



# **ANALYSIS OF THE EFFECT OF PHYSICAL INFRASTRUCTURE DEVELOPMENT ON THE GRDP LEVEL OF CENTRAL JAVA PROVINCE 2016-2020**

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**ABSTRACT-** *This study aims to analyze the effect of physical infrastructure development on the level of Gross Regional Domestic Product (GRDP) in Central Java Province in 2016-2020. The data used in this study is data on the provision of clean water and health facilities in Central Java Province in 2016-2020 which were obtained from the Central Statistics Agency (BPS) of Central Java Province. The data analysis used in this research is panel data regression. Based on the results of the Panel Data Regression estimation and hypothesis testing, it was found that clean water and health had a positive and significant impact on GRDP in Central Java in 2016-2020.*

**Keywords:** *Gross Regional Domestic Product (GRDP), Clean Water Supply, Health Facilities*

**ABSTRAK -** Penelitian ini bertujuan untuk menganalisis pengaruh pembangunan infrastruktur fisik terhadap tingkat Produk Domestik Regional Bruto (PDRB) di Provinsi Jawa Tengah pada Tahun 2016-2020. Adapun data yang digunakan dalam penelitian ini adalah data pengadaan air bersih, dan fasilitas kesehatan di Provinsi Jawa Tengah tahun 2016-2020 yang diperoleh dari Badan Pusat Statistik (BPS) Provinsi Jawa Tengah. Analisis data yang digunakan dalam penelitian ini adalah regresi data panel. Berdasarkan hasil estimasi Regresi Data Panel dan uji hipotesis, ditemukan bahwa air bersih, dan kesehatan berpengaruh positif dan signifikan terhadap PDRB di Jawa Tengah tahun 2016-2020.

**Kata Kunci :** Produk Domestik Regional Bruto (PDRB), Pengadaan Air Bersih, Fasilitas Kesehatan

## **INTRODUCTION-**

The process of trade between regions can run smoothly due to the development of advanced infrastructure. Economic development can increase due to increased productivity, factors of production, increased population movement, and goods and services. To increase prosperity, and achieve social justice for local communities, regional economic development is needed, which is commonly referred to as infrastructure development, while at the same time increasing the rate of economic growth of a region.

According to (David Ray. 2016) in (Sumadisa, Ni Made, and I.G.A.P Wirathi.2016) claim Long-term problems that are often a challenge in infrastructure development in Indonesia, one

of which is the planning and construction of roads that are not appropriate and need to be redesigned thoroughly in order to maintain economic growth in Indonesia. No action has been taken to resolve this issue. However, efforts to enforce regulations appear to have emerged a new influx of private investment. This new flow of private investment plays a role in the drinking water sector which has real and economic risk allocation in public private partnerships.

Water is one of the categories of resources controlled by the State as mandated in the 1945 Constitution, Article 33, Paragraph 3, stating that water is controlled by the state, and is fully utilized for the prosperity of the people. In carrying out the conservation of water resources, the Regional Government must be able to improve clean water infrastructure and ensure its wise use, and ensure the continuity of its supply, maintain the unavoidable quality and value of every business activity by anyone involved, including business actors and the community. World Health Organization explain about describes the meaning of health which is a state of physical, mental and social well-being without stress. Health infrastructure is an important aspect because almost all aspects of people's lives are mutually sustainable.

The role of infrastructure is very important for the level of GRDP. Infrastructure has a considerable influence on improving the quality of life and human welfare as well as economic growth. Therefore, progress in infrastructure development is very important so that economic facilities are adequate and economic activities run smoothly. Thus the level of GRDP of Central Java Province increases.

Table 1.1 [series 2010] Gross Regional Domestic Product (million Rupiah) of Central Java Province 2019-2020 at 2010 Constant Prices

Years	Gross Regional Domestic Bruto (GRDP)
2016	849099354,69
2017	893750296,17
2018	941091143,86
2019	991516543,31
2020	965225709,06

Source: BPS (processed)

Infrastructure development carried out with the hope of facilitating state/regional economic activities. The economic rate of Central Java Province is explained through GRDP on the basis of 2010 constant prices as a whole sector from 2016-2020 which is presented in table 1.1. There is an increase in the Gross Regional Domestic Product (GRDP) of Central Java Province in 2016-2020 experiencing a positive trend. Although there was a decline in 2020. This decline was due to several sectors experiencing a decline. This decrease was found in the districts/cities that were most severely affected by the Covid-19 pandemic. The layoffs in several sectors hampered and reduced the level of Gross Regional Domestic Product (GRDP) in Central Java Province

Based on the background that has been described, the purpose of this planned research is to test, analyze, and find out how the influence of road, water and health infrastructure development on the level of Gross Regional Domestic Product (GRDP) of Central Java Province in 2016-2020

## **LITERATURE REVIEW-**

### **A. Economic Growth**

According to (Boediono.2012) in (Fatmawati, Inna.2015) claims that economic growth is an increase in the number of long-term per capita expenditures that prioritizes processes, outputs and the long-term economy within a certain period of time. a country that is developed for its economy is proof that the country's per capita income has increased significantly compared to the previous year. a successful economic growth is shown by how the process and results of an economic development in the region.

### **B. Gross Regional Domestic Product (GRDP)**

GRDP provides a basis for measuring the added value of goods and services produced by business units from the economic activities of a particular region. GRDP (ADHB) at current prices is income that is allowed by residents of the area and is the added value of a good or service calculated using the price of the year concerned. Constant price GRDP (ADHK), on the other hand, is an evolution of the actual production of goods and services produced by regional economic activities.(BPS.2021)

### **C. Road Infrastructure**

Road infrastructure is a physical infrastructure designed to connect an area with other areas, in addition to advancing the economic development of the community. The existence of road infrastructure affects variable costs and fixed costs that must be borne by economic actors. However, the implementation of road infrastructure procurement is the responsibility of the government, not the private sector. Not only is private construction expensive or very expensive for economic activity, but the existence of road infrastructure has a significant impact on transportation costs. Low shipping costs allow producers to distribute their products to rural and remote areas more quickly, effectively and efficiently, and local people can buy goods and services cheaply and easily.

### **D. Water Infrastructure**

With the spirit of sustainable development in the field of drinking water and sanitation, it is one of the important points that must be met by the government so that the community can take advantage of the potential of existing natural resources.(Saniti.2012) in (Wadu Ludovikus Bomans,dkk.2020)

According to (Setyoad.2014) in (Wadu Ludovikus Bomans,dkk.2020) efforts to develop drinking water and sanitation facilities in certain areas can be successful and have a positive impact on community environmental health which contributes to increasing community productivity to reduce negative impacts and fight community inequality.

### **E. Health Infrastructure**

Expansion of health infrastructure development is one way to advance the development of a country which is supported by almost all areas of life. The purpose and objective of this health infrastructure development is to increase awareness, enthusiasm, and ability of all parties to achieve maximum quality of welfare. Maximum health facilities must also be available to achieve optimal health. Health services and other health services through hospitals and health centers are expected to improve the quality of health that reaches the entire community in order to achieve equitable health development. The development of

health infrastructure, both quantitatively and qualitatively, will encourage an increase in regional income.

## METHODS

The analytical tool that will be used in this research is panel data analysis. Where this study will examine the analysis of the influence of infrastructure on the growth rate of GRDP of Central Java Province for the 2016-2020 period. In analyzing the variables that affect the level of Gross Regional Domestic Product, the econometric model estimation stage will include: parameter estimation of panel data model with Pooled Least Squares (PLS) or Common Effect Model (CEM) approach, Fixed Effect Model (FEM), and Random Effect Model (BRAKE); selection of the best estimator model with Chow Test and Hausman Test; model goodness test (model existence test and coefficient of determination) on the selected estimator model; and test the validity of the effect on the selected estimator model. So that it can be arranged with an econometric model as follows:

$$GRDP_t = \beta_0 + \beta_1 \text{Road Infrastructure} + \beta_2 \text{Water Infrastructure} + \beta_3 \text{Health Infrastructure} + \varepsilon_t$$

Where :

GRDP	: Gross Regional Domestic Product (GRDP) million
$\beta_0$	: Konstanta
Road Infrastructure	: highway length (km)
Water Infrastructure	: Clean Water Supply (m <sup>3</sup> )
Health Infrastructure	: Medical facility (unit)
$\beta_0$	: Constanta
$\beta_1 \dots \beta_3$	: Regression coefficient
$\varepsilon$	: <i>error term</i>
$i$	: Subscrip Place
$t$	: Subscrip time

### ***Good Model Determination***

#### ***A. Common Effect Model***

The simplest panel data regression approach in determining model estimates that combines all cross section data and time series data. In the common effect model, the behavior of the data for each individual is the same in various time periods. Thus, parameter estimation in the common effect model is carried out by combining cross section data and time series data as a unit without looking at time and individual differences. (Widarjono.2013)

#### ***B. Fixed Effect Model***

The method that can be used for model estimation in FEM is the Least Square Dummy Variable method or what is often called LSDV. In the LSDV method, estimation is done by entering a dummy variable which is used to explain the different intercept values due to differences in unit values. (Pangestika.2015)

#### ***C. Random Effect Model***

The application of the fixed effects approach has an impact on the reduction of degrees of freedom which is quite significant if we are faced with the number of cross section units. Then, eventually will reduce the efficiency of the estimated parameters. , it is necessary to have another approach which is also known as the Random Effect Model (REM).

### **Panel Data Testing Method**

#### **A. Chow Test (Likelihood Test)**

Tests to determine the most appropriate Fixed Effect or Random Effect model used in estimating panel data.

- Hypothesis formulation  
 $H_0$  : PLS (*Pooled Least Square*) model is better than *Fixed Effect Model*  
 $H_A$  : FEM (*Fixed Effect Model*) model is better than *Pooled Least Square*
- Determining the degree of significance ( $\alpha$ ) = 0,1 %
- Define test criteria  
 $H_0$  is accepted when the p-value is  $> \alpha$   
 $H_A$  is accepted when the p-value is  $\leq \alpha$

#### **B. Hausman Test**

After performing the Chow test, the next step is to determine the most appropriate model between Fixed Effect Model or Random Effect Model, this test is called the Hausman test. The Hausman test statistic follows a chi-square distribution with degrees of freedom the number of independent variables (k).

- Hypothesis formulation  
 $H_0$  : REM model (Random Effect Model) is better than FEM (*Fixed Effect Model*)  
 $H_A$  : FEM (Fixed Effect Model) model is better than REM (*Random Effect Model*)
- Determining the degree of significance ( $\alpha$ ) = 0,1 %
- Determine test criteria  
 $H_0$  is accepted when the p-value is  $> \alpha$   
 $H_A$  is accepted when the p-value is  $\leq \alpha$

### **Goodness Test Model**

#### **A. R Square ( $R^2$ )**

The coefficient of determination ( $R^2$ ) is used to determine the percentage of variation in the independent variable that can carry out the dependent variation. The regression accuracy level of  $R^2$  ranges from  $0 \leq R^2 \leq 1$ . The greater the value of  $R^2$ , the more precise a linear line is used as an approximation. If the approach value of  $R^2$  is equal to 1 then the approach is absolutely perfect.

#### **B. F Test (Simultaneous)**

The model exists if all free variables simultaneously have an influence on bound variables. The model existence test is the F test. In this study, the temporary conjecture is  $H_0 : \beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$  , free variables simultaneously have no effect on bound variables;  $H_A: \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq 0$  , the free variable simultaneously affects the bound variable. The null hypothesis is not rejected if the statistical probability value of  $F > \alpha$ .; the null hypothesis is not accepted if the probability value of  $F \leq \alpha$ .

#### **C. Partial Regression Coefficient Test (t-test)**

The t-test is used to determine whether the independent variables partially have a significant effect or not on the dependent variable. The degree of significance used is 0,1. If  $t \text{ count} > t \text{ table}$  then this indicates that the independent variable has a significant effect on the dependent variable and vice versa, if  $t \text{ count} < t \text{ table}$  then this means that the independent variable has no significant effect on the dependent variable.

## RESULT

### *Panel Data Testing Method*

#### A. *Chow Test (Likelihood Test)*

Tests to determine the most appropriate Fixed Effect or Random Effect model used in estimating panel data. The results of the Chow test are :

Table 1

Effect Test	Statistic	d.f.	Prob.
Cross-section F	422.797321	(34,137)	0.0000

*Source* : Ouput results regression of panel data using Eviews10

Based on the results of the regression, it can be concluded that the probability F–statistical Chow test is 0.0000 ( $< 0.1$ ),  $H_0$  is rejected so that the model follows the Fixed Effects Model (FEM) approach.

#### B. *Hausman Test*

The Hausman test is a test to determine the right *Fixed Effect Model* or *Random Effect Model* to use in estimating panel data. The results of the hausman test are:

Table 2

Test Summary	Chi-Square Statistic	d.f.	Prob.
Cross-section random	27.934698	3	0.0000

*Source* : Ouput results regression of panel data using Eviews10

Based on the results of the regression, it can be concluded that it can be seen that the probability of  $\chi^2$  Hausman's test statistic is 0.0000 ( $< 0.1$ ), so  $H_0$  is rejected, which means the model follows the Fixed Effect Model (FEM) approach.

The results of the Chow test and Hausman test above conclude that the selected estimator model is the Fixed Effect Model (FEM). Complete FEM estimation results are:

Table 3

$\widehat{PDRB}_{it} = -63679.03 + 30.09043X1_{it} + 0.000499X2_{it} + 35.62630X3_{it}$			
	(0.0001)*	(0.0000)*	(0.0002)*
$R^2 = 0.995370$ ; DW-stat. = 0.864085; F-stat = 795.9584; Prob.F-stat. = 0,0000			

Sources: \* significant on  $\alpha = 0,01$ ; \*\*significant on  $\alpha = 0,05$ ; \*\*\*significant  $\alpha = 0,10$ ; the number in brackets is the t-statistical probability value.

The results of the estimation of the panel data regression equation obtained in this study are :

$$GRDP_t = -63679.03 + 30.09043Road\ Infrastructure_{it} + 0.000499Water\ Infrastructure_{it} + 35.62630Health\ Infrastructure_{it} + \varepsilon_t$$

### **Coefficient of Determination Interpretation ( $R^2$ )**

Based on table 3 shows that the R-square ( $R^2$ ) value of the estimated model, namely the Fixed Effect Model (FEM) is 0.995370. This value shows that the ability of the variable length of highways, clean water, and health facilities is able to explain the variation of the GRDP variable by 99%, while the remaining 1% is explained by variables other than the variables used in this study.

### **FEM Estimated Model Existence Test (F test)**

The model exists when at least one independent variable affects the dependent variable (not all regression coefficients are zero). The model existence test is the F test. Because the best estimated model FEM (Fixed Effect Model) there are 3 independent variables, the formulation of the hypothesis is:  $H_0: \beta_1 = \beta_2 = \beta_3 = 0$  (regression coefficient of all four variables is zero or the model doesn't exist);  $H_A: \beta_1 \neq \beta_2 \neq \beta_3 \neq 0$  (at least one regression coefficient is not equal to zero or the model exists).  $H_0$  is not rejected if the p value (p value), probability, or empirical statistical significance  $F > \alpha$ ;  $H_0$  will be rejected if the p value (p value), probability, or statistical empirical significance  $F \leq \alpha$ . Based on Table 3, it can be seen that the p value (p value), probability, or empirical significance of the F statistic is 0.0000 ( $< 0.1$ ). So,  $H_0$  rejected. In conclusion, the FEM estimated model exists.

### **Partial Regression Coefficient Test (t-test)**

Tabel 4. T Test Panel Data Regression Results

Variabel	Prob t-Stat	Criteria	conclusion
Road Infrastructure	0.0001	$< 1$	Signifikan pada $\alpha 0,01$
Water Infrastructure	0.0000	$< 1$	Signifikan pada $\alpha 0,01$
Health Infrastructure	0.0002	$< 1$	Signifikan pada $\alpha 0,01$

Based on the results of the t-test regression in this study, it was found that the length of the highway, clean water, and health had a positive and significant effect on GRDP in Central Java in 2016-2020..

## **DISCUSSION**

The length of the road will affect Central Java's GRDP from 2016 to 2020. Road infrastructure is transportation In the economy of a region, roads function to support the regional economy. Roads are access from one area to another. According to this feature, roads play an important role in increasing GRDP and reducing disadvantaged areas. found that the length of the highway had a positive influence on GRDP in Palopo City in 2010-2017. The regional economy is highly dependent on road infrastructure facilities that open access to other regions, thereby increasing economic growth.(Warsilan.2015)

Based on the regression results, clean water has an influence on GRDP in Central Java in 2016-2020. Water infrastructure has a positive influence on GRDP, this is due to the relationship between physical infrastructure and the level of GRDP which can be explained through the role of infrastructure in an effort to significantly increase the productivity of workers who are used as inputs in the production process. GRDP. According to (Noor.2015) in research (Saputra ,Nur Dendi.2021) clean water has a positive influence on the level of GRDP. This can happen because in the production process there is a significant relationship between physical infrastructure and the level of GRDP. The high and low production yields greatly affect the productivity of workers in real terms.

Regression results show that there is a positive influence between health infrastructure and GRDP in Central Java. Family welfare goals are achieved if there is an increase in the development of health infrastructure which is closely related to almost all aspects of life. The purpose of this health infrastructure development is as an effort to increase awareness, willingness and ability to live healthy for everyone in order to have optimal quality of welfare. To achieve optimal health conditions, there must be maximum health facilities. (Sartiyah.2016)

## **CONCLUSION**

Based on the discussion of the results of the research analysis, several conclusions can be drawn as follows

1. Based on the results of the regression in this study the selected model is the Fixed Effect Model (FEM) model.
2. Based on the results of the t-test regression in this study it was found that the length of the highway, clean water, and health had a positive and significant effect on GRDP in Central Java in 2016-2020
3. Based on the results of the F test regression in this study, it was found that the model used existed
4. Based on the results shows that the R-square ( $R^2$ ) value of the estimated model, This value shows that the ability of the variable length of highways, clean water, and health facilities is able to explain the variation of the GRDP variable by 99%, while the remaining 1% is explained by variables other than the variables used in this study.



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