Basic Infrastructure and Economic Growth in Sumatra Province, Indonesia

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Abstract: - This study aims to examine the impact of basic infrastructures, such as roads, electricity use, irrigation, and educational facilities, on economic growth in the Sumatra region. The Badan Pusat Statistik (BPS) of the Republic of Indonesia, PLN, the Ministry of Education and Culture, the Ministry of Public Works and Public Housing of the Republic of Indonesia, and Bank Indonesia provided data for this research. The FEM (fixed effect model) technique was used to analyse panel data from 2015 to 2019 in 10 provinces in Sumatra. Economic growth is a temporary variable; the independent variables are roads, electricity, irrigation, and educational infrastructure. According to the findings, the variable length of provincial highways in excellent and moderate condition, electricity consumption, irrigation, and educational infrastructure in the form of school buildings had a positive and significant influence on economic growth in Sumatra provinces from 2015 to 2019. As a result, the government must provide facilities and infrastructure to boost economic growth.

Key-Words: - Economic Growth, Roads, Electricity, Irrigation, Educational, Infrastructure, Sumatra

Received: April 17, 2022. Revised: January 11, 2023. Accepted: February 7, 2023. Published: March 7, 2023.

1 Introduction

The role of government is relatively significant in a socialist economic sy0.e government provides what is called public goods. One of the government's roles in increasing economic growth is to provide facilities and infrastructure. The authors in [1], define infrastructure as physical facilities developed or required by public agents for government functions to facilitate social and economic goals.

Infrastructure has a significant role in accelerating economic development in general. According to Todaro and Smith, [2] the available infrastructure in a nation is a substantial and decisive element in the speed and scope of economic growth.

Infrastructure is required to boost competitiveness, promote more investment,

manufacturing, and trade activities, and increase economic growth and equitable development to reduce poverty and unemployment rates. In addition, the existence of infrastructure is also essential so that the process of developing human resources in an area can run well. The development process accompanied by rapid technological developments necessitates a truly appropriate approach to infrastructure development programs. Several provinces in Indonesia have experienced immediate structure improvements, while some have yet to be realized.

World Bank, [3], divides infrastructure into three categories: economic infrastructure (electricity, telecommunications, water, sanitation, gas), public works (roads, dams, bridges, canals, irrigation, and drainage), and transportation (railways, bus terminals, ports, airports), social infrastructure (education, health, housing, and recreation), and administrative infrastructure (law enforcement).

Sumatra Island, with an area of about 443,065.8 km^2, is one of Indonesia's biggest islands and the island with the second highest economic development after Java Island. Because Java Island has a complete infrastructure, it is faster than Sumatra Island, and its economic growth is higher on average.

Factors, including infrastructure development, shape economic growth on the island of Sumatra. The country's overall Gross Domestic Product (GDP) determines its economic growth. "GDP is the total final output of goods and services produced by a country's economy in that territory, both by citizens and non-citizens", [2]. Because of rising demands and the need for a global supplier of products and services to meet those demands, the importance of developing transportation infrastructure has rarely been more excellent today, [4].

In his book, the author in [5], systematically states that long-term economic growth consists of two main aspects: an increase in GDP and population growth. The following table provides thorough information on the economic growth rates of Sumatra's provinces.

Table 1. Average Economic Growth Rate of Provinces in Sumatra 2015-2019 (percent)

Province	2015	2016	2017	2018	2019	Average
Aceh	-0,73	3,29	4,18	4,61	4,15	3,1
Sumatera Utara	5,1	5,18	5,12	5,18	5,22	5,16
Sumatra Barat	5,53	5,27	5,29	5,14	5,05	5,26
Riau	0,22	2,18	2,68	2,34	2,84	2,05
Jambi	4,21	4,37	4,64	5,26	5,33	4,76
Sumatera Selatan	4,42	5,04	5,51	6,04	5,71	5,34
Bengkulu	5,13	5,28	4,98	4,99	4,95	5,07
Lampung	5,13	5,14	5,16	5,25	5,62	5,26
Bangka Belitung	4,08	4,1	4,47	4,45	3,32	4,08
Kep.Riau	6,02	4,98	2	4,56	5,21	4,55
						4,46

Source: BPS (Data Processed)

Three provinces have an average economic growth below the average growth rate in Sumatra: Aceh, Riau, and Bangka Belitung. Meanwhile, the other seven provinces' average economic growth rate exceeds Sumatra's average economic growth rate. South Sumatra had the most incredible and significant economic growth at 5.34%, while Riau Province had the lowest at 2.05%.

Economic growth in Sumatra before the development of basic infrastructure, for example, roads. Provincial roads play an essential role in the transportation sector, particularly important for the distribution of products and services and the movement of people across areas. Road construction by adding or repairing roads is needed to support the pace of economic growth. If many roads have damaged conditions, it will be difficult for the community to get raw materials or goods and services from other areas. The number of damaged roads in Sumatra and access have hampered the growth of the region, which will hinder the existing economic growth.

Likewise, with electric electrification, the lack of access to isolated areas away from crowds makes it difficult for electricity to enter. The main obstacles are roads, access roads that are damaged, and even still in ground-level conditions in several provinces in Sumatra, making it difficult for PLN to increase the electricity electrification ratio. In 2018, data on the electrification ratio of electricity in Indonesia reached 98.3 percent, meaning that there are still 1.7 percent left, almost 5 million people in Indonesia who have not received electricity or lighting services. Electricity is mandatory for households and production companies. Suppose there is a need for the electrification of electricity. In that case, it will hamper daily life and processing production at factories, reducing the production of goods and services and causing economic growth in an area to weaken. Based on the results of the Growth Diagnostic study conducted by Bank Indonesia in 2015 in 24 of the 34 provinces, the availability of electricity became the most binding constraint in almost all the provinces that were an object of the study. These results indicate that the need for electrical energy is very urgent. The other main obstacle of which is the problem of road quality. According to the Sumatra Island Infrastructure Development Master Plan, the main inhibiting factors for economic growth in Sumatra are electricity and road quality.

According to [6], road infrastructure positively and significantly influences per capita income, indicating that road infrastructure may affect per capita [7]; the road infrastructure variable positively and substantially influences economic growth in Jambi Province. On the other hand, the author in [8], on the other hand, concluded that road infrastructure had no considerable effect on GRDP.

Electricity is one of the essential things that must exist for life today. According to research performed by [9], a lack of electrical capacity is a crucial impediment to the development of businesses in Nigeria. Vital energy in developing modern human existence is electrical infrastructure, the use of electricity in urban and rural regions for various purposes. The energy demand is expanding in tandem with the social progress of civilization. According to authors [8], electrical infrastructure has a significant influence. However, according to [10], electricity infrastructure has a negative impact econ economic growth in Sibolga's development

The view is that infrastructure development in agriculture impacts economic growth significantly. The government has made different attempts to offer high-quality agricultural infrastructure, including repairing or expanding the capacity of damaged infrastructure and new construction. Infrastructure in agriculture is a physical building to support agricultural development. The supporting facilities include providing irrigation water (dams and pump wells), irrigation and drainage channels, and agricultural roads.

Infrastructure development in agriculture is a crucial driver of regional economic prosperity. Infrastructure development in agriculture has a significant impact on economic growth. Irrigation is one of the agriculture sector's supporting infrastructures. According to the authors in [11], the irrigation variable has a positive and considerable influence on the expansion of Sumatra's agricultural industry. According to authors in [12], roads, irrigation, and network expenditures significantly affect the economic growth of cities in North Sulawesi. On the other hand, the author in [13] claimed that irrigation network expenditures have no significant influence on economic growth. It can be seen in Figure 1. A good and wide irrigation area will lead to increased rice production. In South Sumatra Province, an irrigated area of 239,577 ha can increase rice production by 2,603,396.24 tons. However, in contrast to Riau Province in 2019, Riau's irrigation area in 2019 was 437,779 ha, more significant than

South Sumatra. Still, Riau Province was only able to produce a rice production of 230,873 tons. The lowest irrigated area is in the Riau Archipelago Province, with the most rice. An irrigated area of 196 ha only produced 1,150.8 tons of rice in 2019. The area of irrigation will affect the rice production of each region. Rice production will affect each part's income in the agricultural sector. This will affect the economic growth rate in each area.

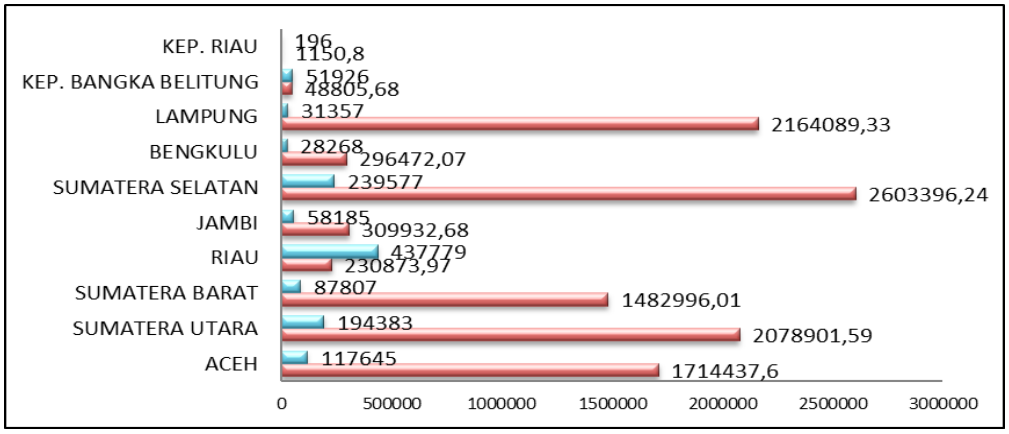

Fig. 1: Comparison of the area of irrigation and rice production in the provinces of Sumatra in 2019
Source: Badan Pusat Statistik

In the regulation of the Minister of Public Works and Public Housing of the Republic of Indonesia, Number 14/PRT/M/2015, concerning criteria and determination of the status of irrigation areas, the authors in [14] explains that irrigation is an effort to provide, regulate, and discharge irrigation water for supporting agriculture, with types including surface irrigation, swamp irrigation, and underground water irrigation. It is often said that an Irrigation Area (DI) is a unit of land that receives water from an irrigation network. Irrigation networks are made up of canals, buildings, and other facilities essential for supplying, distributing, managing, using, and disposing of irrigation water.

According to research by Schultz in [15], the development of human-centered education directly contributes to the economic growth of a country by boosting the workforce's skills and production capacity. Human capital theory shows that formal education is the main factor in creating a productive society. Education requires investment. Thus, the government must be able to provide adequate educational buildings and systems. The average educational infrastructure in the form of school buildings consists of high school buildings, vocational high schools, and madrasas, equivalent from public and private from the year to most prominent is located in North Sumatra Province with as many as 1,617 units.

This improvement in school infrastructure demonstrates the government's attempts to promote education through developing educational infrastructure such as school building amenities. Educational infrastructure is essential in developing productive personnel with appropriate competence, knowledge, and abilities. Employees with proper education and quality are the decisive variables for boosting production capacity and stimulating economic growth, [16]. According to authors in [17], education infrastructure had a positive and significant impact on economic growth in Central Java. The authors in [18] analyzed the effect of infrastructure development on economic growth in Bengkulu Province. The results show that the number of schools has a positive and significant impact on economic growth in the Province. However, according to the research in [19], education at the tertiary level has a negative and significant influence on economic growth in Sidoarjo Regency. Thus, the education infrastructure must be continuously improved so that competent human resources will increase.

The novelty of this research is to use infrastructure in electricity and irrigation. Both of these infrastructures have a vital role in economic activity. Electricity plays an essential role in the

industrial world, especially now that the industrial world uses many electric-powered machines in production activities. Irrigation channels also play a crucial role in the economy because Indonesia is an agricultural country where the farm sector contributes to national income. The existence of irrigation channels can supply plants' water needs, ensure water availability in the dry season, reduce soil temperature, and reduce soil damage which succeeds in agricultural activities.

2 Methodology and Variables

2.1 Methodology

This study is both descriptive and quantitative. Secondary data is utilised, mainly gathered and released by entities such as the Republic of Indonesia's Central Statistics Agency (BPS), PLN, the Ministry of Education and Culture, the Republic of Indonesia's Ministry of Public Works and Housing, and Bank Indonesia. Economic development is the study's dependent variable, whereas the independent variables include road length, electrical energy sold, clean water supplied, and the education index. The scope of this study covers ten provinces on the island of Sumatra for five observation periods, namely from 2015-2019. Panel Data Regression Analysis was employed as the analytical approach in this study. This approach is used because panel data is a combination of two forms of data: time series and cross-section, and it may supply more data, resulting in a higher degree of freedom, and by utilising panel data, one can solve the difficulty of removing missing variables, [20]. The analysis tool in this study uses EViews 10. The regression model in this study is as follows:

$$PE_{it} = \beta_0 + \beta_1 Jalan_{it} + \beta_2 Listrik_{it} + \beta_3 Irigasi_{it} + \beta_4 Pend_{it} + \mu_{it} \quad (1)$$

Where the PE_{it} is Economic growth (percent), $Jalan_{it}$ Is the length of provincial roads according to conditions in the Provinces of Sumatra (Km), $Listrik_{it}$ is the ratio of electrification and energy consumed per capita (kWh/capita), $Irigasi_{it}$ Is Irrigated area (Ha), $Pend_{it}$ Is high school and equivalent vocational school units in the Provinces of Sumatra (units), is 1, 2, . . .n, indicates the number of individual crosses (cross-sections), t is 1, 2, . . .t, shows the time series dimension (time series), β_0 is the intercept, β_1, β_2, β_3,β_4,β_5 is regression coefficient, and μ is the error term.

2.2 Variables

2.2.1 Economic Growth

Growth is measured by using rate data rate growth in every Province in percentage the year. Research this using consistent data from 2010 in form percent in provinces in Sumatra in 2015-2019.

$$PE_t = \frac{PDB_t - PDB_{t-1}}{PDB_{t-1}} X\ 100\% \quad (2)$$

2.2.2 Provincial Road According to Condition

A provincial road is a collector in a system network connecting the primary road capital province with the capital district/city or between capital districts/cities and roads strategic province. Study this use condition road fine and on the way to the area. Data used sums long road provinces in condition good with long road provinces in medium circumstances.

2.2.3 Consumed Electrical Electrification

This research uses installed kWh data sold per capita from 2014-2019. Sold energy to the customer is energy (kWh) sold to TT customers (voltage high), TM (voltage medium), and TR (voltage low) is appropriate with the number of kWh generated accounts (TUL III-09). Electricity consumption per capita (Kwh/Capita) is the ratio of the total sale of power electricity to the total number of residents.

$$Electrification\ Ratio\ and\ three\ energy\ Consumed\ per\ Capita = \frac{Sales\ of\ Electric\ Power}{Total\ population} \quad (3)$$

2.2.4 Coverage Area Irrigation

According to the Ministry of PUPR, Irrigation Areas (DI) are land units that receive water from an irrigation network. Irrigation networks consist of canals, buildings, and complementary buildings, constituting a single unit required to supply, distribute, administer, use, and dispose of irrigation water. Research this using local data irrigation with Ha unit.

2.2.5 Infrastructure Education Total Building School

According to Minister of Education and Culture No. 6 of 2019 concerning Guidelines Organization and Work Procedure, Elementary and Secondary

Education Unit State Education units at the secondary education level and Education Units at an education special are below authority and responsibility to the service area hosting province affairs education.

3 Result and Discussion

3.1 Result

3.1.1 Selection of a Regression Model

There are three methods of model estimation in panel data regression, namely the common effects model (CEM), the fixed effects model (FEM), and the random effects model (REM). To find out the method used in panel data regression was determined through several tests, including the Chow test, the Lagrange multiplier (LM) test, and the Hausman test.

3.1.1.1 Chow test

Chow's test was performed to choose the method best between Common Effect Model (CEM) and the Fixed Effect Model (FEM), using Redundant Fixed Effect-Likelihood Ratio. The Conclusion from results testing done with look mark probability (P-value). If the P-value < than level real (α), then the Fixed Effect model is more appropriate; otherwise, if the P-value > level real (α), then more models Common Effect Models appropriate

Table 2. Chow test results

Effect Test	Statistics	df	Prob.	Decision
Cross-section F	11.393608	(9,36)	0.0000	FEM
Chi-square cross-sections	67.382901	9	0.0000	

Table 3. LM Test Results

	Test Hypothesis			Decision
	Cross-section	time	Both	
Breusch-Pagan	18.43922 (0.0000)	0.000512 (0.9819)	18.43973 (0.0000)	BRAKE

Table 4. Hausman Test Results

Test Summary	Chi-Sq. Statistics	Chi-Sq. df	Prob.	Decision
Random cross-sections	14.693455	4	0.0054	FEM

As can be seen in Table 2, obtained mark probability (p-value) of 0.0000. Less chow of 5% rate trust (α), and the calculated χ value is 67.382901 enormous from χ table 12.59. So the results testing the more fixed effect model (FEM) method are reasonable compared to the standard effect model (CEM) method for analysing data in a study.

3.1.1.2 Lagrange Multiplier Test (LM)

Lagrange Multiplier (LM) test was performed to choose the method best between Common Effect Model (CEM) and Random Effect Model (REM), and the Conclusion from the results testing was done with look mark probability (P-value).Based on Table 3, the Breusch-Pagan value of 18.43922 is more significant than the χ table of 7.81, so the more random effect model (REM) method is suitable compared to the standard effect model (CEM) method for analysing the research data.

3.1.1.3 Hausman test

The Hausman test was used to determine which method was better between the Random Effect Model (REM) and the Fixed Effect Model (FEM); if the p-value < alpha (0.05), then the Fixed Effect Model method is selected, whereas if the p-value > alpha (0,05) then the Random Effect Model method is determined.

Based on Table 4, the value of the Chi-Square Statistic (χ- count) is 14.693455 larger than the Chi-Squares table (χ- table) of 2.58. Weight is also obtained with a probability of 0.0054 < 0.05, so results testing this is a more Fixed Effect Model (FEM) method suitable for analysing and studying this.

Based on the table above, it can be concluded that the best model for estimating the research data is the Fixed Effect Model (FEM).

3.1.2 Classic Assumption Test

Classical assumptions must be met for the available OLS estimator to be the best. Because it is essential in regression analysis, the conditions that need to be completed are: unbiased, linear, and having variance (BLUE = Best Linear Unbiased Estimator). According to authors [20], normality, multicollinearity, heteroscedasticity, and autocorrelation tests are used to determine whether or not the estimated model deviates from classical assumptions.

3.1.2.1 Normality test

The normality test works to test whether, in a regression model, the confounders have a normal distribution. From the data from the initial test results that are not normally distributed, a probability value of 0.00000 is obtained, which is smaller than 0.05. For the data to be normally distributed, the data is transformed into a logarithmic form or by using winsorizing. So, from this logarithmic transformation, the residuals are normally distributed with a probability of 0.840260.

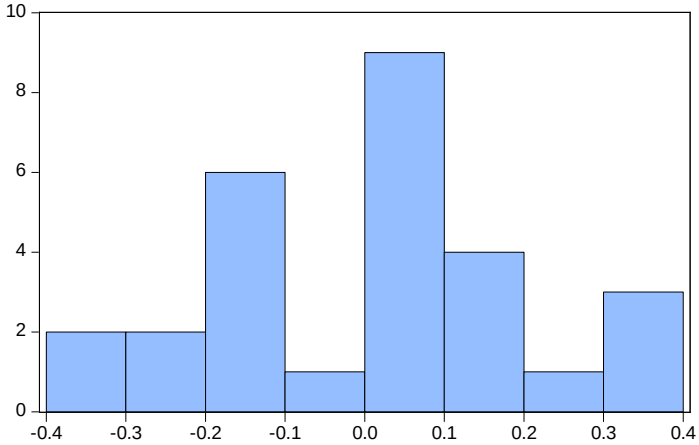

Fig. 2: Normality Test Results

Table 5. Multicollinearity Test Results

	JALAN	LISTRIK	IRIGASI	PEND
JALAN	1.000000	-0.196978	0.585288	0.789942
LISTRIK	-0.196978	1.000000	-0.131391	-0.159956
IRIGASI	0.585288	-0.131391	1.000000	0.306944
PEND	0.789942	-0.159956	0.306944	1.000000

Table 6. Heteroscedasticity Test Results

Variable	Coefficient	Std. Error	t-Statistic	Prob
C	1.284676	0.601584	2.135488	0.0396
JALAN	-0.000359	0.000369	-0.973484	0.3368
LISTRIK	-0.000282	9.57E-05	-1.947400	0.0856
IRIGASI	-1.43E-06	1.12E-06	-1.278148	0.2094
PEND	-0.000225	0.000391	-0.575576	0.5685

3.1.2.2 Deteksi Multikolinieritas

A multicollinearity test was performed to examine whether or not the independent variables in the equation model had a strong link. A decent

Based on Table 5, the results of the multicollinearity test are obtained where the correlation coefficient between the four independent variables in this study shows a coefficient number that is less than 0.90, so it can be concluded that there is no big multicollinearity problem from the data.

From the regression above, it can be concluded that the selected FEM model has a probability > 0.05, meaning there is no heteroscedasticity problem.

3.1.2.4 Autocorrelation Test

Autocorrelation is the correlation between one observation and members of another word at various periods. This study performs the autocorrelation test using the Durbin-Watson test method. The results show that Durbin-Watson (FEM) is Durbin-Watson Stat 1.740166 with d_L and regression model has no connection between the independent variables. The results of multicollinearity testing with a correlation coefficient matrix are shown below.:

3.1.2.3 Heteroscedasticity Test

The heteroscedasticity test is a test to see whether or not there is the same variance from one residual to another residual. Heteroscedasticity testing in this study used the Glejser test. If the probability value of each independent variable is > 0.05, the model is free of heteroscedasticity. d_U values in the Durbin-Watson table, where n = 50 and k = 4, so the importance of d_L = 1.3779 and d_U = 1.7214. As a result, it is possible to conclude that there is no autocorrelation.

3.1.3 Regression Estimation Results

According to the testing result, the LM and Hausman test results belong to the Fixed Effect Model (FEM), so the Fixed Effect Model is the best model to interpret the data in this study (FEM). The following are the regression findings.

Table 7. Regression Model Selection Test Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.688354	1.105343	1.527449	0.1354
JALAN	0.001467	0.000678	2.164988	0.0371
LISTRIK	0.000268	0.000176	2.522341	0.0367
IRIGASI	5.81E-06	2.06E-06	2.828089	0.0076
PEND	0.000667	0.000719	1.927922	0.0496
Effects Specification				
Cross-section fixed (dummy variables)				
R-squared	0.756257		Mean dependent var	4.493000
Adjusted R-squared	0.668239		S.D. dependent var	1.260324
S.E. of regression	0.725930		Akaike info criterion	2.428770
Sum squared resid	18.97108		Schwarz criterion	2.964136
Log-likelihood	-46.71924		Hannan-Quinn criteria.	2.632640
F-statistic	8.592064		Durbin-Watson stat	1.740166
Prob(F-statistic)	0.000000			

Table 8. Individual Parameter Significance Test Results (t-Test)

Variable	t-statistic	t-table	Prob.	Conclusion	Description
Jalan	2,164988	1,67	0,0371	Tolak H_0	Significant
Listrik	2,522341	1,67	0,0367	Tolak H_0	Significant
Irigasi	2,828089	1,67	0,0076	Tolak H_0	Significant
Pend	1,927922	1,67	0,0496	Tolak H_0	Significant

Based on the table above, the following regression equation was obtained:

$$PE_{it} = 1.688354 + 0.001467 Jalan_{it} + 0.000268 Listrik_{it} + 5.81E-06 Irigasi_{it} + 0.000667 Pend_{it} \quad (2)$$

3.1.4 Statistical Test

3.1.4.1 Individual Parameter Significance Test (t-Test)

The t-test is used to determine if there is a significant relationship between the independent variable and the dependent variable.According to the table above, road length, electricity, irrigation, and educational infrastructure partially positively and significantly influenced economic growth in 10 Sumatran provinces from 2015 to 2019.

3.1.4.2 Simultaneous Significance Test (F Test)

A simultaneous significance test (F test) was conducted to determine whether all independent variables had a concurrent or joint effect on the dependent variable.

Table 9. Simultaneous Significance Test Results (Test F)

Df	A	F-table	F-Statistik
45(n-k-1)	0,05	2,58	8,592064

According to Table 9, the results of the F-statistics simultaneous test are 8.592064 and an F-table of 2.58. As a result, all independent variables consisting of basic infrastructure, such as the length of roads in excellent and medium condition, electricity, irrigation, and the number of high school and vocational high school buildings, together have a significant impact on economic growth in 10 provinces on the island of Sumatra in 2015-2019.

3.1.4.3 Coefficient of Determination (R^2)

Based on the results of the analysis, the coefficient of determination (R2) is 0.756257, which means that variations in economic growth can be explained by variations in the number of local road infrastructure according to excellent and moderate conditions, electricity, irrigation area, and the number of educational buildings for SMA and SMK equivalents. by 75%, The remaining 25% is impacted by a variable that is not accounted for in the model.

3.2 Discussion

3.2.1 The Influence of Roads on Economic Growth in Provinces throughout Sumatra in 2015-2019

The growth of basic infrastructure in the form of provincial road lengths based on excellent and moderate conditions has a positive and significant impact on economic growth in provinces throughout Sumatra. The results of this study are research conducted by authors [7] on road infrastructure variables that positively and significantly influence economic growth in Jambi Province. This is due to the Harrord-Domar theory, which states that the more capital, or capital, in this case, road infrastructure, The more output will increase. This increase in production will affect economic growth. For example, if a farmer wants to improve rural production by buying a new tractor but there are no excellent road facilities to transport the additional agrarian output to the market, the investment from this farmer will not increase food production much in that area.

In other research conducted by authors [21], partial variables in road infrastructure have a positive and significant impact on the economic growth rate. This is because an increase in the economic growth rate in the Province of Bali accompanies every increase in road infrastructure. According to authors [22], the road variable positively and significantly affects economic growth. The results of this study are consistent with the hypotheses suspected and with the theory that claims that roads have a substantial impact on economic growth because the Solow theory implies that there are only multiple forms of capital. In addition, research with results similar to this study, namely [23], demonstrates that roads significantly impact economic growth in a given location.

Roads, according to Law No. 38 of 2004, are land transportation infrastructure that includes all parts of the road, including the development of its accessories and equipment intended for traffic, that are on the surface of the ground and water and above the surface of the water, except for railroads, lorry roads, and a cableway. Roads are infrastructure that various regions must own; good road conditions can facilitate access to trade between provinces. However, poor and unpaved road conditions can hamper these activities. There are still many roads that still need to be asphalted or are still dirt in several areas in the Province of Sumatra, which has made economic growth in the regions in Sumatra not increase significantly.

According to Regulation of the Minister of Public Works No. 13 of 2011, Chapter I, Article 1, paragraph 12, road maintenance is an activity for handling roads in the form of prevention, maintenance, and repairs required to maintain road conditions so that they continue to function optimally serving traffic and the specified plan age can be achieved. Road maintenance is urgently needed to improve existing provincial roads to facilitate access between regions.

The role of allocation, essentially the function of the government as a provider of public goods and services such as road construction, school building, lighting facilities, telephones, and so on, is one of the functions of the government to boost economic growth. The government must now offer road access to current community activities. The availability of road infrastructure significantly impacts the distribution of production components or the products and services generated by industry.

3.2.2 The Effect of Electricity Consumption on Economic Growth in Provinces throughout Sumatra in 2015-2019

The results of this study indicate that the electrification of electricity consumption has a positive and significant impact on economic growth. This is in line with existing theories and hypotheses. The results of this study are also in line with research conducted by Prasetyo and Firdaus [24]. The use of electrical energy has a positive and

significant impact on Indonesia's economic growth. Electrical energy production activities have an essential role; for this reason, to increase economic growth, electrical energy is needed.

Another research that was carried out by [25] found that electricity has a positive and significant influence on economic growth in West Java; the considerable influence of electrical infrastructure on economic growth demonstrates that the usage of electricity, particularly in the industrial sector, is critical in generating economic growth since it is required as the primary component in supporting manufacturing process activities.

Furthermore, research by Azuwulandari et al. [26] said that electrical energy positively and significantly influences economic growth. More electricity distributed and installed in Bengkulu Province will encourage economic growth. Electricity infrastructure development is a form of fiscal policy from the government to increase development and economic growth. Subsequent research, namely [27], stated that electricity consumption has a more significant and immediate effect in the short term. Unfortunately, in the long run, the influence of electricity consumption on economic development is insignificant.

According to Yoo, [28], electricity consumption has a causal relationship (two-way) with economic growth. This indicates that a high level of electricity consumption will encourage economic growth and vice versa. High economic growth is needed to increase the level of electricity consumption.

The development of electricity infrastructure is necessary for the continuity of community activities and the production of goods. The availability of energy supplies, especially adequate and affordable electricity, is crucial in the development of the industrial sector because one of the critical aspects in the business of the manufacturing industry sector is the guarantee of the availability of electrical energy, [29]. Electricity is one of the concentrations for the government, especially local governments, because many areas still do not have electricity. Electricity can affect economic growth in the short term; therefore, if the government wants to increase economic growth, the government is expected to be able to meet the supply of electricity needs.

3.2.3 The Influence of Irrigation on Economic Growth in Provinces throughout Sumatra in 2015-2019

According to the results of this study, irrigation has a positive and significant influence on economic growth. This is in line with existing theories and hypotheses. The results of this research are also consistent with the findings of [11], which found that irrigation has a positive and significant impact on the growth of the agricultural sector on the island of Sumatra. Irrigation will create change and increase productivity, boosting the farming industry. The island of Sumatra has good agricultural potential; the agricultural sector plays a vital role in the economic development of the Sumatra region, which is 22.27 percent. The leading commodity in Sumatra is rice.

According to a study by Rarun [12], spending on roads, irrigation, and networks significantly impacts the economic growth of cities in North Sulawesi. Capital expenditures on roads, irrigation, and networks include costs for the procurement, addition, replacement, improvement, and maintenance of irrigation roads and networks, as well as expenses for planning, supervision, and management of irrigation roads and networks that add capacity until the irrigation roads and networks are ready for use. Spending on infrastructure is expected to increase economic growth.

The effect of irrigation on economic growth in provinces throughout Sumatra has a negligible effect because many other factors have a significant influence. Irrigation will have more impact on agricultural products, which will later increase the GRDP of the farming sector and further increase the region's economic growth rate. As with research conducted by [30], the effect of irrigation on yields can increase the productivity of food crops, especially rice. Agricultural productivity per hectare is higher, thus providing more income to farmers and increasing employment in agriculture.

3.2.4 The Influence of Education Infrastructure on Economic Growth in Provinces throughout Sumatra in 2015-2019

Based on the results of this study, educational infrastructure, such as the number of high school buildings and comparable vocational high schools, has a positive and significant impact on economic growth. This is in line with existing theories and hypotheses. The results of this research are also in line with the results by Imp and Resmi [17], which found that educational infrastructure had a positive and significant effect on economic growth in Central Java from 2011 - 2015. This research uses the number of school units in provinces throughout Sumatra. School infrastructure is essential for the

sustainability of quality human resources. More educational facilities accessible will be able to increase the quality of the human resources themselves, resulting in trained human resources capable of propelling the economy forward.

According to the Solow-Swan hypothesis, economic development depends on the availability of production inputs such as population, labor, capital accumulation, and technical innovation. Solow-Swan proposes that the labor component can drive economic development in this approach. The workforce here includes not only the amount but also the quality of the labor. Human resources are a significant asset for increasing productivity. The greater a person's degree of education, the higher his output productivity, which can boost regional economic growth. The government's role, in this case, must provide the facilities and infrastructure needed during the teaching process. The government should focus on remote areas where there are no educational facilities.

4 Conclusion

Based on the data analysis and discussion above, the following conclusions can be drawn: (1) Road infrastructure positively and significantly impacted economic growth in provinces throughout Sumatra in 2015-2019. This signifies that the provincial road infrastructure is in good shape and contributed to Sumatra's economic growth between 2015 and 2019. The existence of good road infrastructure will make it easier for the community to distribute goods and services between regions; good road conditions will also make it easier for PLN to add electricity to remote areas, (2) Consumption of electrified electrical energy has had a positive and significant impact on economic growth in Sumatra Provinces from 2015 to 2019. This signifies that the electrification of electricity contributes to economic growth in Sumatra's regions. Many provinces still need more electricity, making some areas depend on other sites. For example, in West Sumatra Province, which supplies electricity to the surrounding regions, (3) The size of irrigated areas positively and significantly impacted economic growth in the Provinces of Sumatra for the 2015–2019 period. Irrigation has a positive effect, which indicates that it contributes to economic growth. In this case, if the irrigation area is expanded, it will increase the production of agricultural products, resulting in a large number of farm products that can be sold, which will affect economic growth, and (4) Educational infrastructure in the form of high school and vocational high school buildings, both public and private, has had a positive and significant impact on the level of economic growth in the provinces on the island of Sumatra in 2015-2019. Schools have no direct effect on a region's economic progress.

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Contribution of Individual Authors to the Creation of a Scientific Article (Ghostwriting Policy)

Heru Wahyudi created a research framework and team leader. Adinda Putri Mulya wrote the research. Fakhri Rizal Husain collected and managed the research data. Widia Anggi Palupi compiles articles, adapts to the format, and compiles a bibliography.

Sources of Funding for Research Presented in a Scientific Article or Scientific Article Itself

The research in this manuscript is supported by Lembaga Penelitian dan Pengabdian kepada Masyarakat (LPPM) Universitas Lampung.

Conflict of Interest

The authors have no conflicts of interest to declare that are relevant to the content of this article.