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Research article

GEOGRAPHY AND INFRASTRUCTURE DIMENSION ON POVERTY IN RIAU PROVINCE: DATA PANEL APPROACH AT THE VILLAGE LEVEL

廖内省贫困的地理和基础设施维度：村庄级别的数据面板方法

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Abstract

This study aims to analyze the geographical and infrastructure aspects of poverty in districts and cities in Riau Province, Indonesia. This study used statistical data from 2003, 2006, 2009, 2011 and 2014 correspondingly published by the Central Bureau of Statistics (BPS), Indonesia. There are 1,687 villages collected into cross-sections and time series or pooled data. This study proposed a geographical perspective to identify the poverty level. Based on the model specification tests through the three analyses with the pooled least square (PLS), the study found that the regression of the determinant coefficient (R^2) is 0.0492, indicating that the geographical and infrastructure variables can explain 49.2 % of the output percentage variation in poverty levels. The telephone network is a factor that has a significant positive effect on the poverty variable. One variable used, the river as a transportation network, has a significant positive effect, which indicates that the usage of rivers for the purpose of transportation can increase the poverty level in the Riau province of Indonesia.

Keywords: Geography, Telephone Network, Infrastructure, Indonesia, Poverty, Riau Province.

摘要

这项研究旨在分析印度尼西亚廖内省地区和城市中贫困的地理和基础设施方面。这项研究使用了印度尼西亚中央统计局（BPS）相应发布的2003、2006、2009、2011 和
2014年的统计数据。有1687个村庄被收集到横截面和时间序列或汇总数据中。这项研究提出了从地理角度确定贫困水平的观点。基于对模型最小二乘分析（PLS）的模型规格测试，研究发现行列式系数（R2）的回归值为0.0492，这表明地理和基础设施变量可以解释产出百分比的49.2%贫困水平的变化。电话网络是一个对贫困变量产生重大积极影响的因素。河流作为交通运输网络是其中一个变量，具有显着的积极作用，这表明将河流用于交通运输可以增加印度尼西亚廖内省的贫困水平。

关键词: 地理，电话网络，基础设施，印度尼西亚，贫穷，廖内省。

I. INTRODUCTION

Poverty is a protracted problem all over the world, particularly in low-income countries. Similarly, their impact is also faced by the peoples of Indonesia, particularly in Riau province. However, poverty has always been blamed on development issues in Riau province in Indonesia. Poverty is a multidimensional problem beyond the perspective of being unable to fulfill basic needs such as food, clothing, and shelter. Similarly,

poverty also touches on limited access to education, health, infrastructure, and economic resources. The research gap, according to [1], is that the geographical condition of a country becomes a significant factor. A country depends not only on the willingness of the ruling elite, but also on an adequate geographical and resource base. In contrast, [2] argues that the reason the state fails is not because of geographical problems causing unproductiveness of a country. Poverty studies in several countries, such as those of [3] in Africa, [4] in the USA, and [5], explained that the cause of the decline in poverty was infrastructure.

Riau province has vast natural resources in the mining sector (oil, gas, mineral, and coal), forestry, plantations, and river and sea products. The wealth is not directly proportional to welfare, which is reflected by the number of poor people in several cities and regencies in Riau. Many people in Riau are impoverished by geographical conditions and infrastructure.

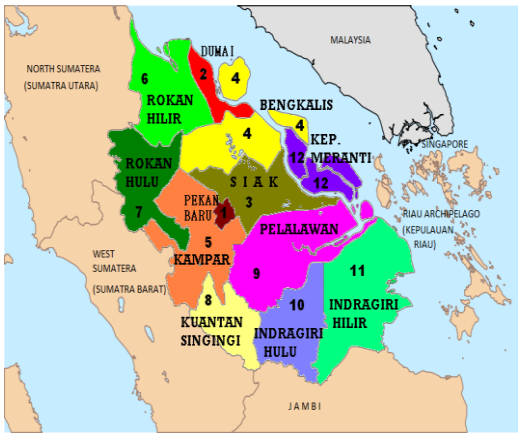


Figure 1. Map of Riau Province.

Roads are one of the essential forms of infrastructure that support the smooth running of business, development, and other activities in Riau. Access to links between regions is crucial. Road damage, poor conditions, and roads that are difficult to travel are common complaints of the community because they all hamper success in various fields. The number of damaged roads in Riau province caused by various things, including the number of heavy vehicles passing through and the road capacity, are not balanced with the needs and structure of the soil that is formed by clay and peat.

II. RESEARCH AIM

This study aims to analyze the influence of geography and infrastructure factors on poverty reduction in Riau Province. Several variables were constructed from survey data for describing geographical conditions and infrastructure, as well as poverty levels at the village level. This is the first study addressing the link between geography and infrastructure to poverty in one of the richest provinces in Indonesia.

III. LITERATURE REVIEW

A. Previous Studies

The poverty research in several countries such as [5] in Turkey explains that substantial improvements are needed for poor households with changes at the macro level. The results of this research have a significantly positive impact on policy, one of which is the measurement of poverty, unlike previous studies that used income as a proxy variable. The study in Iran by [3] describes that there are significant gaps in the geographical distribution of health, resources, and access to health services. The finding of this research study also shows that there are significant geographical gaps in health, resources, and inequality in access to health services. This study has not analyzed the financial aspects. However, financial access factors are essential in the utilization of health services and are considered as physical and geographical accessibility.

Infrastructure has a significant impact in rural areas on poverty alleviation [5], [6], [7], [22], [23]. [6] in Manila explains that government revenues are allocated to mitigate poverty and disparities. The ease of communication and information technology can improve living [8]. The effective approach will increase the quality of water for poor societies [9], [10].

A similar study conducted by [9] in Africa views disparity by exploring the impact of transportation infrastructure on urban poverty. In the same year, Wang conducted a geographical study with the finding that the ease of accessing locations caused vulnerability to poverty in rural communities. The result of the study shows that for urban poverty, infrastructure can help in allocating scarce resources and reducing poverty. This study has not examined which macroeconomic variables are included in poverty.

In the same year, the study of geography conducted by [8] explained that location would make rural societies vulnerable to poverty. The results show that some variables have a significantly positive impact on rural poverty which is under different poverty lines. Locations in mountainous areas, irrigation conditions, large family size, few fixed assets, little land owned or in agriculture will make rural households more vulnerable to poverty.

The study of [10] in Bangladesh explains that infrastructure development is likely to reduce poverty if it improves the quality of life for the poor. District poverty variations per head are well explain by variations in the Infrastructure Development Index (IDI). Districts with higher IDI were associated with lower numbers of employees. Therefore, the exploration of macro, sectoral, and welfare impacts is essential to discuss in this research. [11] study in India found that roads tend to increase interpersonal inequality in the region. The impact of infrastructure variables on the size of consumption inequality indicates that some components of infrastructure, especially electricity and roads, tend to increase inequality at the regional level. For further research, it is necessary to examine the analysis of income inequality at the district level and outside of this study.

Some poverty studies, especially in Riau Province, such as the study by [11], explain the disparity between poor people and the low purchasing power of rural communities. [12] found that the causes of poverty in Riau Province included economic growth, education levels, unemployment, and lack of employment opportunities. [13] suggest that the implementation of development in the coastal region of Riau Province has not been able to improve the welfare of the community, especially in rural areas. It is in line with research by [14] that found that infrastructure access reflected by access to clean water, sanitation, and electricity is a priority in poverty reduction.

Many studies related to poverty have been done. The authenticity of this current research can be seen from the novelty, the object of research and the research perspective. This study analyzes poverty and infrastructure in Riau Province, which is rich in natural resources.

B. Definitions of Poverty

According to [10], variations in poverty in developing countries are triggered by several factors including geographical conditions, population and income level, historical background, whether another country has colonized the country, differences in natural resources, quality of human resources, the role of the tourism sector and the state, economic and political power, division of state power, political structure, and domestic institutions. [13] suggests that poverty includes hunger, no homestay, and the inability to seeks any medical treatment. Similarly, poor people are generally illiterate because they are unable to pay the cost of education, have no jobs, facing future risk, and are described as often losing children due to illness. Poverty refers to helplessness, marginalization, and lack of freedom. [14] documented that there are impressive records of economic growth and poverty reduction in the past two decades in Indonesia.

[15] reveals three main characteristics of the interrelated causes and consequences of poverty in developing countries. First, inadequate educational facilities and infrastructure have an impact on high rates of illiteracy and low skills. The second characterized by few health facilities and people's consumption patterns which cause low productivity. Third, the population is concentrated in the agricultural and mining sectors with outdated production methods. According to [16], a person is categorized as inferior if their experiences, capability deprivation, a condition where a person lacks substantive freedom, safety, and chances or opportunities.

[12] explains the risk of vulnerability in the relatively poor population in Indonesia compared to previous times. [14] uses growth studies and poverty reduction in Indonesia to find that the record of economic growth and poverty reduction in Indonesia has been very impressive in the last two decades.

C. Geographic Concepts

[14] explains that infrastructure is a physical system that provides transportation, irrigation, drainage, buildings and other public facilities for fundamental human needs including social and economic needs. [3] argues that toll roads are a public infrastructure provided by the government even though this is not really a purely public property. According to [15], the availability of infrastructure has an impact on the social and economic systems among societies.

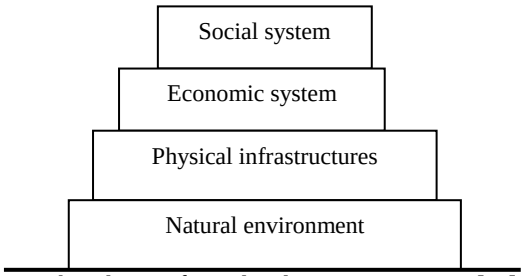


Figure 2. The relation of social and economic systems [14].

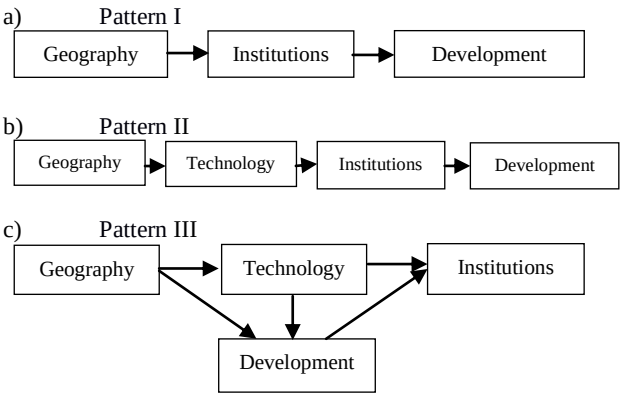
Furthermore, [16] suggested that roads are infrastructures that significantly impact poverty reduction through economic growth. Infrastructure is useful as a mediator between the economic and social systems with the support of natural environmental factors.

D. Infrastructure Concepts

Infrastructure refers to a physical system that provides transportation, irrigation, drainage, buildings, and other public facilities for the fulfillment of fundamental needs both socially and economically [7]. In this case the infrastructure refers to a system consisting of parts or networks of mutually inseparable facilities and infrastructure. According to [12], material infrastructure has two characteristics: first, fulfill social and economic needs, and second is mass production. Infrastructure needs to be used as a basis for consideration in policymaking [11]. [17] defines infrastructure as an essential factor in determining economic development. As well as [14] suggests that infrastructure is not defined by default. The definition of poverty is a problem at the conceptual and practical level, about who is categorized as inferior, and the fact that the poor are those who have difficulty accessing good quality infrastructure.

E. The Relation of Poverty and Geography

Poverty is closely related to geographical conditions [18]. There are four transmission pattern of geographical and institutional approaches that influence development [12], [18], [19]. Pattern one illustrates the influence of geographic conditions on institutions, while institutions influence development. Pattern two illustrates the influence of geographic conditions on technology, while technology itself has an influence on institutions that influence development. Patterns three and four illustrate the path of geographic influence on development more complexly. Pattern three through two paths, the first is geography-technology-development and the second is geography and technology that affects institutions, then institutions affect development. In pattern four the main process is the same as in pattern three but at the end of the path, development will affect technology and so on.



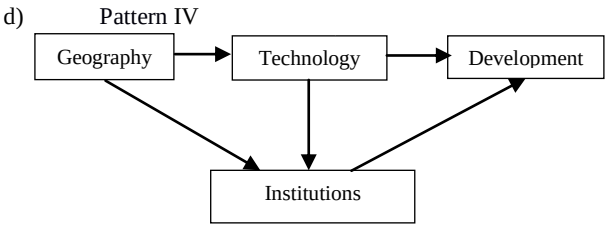


Figure 3. Analytical framework of infrastructure linkages with poverty reduction [14].

F. The Relation of Poverty and Infrastructure

[15] from the Asian Development Bank (ADB) endorsed the importance of project design including the allocation of infrastructure investment. Reduction in poverty can be accelerated if rural road construction, irrigation, and electricity can be provided at the right location to support the needs of the poor. [12] connects infrastructure with poverty as the main determinant of poverty. [2] examined that effect of roads on the growth of cities and districts and find the significantly positive impact of roads on economic growth of that area, an estimated elasticity of 0.05 [13]. According to the [13], [15] approaches the road infrastructure link to reducing poverty in view of increasing consumption of poor households, where for every 1 % increase in kilometers of roads per capita, household consumption increased by 0.08 %.

G. Conceptual Framework

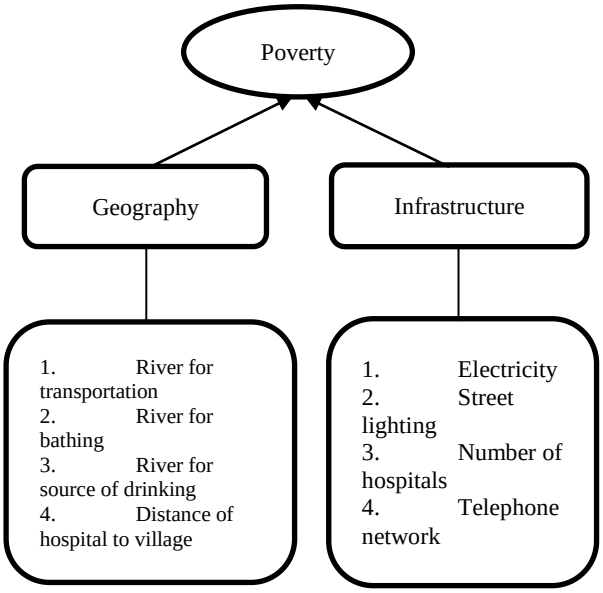


Figure 5. Research analysis framework.

IV. RESEARCH METHOD

This research uses data from the Village Potential Survey (PODES) that was collected by the National Statistic Agency. PODES is a survey conducted three times in every ten years and

covering all villages in Indonesia. The periods used in this study consist of the years 2003, 2006, 2008, 2011 and 2014.

A. Data Analysis Technique

Panel data regression analysis in general:

$$Y_{it} = \alpha + X_{1it} + X_{2it} + \ldots\ldots + X_{kit} + \varepsilon_{it} \ldots\ldots \quad (1)$$

with:

k = 1, 2, …, K

i = 1, 2, …, N

t = 1, 2, .., T

Y_{it} = k-response variable value on observation unit to i and time to t

X_{kit} = predictor variable value on observation unit to i time to t

α = intercept parameter regression coefficient to k

ε_{it} = error term

Three approaches to estimating panel data regression:

1) Common Effect Model

Common Effect Model (CEM) in general:

$$Y_{it} = \alpha + X_{1it} + X_{2it} + \ldots\ldots + X_{kit} + \varepsilon_{it} \ldots\ldots\ldots\ldots \quad (2)$$

2) Fixed Effect Model

Fixed Effect Model (FEM) in general:

$$Y_{it} = \alpha_1 + X_{1it} + X_{2it} + \ldots\ldots + X_{kit} + \varepsilon_{it} \ldots\ldots \quad (3)$$

3) Random Effect Model

Random Effect Model (REM) in general:

$$Y_{it} = \alpha_0 + X_{1it} + X_{2it} + \ldots\ldots + X_{kit} + W_{it} \ldots\ldots \quad (4)$$

This model states that poverty levels are a function of geography and infrastructure with the formula:

POV = f (LIS, PJL, SRS, TLP, STR, SMA, SMI, JRS)

Each formula represents:

POV = Poverty

LIS = Electricity

PJL = Street lighting

SRS = Number of hospitals

TLP = Telephone networks

STR = River for transportation

SMA = River for bathing

SMI = River for the source of drinking

JRS = Distance of hospitals

a) Econometric Specification

$$Pov_{it} = \alpha_{0it} + \beta_1 LIS_{it} + \beta_2 PJL_{it} + \beta_3 SRS_{it} + \beta_4 TLP_{it} + \beta_5 STR_{it} + \beta_6 SMA_{it} + \beta_7 SMI_{it} + \beta_8 JRS_{it} + \varepsilon_{it} \ldots\ldots\ldots\ldots \quad (5)$$

B. Panel Data Selection and Estimation Methods

1) Chow Test

In estimating panel data, the Chow Test is the most effective fixed or common effect.

2) Hausman Test

Hausman Test chooses the best model between fixed and random effect models.

3) Lagrange Multiplier Test

The LM Test compares statistically between a random and common effect or is used to identify whether the random effect model is better than the common effect.

C. Classic Assumption Test

1) Multicollinearity Test

If the main regression equation R is greater than auxiliary regression, then there is no multicollinearity within the model.

2) Heteroscedasticity Test

Linear regression tests must have homoscedasticity with many methods. This research uses Brush-Pagan. If the P-value indicated by "Prob > Chi-square" value > 0.05 then there is heteroscedasticity.

3) Normality Test

This study uses the J-B test method. If J-B counts < Chi-square table, the residual value is normally distributed.

D. Statistic Test

1) Simultaneous Regression Coefficient Test (F Test)

If F count is greater than F table, the exogenous variables have a significant effect on the endogenous variable.

2) Individual Regression Coefficient Test (T-Test)

H0 is rejected if significance level at 5 % and if t count > t table, then the exogenous variable has a significant effect on the endogenous variable.

3) Determination Coefficient R2. Determination Coefficient Value

Between zero and one (0 < R2 < 1) a small value (R2) indicates the limited ability of the independent variable to explain variation. Values close to one indicate that the exogenous variable provides almost all the information needed for predictions of dependent model variations [24].

V. RESULTS AND DISCUSSIONS

A. Results

1) Classic Assumption Test

Heteroscedasticity

The Breusch-Pagan statistical test with the Lagrange multiplier examines the presence or absence of heteroscedasticity.

Table 1.
Heteroscedasticity test results

No	Area	F count	Prob > chi2	PLS/FE
1	Riau Province	1.46	0.0000	FE
2	Kuantan Singingi	0,84	0.9154	PLS
4	Indragiri Hulu	0.79	0.9225	PLS
5	Indragiri Hilir	0.82	0.9308	PLS
6	Bengkalis	2.26	0.0000	FE
7	PekanBaru	38.97	0.0000	FE

Source: Developed by researcher

H1 is accepted which means there is a problem of heteroscedasticity (Prob > Chi-square) < Alpha (0.05). The problem in this regression model is overcome by using the robust method.

2) Multicollinearity

Data is normally distributed and multicollinearity assumptions can be tested. The table indicates the existence of a problem (collinearity) on the independent variable.

Variables with values more than 0.75 should be excluded from the equation model to overcome multicollinearity problems or variables experiencing collinearity. Prob value is greater (>) than chi-square value on skewness/kurtosis test for normality. If the value is greater than 0.05, the residual is normally distributed. Vice versa, the data is not normally distributed.

Table 2.
Normality test results

Skewness/Kurtosis tests for normality						
No	**Area**	**Obs**	**Pr (Skewness)**	**Pr (Kurtosis)**	**Adj chi2(2)**	**Prob > chi2**
1	Riau Province	1687	0.26359	791.766	15.811	0.00001
2	Kuantan Singingi	535	0.56167	167.937	11.289	0.00001
3	Indragiri Hulu	305	0.62873	84.933	9.489	0.00001
4	Indragiri Hilir	467	0.26351	250.317	12.602	0.00001
5	Bengkalis	329	0.74854	62.887	8.844	0.00001
6	PekanBaru	51	0.46869	28.116	6.315	0.00001

This study uses three tests to determine the right method.

3) Restricted F-Test (Chow Test)

Table 3.
Chow test results

	Chi-Square (chi2)	Prob > chi2
Riau Province	1,473.86	0
Kuantan Singingi	92.24	0
Indragiri Hulu	39.87	0
Indragiri Hilir	185.16	0
Bengkalis	59.84	0
PekanBaru	168.95	0

Source: Computed by researcher

Chow Test with a comparison between PLS and fixed effect (FE) produces a P-value (Prob > F) < Alpha 0.05. Table 3 shows that PLS has a probability value of 0.9154 in Singingi, the most significant value of 0.9225 in Indragiri Hulu Regency, and a probability value of 0.9308 in Indragiri Hilir Regency.

The probability value of FE models in Riau Province, Bengkalis Regency and Kota Pekan Baru is P-value (Prob > F) < Alpha 0.05 which indicates that H1 is supported. It decides that PLS was the best choice.

4) Hausman Test

Table 4.
Hausman test

No	Area	Chi-Square	Prob > chi	FE/RE

1	Propinsi Riau	14.98	0.0594	RE
2	Kuantan Singingi	25.09	0.0015	FE
3	Indragiri Hulu	5.77	0.6730	RE
4	Indragiri Hilir	9.34	0.3143	RE
5	Bengkalis	19.23	0.0137	FE
6	Pekanbaru	5.99	0.5260	RE

Source: Computed by researcher

If the value of Prob > Chi-square is smaller than the level of significance, the fixed-effect model is better. Conversely, random effect is better.

The Hausman test results in Table 4 indicates a probability value of more than 0.05, thus the random effect is a better choice regression model.

5) Breusch-Pagan LM Test

Table 5.
LM test

No	Area	Chibar2	Prob > chibar2	PLS/RE
1	Propinsi Riau	2.22	0.0682	PLS
2	Kuantan Singingi	0	1	PLS
3	Indragiri Hulu	0	1	PLS
4	Indragiri Hilir	0	1	PLS
5	Bengkalis	0.97	0.1627	PLS
6	PekanBaru	0.09	0.385	PLS

Source: Stata.13.0

If the value of Prob > Chi-square is smaller than the level of significance, the random effect model is better. Conversely, pooled least square (PS) is better. The LM test results in Table 5 indicate a probability value of more than 0.05. Thus, PLS is a better choice regression model.

Table 6.
Robustness test

Variables	-1	-2	-3
	PLS model	Fixed effect model	Random effect model
Electricity	36.32	57.89	45.59
	-0.45	-0.344	-0.347
Street lighting	9.87	6.15	3.3
	-0.548	-0.791	-0.846
Number of hospitals	-47.72	114.77	-36.03
	-0.476	-0.319	-0.595
Telephone networks	0.29***	0	0.28***
	0	-0.94	0
River for transportation	48.29**	40.62	46.22**
	-0.003	-0.145	-0.009
River for bathing	16.83	3.05	4.71
	-0.381	-0.927	-0.82
River for source of drinking	-51.17**	19.58	-32.91
	-0.009	-0.54	-0.119
Distance of hospital to village	-0.97***	-0.88	-1.01***
	-0.001	-0.129	-0.002
Constant	93.83***	71.59	95.20***
	-0.071	-0.304	-0.073
R-squared	0.0492**	0.0080*	0.0021*
Number of obs	1687	1687	1687

Robust standard errors in parentheses
*p < 0.10, **p < 0.05, ***p < 0.01

Test model specifications on these three analyses using the Likelihood and Hausman tests produce suggestions for different models. Likelihood or Chow Test recommends pooled least square (PLS). The Hausman test recommends using the random effect (RE) model through the Lagrange multiplier (LM) In testing to choose between the RE and PLS models, it was found that PLS was recommended to be used. Conclusions obtained through three tests both the first, second and third models are for using PLS.

This represents that 49.2 % of the output variation in the percentage of poverty output can be described through geographic and infrastructure variables.

VI. Discussions

A. Electricity

PLS test shows the calculation of the partial regression coefficient of 36.32 and the value of 0.450. Because of the value (p > | z |) < ɑ, this means that electricity does not significantly influence poverty. This result is not in accordance with the theory, which states that high electricity supply will affect poverty reduction. Such an explanation is motivated by the fact that poor families do not have access to electricity. This result is not in line with the research conducted by [5] which states that electricity infrastructure has a significant effect on poverty reduction.

B. Street Lighting

The test result shows a positive but not significant effect of street lighting on poverty, indicated by a coefficient of 9.87 and a value of 0.584 because of the value (p > | z |) < ɑ, meaning street lighting did not significantly influence poverty. This result is different from the theory, which states that a higher amount of street lighting influences poverty reduction. This is different from [5] conclusion, which states that street lighting infrastructure has a significant effect on poverty reduction in rural areas.

C. Number of Hospitals

The coefficient is - 47.72 and the value is 0.476. Because of (p | z |) < α it indicates that the number of hospitals has no effect on poverty. This is not in accordance with the research, which states that a higher number of hospitals has an effect on poverty reduction. Our results show that the number of hospitals does not affect poverty reduction, explained as such because the presence or absence of a hospital does not have an impact on poverty itself. These results show differences with the study conducted by [3], [12], [15] who emphasize the importance of infrastructure in general in the effort to reduce poverty.

D. Telephone Networks

The coefficient is 0.29 and the value is 0.000. Because of (p | z |) < α, it indicates that the number of telephone networks has no effect on poverty. This is not in accordance with the research, which states that a higher number of telephone networks has an effect on poverty reduction. Our calculation results show that the number of telephone networks does not affect poverty reduction, explained as such because the presence or absence of telephone networks does not have an impact on poverty itself. These results agree with the study conducted by [4] who emphasizes that telephone networks are not important in the effort to reduce poverty.

E. River for Transportation

The calculation results show that the transportation variable has a significantly positive effect on the poverty variable indicated by a coefficient of 48.29, 0.003. Because of the value (p > |z|) < α, this means that transportation has an effect on poverty. The finding of this research study indicates that improved transportation will reduce poverty. The explanation is that adequate transportation can make it easier for people to carry out economic activities. Accordance to the [4], in the USA, the best approach to improve the quality of life-based on the quality of water.

F. River for Bathing

The number of rivers for bathing does not affect the poverty variable, indicated by a coefficient of 16.83 and a value of 0.381. This research is not in accordance with the theory which states that the use of rivers for bathing has no effect on poverty because of the value (p > |z|) < α. Poor people do not always use river water for daily activities. This result is in line with the research of [17] which states that water used for bathing can cause transmission of disease.

G. River for Source of Drinking

A river for source of drinking is a variable that has an insignificant with the poverty variable with a coefficient of -51.17 and a value of 0.381. Because (p > |z|) < α, the results of this study also state that the availability of clean water for consumption can reduce poverty. The percentage of poor people using the river as a source of drinking water will increase the poverty level. This finding also supported to the finding of the other study [18].

E. A Distance of Hospital to Village

The distance between the hospital and the village has a significantly positive effect on the poverty variable, indicated by the coefficient of -9.87 and a value of 0.001 because of the value (p > |z|) < α. This result is in accordance with the theory which states that a long distance from the hospital to the village will increase the level of poverty. This can be explained because of the delay in helping people who need hospital services. This study is in line with that of [20] which states a significant relationship between the distance of health facilities and villages to reduced transportation costs.

VII. CONCLUSIONS

This study carried out a quantitative approach using time series and cross-section data from Village Potential Statistics for 2003, 2006, 2008, 2011 and 2014. There were 1,687 villages in the entire Riau Province in this study including Kuantan Singingi, Indragiri Hulu, Indragiri Hilir, Bengkalis, and Pekan Baru. Poverty is still an interesting phenomenon to study. The wealth of oil resources in Riau Province does not reflect the condition of the poor in a number of cities and regencies in Riau Province.

The infrastructure of Riau Province including roads is a vital infrastructure in supporting the smooth running of business, development and other activities. Roads in Riau Province are inadequate and road damage rates are very high despite the fact that 82 % of their GDP is influenced by the length of the road.

Based on the model specification tests through three analyses, pooled least square (PLS) is a model used with the best model to test geography and infrastructure models for poverty. The regression value of the determinant coefficient (R2) is 0.0492 which is interpreted that 49.2 % of the variation in the percentage of poverty output can be described through geographic and infrastructure variables. One factor that significantly influences poverty is telephone networks. Telephone networks have a significant effect on the poverty variable. This study justifies

the results approach taken by [21], which explained that telephone networks play an important role in increasing growth and poverty reduction.

The existence of the river shows a very important role for the people of Riau Province because the river can be used to support the needs of the people living along with it. River water flow is used for drinking, bathing, washing tasks in households and transportation. The versatile function of the river actually creates pressure when there is industrial waste pollution. The river for transportation shows a positive effect, indicating that a higher number of rivers managed for transportation will increase the amount of poverty. More and more rural communities use water for transportation, increasingly reflecting the poverty level of rural communities. This finding justifies the study conducted by [17] that water plays an essential role in poverty reduction.

The existence of the river as a source of drinking negatively affects poverty. The more rivers that provide clean water for drinking, the more we find a reduction in poverty in Riau Province. This finding is in line with research by [18] and [19], which state that villagers face limited access to clean water for consumption.

The distance between hospitals and villages has a significant negative effect on poverty. The further distance the hospital travels to the village will further reduce poverty. The [18] and [21] states a significant relationship between access to health facilities and villages to reduced transportation costs.

Increased and even distribution of infrastructure is a major concern for the Riau Provincial Government and its cities and districts. Improvement of transportation infrastructure in rural areas needs to be done. The farther the distance between the hospital and the village, the more poverty is increased. Improvement of facilities and infrastructure between regions, improved geographical conditions and adequate road access will reduce barriers to economic growth in several regions of Riau Province. These things will have an impact on the level of community welfare in Riau Province.

VIII. SUGGESTIONS

Based on analysis and conclusions, this study provides some suggestions:

1. There needs to be consistency of the government in alleviating poverty in the rural and urban areas spread throughout Riau Province.
2. It is important to improve the quality of infrastructure, to improve public access. Improving transportation infrastructure is a fundamental effort that is important for the transportation process and stimulates economic growth.
3. River flow plays a vital role in the economy because it functions for transportation infrastructure and is the source of life for the surrounding area that it crosses. The river is used for bathing, washing, and latrines, as a source of consumption, and fulfilment of industrial needs. Thousands of people need rivers. In this case, drinking water and the development of waste management program is needed. This activity would improve the adequacy of drinking water and the improvement of drinking water infrastructure and facilities.
4. Improvement of health services is needed, with adequate facilities and treatment for those in rural communities.

REFERENCES

[1] KAUFMANN, D., KRAAY, A. and MASTRUZZI, M. (2010) The worldwide governance indicators: methodology and analytical issues. *Hague Journal on the Rule of Law*, 3(2), pp. 220-246.

[2] ALI, A.M. and ISSE, H.S. (2003) Determinants of Economic Corruption: A Cross-Country Comparison. *Cato Journal*, 22(3), pp. 449-466.

[3] VEE, C. and SKITMORE, C. (2003) Professional ethics in the construction industry. *Engineering, Construction and Architectural Management*, 10(2), pp. 117-127.

[4] FJELDSTAD, O.H. and SEMBOJA, J. (2001) Why People Pay Taxes: The Case of the Development Levy in Tanzania. *World Development*, 29(12), pp. 2059-2074.

[5] Worldwide Governance Indicators. [Online] Available from: www.govindicators.org [Accessed 18/09/19].

[6] KAUFMANN, D. (1997) *Listening to Stakeholders' Views about Corruption in Their Countries*. Harvard Institute for International Development, Cambridge.

[7] SHABBIR, M.S., SHARIFF, M.N.M., ASAD, M., SALMAN, R., and AHMAD, I. (2018) Time-Frequency Relationship between Innovation and Energy Demand in Pakistan: Evidence from Wavelet Coherence Analysis. *International*

Journal of Energy Economics and Policy, 8(5), pp. 251-258.

[8] KAUFMANN, D., KRAAY, A., and ZOIDO, P. (1999) *Governance matters*. [Online] World Bank Policy Research Working Paper No. 2196. Available from: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=188568 [Accessed 28/09/19].

[9] SANTOSO, T. and KHARISMA, B. (2019) Indikator Makroekonomi Dan Pembangunan Kota Bandung. *E-Jurnal Ekonomi dan Bisnis Universitas Udayana*, 8(6), pp. 622-650.

[10] BILLGER, S.M. and GOEL, R.K. (2009) Do existing corruption levels matter in controlling corruption?: Cross-country quantile regression estimates. *Journal of Development Economics*, 90(2), pp. 299-305.

[11] RAMLI, A., SHABBIR, M.S., SHUKRI, M., BAKAR, B., MOHD, P., MOHD, N., and AHMAD, I. (2018) Mediating Role of E-Learning Resources in Developing Entrepreneurial Inclinations Amongst Undergraduate Students at Universiti Utara Malaysia. *International Journal of Engineering & Technology*, 7(4), pp. 51-56.

[12] VAN DER MERWE, A. and HARRIS, G. (2012) Attitudes toward Public Sector Corruption: A Study Of University Students in Kwazulu-Natal. *International Business & Economics Research Journal*, 11(2), pp. 171-178.

[13] MUKTIYANTO, A. (2016) Good University Governance dan Kinerja Program Studi: Pengaruh Penerapan Akuntansi Manajemen, Teknik Manajemen, dan Pilihan Prioritas Strategi Sebagai Model Mediasi Fit. Doctoral Thesis. Universitas Indonesia.

[14] FERRELL, O.C. and FRAEDRICH, J. (2015) *Business Ethics: Ethical Decision Making & Cases.* Nelson Education, Toronto.

[15] AHMAD, I. and AHMAD, S. (2018). Multiple Skills and Medium Enterprises' Performance in Punjab Pakistan: A Pilot Study. *Journal of Social Sciences Research*, Special Issue 4, pp. 44-49.

[16] TABISH, S.Z.S. and JHA, K.N. (2012) The impact of anti-corruption strategies on corruption free performance in public construction projects. *Construction Management and Economics*, 30(1), pp. 21-35.

[17] SHIM, D.C. and EOM, T.H. (2008) E-government and anti-corruption: Empirical analysis of international data. *International Journal of Public Administration*, 31(3), pp. 298-316.

[18] ASAD, M., AHMAD, I., HAIDER, S.H., and SALMAN, R. (2018) A Crital Review of Islamic and Conventional Banking in Digital Era: A Case of Pakistan. *International Journal of Engineering & Technology*, 7(4), pp. 57-59.

[19] HOBBES, T. and DUNN, J. (2010) *Leviathan: Or the Matter, Forme, and Power of a Common-Wealth Ecclesiasticall and Civil*. Yale University Press, New Haven.

[20] SYVIENGXAY, O. (2008) *Infrastructure (Rural Road) Development and Poverty Alleviation in Lao PDR.* Institute of Developing Economies, Japan External Trade Organization, Chiba.

[21] HADANI, M., GORANOVA, M., and KHAN, R. (2011) Institutional investors, shareholder activism, and earnings management. *Journal of Business Research*, 64(12), pp. 1352-1360.

[22] ASAD, M., SHABBIR, M., SALMAN, R., HAIDER, S., and AHMAD, I. (2018) Do entrepreneurial orientation and size of enterprise influence the performance of micro and small enterprises? A study on mediating role of innovation. *Management Science Letters*, 8(10), pp. 1015-1026.

[23] RAKHIMOVA, G. (2014) Structural elements of the sources of potential of regional economy. *Journal of Contemporary Economics Issues*, 1. https://doi.org/10.24194/11406.

[24] GUJARATI, D.N. and PORTER, D.C. (Eds.) (2003) *Basic Econometrics.* McGraw-Hill, New York.

参考文

[1] 考夫曼·D。，克拉伊·A。和马斯特鲁齐·M。（2010年），全球治理指标：方法论和分析问题。《海牙法治杂志》，3(2)，第 220-246 页。

[2] ALI，上午 和 ISSE，H.S。（2003）经济腐败的决定因素：跨国比较。卡托日记，22（3），第 449-466 页。

[3] VEE，C. 和 SKITMORE，C.（2003）建筑行业的职业道德。工程，建筑与建筑管理，10（2），第 117-127 页。

[4] FJELDSTAD，O.H. 和 SEMBOJA，J.（2001）人们为什么要缴税：坦桑尼亚的发展税案。世界发展，29（12），第 2059-2074 页。

[5] 全球治理指标。[在线]可从以下网站获得：www.govindicators.org [19年9月18日访问]。

[6]KAUFMANN，D.（1997）倾听利益相关者对其本国腐败的看法。哈佛国际发展研究所，剑桥。

[7]SHABBIR，M.S.，SHARIFF，M.N.M.，ASAD，M.，SALMAN，R. 和 AHMAD，I.（2018）巴基斯坦创新与能源需求之间的时频关系：小波相干分析的证据。国际能源经济与政策杂志，8（5），第 251-258 页。

[8] 考夫曼·D。，克拉伊·A。和佐伊多·P。（1999）治理很重要。[在线]世界银行政策研究工作文件第2196号。可从以下网站获得：https://papers.ssrn.com/sol3/papers.cfm?abstract_id=188568 [访问时间：19/09/28]。

[9] SANTOSO，T. 和 KHARISMA，B.（2019）指标者万隆市宏观经济与发展。Udayana大学江多见经济与商业，8（6），第 622-650 页。

[10] BILLGER，S.M。和 GOEL，R.K.（2009）现有的腐败程度对控制腐败有影响吗？：跨国分位数回归估计。发展经济学杂志，90（2），第 299-305 页。

[11]RAMLI，A.，SHABBIR，MS，SHUKRI，M.，BAKAR，B.，MOHD，P.，MOHD，N。和 AHMAD，I。（2018年），《电子学习资源在发展创业中的作用》马来西亚北方大学的本科生之间的倾向。国际工程技术杂志，7（4），第 51-56 页。

[12] 范德默威（A. VAN DER MERWE）和格林斯（G. HARRIS）（2012）对公共部门腐败的态度：夸祖鲁-纳塔尔省大学生研究。国际商业与经济研究杂志，11（2），第 171-178 页。

[13]MUKTIYANTO，A。（2016年），良好的大学治理和表现计划研究：应用管理会计，管理技巧，战略优先选择的影响模型健康调解。博士论文。印度尼西亚大学。

[14] O.C. FERRELL 和 FRAEDRICH，J.（2015年），《商业道德：道德决策与案例》。多伦多纳尔逊教育。

[15] I. AHMAD 和 S. AHMAD（2018）。巴基斯坦旁遮普邦的多种技能和中等企业的绩效：一项初步研究。社会科学研究杂志，特刊4，第 44-49 页。

[16] TABISH，S.Z.S。和 JHA，K.N.（2012）反腐败策略对公共建设项目无腐败绩效的影响。《建筑管理与经济学》，30(1)，第 21-35 页。

[17] 华盛顿特区的希姆和T.H.的EOM。（2008）电子政务与反腐败：国际数据的实证分析。国际公共行政杂志，31（3），第 298-316 页。

[18] M. ASAD，I。AHMAD，S.H。HAIDER 和 R. SALMAN（2018年），《数字时代的伊斯兰和传统银行业务的回顾：巴基斯坦的案例》。国际工程技术杂志，7（4），第 57-59 页。

[19] HOBBES，T. 和 DUNN，J.（2010年）利维坦：或者是

普通教会和公民的事务，形式和力量。耶鲁大学出版社，纽黑文。

[20]SYVIENGXAY，O.（2008）老挝人民民主共和国的基础设施（农村公路）发展与扶贫。日本对外贸易组织发展经济研究所，千叶。

[21] HADANI，M.，GORANOVA，M. 和 KHAN，R.（2011）机构投资者，股东积极性和收益管理。商业研究杂志，64（12），第 1352-1360 页。

[22] M. ASAD，M。SHABBIR，M。SALMAN，R。HAIDER 和 I. AHMAD（2018）企业的创业方向和规模是否会影响微型和小型企业的绩效？关于创新的中介作用的研究。管理科学快报，8（10），第 1015-1026 页。

[23]RAKHIMOVA，G.（2014）区域经济潜力来源的结构要素。《当代经济学问题杂志》，1。https：//doi.org/10.24194/11406。

[24] GUJARATI，D.N。和 PORTER，D.C。（编）（2003年），《基本计量经济学》。纽约麦格劳-希尔。