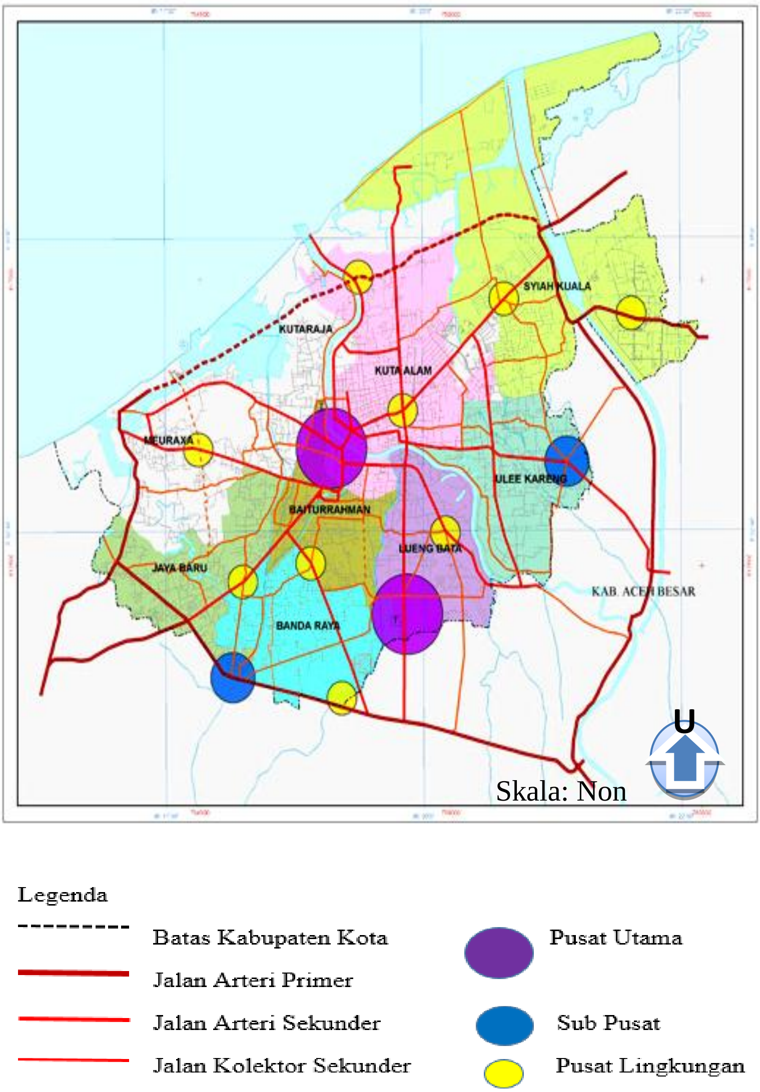
The development of theseurban service centers is supported by the planned development of utility networks, especially primary and secondary road network systems, namely primary arterial networks connecting the outside areas of Banda Aceh city (Meulaboh, Medan, Aceh Besar/Jantho, MalahayatiPort, Iskandar Muda Airport) with The downtown area as well as the secondary arterial network connecting the central city with BWK centers.

2.4 The Development of Banda Aceh city

The development of Banda Aceh city can be categorized in the growing pattern of "Multi Nuclei Model" or which has several growing points. The growth pattern of these growth points has a tendency of linear pattern and develops following the road network so that it shows the pattern of space development with Linear Growth Model.

From the existing spatial structure shows that the direction of the urban development trend (Banda Aceh city) leads to the south (directly adjacent to Aceh Besar), thus the urban service center (trade and service), sports center are on the border between Banda Aceh and Aceh Besardistrict. Therefore, the tendency of the upcoming Banda Aceh urban center is expected to lead to the South in the Batoh/Lamdom Area even to the district of Aceh Besar (Frickerand Whitford, 2004).

Figure. 1
Spatial Structure of Banda Aceh



3. METHODOLOGY

3.1 Research Location

The research is located in the administrative area of Banda Aceh city, Aceh Government, the geographic location of Banda Aceh is between 05º30 '- 05º35' LU and 95º30 '- 99º16' east longitude, consisting of 9 districts, 70 villages and 20 villages with total ± 61.36 km^2.

The spatial structure of Banda Aceh city shows a "symmetrical radial pattern", this can be seen from the concentration of activities with density concentrations in the central city, where the activity extends almost linearly following the pattern of the main road network, and radial elegance with the Great Mosque of Baiturrahmanand its surroundings as the main center which is reinforced by the existence of two central markets. The main center is supported by several sub-centers of major service centers and the sub service centers are the main attraction for the system of movement or transportation in Banda Aceh city. Central and sub-center interactions have a considerable impact on urban traffic generation, as they are supported by trade and services, offices, restaurants and other activities with different characteristics. The existence of a sub service center becomes a stimulus to grow and the development of residential areas in the vicinity, so this is a factor of the traffic awakening growth.

Based on the condition of Banda Aceh citypost tsunami, it is generally possible to see the land use pattern consisting of the constructedarea of 2,124.95 Ha or 34.63% and the non-constructed area in the form of open space of 4,010.95 Ha or 65.37%. This constructed area is a factor that generates the traffic generation, from the settlement to trade and services, offices, health facilities, education, and other activities.

3.2 Types of Research

The type of research used is quantitative by using path analysis. The data used to model the development of transportation infrastructure and the spatial structure with the concept of TOD consists of:

1. Four-stage transportation planning data, including data, push and pull, destination data, movement distribution data, *moda* selection data, route selection data;

2. Transportation network data, including data, zone selection, network and road class and travel costs, road network pattern, road hierarchy, node and segment;

3. Current data on the network, which covers data of traffic volume during the planning hours;

4. Demographic Data – covers data on the number and distribution of population by sub-district;

5. Socio-economic, which covers data, education level, number of labor dispersion, and other data organized according to sub-district;

6. Spatial data, which covers data of land use per activity type, the pattern of location spreading activities, the amount of land use and the pattern of its activities;

3.3 Population and Sample of Research

The determination of the sample size depends on the population. In this study the population taken is the number of residents in the district,whichpotentially perform the routine movement, seen from the main activities, so that the sample taken is the number of working population.The determination of the sample size is calculated by using the Slovin formula Siregar (2013) as follows:

$$n = \frac{N}{1+Ne^2} \qquad (14)$$

Where:

n = the minimum sample size;

N = the number of working population;

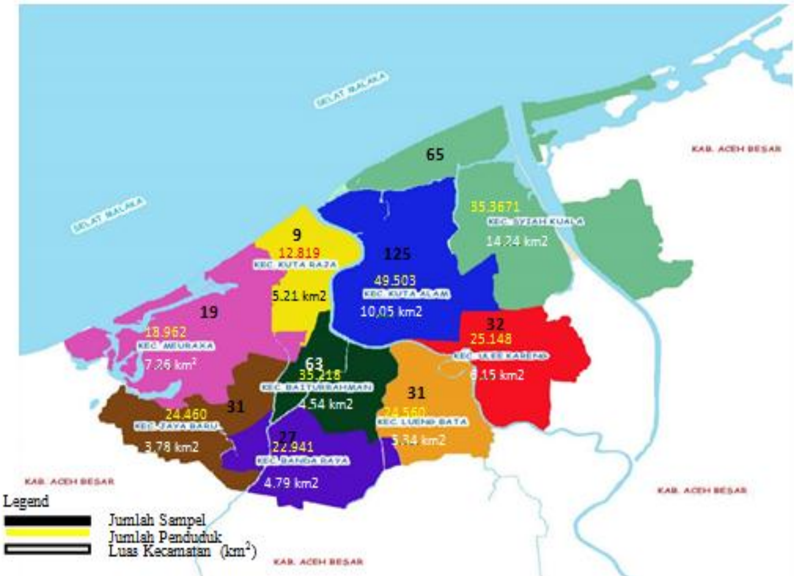
E = the estimated error rate taken at 5%.

From the Banda Aceh data in 2014, the number of labor force in Banda Aceh cityis 97,973 inhabitants, which can be seen in Table 3.1 below.

Table.1
Number of Sample Based on Labor Force

No	Subdistrict	Population (person)	Labor Level (person)	Distribution of Labour Level Per Subdistrict (%)	Population of Labor Level (person)	Population Distribution	Total of Sample
1	Meuraxa	18962	90944	0.208501935	3953.613696	0.045818931	19
2	Jaya Baru	24460		0.268956721	6578.681386	0.076241174	31
3	Banda Raya	22941		0.252254134	5786.962098	0.067065839	27
4	Baiturrahman	35218		0.387249296	13638.14572	0.158054202	64
5	Luengbata	24560		0.270056298	6632.582688	0.076865843	31
6	Kuta Raja	12819		0.140954873	1806.900521	0.0209404	9
7	Syiah Kuala	35671		0.392230384	13991.25001	0.162146373	68
8	UleeKareng	25148		0.276521816	6953.970619	0.080590448	33
9	KutaAlam	49503		0.54432398	26945.66996	0.31227679	125
TOTAL		249282			86287.7767		407

Figure.2
Number of Research Sample of Subdistrict Population and Width



Non Skala

3.4 Data Collection Techniques

Data collection is conducted in two ways, namely secondary survey and primary survey. The method of survey implementation isa primary data collection techniquewhich is conducted through field observation and questionnaire distribution, while the technique of collecting secondary data is conducted through literature review/document either from journals, or from related institutions (Statistics Central Bureau of Banda Aceh city, Information Agency, Communication and Information of Banda Acehcity, Public Works Department of Banda Aceh city, Bappeda Kota Banda Aceh).

3.5 Types and Sources of Data

For completeness of this study, the data obtained and to be collected are grouped into several types, namely:

a. Secondary data which are sourced from books, papers, research journals, and other written materials related to the research topic.

b. Primary data which are sourced from:

• Questionnaire, which is conducted by submitting a questionnaire containing a number of questions to the respondent.

• Observation, which is conducted by observing directly and recording matters related to the problem and the object being studied.

The designed questionnaires use revealed preference which in the research is used to observe the characteristics of travelers such as characteristics, behaviors, and decisions made by direct observation in the field. The revealed preference survey is a form of survey questionnaire that tells the respondents the obvious things about something becomes the object of the study and the respondents are asked to respond to each question contained in the questionnaire. The answers given by the respondents are related to the respondents' own experiences of all the problems contained in the questionnaire (McNally, 2007).

The respondents' answers in the questionnaires with Revealed Preference techniques are the characteristics and behaviors and experiences of the respondents so that the questions in the questionnaire should be carefully compiled, easy to understand. To facilitate the implementation of the survey, in the preparation of the revealed preference questionnaire, the answers from the respondents should have been grouped first into several answers groups so that the respondents simply choose by cross-marking the options.

3.6 Variables and Indicators of Research

This research consists of independent variables that will affect the dependent variable, this research uses path analysis to obtain the direct or indirect influence. The indirect influence of an independent variable on the dependent variable is the influence of the independent variables on the dependent variables through another variable which is called intervening variable.

3.7 The Push and Pull of the Travel

The variables of this research use for the push and pull of travel in the Banda Aceh cityis, population density (X_{11}), building density (X_{10}), road performance/VC ratio (X_9), travel expenses incurred (X_7), travel distance (X_3) and landused type (X_2).

Spatial structure can be divided into several levels and criteria in measuring and comparing the urban area form (Bourne, Larry S, 1982), namely: 1) level of context with the criteria of time, functional, external environment and relative location, 2) macro form with the criteria of scale, shape, location and topographic shape, transport and density networks, 3) internal shape and function with homogeneity criteria of concentration level, division level, relationship level, level of sustainability and replacement rate, and 4) arrangements and behaviors with the criteria of organizing, computerization, regulatory mechanisms and goal orientation.

This research variables use travel distance (X_3), transportation network connectivity (X_4), travel frequency/mobility of movement (X_5), travel aspect (X_6), travel expenses (X_7) and travel time to and from the destination (X_8), and the spatial structure variable is (X_1) the diversity of fasos/fasum at the sub-district in Banda Aceh city.

3.8Variables of Transportation Infrastructure Development (X_2)

The interrelationships between spatial - transportation, can be divided into several parts, namely: 1)the space structure determines the location of activities; 2) the distribution of activities in space requires/causes spatial interaction in the transport system 3)the distribution of infrastructure of the transportation system creates the spatial connectivity level from a location (considered as accessibility level) and 4) the distribution of accessibility in space determines the selection of location that produces the changes in the space system. From these four indicators, the variables of transportation infrastructure development are landuse type (X_2). And the space structure becomes the intervening variable(Bayes, 2011).

3.9 Data Analysis Model

The developed methodology will link the variables of the Transportation Infrastructure Development and the Space Structure with the concept of TOD into a model form. The model used is a four-stage transportation planning model. Model calibration was conducted by using transportationnetworkdata condition with TOD concept, socio-economic and population, and the existing pattern of space structure in Banda Aceh city. From the calibration results, it is obtained some models that are needed to predict the travel demand and the transport infrastructure performance in the future.

In analyzing the data from 10 years to 20 years for the population number, the population growth rate is used as much as 2.4% per year for Banda Aceh city(Pemerintah Kota Banda Aceh, 2009), and building density is also assumed to increase 2.4% per year. The number of fasos/fasum when they are applied by TOD method is assumed that every sub-district in Banda Aceh already has the number of fasos/fasumof 4 to 6 facilities, as well as the shorter travel distance due to the availability of fasos/fasum. This research assumes shorter trip distance between 3- 5 km, so the travel costs become less assumed to fall by 10% in the first 10 years and continue to decline over the next 10 years, so that the road performance will increase by 10% in the first 10 years and continue to increase over the next 10 years. Meanwhile the type of landused, network connectivity, travel frequency, time and travel intentions are fixed by applying the TOD concept.

3.10 Data of Road Transport Network System

In the route selection stage,it requiresthe data as follows:The data of Banda Aceh city road network (map) of at least 1: 100,000 scale, which is supported by the length of each road segment reviewed. This data is used to view the roads connecting between zoning/cordon areas, and user equilibrium is conducted for the balance between the demand and the supply of the route network loading of the road network. The road performance data of Banda Aceh city, the data used is road capacity and travel time (hours) at the time of free flow obtained from the secondary data (Newmanand Kenworthy, 1999).

4. DISCUSSION

4.1 Regression Analysis of Transportation Infrastructure Development in Banda Aceh

At this stage, there will be the regression analysis by viewing the effect of combined and partially, by adding the variable of space structure to the development of transportation infrastructure.

Table. 2
Correlations of Transportation Infrastructure Development

Correlations									
		Landused Type	**Variety of Fasos / Fasum**	**Travel Distance**	**Transportation Network Connectivity**	**Frequency/Movement Mobility**	**Travel Purpose**	**Travel Cost**	**Travel Time**
Pearson Correlation	Landused Type	1,000	,698	,664	,602	,621	,685	,660	,570
	Variety of Fasos / Fasum	,698	1,000	,700	,602	,525	,737	,661	,495
	Travel Distance	,664	,700	1,000	,674	,694	,704	,763	,604

	Transportation Network Connectivity	,602	,602	,674	1,000	,552	,719	,727	,404
	Travel Frequency/ Mobility	,621	,525	,694	,552	1,000	,616	,610	,652
	Travel Purpose	,685	,737	,704	,719	,616	1,000	,668	,510
	Travel Cost	,660	,661	,763	,727	,610	,668	1,000	,539
	Travel Time	,570	,495	,604	,404	,652	,510	,539	1,000
Sig. (1-tailed)	Landused Type	.	,000	,000	,000	,000	,000	,000	,000
	Variety of Fasos / Fasum	,000	.	,000	,000	,000	,000	,000	,000
	Travel Distance	,000	,000	.	,000	,000	,000	,000	,000
	Transportation Network Connectivity	,000	,000	,000	.	,000	,000	,000	,000
	Travel Frequency/ Movement Mobility	,000	,000	,000	,000	.	,000	,000	,000
	Travel Purpose	,000	,000	,000	,000	,000	.	,000	,000
	Travel Cost	,000	,000	,000	,000	,000	,000	.	,000
	Travel Time	,000	,000	,000	,000	,000	,000	,000	.
N	Landused Type	407	407	407	407	407	407	407	407
	Variety of Fasos / Fasum	407	407	407	407	407	407	407	407
	Travel Distance	407	407	407	407	407	407	407	407
	Transportation Network Connectivity	407	407	407	407	407	407	407	407
	Travel Frequency/ Movement Mobility	407	407	407	407	407	407	407	407
	Travel Purpose	407	407	407	407	407	407	407	407
	Travel Cost	407	407	407	407	407	407	407	407
	Travel Time	407	407	407	407	407	407	407	407

Source: Data processed (2016)

Table.3

Summary Model of Transportation Infrastructure Development

Summary Model[d]									
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**	**Change Statistics**				
					R Square Change	**F Change**	**df1**	**df2**	**Sig. F Change**
1	,790[a]	,624	,618	,81925	,624	94,639	7	399	,000
2	,790[b]	,624	,618	,81823	,000	,001	1	399	,971
3	,789[c]	,623	,618	,81887	-,002	1,634	1	400	,202
a. Predictors: (Constant), Travel Time, Transportation Network Connectivity, Variety of Fasos/Fasum, Travel Frequency/Movement Mobility, Travel Cost, Travel Purpose, Travel Distance									
b. Predictors: (Constant), Travel Time,Transportation Network Connectivity, Variety of Fasos/Fasum, Travel Frequency/Movement Mobility, Travel Cost, Travel Purpose									
c. Predictors: (Constant), Travel Time,Variety of Fasos/Fasum, Travel Frequency/Movement Mobility, Travel Cost, Travel Purpose									
d. Dependent Variable: LandusedTYpe									

Source: Data processed (2016)

From the three summary models in the magnitude of the R2 for 1 and 2 models is 0.624, the model 3 is 0.623, the number can be used to see the effect of independent variables on the dependent variable that is the transportation infrastructure development variables used are landused type variables, by calculating the coefficients Determination (KD) using the equation as follows:

$$KD = r^2 \times 100\%$$

KD = 0,623 x 100%hfghd

KD = 62,3%

The number has the intention that the influence of independent variables jointly to the development of transportation infrastructure is 62.3%, while 37.7% is influenced by other factors. In other words, the variability of transportation infrastructure development that can be explained by using the independent variable is 62.3%, while the effect 37.7% is caused by other variables outside this model (Najid, 2001).

It appears that the determination coefficient for models 1 and 2 (R^2) is 0,624 and the model 3 (R^2) is 0,623, so that the error model, ε= $1 – R^2 = 1 – 0,623 = 0,377$.

Table.4

Anovaof Transportation Infrastructure Development

ANOVA[a]						
Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	**Regression**	444,634	7	63,519	94,639	,000[b]
	Residual	267,798	399	,671		
	Total	712,432	406			
2	**Regression**	444,633	6	74,106	110,688	,000[c]
	Residual	267,799	400	,669		
	Total	712,432	406			
3	**Regression**	443,539	5	88,708	132,290	,000[d]
	Residual	268,893	401	,671		
	Total	712,432	406			
a. Dependent Variable: Landused Type						
b. Predictors: (Constant), Travel Time, Transportation Network Connectivity, Variety of Fasos/Fasum, Travel Frequency/Movement Mobility, Travel Cost, Travel Purpose, Travel Distance						
c. Predictors: (Constant), Travel Time, Transportation Network Connectivity, Variety of Fasos/Fasum, Travel Frequency/Movement Mobility, Travel Cost, Travel Purpose						
d. Predictors: (Constant), Travel Time, Variety of Fasos/Fasum, Travel Frequency/Movement Mobility, Travel Cost, Travel Purpose						

Source: Data processed (2016)

Based on the analysis result in the above table, it is found that model 1, Fo = 94,639; df1 = 7; db2 = 399; p-value = 0,000 < 0.05 or H_0 is rejected, model 2, Fo = 110,688; df1 = 6; db2 = 400; p-value = 0,000 < 0.05 or H_0 is rejected, model 3, Fo = 132,290; df1 = 5; db2 = 401; p-value = 0,000 < 0.05 or H_0 is rejected, thus simultaneously the models 1, 2 and 3, variable remuneration variable remuneration (X_1) fasos/fasum variety, (X_2) travel distance, (X_3) transportation network connectivity, (X_4) Frequency of travel/mobility of movement, (X_5) travel intent, (X_6) travel expense and (X_7) travel time influence to the variable transportation infrastructure development (landused type) (Ortuzarand Willumsen, 2011).

By using the backward method, we get three models of dataprocessing result, which is model 1, 2 and model 3. The path coefficient will be shown by Standardized Coefficients (Beta) column. From this analysis it can be seen that the coefficient of travel distance (X_2), transportation network connectivity (X_3) are not significant, which can be seen in Table Excluded Variables.

Table. 5
Excluded Variables Development of Transport

Excluded Variables[a]						
Model		**Beta In**	**t**	**Sig.**	**Partial Correlation**	**Collinearity Statistics**
						Tolerance
2	Travel Distance	,002[b]	,037	,971	,002	,277

3	Travel Distance	,011[c]	,189	,850	,009	,281
	Transportation Network Connectivity	,065[c]	1,278	,202	,064	,366
a. Dependent Variable: Landused Type						
b. Predictors in the Model: (Constant), Travel Time, Transportation Network Connectivity, Variety of Fasos/Fasum, Travel Frequency/Movement Mobility, Travel Cost,Travel Purpose						
c. Predictors in the Model: (Constant), Travel Time, Variety of Fasos/Fasum, Travel Frequency/Movement Mobility, Travel Cost, Travel Purpose						

Source: Processed Data, 2016

Table.6

Coefficients of Transportation Infrastructure Development

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.	95,0% Confidence Interval for B Lower Bound	95,0% Confidence Interval for B Upper Bound
1	(Constant)	-1,527	,163		-9,394	,000	-1,847	-1,207
	Variety of Fasos/Fasum	,650	,108	,301	6,021	,000	,438	,862
	Travel Distance	,004	,099	,002	,037	,971	-,191	,198
	Transportation Network Connectivity	,074	,058	,065	1,263	,207	-,041	,188
	Travel Frequency/Movement Mobility	,373	,115	,155	3,229	,001	,146	,600
	Travel Purpose	,200	,071	,156	2,813	,005	,060	,341
	Travel Cost	,183	,072	,140	2,563	,011	,043	,324
	Travel Time	,345	,108	,137	3,195	,002	,133	,558
2	(Constant)	-1,526	,161		-9,492	,000	-1,842	-1,210
	Variety of Fasos/Fasum	,651	,105	,301	6,218	,000	,445	,857
	Transportation Network Connectivity	,074	,058	,065	1,278	,202	-,040	,188

	Travel Frequency/Movement Mobility	,374	,111	,156	3,365	,001	,155	,592
	Travel Purpose	,201	,071	,156	2,831	,005	,061	,340
	Travel Cost	,184	,068	,141	2,721	,007	,051	,317
	Travel Time	,346	,107	,137	3,242	,001	,136	,556
3	(Constant)	-1,457	,152		-9,615	,000	-1,755	-1,159
	Variety of Fasos/Fasum	,652	,105	,302	6,222	,000	,446	,858
	Travel Frequency/Movement Mobility	,388	,111	,162	3,509	,001	,171	,606
	Travel Purpose	,235	,066	,183	3,588	,000	,106	,364
	Travel Cost	,222	,061	,170	3,657	,000	,103	,342
	Travel Time	,327	,106	,130	3,096	,002	,120	,535
a. Dependent Variable: Landused Type								

Source: Processed Data, 2016

The Transportation InfrastructureDevelopment = -1,457 + $0{,}652X_1 + 0{,}388X_5 + 0{,}235X_6 + 0{,}222X_7 + 0{,}327X_8$

Where:

X_1 = Diversity of Fasos/Fasum

X_5 = Frequency of Travel/ Movement Mobility

X_6 = Travel Purpose

X_7 = Travel Cost

X_8 = Travel Time

The model fitting test is performed by using the equation below.

$$R = \frac{1 - Rm^2}{1 - Re^2}$$

So it is obtained R^2_m = 1-(1-0,623)*(1-0,624) = 0,858

Furthermore the coefficient of determination for model 2 each on structural 1 and 2 (after trimming):R_e^2 = 1-(1-0,616)*(1-0,623) = 0,855, so that the value of Q = 1- 0,858 / 1- 0,855 = 0,979.With the sample size (n) = 407, and the number of path coefficients is not significant (d) = 4, the chi-square with W = -(n-d) ln Q = -(407-4) ln (0,979) = 8,55 From chi-square table with db = d = 4 at a significance levelα = 0,05 it is obtained $X^2_{tab} = X^2_{(0,05;2)}$ = 9,48, because W = 8,55 <= 9,48 or $H_O$is rejected.Thus, the model obtained is suitable or fit (fit model) with thedata.

5. CONCLUSIONS

The push and pull of Banda Acehcity is the second model of the planning model that is the optimization one, which emphasizes the optimum achievement of a journey due to resource constraints or limitations, which are obtained from the model of the push travel used as the basis to estimate the rate of push travel in the existing condition, Oi = -37,126 + 58,723 X_9 + 17,968X_2, where the road performance variable (V/C) (X_9) and dominant landused (X_2), indicate the amount of push travel. This means the double correlation coefficient between the road performance (X_9) and the dominant landused (X_2) along with the push travel (Y) is significant, so that the determination coefficient of 83.1% of push travel can be explained by the dominant road and landused performance. For the pull travel on the existing condition Dd = -20,351 + 30,903X_2, where only the dominant landused (X_2) indicates the size of pull travel Banda Acehcity, and the dominant landused variable (X_2) together with the pull travel (Y) is significant, so the determination coefficient of 81% of the pull travel can be explained by the dominant landused. From the model obtained by Banda Aceh city which is a region of homogeneous region type is characterized by the existence of the relative similarity in the region and has not yet characterized the layout with the TOD concept.

REFERENCES

ADJI, A. 2012.**JaringanTransportasi**. GrahaIlmu. Jakarta.Indonesia.

BAYES, A. 2011.**The Traditional Four Steps Transportation Modeling Using Simplified Transport Network: A Case Study of Dhaka City, Bangladesh.**IJASETR.Vol. 1. N^{o} 1. Article#03, ISSN: 1839-7239.India.

BLACK, J. 1981. **Urban transport planning: Theory and practice**. Croom Helm. London. UK.

BLUNDEN, W.& BLACK, J. 1984.**The Land-Use/Transport System.**Second Edition.Pergamon Press. New York. USA.

BOURNE, L. 1983.**Internal Structure of the City, Reading on Urban Form, Growth, and Policy**.2nd ed. Oxford University Press. UK.

FRICKER, J., & WHITFORD, R. 2004. **Fundamentals of Transportation Engineering A Multimodal Systems Approach.** Pearson International Edition. UK.

GHANI, Z. 2013. **The Readiness of Transit Orieted Development in Nusajaya, Johor**.Thesis.Faculty of Built Environment.University Teknologi Malaysia.Malaysia.

Greater Clevelend Regional Transit Authority.2007. Transit Oriented Development Guidelines, Regional Transit Authority. USA.

JOTIN, C., & KENT, B. 2003.**Transportation Engineering: An Introduction**. Third Edition.Prentice Hall.

LUND, H., CARVERO, R., & WILSON, R. 2004. **Travel Characteristics of Transit-oriented Development in California.** Institute of Transportation Studies Library.UC Berkeley Library. USA.

MCNALLY, M.G. 2007.**Handbook of Transport Modeling the Four Step Model.**2nd Ed. Pergamon Press. UK.

MISHRA, S., YE, X., DUCCA, F., & KNAAPGERRIT, J. 2011.**A functional integrated land use-transportation model for analyzing transportation impacts in the Maryland-Washington.** DC Region. Sustainability: Science, Practice and Policy.Vol. 7. N° 2. UK.

NAJID, T. 2001. **PengaruhTransportasidalamPemilihanLokasiTempatTinggal di Kota Bandung.**FSTPT IV. Udayana Bali.Indonesia.

NEWMAN, P., & KENWORTHY. 1999. **Sustainability and City: Overcoming Automobile**. Island Press. USA.

NGO, V. 2012.**Identifying Areas for Transit-Oriented Development in Vancouver Using GIS.** Trail Six: An Undergraduate Journal of Geography.Canada.

ORTUZAR, J., & WILLUMSEN, L. 2011. **Modelling Transport**.Fourth Edition.John Wiley and Sons.Ltd Publication. USA.

Pemerintah Kota Banda Aceh.2009. Rencana Tata Ruang Wilayah (RTRW) Kota Banda Aceh Tahun.2009-2029.Indonesia.

SETIJOWARNO, D., & FRAZILA, R. 2001. **PengantarSistemTransportasi**, **PenerbitUnikaSoegijapranata**. Semarang.Indonesia.

SIREGAR, S. 2013. **MerodePenelitianKuantitatif: DilengkapidenganPerbandinganPerhitungan Manual and SPSS**. Kencana. Jakarta. Indonesia.

TODING, K., & JINCA, M. 2013. **Sistem Transit Oriented Development (TOD) PerkeretaapiandalamRencanaJaringanKeretaApiKomuter Mamminasata.**JurnalSains and Teknologi.Vol. 2 N^{o} 1: 46-53.ISSN.2303-3614.Indonesia.

TRB, 2004.Transit-Oriented Development in the United States: Experiences, Challenges and Prospects. TCRP Report 102. USA.

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