Effect of Highway Network Connectivity on Regional Development in the North Zone of Aceh

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ABSTRACT

The geographical area of the province of Aceh which is bordered by the oceans and only has land connection with the province of North Sumatra has made Aceh dependsgreatly on this neighboring province. In fact, The north zone of aceh covering Lhokseumawe City, North Aceh Regency and Bireuen Regency crossed by Sea Lane of Communication (Sloc), the Malacca Strait has geo-economic advantages.This study aims to analyze and assess the correlationbetweenHighway Network Connectivity with Regional Development of thezone.This research was done by conducting field surveys, interviews, questionnaires and data analysis on the The north zone of aceh, covering Lhokseumawe, North Aceh, Bireuen, Bener Meriah and Central Aceh districts. The analysis was done by using Structural Equation Modeling / SEM.Regression Weight results show that the relationship between Highway Network Connectivity variableland Region Development is 0.546. This study concludes that the Highway Network Connectivity has the strongest or most significant relation to Regional Development activities, therefore it can be suggested for the Aceh provincial, , district and municipal governments in the zonetomakehighway network policies to be oriented towards the development of new economic zones and supporting the implementation of Special Economic Zones of Arun Lhokseumawe.

Keywords: Sloc, Aceh, Arun Lhokseumawe.

INTRODUCTION

Aceh is one of the provinces in Indonesia which has special autonomy status in 2001 through LawNo. 18 of year 2001 on Special Autonomy for the Province of Nanggroe Aceh Darussalam.Currently, Aceh is highly dependent on the province of North Sumatra. Not only in the aspect of connecting transportation through the highwaynetwork, but also almost in all aspects of economy. This can be seen from the fact that Aceh plays a role more as a consumer rather than a producer. Food, clothing, housing, and industrial needs are still imported from Medan by trucks. Aceh as an agricultural and fishery area also sends the products by trucks[1].

Therefore the movement of goods in Aceh is dominated by highway mode (up to 95%), while the rest transported byusing sea and air transportation due to the lack of availability of infrastructure and facilities and the weakness of the system and regulationwhich made the movement of goods through highway considered as more efficient option[2].

Aceh to date has a national highway length of about 1,803,354 km consisting of 538,251 km of arterial highway, and 1,265,103 km of primary collector highway. The 640,5 km of westbound highway, the 469.98 km of central highway and 532.2 km of eastern route and 161.7 km of the cross diagonal and non cross . Stability of highways in Aceh is quite high at 94.62%.Therefore, connectivity becomes a key element of development strategy in Aceh. In addition to the highway, other infrastructure projects should be further developed to improve connectivity between regencies in Aceh.

To support the future economic growth in Aceh, especially in The north zone of aceh, one of the indispensable factors is good highway network

connectivity in order to accelerate the development of the region. The highway network connectivity located in Aceh's North Zone is divided into 3 main groups: (1) Highway connection of KruengGeukueh - Sp. KKA - Jamuan - Sp. TigaRedelong - Takengon, (2) KruengGeukueh - Bireuen - Takengon, (3) KruengGeukueh - Lhokseumawe - Lhoksukon - Panton Labu.

General Description of the North Zone of Aceh

In developing the transportation system in the Aceh region (Figure 1), based on its geographical location and strategic development plan of Aceh region, several working zones (Transportation Authority) were set as can be seen below
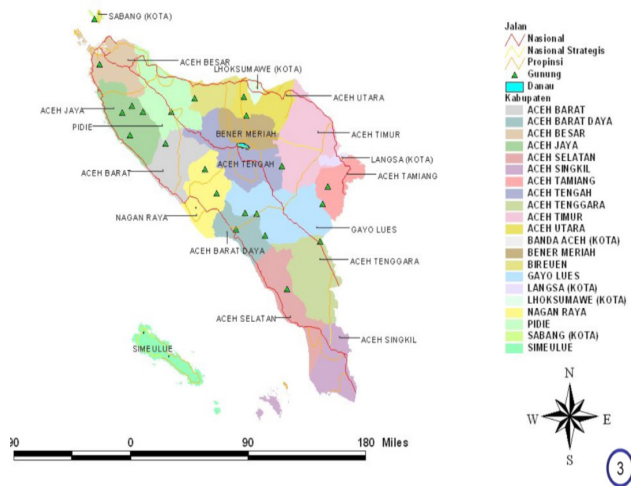

Figure 1. Map of Aceh

1. Central Zone, consisting of SabangMunicipality, Aceh BesarRegency, PidieRegency, Pidie Jaya Regency and Banda Aceh Municipality;

2. North Zone, consisting of Aceh UtaraRegency, LhoksumaweMunicipality, BireuenRegency, BenerMeriah Regency and AcehTengah Regency;

3. East Zone, consisting of Aceh Timur Regency, LangsaMunicipality and Aceh Tamiang Regency;

4. West Zone, consisting of Aceh Barat Regency, Nagan Raya Regency and Aceh Jaya Regency;

5. South - Southest Zone, consisting of Aceh Selatan Regency, Aceh Barat Daya Regency, Simeulue Regency, GayoLues Regency, Aceh Tenggara Regency, Subulussalam Municipality and Singkil Regency.

Based on the purpose of this study, the highway network for the development of the area in the north zone of aceh will be centred at KruengGeukueh Port to support the ArunLhokseumawe Special Economic Zone.

METHODOLOGY

This study analyzed the existing highway network connectivity in the north zone of aceh, covering Lhokseumawe, Aceh Utara, Bireuen, Bener Meriah and Aceh Tengah regency by taking into consideration several aspects includingperformance of structurepavement, geometric design of the highway, highwaymaintenance, traffic volume, traffic flow, and supporting infrastructure.

The development of the area that occurs with existing highway network connectivity and transportation of goods isbased on the aspect of economic growth, human resources improvement, management of land use and environmental harmonization. This regional development approach is used in order to find out the connection between the two variables. Figure 2 below is a conceptual framework of research.
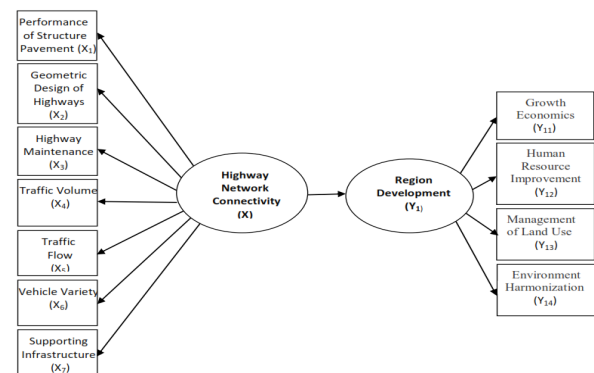

Figure 2. Conceptual research framework

Source : Researcher

Research Design

This research is explanatory research in design, that is conducted by explaining the symptoms caused by an object of researchand aims to explain causal relation to know if there is relationshipbetween highway network connectivity and development area in the north zone of Aceh[3].

Futhermore, this research used a combination of quantitative and qualitative method. Quantitative method is used when the problem investigatedis more common with large scope and complex level of variation.

With a quantitative approach, this study is a causaleffect study, in which research is conducted to the facts to prove empirically[4] that Performance of Structure Pavement, Geometric Design of Highways, Highway Maintenance, Traffic Volume, Traffic Flow, and Supporting Infrastructure, Supply and demand are predictors forhighwaynetworkconnectivity in The north zone of aceh. While the aspect of economic growth, human resources improvement, management of land use and environmental harmonization are predictors for regionaldevelopment.

Sample and Population

The population in this studywas business people in the field of goods transportation by using the trucks, and in the field of construction. In addition, entrepreneurs, traders, and truck driversin the area of Lhokseumawe, North Aceh, Bireuen, Bener Meriah and Aceh Tengah were also involved. The population used for this study was the population of the north zone of aceh in 2015(1,547,832 people) [7-12]. The following are tabulated samples selected from each municipality and district in the the north zone of aceh:

Table 1. Population and sample

No.	Regency/ municipality	Population	Sample
1	Lhokseumawe	191,407	37
2	Aceh Utara	583,892	113
3	Bireuen	435,300	89
4	Bener Meriah	136,821	27
5	Aceh Tengah	200,412	39
Total		1, 547,832	300

Source: Statistic data, 2015 (Calculated by the researcher)

Research Indicators and Variables

This research involved 2 (two) variables -Highway Network Connectivity (X) as exogenous latent variable (independent variable not directly measured) and Regional Development (Y1) as endogenous latent variable (dependent variable not directly measured) .

Highway Network Connectivity Variable (X)

Chourmain (2008)[3] defines conceptual variable a as brief, clear and decisive definition of research variable. The Highway Network is a major infrastructure system that is part of a land transportation network system. The highwaynetwork is also called a milestone for regional economy, because it can increase economic growth and reduce regional disparties. The existence of the highway network will create inter-regional connectivity. The term connectivity is used to describe the connection and density between links (highways) on the highway network. Connectivity is the key to success in the north zone of aceh to build a good system with three important dimensions: poverty reduction, regional development and increased competitiveness.

Regional Development Variable (Y1)

Regional development is defined operatively as an effort to spur socio-economic development in connection to spatial and regional arrangements, reduce inter-regional disparities and preserve the environment of a region that emphasizes on strengthening endogenous factors of the region (economic growth, human capital improvement, , environmental protection) as a driver of the region's competitiveness.

Analysis and Results

Analysis of Respondents' Response against Highway Network Connectivity Variable

Responses of respondents to highway network connectivity variable measured from six (6) indicators, namely: Stability of Highway Structure; Highway Trajectory; HighwayMaintenance; Traffic Volume; The Supporting Infrastructure and Supply and Demandwhich are shown in table 2. Below.

Table 2. Analysis of respondents'responsesagainst highwaynetwork connectivity variable

No	Indicator	Category										F	Mode	Mean score
		STS		TS		R		S		SS				
		F	%	F	%	F	%	F	%	F	%			
1	Stability of highwaystructure	9	3.0	84	28.0	79	26.3	110	36.7	18	60	300	4	3.15
2	Highwaytrajectory	0	0	6	2.0	164	54.7	130	43.3	0	0	300	3	3.41
3	Highway maintenance	0	0	16	5.3	170	56.7	114	38.0	0	0	300	3	3.33
4	Traffic volume	1	3.0	57	19.0	185	61.7	57	19.0	0	0	300	3	2.99
5	Supporting infrastructure	14	4.7	145	48.3	105	35.0	36	12.0	0	0	300	2	2.54
6	Supply and demand	1	3.0	7	2.3	35	11.7	105	35.0	152	50.7	300	5	4.33
Total of Mean Score														3,29

Source: *(Calculated by the researcher)*

Respondents' Response Analysis against Regional Development Variable

Responses to regional development variable which were measured from four (4) indicators, namely: economic growth; human resource Improvement; improved land use; and environmental protection are shown in table 3 below.

Table 3. Respondents'response analysis against regional development variable

No	Indicator	Category										F	Mode	Mean Score
		STS		TS		R		S		SS				
		F	%	F	%	F	%	F	%	F	%			
1	Economic growth	1	3.0	7	2.3	122	40.7	159	53.0	11	3.7	300	4	3.57
2	Human resource	11	3.7	69	2.30	113	37.7	94	31.3	13	4.3	300	4	3.16
3	Improvement Improved land use	1	3.0	7	2.3	108	36.0	143	47.7	41	13.7	300	4	3.72
4	Environmental protection	3	1.0	8	2.7	109	36.3	122	40.7	58	19.3	300	4	3.75
Total of Mean Score														3,55

Source: *(Calculated by the researcher)*

CFA Confirmatory Analysis of Highway Network Connectivity Variable

An analysis of the confirmatory factor in the latent variable of highwaynetwork connectivity was carried out to be able to confirm all indicators that make up the latent construct of highway network connectivity. Figure 3shows the results of confirmatorial data analysis of highwaynetwork connectivity.
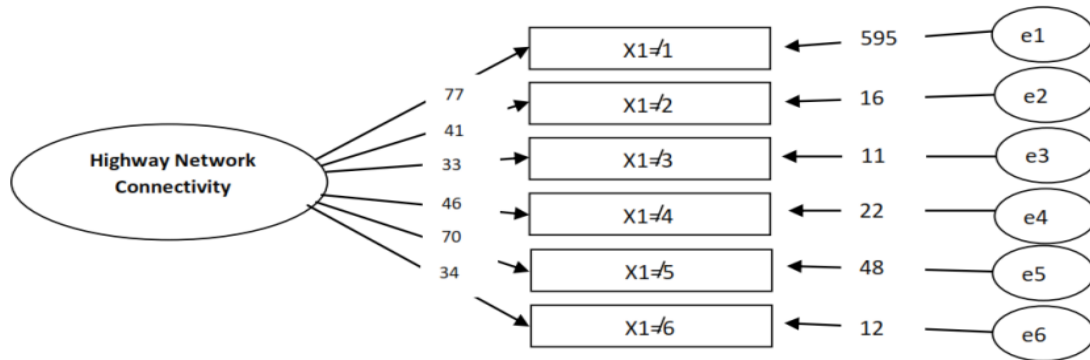

Figure 3. Confirmatory analysisnetwork connectivity variable

It is find out from CFA analysis result that CFA model for highwaynetwork connectivity considered fit. All indicators were declared valid and trusted to measure highway network connectivity variable. The highway structure stability indicator is the largest loading factor and subsequent supporting infrastructure. Output result of CFA analysis of connectivity of the highwaynetwork variable is shown in table 4.

Table 4. Output of CFA analysis of connectivity of the highwaynetwork variable

Standardized Regression Weights : (Group number 1 - Default model)			
			Estimate
x1≠1	◄- - - -	Highway_network_connectivity	0.768
x1≠2	◄- - - -	Highway _network_connectivity	0.406
x1≠3	◄- - - -	Highway _network_connectivity	0.334
x1≠4	◄- - - -	Highway _network_connectivity	0.465
x1≠5	◄- - - -	Highway _network_connectivity	0.696
x1≠6	◄- - - -	Highway _network_connectivity	0.344

Source: *(Analysis)*

CFA of Regional Development Variable

The analysis of the confirmatory factor in the latent variable of Region Development was done to confirm all the indicators that make up the latent construction of Regional Development. The results of CFA analysis can determine whether or not the CFA model for Regional Development fit[5,6] Figure 4below shows the results of data processing, the results of Confirmatory analysis of Regional Development.
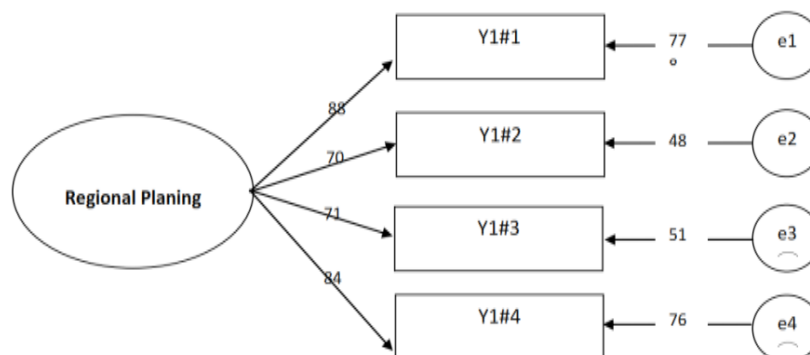

Figure 4.Analysis of regionaldevelopment confirmatory

Based on the results of CFA analysis, it is known that CFA model for the development of the region is considered fit. All indicators were declared valid and were believed to measure the variable of Regional Development. The Economic Growth Indicator is the greatest loading factor value and subsequent Environmental Protection. Results of Output of The CFA Analysis of Region Development Variable are shown in table 5.

Table 5. Output of the CFA analysis of region development variable

Standardized Regression Weights : (Group number 1 - Default model)			
			Estimate
y1$\neq$1	◄ - - -	Regional_development	0.882
y1$\neq$2	◄ - - -	Regional_development	0.695
y1$\neq$3	◄ - - -	Regional_development	0.712
y1$\neq$4	◄ - - -	Regional_development	0.835

Source: *(Analysis)*

There are four indicators that were declared entirely capable of measuring regional development variable because it has a value loading factor of > 0.30 ie Y1.1 (economic growth) with the value of (0.882); Y1.2 (Human Resource Improvement) with the value of 0.695; Y1.3 (improvement of land use) with the value of (0.712); Y1.4 (environmental protection) with the value of 0.835. Therefore, all variable-building factors would be used in the next full SEM processing.

Result of Feasibility Analysis of Research Model

Analysis of research model was doneusing the criteria of Goodness of Fit (GoF), which is summarized in table 6below. Results obtained wereaccording to desired criteria. GoF model has been fulfilled in its entirety, and it is concluded the model is fit with the data used.

Table 6. Index of modification of SEM model after modification

Goodness of Fit Index	Cut-off Value	Analysis Results	Evaluation Model
χ^2 - Chi - square	Expected to be low (df=116)	532,862	Good
Probability	$\geq$0,05	0,01	Marginal
RMSEA	$\leq$0,08	0,014	Good
GFI	$\geq$0,90	0,889	Marginal
AGFI	$\geq$0,90	0,861	Good
TLI	$\geq$0,90	0,884	Marginal
CFI	$\geq$0,90	0,915	Good

Source: *(Analysis)*

The table above shows that the criteria for assessing the feasibility of SEM model consisting of χ^2 - Chi-square, probability, RMSEA, GFI, AGFI, TLI and CFI generally indicate that the model is fit with the data because in general, it isconsidered meeting GOF criteria and next it can be continued on the next data processing.

Furthermore, the calculation of the coefficient of influence through regresssion weight was done which would be used as the basis for answering hypotheses in this study. The results of data processing are shown in table 7.

Table7. Regression weight

Relation between variables			Estimate	P	Result
Highway Network Connectivity		Region Development	0.546	0.014	Significant

Source: *(Analysis)*

Based on the results of regression weight, it can be seen the results of the significance of the influence of each variable that impact on the development of the region in the North Aceh Zone. Highway Network connectivity has also proved to have a significant effect on the success of the Region Development in the The north zone of aceh. Data on the regression weight table shows that the significance value obtained is p (0.014) and it fit the criteria that is at the standard of p <0.05. This means that Highway Network Connectivity has a very strong relationship and significantly influences the activities and success of the Region Development in the The north zone of aceh. Highway Network connectivity has a role or contributes to the success of the Region Development activity (0.546). So the Highway Network Connectivity has a significant effect on the development of the region seen from economic growth, human resource development, land use improvement and environmental protection.

CONCLUSIONS

Based on the field data analysis and discussion of results, it can be concludedthat:

The variable of highway network constancy (X) is formed from the highway structure consistency indicator (X1), highwayway condition (X2), highway maintenance (X3), traffic volume (X4), supporting infrastructure (X5) and supporting infrastructure (X6) indicators that are proven to be valid and reliable in measuring their influence on regional development;

Yield variables (Y1) formed from indicators of economic growth (Y11), improvement of human resources (Y12), improvement of land use (Y13) and environmental protection (Y14) are proven valid and reliable indicators in measuring their relation to highway network connectivity and transportation of goods;

Highway network connectivity has also proved to have a significant effect on the success of Regional Development in the The north zone of aceh.

Recommendation

Based on the discussion of resultsand conclusions of this study, some suggestions may be given as recommendations:

The results of this study may serve as a reference for Aceh provincial and district/municipality governments in The north zone of aceh in making highway network policy, territorial development and transportation of goods;

The results of this study can also be meaningful inputs for the Aceh government, the Lhokseumawe city government and the North Aceh district government in formulating the policy of the Special Economic Zone of ArunLhokseumawe, especially in preparing the development of a new economic region.

Conflict of Interest: Nil

Source of Funding: Self

Ethical Clearance: IJRISE Journal Reviewer Committee

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