

Analysis of the Effect of Basic Infrastructure and Human Resources on Gross Regional Domestic Product in Indonesia in 2017-2021

M. Razaka Fitrahmayudi¹, Ambya²

University of Lampung, Indonesia

E-mail: rafi021202@gmail.com¹, ambya.mahmud@gmail.com²

Abstract

Indonesia, an archipelago with a diverse and growing population of 278.69 million as of mid-2023, faces both advantages and challenges in its pursuit of becoming a developed country. The key challenge lies in the unequal distribution of infrastructure development, especially in remote areas. Economic growth, driven by increased goods and services, is closely tied to infrastructure such as roads, electricity, and water distribution. This study analyzes the impact of these infrastructural elements and labor force participation on economic growth, measured by Gross Regional Domestic Product (GRDP), across 34 provinces from 2017 to 2021. Using panel data regression, the results reveal that road length, electricity distribution, and clean water distribution have significant positive effects on GRDP. However, labor force participation shows an insignificant impact. Together, these variables explain 57% of GRDP growth. The findings highlight the critical role of infrastructure in economic development, with provinces like Jakarta leading the growth while regions like North Maluku lag behind. Improving infrastructure and addressing regional disparities are essential to enhancing Indonesia's overall economic performance.

Keywords infrastructure, labor force, road length, electricity distribution, clean water distribution, economic growth, gross regional domestic product

INTRODUCTION

Indonesia is a vast archipelago and also has a very large population. This huge population is a mixture of pluralistic and diverse populations ranging from ethnicity, religion, and race. The total population of Indonesia until mid-2023 was recorded at 278.69 million people, an increase of 1.05% compared to 2022 which amounted to 275.77 million people (Badan Pusat Statistik, 2023). The vastness of the territory and also the large population of Indonesia is certainly an advantage as well as a weakness for Indonesia to become a developed country. For example, one of the weaknesses is the development of adequate infrastructure that has not been evenly distributed and has not been felt by all Indonesian people, especially the Indonesian people who are in the outermost regions.

Economic growth can be used as one of the determining indicators in measuring the success of the government in carrying out development. Economic growth itself is an activity in the economy that ultimately causes the goods and services produced by the community to increase and the welfare of the community to increase. Economic growth created by the performance of the business world is expected to have a positive impact on poverty levels, increased employment, increased population welfare, and others affected by economic growth. Meanwhile, to measure the success of economic growth, there is one indicator that can be used, namely the Gross Regional Domestic Product (GRDP), both at current prices and at constant prices. Because basically GRDP is the total value added of goods and services produced by economic activities in a region within a certain period so that GRDP becomes



one of the indicators for measuring Economic Growth. In addition, GRDP can also be used as an assessment document for economic development activities carried out by both government and non-government institutions (Mudji & Taripar, 2017).

Growth, development, as well as equitable distribution of the economy can be realized with adequate infrastructure development. Infrastructure itself has an important role to encourage, expand the reach of the community, and also increase investment into the area, these things will certainly have an impact on equitable development, trigger economic growth to trigger Indonesia's economic development.

Infrastructure development in Indonesia has shown a positive trend in recent years. For example, basic infrastructure such as roads, electricity and water. The length of roads in Indonesia is increasing every year. This is because Indonesia continues to open new land that has not been explored for infrastructure access before from year to year. In 2016, the length of roads in Indonesia was 537,838km while in 2020 it has increased by 1.96% to 548,366km. As for the electricity distributed in 2016, 213,670GWh increased by 11.48% to 241,405GWh in 2020. Meanwhile, the distribution of clean water which was originally 3,285,785m³ increased by 32.37% to 4,350,726m³ (Badan Pusat Statistik, 2023). The increasing trend in the amount of basic infrastructure is certainly a benchmark that every year the Indonesian government develops infrastructure that meets the basic needs of the Indonesian people.

A country can grow faster than other countries if it has more production factors than other countries. The economic growth of a country is determined by the quantity and quality of production factors owned, both natural production factors (resource endowment) and human resource production factors (human resources). The difference in economic growth between industrialized countries and developing countries is due to the low quality of human capital in these developing countries. Mankiw et.al. (1992) found that 80% of the difference in economic growth between countries is due to physical and human capital factors, while the remaining 20% is due to other factors.

Human capital, apart from being seen from the quality of human resources, can also be seen from the Labor Force Participation Rate. According to Simanjuntak (2005), the labor participation rate is the number of labor force divided by the number of workers in the same group. The greater the labor force participation rate, the higher the labor force in a country. However, if a country has a larger labor force that is not classified as labor force, it will result in a smaller labor force participation rate. The higher the income, the greater the amount spent on goods and services because with With a large income, they tend to use the goods they need (Murwiati & Zulkarnain, 2023)

The percentage of labor force participation rate, which was 66.3% in 2016, increased by 1.9% in 2019, to 68.2%, while in 2020 there was a mass disaster of the Covid-19 pandemic which caused many unilateral terminations of employment which resulted in a decrease in the labor force participation rate by 0.8% to 67.4%, which resulted in an inevitable increase in unemployment (World Bank, 2023). The labor force participation rate shows a positive and significant value on GDP in 25 upper-middle income countries for the

period 2012-2021. This can be influenced by several factors such as the level of education, population growth, and the number of workers.

Economic growth measures developments from one period to the next. The occurrence of an increase in economic growth in a certain period of years can explicitly mean an increase in the value of goods and services produced in that period of years. Therefore, all development activities must be focused on efforts to increase economic growth (Khairul, 2017). One important indicator to determine the economic conditions in a country in a certain period is Gross Domestic Product data. Gross domestic product is the final value of all goods and services produced in the country within a certain period of time, including goods and services produced by other citizens living in the country (Badan Pusat Statistik, 2023). Economic growth can be measured using Gross Domestic Product (GDP) or using Gross Regional Domestic Product (GRDP) in a region (Rahardjo, 2013).

Indonesia's gross domestic product in 2016 was 12,401,728 billion rupiah, which is quite large for a developing country like Indonesia. In 2019 the gross domestic product increased by 3,430,807 to 15,832,535 billion rupiah. This means that Indonesia's GDP increased by 27.66%. The GDP development trend that continued until 2019 had to end in 2020 because unfortunately in 2020, the Covid-19 Pandemic hit Indonesia so that it had an impact on economic activities that took place domestically and from abroad which resulted in Indonesia's gross domestic product falling to 15,434,151 billion Rupiah or a decrease of 2.51% (Badan Pusat Statistik, 2023).

A country will experience good economic growth if the growth of gross domestic product always increases every year. However, in reality, according to the Central Bureau of Statistics (2023), the rate of economic growth fluctuates every year. This refers to data from the Central Bureau of Statistics which explains that Indonesia's economic growth rate since 2013 has been around 4%-5%, which then dropped in 2020 to record -2.07%. The government made efforts to save the economy through a national economic recovery program which resulted in an increase in Indonesia's economic growth rate in 2021 at 3.7%. Then it fluctuated again around 4%-5% in 2022 and the first quarter of 2023.

In practice, the development of infrastructure and human resources acts as an increase in the capacity of capital and labor to deal with both internal and external constraints. The quality of human resources, management, and the huge amount of costs while the budgetary capacity of the central and local governments is very limited, are some of the internal constraints. Meanwhile, weak public awareness, natural disasters and difficulties in land acquisition are some of the external constraints to infrastructure and human resource development.

According to Adam Smith, economic growth is caused by two main factors: total output growth and population growth. While the main elements that exist in the state system are three, namely:

1. Natural Resources
2. Human Resources (Total Population)
3. Existing stock of capital goods as it will determine the growth rate of output



$$Y = f(K, L, R, T)$$

Description:

Y : Economic Growth Rate

K : Stock of Capital Goods

L : Labor Force

R : Number/Type of Wealth Used

T : Technology Used

From the above equation we can conclude that referring to classical growth theory, the country's economic growth rate depends on the level of technological development, the role of capital in creating national income (marginal production of capital) multiplied by the rate of development of capital stock, and the role of labor in creating national income (labor productivity) multiplied by the rate of increase in labor (Arsyad, 2004: 60).

The concept of Gross Regional Domestic Product describes the economic level of a region, both goods and services produced by households, private and government in a region in a certain period. The entire production of goods and services produced by a region is recorded by GRDP so that GRDP can indirectly be used to measure economic growth in a region.

The concept of infrastructure is an integral element that can be used to promote economic operations by promoting the circulation of commodities and ideas. Any effort to increase and diversify production and expand trade, spread population, reduce poverty and improve environmental conditions requires infrastructure. In the Indonesian dictionary, infrastructure can be defined as public facilities and infrastructure. Commonly referred to as public facilities, such as roads, electricity, bridges, hospitals, ports. The Dictionary of Modern Economics states Infrastructure is a structural element of the economy that promotes the flow of goods and services between buyers and sellers. At the same time, The Routledge of Economics (1995) provides a broader definition of infrastructure. It is the main service of a country and contributes to economic activities and community activities to be carried out, namely by providing transportation and other supporting facilities.

In 1990 UNDP (United Nations Development Programme) in its report "Global Human Development Report" introduced the concept of "Human Development" as a new paradigm of development model. According to UNDP, human development is formulated as enlarging the choices of people, which can be seen as a process of efforts towards "expanding choices" and at the same time as the level achieved from these efforts. At the same time, human development can also be seen as the formation of human capabilities through improvements in health, knowledge and skills; as well as the utilization of their capabilities/skills. Humans are the subject of development, namely as the noblest creatures of God on this earth, whose dignity will be built. In line with the philosophy of Pancasila, Isran (2013, p.97) says that "humans are the most important development resource among other resources that will be built capabilities and strengths as implementers and drivers of development". Development is also assumed to be growth.

METHOD

This research is a type of quantitative descriptive research that conducts research on independent variables and dependent variables. Using panel data with the N value used in this study is from 2017-2021. Quantitative descriptive research itself is to explain by describing, describing, explaining, and also connecting between research and facts. Quantitative itself means using data and also numbers that are processed using the EViews application.

The type of data used in this study is secondary panel data obtained from the Central Statistics Agency (BPS). In addition, the data obtained is taken from publications by BPS, previous journals as well as previous theses, and other literature related to this research. The data uses annual data starting from 2017-2021. The variables used are Gross Regional Domestic Product (Y), Road Infrastructure (X1), Electricity Infrastructure (X2), Water Infrastructure (X3), and TPAK (X4) in Indonesia.

To identify the factors that influence economic growth in 34 provinces in Indonesia, a panel data regression equation is used. The dependent variable in this study is Economic Growth and the independent variables in this study are total road length, electricity distribution, clean water distribution, and labor force participation rate. For this reason, the equation function used in this study is:

$$\text{LOG}(PDRB_{it}) = \beta_0 + (\beta_1 PJ_{it}) + (\beta_2 DL_{it}) + \text{LOG}(\beta_3 DAI_{it}) + \beta_4 TPAK_{it} + e_{it}$$

Description:

GRDP	= Gross Regional Domestic Product
PJ	= Total Road Length
DL	= Electricity Distribution
DAI	= Clean Water Distribution
TPAK	= Labor Force Participation Rate
β_0	= Constant
$\beta_1 - \beta_4$	= Independent variable regression coefficient
e	= Error term
i	= Province
t	= Time

RESULTS AND DISCUSSION

Descriptive Statistical Analysis Results

Descriptive statistics is a method in statistical analysis used to describe and summarize the data that has been collected. This method can provide useful information about data properties such as data center, data variation, and data distribution. In this study, descriptive statistics are used to provide an explanation of the research variables, namely the value of Indonesian imports, oil imports, wheat imports, steel imports, gold prices. The results of descriptive analysis are in the form of data variables consisting of mean value, median value, maximum value, minimum value, and standard deviation.



Table 1. Descriptive Statistical Analysis

Variable	Obs	Mean	Std. Dev	Min	Max
PDRB (log)	170	5.193289	0.495095	4.365691	6.268596
PJ	170	15968.75	9945	3.183	42.521
DL	170	7127.761	12037.32	180.59	54.480.28
DAI (log)	170	4.720863	0.567834	3.674494	5.867516
TPAK	170	67.76047	3.413082	60.18	79.02

Multiple Linear Regression Results

Table 2. Multiple Linear Regression (REM Model)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.024678	0.671577	4.503843	0.0000
(PJ)	1.536485	7.20E-06	2.135366	0.0385
(DL)	1.245938	4.32E-06	2.881156	0.0028
log(DAI)	0.273338	0.060782	4.497038	0.0000
(TPAK)	0.008029	0.006192	1.296714	0.1598
R-squared				0.575754
F-statistic				19.38372
Durbin-Watson stat				1.415467

Source: Eviews 10 Output

Based on the above, it was found that three variables in the study had a significant positive effect, one variable had an insignificant positive effect, on economic growth in Indonesia at an error rate of 5%. The estimation results of the regression equation show that the coefficient of the road length variable (PJ), the electricity distribution variable (DL), the clean water distribution variable (logDAI) has a positive and significant coefficient on economic growth of Indonesian GRDP. Meanwhile, the labor force participation rate variable (TPAK) has an insignificant positive coefficient on the economic growth of Indonesian GRDP. The R² statistical value of 0.57 indicates that the length of roads, the amount of electricity distribution, the volume of clean water distribution, and the level of labor force participation affect the economic growth of GRDP by 57% (Gujarati 2007).

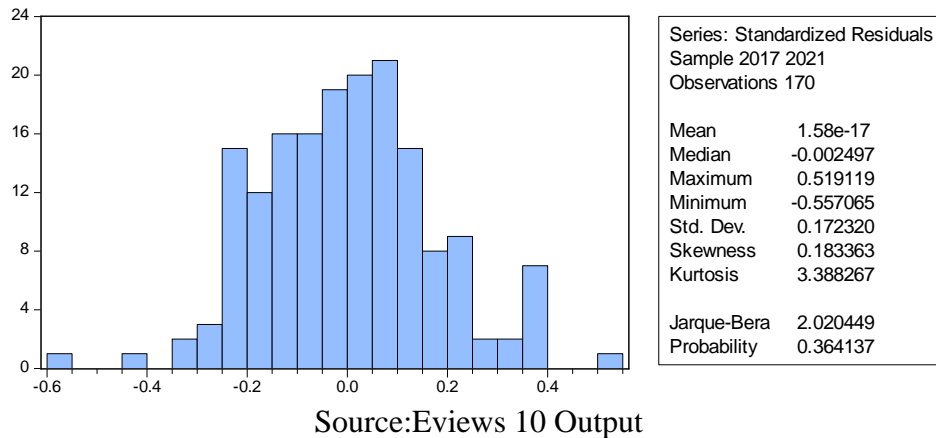
The following coefficients are obtained from the regression results:

$$\text{GRDP} = 3.024678 + 1.536485\text{PJ} + 1.245938\text{DL} + 0.273338\text{logDAI} + 0.008029\text{TPAK}$$

Classical Assumption Test

Residual Normality Test

Picture 1. Normality Test



Based on the results of the eviews output above, the Jarque-Berra probability value is 0.364137 greater than alpha 0.05 so that the null hypothesis is accepted or the residuals are normally distributed.

Multicollinearity Detection Result

Table 3. Multicollinearity Detection

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	0.753680	394.4868	NA
PJ	2.55E-11	4.725852	1.319120
DL	2.79E-11	2.877703	2.134791
logDAI	0.012185	144.2775	2.137257
TPAK	0.000126	303.3980	1.072025

Source: Eviews 10 Output

Based on the results of the eviews output above, it can be seen that the regression model does not have multicollinearity. This is evidenced by the Centered VIF value of the PJ variable of 1.319120, the DL variable of 2.134791, the DAI variable of 2.137257, and the TPAK variable of 1.072025, where the number is not more than 10, which means that the model does not have a multicollinearity problem.

Heteroscedasticity Test Result

Table 4. Heteroscedasticity Test

Dependent Variable: ABS(RES)

Variable	Prob	Description
PJ	0.1260	free from heteroscedasticity



DL	0.7051	free from heteroscedasticity
DAI	0.7896	free from heteroscedasticity
TPAK	0.2759	free from heteroscedasticity

Source: Output Eviews 10

Based on the results of the eviews output above, the t-statistic probability value of the three independent variables is greater than alpha (0.05) or statistically insignificant so it can be concluded that there is no heteroscedasticity problem in the model.

Autocorrelation Test Result

Table 5. Autocorrelation Test

R-squared	0.575754	Mean dependent var	2.254326
Adjusted R-squared	0.568394	S.D. dependent var	0.293276
S.E. of regression	0.244812	Sum squared resid	9.888926
F-statistic	19.38372	Durbin-Watson stat	1.415467
Prob(F-statistic)	0.000000		

Source: Output Eviews 10

From the random effect model used in this study, it shows that the durbin Watson stat value is 1.415467. With the number of observations of 170 and the number of independent variables is 4. So because 1.415467 is between -2 to +2, it can be concluded that there is no autocorrelation.

The Coefficient of Determination

The coefficient of determination (R^2) measures the level of accuracy or suitability of panel data regression, which is the percentage of contribution of independent variables to the variation (ups and downs) of the dependent variable. The value of R^2 is between 0 (zero) and 1 (one), namely $0 < R^2 < 1$. If R^2 is closer to 1, then the model is getting better and the influence on the dependent variable is getting stronger. Based on the results of the random effect model regression calculation, the coefficient of determination or R^2 is 0.575754, while the adjusted R^2 value is 0.568394. Thus it can be concluded that road length, electricity distribution, clean water distribution, and labor force participation rate explain 57.5% of changes in gross regional domestic product in Indonesia while the remaining 42.5% is represented by other more significant supporting variables of gross regional domestic product changes.

CONCLUSION

The Road Length variable has a significant effect on GRDP. The results of panel data regression using the Random Effect method provide information that road length has a significant effect on GRDP of provinces in Indonesia. By involving all 34 provinces in the

modeling estimation, it shows that partially road length has a significant effect on GRDP. This means that the addition of road length means that the level of GRDP will increase.

Electricity Distribution variable has a positive effect on GRDP. The results of panel data regression using the Random Effect method provide information that Electricity Distribution has a positive effect on Provincial GRDP in Indonesia. By involving all 34 provinces in the modeling estimation, it shows that partially Electricity Distribution has a significant positive effect on GRDP. This means that the higher the Electricity Distribution in a Province will increase GRDP.

The Clean Water Distribution variable has a positive effect on GRDP. The results of panel data regression using the Random Effect method provide information that Clean Water Distribution has a positive effect on Provincial GRDP in Indonesia. By involving all 34 provinces in the modeling estimation, it shows that partially Clean Water Distribution has a significant positive effect on GRDP. This means that the higher the Clean Water Distribution in a Province will increase GRDP.

The TPAK variable has no significant effect on GRDP. The results of panel data regression using the Random Effect method provide information that TPAK has a positive and insignificant effect on GRDP of provinces in Indonesia. By involving all 34 provinces in the modeling estimation, it shows that partially TPAK has an insignificant positive effect on GRDP. This means that the higher the TPAK in a province will not have an impact on a significant increase in GRDP.

The variables of Road Length, Electricity Distribution, Clean Water Distribution, and TPAK together have a significant positive effect on GRDP. The results of panel data regression using the Random Effect method provide information on the positive effect on GRDP of provinces in Indonesia. By involving all 34 provinces in the modeling estimation, it shows that cumulatively road length, electricity distribution, clean water distribution, and TPAK have a significant positive effect on GRDP. DKI Jakarta Province is the province whose infrastructure and human resources have the greatest effect on Indonesia's GRDP, while North Maluku Province is the province whose infrastructure and human resources have the lowest effect on Indonesia's GRDP.

REFERENCES

- Ambya, A. (2020). How Government Spending on Public Sector Affect The Economic Growth? *Jurnal Ekonomi dan Kebijakan*, 13(1), 218-229.
- Amri, Khairul. 2017. "Analisis Pertumbuhan Ekonomi dan Ketimpangan Pendapatan: Panel Data 8 Provinsi di Sumatera". *Jurnal Ekonomi dan Manajemen Teknologi*, Volume 1, Nomor 1.
- Arsyad, L. 2008. *Ekonomi Manajerial*. DIY: Universitas Gadjah Mada.
- Badan Pusat Statistik Indonesia. 2023. *Listrik Yang Didistribusikan Kepada Pelanggan*. <https://www.bps.go.id/indicator/7/314/1/listrik-yang-didistribusikan-kepada-pelanggan.html> (Diakses: 14 Maret, 2023).



- Badan Pusat Statistik Indonesia. 2023. *Jumlah Air Bersih yang Disalurkan Perusahaan Air Bersih*. <https://www.bps.go.id/indicator/7/115/1/jumlah-air-bersih-yang-disalurkan-perusahaan-air-bersih.html> (Diakses: 14 Maret, 2023)
- Badan Pusat Statistik Indonesia. 2023. *Jumlah penduduk pertengahan tahun*. <https://www.bps.go.id/indicator/12/1975/1/jumlah-penduduk-pertengahan-tahun.html> (Diakses: 19 Juni, 2023)
- Badan Pusat Statistik Indonesia. 2023. *Panjang Jalan Menurut Jenis Permukaan*. <https://www.bps.go.id/indicator/17/51/1/panjang-jalan-menurut-jenis-permukaan.html> (Diakses: 14 Maret, 2023)
- Badan Pusat Statistik Indonesia. 2023. *Panjang Jalan Menurut Provinsi Di Indonesia (Km) 2017-2021*. Jakarta: Badan Pusat Statistik
- Badan Pusat Statistik Indonesia. 2023. *Panjang Jalan Menurut Tingkat Kewenangan*. <https://www.bps.go.id/indicator/17/50/3/panjang-jalan-menurut-tingkat-kewenangan.html>. (Diakses: 20 Juni, 2023)
- Badan Pusat Statistik Indonesia. 2023. *PDRB Atas Dasar Harga Konstan 2010 Menurut Provinsi (milyar Rupiah) 2017-2021*. Jakarta: Badan Pusat Statistik
- Badan Pusat Statistik Indonesia. 2023. *Tingkat Pengangguran Terbuka dan Tingkat Partisipasi Angkatan Kerja Menurut Provinsi 2017-2021*. Jakarta
- Mankiw, N.Gregory, 2001. *Principles of Economics*, (Alih bahasa: Aris Munandar), Erlangga, Jakarta.
- Mudji, A & Taripar, W. (2017). Analisa Produk Domestik Bruto (PDRB) Kota Malang. *Jurnal Pangripta*, 1(1), 35-46.
- Murwiati, A., & Zulkarnain, R. (2023). Analisis Pengaruh Produk Domestik Regional Bruto, Keluarga Penerima Manfaat, dan Inflasi Terhadap Konsumsi Rumah Tangga Di Indonesia Dengan Regresi Kuantil. *Journal of Social Science Research*, 3(2), 8631–8643
- Pratama, R. I., & Taher, A. R. Y. (2024). Kontrol Korupsi, Nilai Tukar Perdagangan, Tingkat Partisipasi Angkatan Kerja, dan Utang Jangka Pendek Serta Pengaruhnya Terhadap Perekonomian di 25 Negara Upper-Middle Income. *EKOMA: Jurnal Ekonomi, Manajemen, Akuntansi*, 3(4), 1487-1498.
- Simanjuntak, P. 2005. *Pengantar Ekonomi Sumber Daya Manusia*. LPFEUI.
- World Bank. 2023. *Labor Force Participation Rate, total - Indonesia*. <https://data.worldbank.org/indicator/SL.TLF.CACT.NE.ZS?locations=ID&view=chart> (Diakses: 28 Mei, 2023)