

Analysis of the Effect of Infrastructure on Economic Growth in Samosir Regency

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Abstract. Infrastructure is one of the important factors in driving economic growth in various regions, including Samosir Regency. This study aims to determine the effect of infrastructure on economic growth in Samosir Regency. This research method uses quantitative research with Multiple Linear Regression analysis techniques with the help of SPSS 26. the results of this study are Road Infrastructure (X1) has a positive and insignificant effect on Economic growth in Samosir Regency; Electricity Infrastructure (X2) has a positive and significant effect on economic growth in Samosir Regency; Water infrastructure (X3) has a positive and significant effect on economic growth in Samosir Regency; Road infrastructure (X1), electrical infrastructure (X2), and water infrastructure (X3) have a significant effect together on economic growth in Samosir Regency; The coefficient of determination (R^2) is 0.492 which means that 49.20% of the economic growth variable can be explained by the Road Infrastructure variable (X1), electrical infrastructure (X2), and water infrastructure (X3). while the remaining 50.80% is influenced by other variables outside this regression equation or variables not examined.

Keywords : Infrastructure, Road infrastructure, electrical infrastructure, water infrastructure, Economic Growth,

1. INTRODUCTION

Infrastructure is one of the important factors in driving economic growth in various regions, including Samosir Regency. Good infrastructure can improve the efficiency of distribution of goods and services, accelerate market accessibility, and increase investment attractiveness. Conversely, poor or underdeveloped infrastructure can be an obstacle to optimal economic activity, reduce the quality of life of the community, and slow down the pace of regional economic development.

Samosir Regency, located in North Sumatra Province, has considerable economic potential, particularly in the tourism, agriculture and fisheries sectors. However, despite having abundant natural resources, these sectors still face various challenges, one of which is limited infrastructure. Uneven road availability, limited transportation facilities, and inadequate accessibility to certain areas are some of the problems that hinder the rate of economic growth in this region.

Samosir Regency is one of the regencies in North Sumatra Province which is a national super-priority tourism area with the existence of the Lake Toba Region. Samosir Regency continues to strive to mobilize various economic potentials in its region. This is done so that

economic actors can participate and actively participate in driving the economy so that they can contribute to economic growth in Samosir Regency.

Economic growth in Samosir Regency in the last 5 (five) years has fluctuated. In 2017 to 2019 the economy of Samosir Regency experienced an increase where economic growth always increased. The impact of the Covid 19 pandemic in 2020 caused economic growth to decline sharply by -0.50 percent, but in 2021 the economic growth of Samosir Regency quickly recovered or returned to positive to a level of 2.65 percent.

Although infrastructure has been identified as an important factor in influencing economic growth in many regions, research related to its impact on economic growth in Samosir Regency is still limited. Most of the existing literature focuses on the relationship between infrastructure and economic growth in big cities or regions with more advanced economic development. There is not much research that specifically examines the effect of infrastructure on economic growth in regions such as Samosir Regency, which has different geographical and economic characteristics.

In addition, most existing studies tend to examine the effect of infrastructure in general without considering the role of sector-specific infrastructure, such as roads, transportation, or telecommunication networks, which have different impacts on specific economic sectors. In Samosir Regency, the tourism, agriculture and fisheries sectors play an important role, so a deeper understanding of how the infrastructure that supports these sectors contributes to regional economic growth is needed.

In addition, most existing studies do not specifically identify the challenges and constraints faced by Samosir Regency in infrastructure development, and how local policies can respond to these issues. Therefore, there is a need for research that examines in more detail the relationship between infrastructure development and economic growth dynamics in Samosir Regency, taking into account specific local conditions.

Thus, this research aims to fill the existing research gap by focusing on analyzing the effect of infrastructure development on economic growth in Samosir Regency, as well as offering a more applicable and relevant perspective for future regional development policies.

The importance of infrastructure availability is one of the things needed in achieving the expected economic growth. The availability of infrastructure is one of the most vital aspects in the process of accelerating national development. Infrastructure is believed to be one of the driving forces for economic growth. The importance of the role of infrastructure, the authors are interested in taking the research title “The Effect of Infrastructure on Economic Growth in Samosir Regency”.

2. LITERATURE REVIEW

Theory of Economic Growth

Economic growth is actually different from the term economic development. Some economists claim that economic growth is one of the indicators of a nation's economic development. However, at present the term economic growth is generally identified with economic development. Economic development is broadly defined as a process of improving the standard of living of people in a particular area. In addition, economic growth can also be interpreted as economic change in the long term slowly and steadily. In general, economic development is defined as economic change along with changes in economic structure. In other words, economic growth is the main requirement for economic development.

According to Boediono (2018:1), economic growth is the process of increasing output per capita in the long term. Economic growth is a process, not a picture of the economy at any one time. Regional income illustrates the rewards for the factors of production operating in the region (Land, Capital, Labor, and Technology), this means that it can describe the prosperity of the region. The prosperity of a region in addition to being determined by the amount of added value created in the region is also determined by how much Transfer Payment occurs, which is the part of income that flows outside the region or gets a flow of funds from outside the region.

According to Simon Kuznets, "Economic growth is a long-term increase in the capacity of the country concerned to provide various economic goods to its population. The increase in capacity itself is determined or made possible by technological, institutional and ideological advances or adjustments to various demands."

Theory of Infrastructure

Kamus Besar Bahasa Indonesia (KBBI) defines infrastructure as infrastructure. The availability of infrastructure is one of the important things in the context of developing economic development in a region. Infrastructure is also an important part of accelerating the process of national economic development. Infrastructure is believed to be one of the driving wheels of economic growth.

Road infrastructure is a land transportation infrastructure that includes all parts of the road, including complementary buildings and equipment intended for traffic on the surface of the land, below the surface of the land and / or water, as well as above the surface of the water, except railways, lorry roads, and cable roads.

Another infrastructure that is also very important for the regional economy is electricity. Electrical energy is one of the energy that is indispensable as one of the supporters of

production and daily life. The more advanced a region is, the need for electricity becomes a primary demand that must be met, not only for households but also for economic activities, especially industry. In an increasingly modern society, more and more households, industries, and community activities rely on energy sources from electricity.

Clean water is a vital necessity that is absolutely necessary in human life so that the procurement of this resource is included in development priorities. Efficient allocation of clean water must be based on the nature of liquid substances that are easy to flow, evaporate, seep, and exit through a certain medium (Wahyuni, 2009). The largest use of water based on the activity sector can be divided into three major groups, namely domestic needs, agricultural irrigation and industry. Domestic needs for the community will increase in line with population growth in both urban and rural areas. Water for agricultural irrigation purposes also continues to increase in order to meet the food needs of a growing population. Likewise in the industrial sector, which is increasing due to the economic structure that leads to industrialization.

3. METHODS

Type and Source of Data

The type of data used in this research is secondary time series data obtained from the Samosir Regency Central Bureau of Statistics (BPS) and other literature related to this research.

The data used in this study uses annual data starting from 2005 - 2021. The variables used are Economic Growth (Y), Road Infrastructure (X1), Water Infrastructure (X2), and Electricity Infrastructure (X3) in Samosir Regency.

Operational Definition of Variables

To clarify the variables to be analyzed in this study, it is necessary to formulate operational defines as follows:

- 1) Economic growth is the increase in overall community income that occurs in a region, the increase in opinion is the increase in all value added that occurs in the region (Tarigan, 2012). The economic growth used in this study is the economic growth of Samosir Regency from 2005 - 2021 in percent.
- 2) Road Infrastructure, The road infrastructure variable in this study is proxied by the length of the road is the entire length of the road (Km) in Samosir Regency in good condition, being damaged or severely damaged from 2005-2021.

- 3) Electricity Infrastructure, The electricity infrastructure variable in this study is proxied by the number of electricity customers in Samosir Regency registered with the State Electricity Company (PLN) from 2005 - 2021.
- 4) 4) Clean Water Infrastructure, The water infrastructure variable used in this study is the number of PDAM customers recorded by PDAM Tirtandai in Samosir Regency from 2005 - 2021.

Data Analysis Technique

The analysis techniques used in this research are descriptive analysis and quantitative analysis. Descriptive analysis aims to explain the development of infrastructure and economic growth in Samosir Regency using the help of tables and graphs. Meanwhile, quantitative analysis is used to explain the relationship between infrastructure variables and economic growth variables.

The relationship can be done with multiple regression models and using Ordinary Least Square (OLS) techniques. With the Ordinary Least Square (OLS) technique, it is expected to know the effect of infrastructure development consisting of road length (km), the amount of clean water, and the amount of electrical energy.

This research model is used to analyze the effect of economic infrastructure on economic growth by using Multiple Linear Regression Ordinary Least Square approach.

$$Y = \alpha + \beta_1 \text{Ln}X_1 + \beta_2 \text{Ln}X_2 + \beta_3 \text{Ln}X_3 + \varepsilon$$

Dimana:

Y = Economy Growth (%)

X₁ = Road Infrastructure

X₂ = Water Infrastructure

X₃ = Electricity Infrastructure

A = Constant (*Intersept*)

$\beta_1, \beta_2, \beta_3$ = Coeficient

ε = *Error Term*

4. RESULTS

From the calculation results with the SPSS 26 program, the following results were Obtained:

Table 1. Output SPSS

Model	Unstandardized Coefficients		Coefficients ^a			Correlations			Collinearity Statistics	
	B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part	Tolerance	VIF
1 (Constant)	171.598	55.391		3.098	.008					
LNX1	13.171	10.662	.705	1.235	.239	-.151	.324	.244	.120	8.321
LNX2	35.218	10.503	3.736	-3.353	.005	-.206	-.681	.663	.032	31.744
LNX3	13.064	3.920	2.948	3.333	.005	-.059	.679	.659	.050	20.005

a. Dependent Variable: PertumbuhanEkonomi

$$Y = \alpha + \beta_1 LNX_1 + \beta_2 LNX_2 + \beta_3 LNX_3 + \epsilon$$

$$Y = 171,598 + 13,171X_1 + 35,218X_2 + 13,064X_3 + \epsilon$$

The equation can be explained as follows:

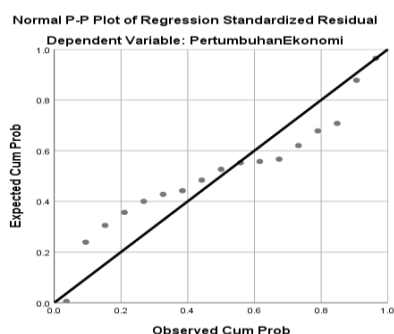
- a. The α value of 171.598 mathematically states that if the independent variables X1, X2, and X3 are equal to 0, then the value of Y is -171.598 units. In other words, the value of economic growth in Samosir Regency without road infrastructure, clean water infrastructure, and electricity infrastructure is 171.598 units.
- b. The regression coefficient of the road infrastructure variable (X1) of 13.171 units is positive, meaning that the policy in terms of road length variables on economic growth will increase by 13.171 units.
- c. The regression coefficient of the electricity infrastructure variable (X2) of 35.218 units is positive, meaning that the policy in terms of the variable increase in the number of PLN customers in Samosir Regency on economic growth in Samosir Regency will increase by 35.218 units.
- d. The regression coefficient of the clean water infrastructure variable (X3) of 13.064 units is positive, meaning that the policy in terms of the variable number of clean water customers at PDAM Tirtauli Samosir branch on economic growth in Samosir Regency will increase by 13.064 units..

Classical Assumption Test

Normality Test

Normality test is a test used to determine whether the residuals are normally distributed or not. Normality testing is carried out using the normal P-Plot graph method. From the graph results it can be seen whether the distribution of research data has a normal data distribution or

not. The distribution of data is said to be normal if the distribution of points follows the diagonal line or approaches the diagonal line.



Source: Research Results, 2022 (Data processed)

Figure 1. Scater Plot Normality Test

From the picture it can be seen that the distribution of points around the diagonal line and follow the direction of the diagonal line. This illustrates that the data is normally distributed.

Multicollinearity Test

Multicollinearity is a linear relationship that occurs between the independent variables Testing of multicollinearity symptoms can be done by calculating the Variance Inflation Factor (VIF) of the estimation results. If the Variance Inflation Factor (VIF) value is not more than 10 and the Tolerance value is not less than 0.1, then the model can be said to be free from multicollinearity.

Table 2. Multicollinearity test

Model	Unstandardized Coefficients		Standardized Coefficients			Correlations			Collinearity Statistics	
	B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part	Tolerance	VIF
1 (Constant)	171.598	55.391		3.098	.008					
LNX1	13.171	10.662	.705	1.235	.239	-.151	.324	.244	.120	8.321
LNX2	-35.218	10.503	-3.736	-3.353	.005	-.206	-.681	-.663	.132	9.744
LNX3	13.064	3.920	2.948	3.333	.005	-.059	.679	.659	.150	9.905

a. Dependent Variable: PertumbuhanEkonomi

From the results of the tolerance value in the table above shows:

- 1) Road length (in km) tolerance value $0.120 > 0.1$, VIF value $8.321 < 10$
- 2) Total clean water (in m3) tolerance value $0.132 > 0.1$, VIF value $9,744 < 10$
- 3) Total electrical energy (in KwH) tolerance value $0.150 > 0.1$, VIF value $9.905 < 10$

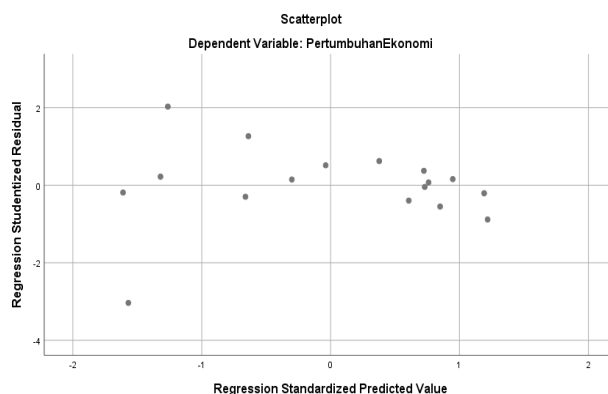
Based on this information, none of the tolerance values has a value less than 0.1, which means that in this regression there is no multicollinearity problem. The results of the calculation of the Variance Inflation Factor (VIF) value also show that there are no variables that are worth

more than 10. Therefore, it can be concluded that there is no multicollinearity between the independent variables in the regression model.

Heteroscedasticity Test

Heteroscedasticity test is used to test whether in the regression model there is an inequality of variance or residuals from one observation to another. One way to test for Heteroscedasticity is with the Scatter Plot test.

- a. This test is done by looking at the pattern of dots on the regression scatter plot.
- b. If the dots spread with an unclear pattern above and below zero on the Y axis, there is no heteroscedasticity problem.



Source: Research Results, 2022 (Data processed)

Figure 2. Scatter Plot of Heteroscedasticity Test

In the Scatterplot graph, it can be seen that the points spread randomly (random) and spread both above and below 0 on the Y axis. It can be concluded that there is no Heteroscedasticity problem in this study.

5. DISCUSSION

The results of this study are first, road infrastructure (X1) has a positive and insignificant effect on economic growth in Samosir Regency. The development and improvement of roads in Samosir Regency will affect the increase in economic growth in Samosir Regency. People need good road access to facilitate them in economic activities. The development carried out by the Samosir Regency Government to date has been going well, due to the existence of the Lake Toba Tourism Area which is a national super-priority destination in North Sumatra Province.

The results of this study are similar to the results of previous research conducted by Fitriyah (2021) which states that road infrastructure has a positive and insignificant effect on economic growth in East Java Province. The results of this study are also in accordance with

the theory that states roads have a dual function. On the one hand, roads have a function as a driver of economic growth by facilitating the flow of goods and services between production centers and marketing areas and vice versa. On the other hand, roads serve to reduce development imbalances between regions. Therefore, road development is the cornerstone of a region's development.

Second, electricity infrastructure (X2) at PLN Samosir Regency has a positive and significant effect on economic growth in Samosir Regency. The development of electricity infrastructure in Samosir Regency has an impact on the daily economic activities of the community. The community is helped by the provision of electricity by PLN so that the community can increase their income. The number of PLN electricity customers in Samosir Regency increases every year. The community can already enjoy electricity in villages around the Samosir Regency area.

The results of this study are the same as previous research conducted by Nanda (2021) which states that electrical infrastructure has a positive and significant effect on economic growth in West Sumatra Province. The thing that causes electrical infrastructure to have a positive and significant effect on economic growth in Samosir Regency is that it still depends on the agricultural sector and the processing industry which needs to use electrical energy.

Third, clean water infrastructure (X3) has a positive and significant effect on economic growth in Samosir Regency. The results of this study are the same as previous research conducted by Septi Indah Sari & Cut Putri Mellita Sari (2021) which states that clean water infrastructure has a positive effect on economic growth in South Sumatra Province. The results of this study are also in accordance with what states that clean water infrastructure is an important part of basic infrastructure that can have an influence on economic growth. In Samosir Regency, the amount of clean water is significant because most people in Samosir Regency use groundwater / boreholes / river water in their daily lives so that they are affected by the provision of clean water managed by PDAM Tirtanadi Samosir Regency.

Efforts to improve infrastructure conditions are recognized as playing an important role in reducing income inequality and its long-term impact on GDP per capita. Infrastructure improvements have contributed to increasing productivity and are expected to support economic growth in the long term. Referring to the World Bank publication in 1994 which states that infrastructure plays an important role in increasing economic growth where higher economic growth is found in areas with sufficient levels of infrastructure availability (Maryaningsih, et al, 2014).

Infrastructure can be classified as a public good. According to Stiglitz (2000), a pure public good is a good in which the marginal cost of providing it is zero from the increase in use (non-rivalry), and does not allow it to prevent someone from consuming the good (non-excludable). Infrastructure has a positive externality impact. An externality is a condition when the actions of a company or individual have an impact on other individuals or companies without having to pay for the impact (Stiglitz, 2000). As infrastructure is provided by the government, those who use the infrastructure do not pay directly for the use of infrastructure.

A significant increase in the infrastructure budget occurred during the transition of Joko Widodo's administration. The massive disbursement of funds in President Jokowi's era can be said to be a form of fulfillment of his promise to advance Indonesia economically through infrastructure development. According to Nurkse (1953), one of the factors and at the same time the main factor in economic development is the formation or collection of capital. Capital formation leads to the full utilization of existing resources. If capital formation leads to the proper use of natural resources and the establishment of various types of industries. Thus, the level of income increases and the various needs of the people are met. Finally, the increase in the rate of capital formation.

The condition of infrastructure in Samosir Regency in 2019 is very concerning so that it has a direct impact on the economic growth of Samosir Regency which is below the economic growth of North Sumatra Province. Therefore, the Samosir Regency Government should pay more attention to the development and maintenance of infrastructure in Samosir Regency so that people can live prosperously with increased economic growth in Samosir Regency.

6. CONCLUSION

Based on the results of data analysis and findings obtained, it can be concluded that:

- a. Road Infrastructure (X1) has a positive and insignificant effect on Economic growth in Samosir Regency.
- b. Electricity Infrastructure (X2) has a positive and significant effect on economic growth in Samosir Regency.
- c. Water infrastructure (X3) has a positive and significant effect on economic growth in Samosir Regency.
- d. Road infrastructure (X1), electrical infrastructure (X2), and water infrastructure (X3) have a significant effect together on economic growth in Samosir Regency.
- e. The dominant independent variable that has a significant effect on economic growth in Samosir Regency is electricity infrastructure (X2).

- f. The coefficient of determination (R^2) is 0.492 which means that 49.20% of the economic growth variable can be explained by the Road Infrastructure variable (X1), electrical infrastructure (X2), and water infrastructure (X3). while the remaining 50.80% is influenced by other variables outside this regression equation or variables not examined.

From the above conclusions, the author tries to express some suggestions, including the following:

1. The Samosir Regency Government needs to open up more opportunities for other parties (private) in road construction, especially in remote areas, so as not to overburden state finances so as to increase economic growth and per capita income of the people in Samosir Regency.
2. The Samosir Regency Government through the Samosir Branch of PDAM Tirtanadi needs to pay attention to the availability of clean water for the community in Samosir Regency so that the quality of life of the community can improve and help economic activities grow.
3. The Samosir Regency Government needs to reach people who have not experienced electricity services in remote villages in Samosir Regency by building electricity in villages so that people can be more productive in their economic activities.
4. This research still needs to be conducted further research that includes other variables such as educational facilities, health facilities, and other public service facilities in Samosir Regency.

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