# The Influence of Infrastructure on The Economic Growth of Regencies/Cities in The Province of South Sumatera

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Abstract: This study aims to determine the effect of infrastructure which consists of the length of the road, electric power and clean water for the economic growth of the regencies/city in South Sumatra Province. The data used in this study is panel data consisting of 15 regencies/cities from 2008-2015. Data were obtained from the publication of the regencies/city Statistics Center in South Sumatra Province. The model used in this study is the Fixed Effect model. The estimation results show that the variables of road length, electricity, and clean water together and partially have a significant effect on economic growth variable at a significant level of 5 percent. More than 99 percent of the variation in economic growth variables can be explained by variations in road length, electricity, and clean water variables.

## 1 INTRODUCTION

One of the government's objectives listed in the opening of the 1945 Constitution is to promote the general welfare and standard of living of its people. In an effort to achieve prosperity, the government is trying to accelerate economic growth through various policies and development, including building infrastructures such as roads and bridges, power plants and clean water treatment facilities. With the increase in infrastructure, it is expected that the ability of a country or region to produce goods and services will increase. The increase in goods and services that can be produced by a country or region is reflected by changes in Gross National/Regional Domestic Products which are calculated based on constant prices for a given base year. The development of Gross Regional Domestic Product (GRDP) for Regencies/Cities in South Sumatra Province in the period of 2008 - 2015 can be seen in Figure 1 below.

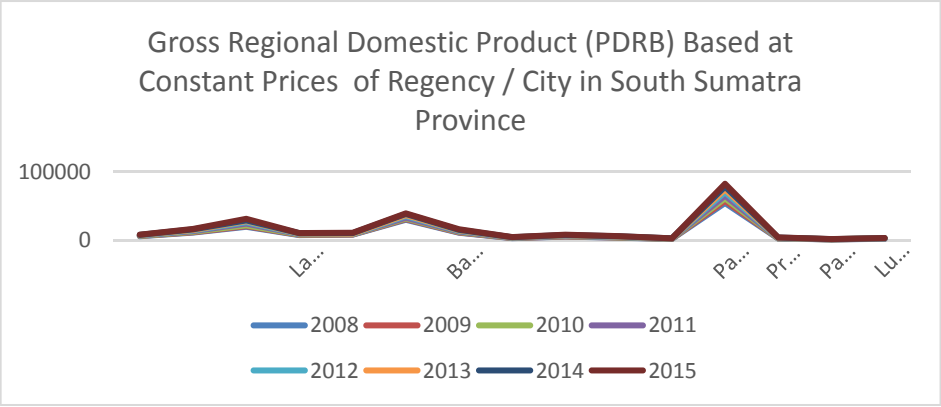


Figure 1: PDRB City Regencies in South Sumatra Province at Constant Prices of 2010 during the period 2008-2015 (in billion rupiah).



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Figure 1 shows that the GRDP of Regency/City in South Sumatra Province has always experienced an increase during 2008-2015. In that period, the city of Palembang became the largest contribution to the GRDP of South Sumatra Province, followed by Musi Banyuasin Regency in the second place. While regencies/cities that contribute the least in the GRDP of South Sumatra Province are the City of Pagaralam.

According to Todaro (2009: 170) there are three most important components in increasing economic growth including: (1) capital accumulation, which includes all new investments in land, physical equipment and natural resources through various improvements in health, education and quality of resources; (2) Growth of population and labor force as well; (3) Technological progress.

The capital in question is one of them comes from the infrastructure sector or physical investment. The existence of infrastructure will encourage an increase in productivity for production factors. Wahyuni, (2009: 4) said that infrastructure development such as roads and bridges, electricity generation, and clean water are very important roles in efforts to improve the economy and living standards of people in a region. Therefore, based on the explanation above, one of the factors influencing economic growth in South Sumatra Province is infrastructure.

Road infrastructure is a means of connecting from one region to another and has an important role in accelerating the flow of goods and services distribution. Research by Iskarno, Kuncara, and Irianto (2014) and Suminar, Hanim, and Prianto (2016) stated that road length infrastructure had a positive and significant impact on economic growth, but different results were revealed in the research of Sumadiasa, Tisnawati, and Wirathi (2015), road infrastructure has an influence positive but not significant to economic growth.

Variable electric power is a very important energy for the household and industrial life. Electricity is not only used by the household but can also be used by the private sector as a factor of production. Putri's research (2014) revealed that electricity has a positive and significant influence on economic growth. However, according to Chaerunnisa's research (2014), electricity has a negative and insignificant effect on economic growth. Furthermore, clean water as a variable that can affect economic growth has been investigated by Warsilan and Noor (2015). In this study revealed that the variable clean water has a positive and significant influence on economic growth.

Basically, infrastructure is one of the keys to supporting economic growth, effective infrastructure development is expected to accelerate economic growth and increase community prosperity. Based on the description above, this study will discuss how infrastructure influences such as road length, electricity and clean water to the economic growth of Regencies/Cities in South Sumatra Province.

# 2 LITERATURE REVIEW

## 2.1 Endogenous Growth Theory

This theory assumes that public and private sector investment in human resources results in an external economy and increased productivity which reverses the tendency for natural decline. This theory explains the existence of increasing scale of returns and long-term growth patterns that vary between countries. Because technology still plays an important role in these models, exogenous change is no longer needed to explain long-term growth (Todaro, 2009: 183).

According to Mankiw (2010;223) endogenous growth theory rejects Solow's basic assumption of changes in exogenous technology (which comes from outside). Start with a simple production function: $Y = AK$, where $Y$ is output, $K$ is a capital stock, and $A$ is a constant that measures the amount of output produced by each unit of capital (note that this production function does not have a declining return on capital). An additional unit of capital produces an additional unit of output regardless of the available capital. The absence of this declining return on capital is a key difference between this endogenous growth model and the Solow model. Capital accumulation can be described by the equation: $\Delta K = sY - \delta K$. This equation states that changes in capital stock $(\Delta K)$ are equal to investment $(sY)$ minus depreciation $(\delta K)$. We combine this equation with the production function above and get it:

$$\Delta Y/Y = \Delta K/K = sA - \delta \quad (1)$$

The above equation shows what determines the rate of growth of output $\Delta Y/Y$. As long as $sA > \delta$, economic income grows forever, even without the assumption of exogenous technological progress. In the Solow model, savings encourages temporary growth, but increasingly declining capital returns ultimately drive the economy closer to a steady state where growth depends only on exogenous technological progress. Conversely, in the endogenous growth model, savings and investment can drive sustainable growth.

## 2.2 Infrastructure

According to the Grand Indonesian Dictionary (2008), infrastructure can be interpreted as public facilities and infrastructure. Public facilities are known as infrastructures such as hospitals, roads, bridges, sanitation, telephone, and other facilities. In the World Bank Report infrastructure is divided into 3 groups, namely; (1) Economic infrastructure, is a physical asset that provides services and is used in production and final consumption including public utilities (telecommunications, drinking water, sanitation and gas), public works (dams, irrigation and drainage channels) and the transportation sector (roads, trains, port transport and airfields). (2) Social infrastructure is an asset that supports the health and expertise of the community including education (schools, and libraries), health (hospitals, health centers) and for recreation (land, museums, etc.). (3) Administrative / agency infrastructure, including law enforcement, administrative control and coordination and culture (The World Bank, 1994: 13). While Todaro (2009: 170) explained that economic infrastructure is the amount of physical and financial capital that takes the form of highways, railway facilities, water transportation facilities, air force facilities, and means of transportation and communication, plus various other facilities such as water supply, financial institutions, electricity, and public services such as health and education.

## 2.3 Previous Research

Many studies have been conducted to see the influence of infrastructure on economic growth. Winanda (2016) in his study discussing electricity infrastructure, clean water infrastructure and Length of Road infrastructure that is linked to economic growth, concluded that the variables of electricity infrastructure and clean water infrastructure have a positive and significant influence on economic growth, while the Length of Road infrastructure variable has a negative relationship and significant to economic growth in Bandar Lampung City. While the research by Prasetyo and Firdaus (2009) on the relationship of electricity infrastructure, road length and clean water to regional economic growth showed slightly different results. The study shows that electricity infrastructure, road length and clean water have a positive influence on the economy in Indonesia.

Sumadiasa, Tisnawati and Wirathi (2015) conducted a study using variable lengths of road infrastructure, electricity and PMA to see its effect on GRDP growth. The study concluded that the road length variable had a positive but not significant effect on GRDP growth, while the variables of electric power and foreign investment (PMA) had a positive and significant influence on the growth of GRDP in Bali Province.

According to Pranessy, Nurazi and Anitasari (2010) in their study of the influence of infrastructure development on economic growth, based on the results of their study indicate that electrical energy, the number of health centers and the number of schools have a positive and significant effect on economic growth in Bengkulu Province.

Morimoto and Hope (2001) examine the impact of electricity supply on economic growth. The results of the study explain that flows and changes in electricity supply have a significant impact on changes in real GDP in Sri Lanka, any increase in 1 MWh of electricity supply will increase GDP between 88,000 to 137,000 Sri Lankan Rupees. Furthermore, Worku (2010) and Peter, Rita and Edith (2015) analyzed the relationship between road infrastructure and economic growth, the results of these studies indicate that road infrastructure has a positive impact on economic growth.

# 3 METHODOLOGY

This study is a causality study that analyzes the effect of infrastructure which consists of the length of the road, the amount of electricity sales and the amount of clean water channeled to the economic growth of the Regency / City in South Sumatra Province for the period 2008-2015. The data used is a panel data consisting of 8 years time series data and 15 cross-section data in South Sumatra Province.

The data analysis method used in this study is a multiple regression analysis technique with a panel data regression model to measure the influence of infrastructure which consists of the length of the road, the amount of electricity sales and the amount of clean water distributed to the economic growth of regencies / cities in South Sumatra Province.

This test is done with the following equation model:

$$PE_{it} = \alpha_i + ß_1 PJ_{it} + ß_2 L_{it} + ß_3 A_{it} + e_{it} \quad (2)$$

Where:

$PE_{it}$ = Log PDRB (in miryar rupiah)
$\alpha_i$ = Constants
$ß_1$- $ß_3$ = The regression coefficients of each independent variable
$PJ_{it}$ = Log Road Length by Regency / City in South Sumatra (in kilometres)

$L_{it}$ = Log of electricity sold by regencies / cities in South Sumatra (in GWh)
$A_{it}$ = Log The amount of water distributed according to regencies / cities in South Sumatra (in $Dam^3$)
i = Regency / city
t = Year
$e_{it}$ = Standard error

# 4 RESULTS AND DISCUSSION

## 4.1 Selection of Final Estimation Model

To determine the best model to be chosen in this study, two tests were tested, namely Chow Test and Hausman Test. Here are the results and explanations of the Chow Test and the Hausman Test:

Table 1: Regression Results with Chow Test

| Effects Test | Statistic | d.f. | Prob. |
|---|---|---|---|
| Cross-section F | 210.554563 | (14,102) | 0.0000 |
| Cross-section Chi-square | 407.741597 | 14 | 0.0000 |

Source: Chow Test Regression Results, Data processed in 2018

The Chow test (Table 1) is used to determine whether the model is either an ordinary OLS model, a fixed effect model or random effect. Based on the Chow Test results show that the Chi-square Cross-Section value is 407.74 with a probability of <0.05 which indicates that Ho is rejected because the probability value of this test is smaller than the five percent error level with a 95 percent confidence level which means the Fixed Effect model is accepted.

The Hausman test (table 4.2) is then carried out to determine whether a suitable model is a random model or a fixed effect model. Based on the results of the Hausman test the results are as follows:

Table 2: Regression Results with Hausman

| Test Summary | Chi-Sq. Statistic | Chi-Sq. d.f. | Prob. |
|---|---|---|---|
| Cross-section random | 42.805346 | 3 | 0.0000 |

Source : Hausman Test Regression Results, Data processed in 2018

Table 2 explains that the value of the random chi-square cross section is 42.81 with a probability of <0.05, indicating that Ho is rejected because the probability value of this test is smaller than the five percent error level with a 95 percent confidence level, in other words the Fixed Effect model cannot be rejected. The choice of the best model chosen for this study is based on the regression results of the Chow Test and the Hausman Test using the Fixed Effect Model method

## 4.2 Fixed Effect Model

The final model used in this study is the Fixed Effect model as indicated by the Chow Test and Hausman Test. Following is the panel data regression calculation with the Fixed Effect method:

Table 3: Regression Estimation Results with Fixed Effect Method

Dependent Variable: LOG(PDRB?)
Method: Pooled Least Squares
Date: 09/14/18 Time: 09:58
Sample: 2008 2015
Included observations: 8
Cross-sections included: 15
Total pool (balanced) observations: 120

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 6.413240 | 0.344284 | 18.62776 | 0.0000 |
| LOG(PJ?) | 0.269324 | 0.050877 | 5.293609 | 0.0000 |
| LOG(L?) | 0.059076 | 0.017128 | 3.449013 | 0.0008 |
| LOG(A?) | 0.056606 | 0.016967 | 3.336202 | 0.0012 |
| Fixed Effects (Cross) | | | | |
| _OKU--C | -0.117824 | | | |
| _OKI--C | 0.428600 | | | |
| _ME--C | 0.922610 | | | |
| _LHT--C | 0.059228 | | | |
| _MURA--C | -3.78E-05 | | | |
| _MUBA--C | 1.340158 | | | |
| _BA--C | 0.464593 | | | |
| _OKUS--C | -0.593517 | | | |
| _OKUT--C | -0.079937 | | | |
| _OI--C | -0.521910 | | | |
| _EL--C | -0.913989 | | | |
| _PLG--C | 1.775525 | | | |
| _PRA--C | -0.564022 | | | |
| _PGA--C | -1.281303 | | | |
| _LLG--C | -0.918175 | | | |

Effects Specification

Cross-section fixed (dummy variables)

| | | | |
|---|---|---|---|
| R-squared | 0.991720 | Mean dependent var | 8.980140 |
| Adjusted R-squared | 0.990340 | S.D. dependent var | 1.015699 |
| S.E. of regression | 0.099831 | Akaike info criterion | -1.633201 |
| Sum squared resid | 1.016549 | Schwarz criterion | -1.215077 |
| Log likelihood | 115.9921 | Hannan-Quinn criter. | -1.463399 |
| F-statistic | 718.6030 | Durbin-Watson stat | 0.473119 |
| Prob(F-statistic) | 0.000000 | | |

Source :Fixed Effect Method Result, Data processed in 2018

By using a confidence level of 95 percent ($\alpha$ = 0.05) with df1 (nominator) = 3 and df2 (denominator) = 116, the F-table value is 2.68. Whereas in this study the F-count value is 718.6030 which means that the significance level is much smaller than 0.05 (F-count = 718.6030> F-table = 2.68). The results of this test indicate that the variable length of road infrastructure, electricity infrastructure and clean water infrastructure for 15 regencies/cities in South Sumatra Province together significantly affect economic growth at a 95 percent confidence level. Furthermore, based on the estimation results obtained the coefficient of determination (R2-adjusted) of 0.99 which means that the variation in the variable Gross Regional Domestic Product is determined by the variation in the variable length of the road, the variable electric power and the variable clean water by 99 percent, while the remaining one percent is determined by other variables outside the model.

To see which variables partially affect economic growth, 95 percent confidence level ($\alpha = 0.05$) is also used. Based on the estimation results with the above Fixed Effect method, with degree of freedom (n-k) = 120-4 = 116 obtained t-table of 1.98, which means that there is a positive and significant relationship between the variable Length of Road (PJ), variable Electricity ( L) and the variable Clean Water (A) with the variable Economic Growth, which is indicated by the coefficient of the variable Length of the Road of 0.27 (t-count = 5.29), then the variable coefficient of Electricity is 0.06 (t-count = 3.45) and the variable coefficient of Clean Water equal to 0.06 (t-count = 3.33) with each probability far smaller than one percent.

# 5 DISCUSSION

The estimation results are carried out using the fixed effect method theoretically in accordance with expectations, all coefficients for each variable show a positive sign. This sign can be interpreted that the Length of Road infrastructure has a positive effect on the Economic Growth of Regency / City in South Sumatra Province with a variable coefficient value of 0.27. This means that every time there is a one-percent increase in road length, the GRDP will increase by 0.27 percent.

Although the road infrastructure in the Regency / City of South Sumatra Province there are still some roads that are not good and there are still many roads that are in damaged condition, besides the mode of transportation in the province of South Sumatra not only uses land transportation but also uses river and rail transport but can still encourage mobility of economic activity. The results of this study are different from the research conducted by Sumadiasa, Tisnawati, and Wirathi (2015), where road infrastructure has a positive but not significant effect on the growth of Bali Province GRDP in 1993-2014. Estimation results conducted using fixed-effect method theoretically correspond to expectations, all coefficients for each variable show a positive sign. This sign can be interpreted that the Length of Road infrastructure has a positive effect on the Economic Growth of Regency / City in South Sumatra Province with a variable coefficient value of 0.27. This means that every time there is a one-percent increase in road length, the GRDP will increase by 0.27 percent.

Furthermore, it can also be seen that the variable electric power has a positive coefficient that is equal to 0.06, which means that every electrical energy sold increases by one percent, it will increase the GDP by 0.06 percent. Therefore statistically the electricity variables significantly affect economic growth, so that from the estimation results of the model it can be concluded that the electricity infrastructure in the regencies/cities in the province of South Sumatra between 2008 and 2015 had a positive and significant influence on economic growth. The results of this study are in line with the results of research conducted by Pranessy, Nurazi, and Anitasari (2010) and Winanda (2016).

Then, the results of panel data regression using the fixed effect method also shows that the variable clean water has a positive and significant effect on the economic growth of the regencies/city in South Sumatra Province with a variable coefficient value of 0.06, which means that every one percent increase of the variable of clean water will increase GDP growth by 0.06 percent. The results of this study are in line with the results of research conducted by Prasetyo and Firdaus (2009) which examined the influence of infrastructure on regional economic growth in Indonesia, which shows that clean water infrastructure has a positive and significant influence on the economy in Indonesia.

Based on the results of the estimation of the Fixed Effect model, the intercept value of the Regency/city in South Sumatra Province is known as follows at Table 4.

Table 4: Regression Intercept of Regency / City in South Sumatra Province

| Kab/Kota | Effect | C | C + C Wilayah | Peringkat |
|---|---|---|---|---|
| _OKU—C | -0.117824 | 6.41324 | 6.29542 | 9 |
| _OKI—C | 0.428600 | 6.41324 | 6.84184 | 5 |
| _ME—C | 0.922610 | 6.41324 | 7.33585 | 3 |
| _LHT—C | 0.059228 | 6.41324 | 6.47247 | 6 |
| _MURA--C | -3.78E-05 | 6.41324 | 6.4132 | 7 |
| _MUBA--C | 1.340158 | 6.41324 | 7.7534 | 2 |
| _BA—C | 0.464593 | 6.41324 | 6.87783 | 4 |
| _OKUS--C | -0.593517 | 6.41324 | 5.81972 | 12 |
| _OKUT--C | -0.079937 | 6.41324 | 6.3333 | 8 |
| _OI--C | -0.521910 | 6.41324 | 5.89133 | 10 |
| _EL--C | -0.913989 | 6.41324 | 5.49925 | 13 |
| _PLG--C | 1.775525 | 6.41324 | 8.18877 | 1 |
| _PRA--C | -0.564022 | 6.41324 | 5.84922 | 11 |
| _PGA--C | -1.281303 | 6.41324 | 5.13194 | 15 |
| _LLG--C | -0.918175 | 6.41324 | 5.49507 | 14 |

Table 4 shows the differences in economic growth rates for each regencies/cities in the province of South Sumatra. The calculation results show that Palembang City ranks first with an intercept of 8.19, while the last rank is the City of Pagaralam with an intercept of 5.13. Based on the calculation results above indicate that during the period 2008-2015 the economic growth between regencies/cities in the province of South Sumatra varied greatly.

## 6 CONCLUSION

The suitable estimation model in this study is the fixed effect model. Estimation results show that the variable length of the road, variable electric power and variable clean water together and partially have a positive and significant influence on the economic growth of the Regency / City in South Sumatra Province. The estimation results also show that there are differences in growth between regencies/cities in the province of South Sumatra.

Based on the results of this study that the economic growth of an area cannot be separated from the availability of infrastructure, the local government in implementing development is expected to improve the quality and quantity of road infrastructure, provision of electricity and drinking water infrastructure and other infrastructure in efforts to achieve economic growth between regencies / cities in the province of South Sumatra.

## REFERENCE

BPS. Sumsel Dalam Angka Berbagai Edisi. Badan Pusat Statistik.

Chaerunnisa, Desty Nurhidayanti. 2014. Pengaruh Infrastruktur Terhadap Pertumbuhan Ekonomi di Kota Sukabumi tahun 1990-2012. (Skripsi). Bogor: Institut Pertanian Bogor.

Iskarno, Puput Evira dkk. 2014. Pengaruh Tingkat Pendidikan dan Infrastruktur Terhadap Pertumbuhan Ekonomi di Indonesia Tahun 2008-2012. Jurnal Ekonomi. Hal.1-17..

Mankiw, Gregory N. 2010. Macroeconomics. Worth Publishers, all rights reserved. New York, Uited States.

Morimoto, Risako and Chris Hope. 2001. The Impact Of Electricity Supply On Economic Growth In Sri Lanka. The Judge Institute Of Management Studies. p.1-17.

Peter, Siyan, Ereminkhale Rita and Makwe Edith. 2015. The Impact of Road Transportation Infrastructure on Economic Growth in Nigeria. International Journal of Management and Commerce Innovations. Vol.3. p. 673-680.

Pranessy, Lise, Ridwan Nurazi dan Merri Anitasari. 2010. Pengaruh Pembangunan Infrastruktur Terhadap Pertumbuhan Ekonomi Provinsi Bengkulu. Jurnal Ekonomi Dan Perencanaan Pembangunan (JEPP). Vol.4 No.3. Hal.51-62.

Prasetyo, Rindang Bangun dan Muhammad Firdaus. 2009. Pengaruh Infrastruktur Pada Pertumbuhan Ekonomi Wilayah Di Indonesia. Jurnal Ekonomi dan Kebijakan Pembangunan. Vol.2 No.2. Hal.222-236.

Putri, Phany Ineke. 2014. Pengaruh Investasi, Tenaga Kerja, Belanja Modal dan Infrastruktur Terhadap Pertumbuhan Ekonomi Pulau Jawa. Journal of Economics and Policy. Vol.7 No.2. Hal.109-120.

Sumadiasa, I Ketut dkk. 2016. Analisis Pengaruh Pembangunan Infrastruktur Jalan, Listrik Dan PMA Terhadap Pertumbuhan PDRB Provinsi Bali Tahun

1993-2014. E-Jurnal EP Unud. Vol.5 No.7 Hal.925-947.

Suminar, Hasti Aringga, Anifatul Hanim dan Fajar Wahyu Prianto. 2016. Pengaruh Pembangunan Infrastruktur Terhadap Pendapatan Regional Kabupaten Jember. Artikel Ilmiah Mahasiswa 2016. Hal.1-5.

Todaro, Michael P. 2009. Pembangunan Ekonomi. Jakarta: Erlangga.

Wahyuni, Krismanti Tri. 2009. Analisis Pengaruh Infrastruktur Ekonomi Dan Sosial Terhadap Produktivitas Ekonomi Di Indonesia. (Skripsi). Bogor: Fakultas Ekonomi dan Manajemen Institut Pertanian Bogor.

Warsilan dan Akhmad Noor. 2015. Peranan Infrastruktur Terhadap Pertumbuhan Ekonomi dan Implikasi pada Kebijakan Pembangunan di Kota Samarinda. MIMBAR. Vol.31 No.2. Hal.359-366.

Winanda, Ade Ayu. 2016. Analisis Pengaruh Infrastruktur Terhadap Pertumbuhan Ekonomi Di Kota Bandar Lampung. (Skripsi). Bandar Lampung: Fakultas Ekonomi dan Bisnis Universitas Lampung Bandar Lampung.

World Bank. 1994. World Development Report: Infrastructure for Development. Oxford University Press, New York.

Worku, Ibrahim. 2010. Road Sector Development And Economic Growth In Ethiopia. Ethiopian Journal of Economics. Vol.XIX No.2. p.101-146.