

STUDY OF ECONOMIC GROWTH THROUGH THE ENVIRONMENTAL QUALITY INDEX ON THE ISLAND OF KALIMANTAN

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Abstract

This study examines the relationship between economic growth and environmental quality in four provinces on the island of Kalimantan: West Kalimantan, Central Kalimantan, South Kalimantan, and East Kalimantan, during the period from 2013 to 2020. The focus of this research is to analyze the impact of government spending, domestic investment, and labor productivity on the Environmental Quality Index (EQI) and economic growth in each province. The background of this research relates to the issue of sustainable economic development in Kalimantan, which faces significant challenges such as deforestation, pollution, and climate change. While economic growth, reflected by Regional Gross Domestic Product (RGDP), has benefited societal welfare, it has also negatively affected environmental quality. This quantitative study employs panel data regression analysis and path analysis methods to evaluate data on government spending, domestic investment, labor productivity, EQI, and economic growth from 2013 to 2020. The regression results indicate that government spending negatively impacts both EQI and economic growth, while domestic investment and labor productivity positively affect both. Additionally, EQI negatively influences economic growth. Path analysis reveals no indirect effect of government spending, domestic investment, and labor productivity on economic growth through EQI. The findings suggest a negative relationship between economic growth and environmental quality, where increased economic growth tends to decrease environmental quality. This research aims to contribute to policymaking related to sustainable economic development, particularly in balancing economic growth with environmental preservation in Kalimantan. Furthermore, it may serve as a reference for future studies focusing on similar topics.

Keywords: Panel Data, Path Analysis, Economic Growth, Environmental Quality Index, Government Spending, Domestic Investment, Labor Productivity, Kalimantan.

Introduction

The issue of linkages between economic growth and environmental quality is an important concern in sustainable development, especially in Kalimantan. The region is facing extreme environmental changes such as forest fires, floods, and global warming that indicate a decline in environmental quality. Kalimantan is the largest island in Indonesia with abundant natural resources, and natural resources are an important factor in economic growth activities and regional development. However, while economic growth brings benefits to development and people's welfare, it often has a negative impact on environmental quality. This creates a complex relationship between economic growth and the environment. Kalimantan, with its significant natural resources, is a clear example where economic growth goes hand in hand with challenges in maintaining environmental quality (Akbar et al., 2021; Bieth, 2021; Damayanti & Chamid, 2016).

In this context, policy instruments are needed to ensure sustainable development that takes into account environmental management. These instruments have been regulated in various regulations, including Law Number 32 of 2009 concerning Environmental Protection and Management. In addition, the implementing regulations are contained in Government Regulation Number 46 of 2016 concerning Procedures for Conducting Strategic Environmental Assessments. To get a clear picture of the problems that occur in the environment and their influence on economic growth on the island of Kalimantan itself, it is necessary to look at indicators that can affect the quality of the environment and economic growth in each region on the island of Kalimantan (Huang, 2018; Idris, 2012; Nikensari et al., 2019).

Economic growth is one of the benchmark indicators of the development of development activities of each country or region. Economic growth can be measured by Gross Regional Domestic Product (GRDP) at the regional or provincial level using GRDP at constant prices (ADHK). The quality of the environment is described through the Environmental Quality Index (IKLH) created in 2009. The environmental quality index (IKLH) is a picture or initial indication that provides a quick conclusion of a living environment within the scope of a certain period (Febriana, Selly., Diartho, H. C., Istiyani, 2019; Fitri, 2015; Haq & Imamudin, 2018).

Based on several previous studies, the relationship between economic growth and environmental quality has an inverse relationship where if economic growth increases the quality of the environment (IKLH) decreases, where in research (Wafiq & Suryanto, 2021) GRDP in 33 provinces in Indonesia has a negative effect on environmental quality, and also in research (Aida et al., 2022) that an increase in economic growth reduces the quality of the environment in Indonesia.

An indicator that is believed to influence the high and low economic growth and environmental quality index (IKLH) is government spending. The role of government spending in driving the economy and improving environmental quality is important. Local governments can use these funds to implement an environment-based budget in accordance with Law Number 32 of 2009 concerning Environmental Protection and Management Article 45 paragraph 1 to finance environmental protection and management activities and environmentally sound development programs. In an effort to increase economic growth and sustainable development, the indicator that can influence is investment. Based on Law no. 25 of 2007 in article 3 where investment is based on the principle of one of the principles of sustainable, environmentally sound. Indonesia, especially Kalimantan Island, has the potential and diversity of abundant natural resources and opens up opportunities to be managed through investment activities (Kjellstrom et al., 2009; Puspitasari & Yuliawan, 2023; Syabilla et al., 2021).

Another indicator that can affect economic growth and environmental quality is labor productivity. Productivity and growth are two indicators that cannot be separated. Productivity has always been the main concern of entrepreneurs and governments, as it is a basic measure of efficiency. Economic growth is defined as an increase in community output caused by the increasing number of factors of production used in the production process without any change in the methods or technology itself (Fatoni et al., 2021). Labor productivity can also affect the state of environmental quality in the area around economic activities carried out where between productivity and environmental quality have a complex relationship where to increase labor productivity requires a safe, healthy and conducive environment to increase the productivity of the output of goods produced.

The relationship between economic growth and changes in environmental quality is one of the indicators of sustainable development carried out by local governments. The goal is to protect the environment while ensuring that regional economic development continues to run well.

Based on the background description and the data described, the researcher tries to further examine the indicators that can affect economic growth and environmental quality in 4 provinces on the island of Kalimantan, with the title "Study of Economic Growth Through the Environmental Quality Index on the Island of Kalimantan".

Research Methods

This research is a type of quantitative research using panel data regression analysis with path analysis method and secondary data analysis. There are 3 (three) independent variables that will be examined, namely: Direct expenditure; Domestic investment (PMDN); and labor productivity, 1 (one) intervening variable, namely the environmental quality index (IKLH) and 1 (one) dependent variable, namely economic growth. This study uses data for the period 2013 to 2020 in 4 (four) provinces on the island of Kalimantan, namely West Kalimantan, Central Kalimantan, South Kalimantan, and East Kalimantan.

Results and Discussion

The calculation in this study uses path analysis which is the development of multiple regression analysis and uses panel data, this research was conducted to determine and analyze direct spending, domestic investment (PMDN) and labor productivity on economic growth (GDP) through the environmental quality index. The program used in this research is Eview 9 on equation model 1 (1.3) and equation model 2 (1.4).

Based on model selection testing for equation model 1, the Fixed Effect Model was selected and equation model 2, the Random Effect Model was selected. Then the panel data regression results in this study can be determined.

Table 1. Panel Data Regression Results Model Equation 1

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-192.6669	186.2554	-1.034423	0.3108
LOG(BLX1)	-7.305804	3.319345	-2.200978	0.0372
PMDNX2	2.73E-13	1.25E-13	2.184459	0.0385
LOG(PTKX3)	25.65047	10.49272	2.444598	0.0219
Effects Specification				
Cross-section fixed (dummy variables)				
R-squared	0.858096	Mean dependent var	70.55531	
Adjusted R-squared	0.824040	S.D. dependent var	7.295043	
S.E. of regression	3.060099	Akaike info criterion	5.265411	
Sum squared resid	234.1051	Schwarz criterion	5.586041	

Log likelihood	-77.24658	Hannan-Quinn criter.	5.371691
F-statistic	25.19599	Durbin-Watson stat	1.967144
Prob(F-statistic)	0.000000		

Source: Eview 9 Analysis Results, data processed

Notes: * Significant at $\alpha = 5\%$

Based on model selection testing, the initial hypothesis Fixed Effect Model using equation model 1 (1.3) is changed to equation model 1 (1.5), the panel data regression results are shown in table 2 with equation model 1 (1.6) as follows:

$$Y_1 = b_0 + b_1 \log X_{1it} + b_2 X_{2it} + b_3 \log X_{3it} + e_1 \quad (1.5)$$

$$Y_1 = -192.51 - 7.31 \log X_{1it} + 2.73 X_{2it} + 25.65 \log X_{3it} + e_1 \quad (1.6)$$

Table 2. Panel Data Regression Results Model Equation 2

Dependent Variable: LOG(PDRBY2)				
Method: Panel EGLS (Period random effects)				
Sample: 2013 2020				
Periods included: 8				
Cross-sections included: 4				
Total panel (balanced) observations: 32				
Swamy and Arora estimator of component variances				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	8.698857	4.211639	2.065433	0.0486
IKLHY1	-0.003990	0.010021	-0.398214	0.6936
LOG(BLX1)	0.219371	0.234548	0.935293	0.3579
LOG(PMDNX2)	0.164884	0.065600	2.513488	0.0182
LOG(PTKX3)	0.716789	0.146793	4.883001	0.0000
Effects Specification				
			S.D.	Rho
Period random			0.000000	0.0000
Idiosyncratic random			0.213039	1.0000
Weighted Statistics				
R-squared	0.925369	Mean dependent var	32.66327	
Adjusted R-squared	0.914312	S.D. dependent var	0.659948	
S.E. of regression	0.193183	Sum squared resid	1.007633	
F-statistic	83.69465	Durbin-Watson stat	0.555542	
Prob(F-statistic)	0.000000			
Unweighted Statistics				
R-squared	0.925369	Mean dependent var	32.66327	
Sum squared resid	1.007633	Durbin-Watson stat	0.555542	

Source: Eview 9 Analysis Results, data processed

Notes: * Significant at $\alpha = 5\%$

Based on testing the selection of the selected model Random Effect Model used in equation model 2 (1.4), the panel data regression results are shown in table 3 with equation model 2 (1.7) (1.8) as follows:

$$\log Y_2 = b_0 + b_1 Y_{1it} + b_2 \log X_{1it} + b_3 \log X_{2it} + b_4 \log X_{3it} + e_2 \quad (1.7)$$

$$\log Y_2 = 8.699 - 0.004 Y_{1it} + 0.219 \log X_{1it} + 0.165 \log X_{2it} + 0.717 \log X_{3it} + e_2 \quad (1.8)$$

Description:

Y_2	= ADHK GRDP (Rupiah)
Y_1	= Environmental Quality Index (Percent)
b_0	= Constant
$b_1, b_2, b_3, \dots b_n$	= Regression Coefficient
X_1	= Direct Expenditure (Rupiah)
X_2	= Foreign Direct Investment (IDR)
X_3	= Labor Productivity (Rupiah/life)
e_1	= Structure confounding error 1
e_2	= Structure confounding error 2
log	= Logarithm

Sobel Test

The sobel test is a test to determine whether the relationship through an intervening variable is significantly able to mediate the relationship.

1) Calculation of Sobel Test: Effect of Direct Expenditure (X1) on GRDP Variable (Y2) through IKLH Variable (Y1)

$$z = \frac{ab}{\sqrt{(b^2 SE_a^2) + (a^2 SE_b^2)}}$$

$$z = \frac{-7.305804 \times -0.003990}{\sqrt{(-0.003990^2 \times 3.319345^2) + (-7.305804^2 \times 0.010021^2)}}$$

$$z = 0.39180438$$

Table 3. Sobel Test Results 1

LOG(BLX1)		IKLHY1	
Coefficient	Std. Error	Coefficient	Std. Error
-7.305804	3.319345	- 0.003990	0.010021
T tabel	2.05		
Z	0.39180438		

From the results of the sobel test calculation above, the z value is 0.39180438, because the z value obtained is $0.392 < 2.05$ with a significance level of 0.05, it proves that the Environmental Quality Index is not able to mediate or mediate the relationship between the influence of Direct Expenditure on Gross Domestic Product as an indicator of economic growth. It can be concluded that there is no indirect effect of Direct Expenditure (X1) on the GRDP Variable (Y2) through the IKLH Variable (Y1).

2) Calculation of Sobel Test: The effect of PMDN (X2) on GRDP Variable (Y2) through IKLH Variable (Y1)

$$z = \frac{ab}{\sqrt{(b^2SE_a^2) + (a^2SE_b^2)}}$$

$$z = \frac{2.732738 \times -0.003990}{\sqrt{(-0.003990^2 \times 1.250991^2) + (2.732738^2 \times 0.010021^2)}}$$

$$z = -0.39171017$$

Table 4. Sobel Test Results 2

PMDNX2		IKLHY1	
Coefficient	Std. Error	Coefficient	Std. Error
2.732738	1.250991	-0.003990	0.010021
T tabel	2.05		
Z	-	0.39171017	

From the results of the sobel test calculation above, the z value is -0.39171017, because the z value obtained is $-0.392 < 2.05$ with a significance level of 0.05, it proves that the Environmental Quality Index is unable to mediate or mediate the relationship between the influence of Domestic Investment on Gross Domestic Product as an indicator of economic growth. It can be concluded that there is no indirect effect of PMDN (X2) on the GRDP Variable (Y2) through the IKLH Variable (Y1).

3) Calculation of Sobel Test: Effect of Labor Productivity (X3) on GRDP Variable (Y2) through IKLH Variable (Y1)

$$z = \frac{ab}{\sqrt{(b^2SE_a^2) + (a^2SE_b^2)}}$$

$$z = \frac{25.65047 \times -0.003990}{\sqrt{(-0.003990^2 \times 10.49272^2) + (25.65047^2 \times 0.010021^2)}}$$

$$z = -0.39298536$$

Table 5. Sobel Test Results 3

LOG(PTKX3)		IKLHY1	
Coefficient	Std. Error	Coefficient	Std. Error
25.65047	10.49272	-0.003990	0.010021
T tabel	2.05		
Z	-	0.39298536	

From the results of the sobel test calculation above, the z value is -0.39298536, because the z value obtained is $-0.392 < 2.05$ with a significance level of 0.05, it proves that the Environmental Quality Index is unable to mediate or mediate the relationship between the influence of Labor Productivity (X3) on GRDP as an indicator of economic growth. It can be concluded that there is no indirect effect of Labor Productivity (X3) on GRDP Variable (Y2) through the IKLH Variable (Y1).

Direct Expenditure on Environmental Quality

The regression estimation results of table 1.2. equation model 1 (1.5) in this study show that direct expenditure denoted by (X1) has a coefficient of -7.305 with a probability value of 0.037 with a significant level of α of 0.05, which means that direct expenditure has a negative and significant effect on the environmental quality index (IKLH).

It shows that if direct expenditure increases by 1%, it will cause a decrease in the environmental quality index (IKLH) value by 7.30%, assuming other factors are constant.

The results of this study are in accordance with the results of Yuda and Idris (2022) where the environmental budget is negative and insignificant to the quality of the environment in Indonesia. and the results of Butarbutar's research (2023) where government spending on environmental protection and forestry functions negatively affects the environmental quality index.

PMDN on Environmental Quality

The regression estimation results of table 2 equation model 1 (1.5) in this study show that domestic investment (PMDN) denoted by (X2) has a coefficient of 2.733 with a probability value of 0.038 with a significant level α of 0.05, it can be interpreted that domestic investment (PMDN) has a positive and significant effect on the environmental quality index (IKLH).

Where it shows that if domestic investment (PMDN) increases by Rp.1, it will increase the value of the environmental quality index (IKLH) by 2.73%, assuming other factors are constant.

The results of this study are in accordance with research from Syabilla (2021) that green investment or also called sustainable investment has a positive effect on disclosure of carbon emissions for companies listed on the Indonesia Stock Exchange.

Labor Productivity on Environmental Quality

The regression estimation results of table 2 equation model 1 (1.5) in this study show that labor productivity denoted by (X3) has a coefficient of 25.650 with a probability value of 0.0219 with a significant level of α of 0.05, which means that labor productivity has a positive and significant effect on the environmental quality index (IKLH).

Where it shows that if labor productivity increases by 1%, it will increase the value of the environmental quality index (IKLH) by 25.65%, assuming other factors are constant.

There is not much literature or journals found by researchers to support the relationship between productivity and environmental quality on the island of Kalimantan. In Kjellsstrom et al. (2009), Kjellsstorm looks more at the effect of climate change on labor productivity where the results of labor productivity increases if climate change in an area decreases and is overcome.

Environmental Quality on Economic Growth (GRDP)

The regression estimation results in table 3 equation model 2 (1.6) in this study show that the environmental quality index denoted by (Y1) has a coefficient of -0.003990 with a probability value of 0.6936 with a significant level of α of 0.05, it can be interpreted that the environmental quality index (IKLH) has a negative and insignificant effect on economic growth (GRDP). Where it shows that if the environmental quality index

(IKLH) increases by 1%, it will cause a decrease in economic growth (GRDP) value of 0.003%, assuming other factors are constant.

The results of this study are in accordance with the results of research by Damayanti and Chamid (2016) mentioning in their research that the air quality index has a negative effect on GRDP in East Java. According to Damayanti and Chamid's research, GRDP has a negative relationship pattern with IKLH, where the lower the environmental quality of a region, the higher the GRDP of that region.

Direct Expenditure on Economic Growth (GRDP)

Regression estimation results table 3 model equation 2 (1.6) in this study shows that direct expenditure denoted by (X1) has a coefficient of 0.219371 with a probability value of 0.3579 with a significant level α of 0.05, it can be interpreted that direct expenditure has a positive and insignificant effect on economic growth (GRDP). Where it shows that if direct spending increases by 1%, it will cause a decrease in economic growth (GRDP) value of 0.22%, assuming other factors are constant.

Masithah and Rahmawati (2024) shows the results where direct expenditure and direct expenditure in the previous year have a positive and significant effect on GRDP. From the results of research by Muliati et al. (2021), there are empirical findings that the insignificant effect of the ratio of direct expenditure on economic growth in Java and Kalimantan Island shows that the direct expenditure made by the government is not appropriate, so it has not been able to encourage increased production on the economy in Java and Kalimantan Islands.

PMDN on Economic Growth (GRDP)

The regression estimation results table 3 equation model 2 (1.6) in this study show that domestic investment (PMDN) denoted by (X2) has a coefficient of 0.164884 with a probability value of 0.0182 with a significant level α of 0.05, it can be interpreted that domestic investment (PMDN) has a positive and significant effect on economic growth (GDP). Where it shows that if domestic investment (PMDN) increases by 1%, it will increase economic growth (GRDP) by 0.165%, assuming other factors are constant.

Putri's research results (2014) that the PMDN variable has a significant positive effect on economic growth, meaning that the higher the value of PMDN realization, the higher the economic growth in Java Island. The results of research by Bela et al. (2019) the PMDN variable partially has a positive and significant effect on Regency/ City Economic Growth in Bali Province for the period 2010-2016. This means that the higher the level of PMDN in the Regency/ City, the higher the opportunity for better economic growth. The results of Bela and Setiawina's research are in accordance with Harrod-Domar's statement on the economic growth model in developed countries which found that the accumulation of investment and national savings is a determining factor in economic growth.

Labor Productivity on Economic Growth (GRDP)

The regression estimation results table 3 equation model 2 (1.6) in this study show that labor productivity denoted by (X3) has a coefficient of 0.7168 with a probability value of 0.0000 with a significant level α of 0.05, it can be interpreted that labor productivity has a positive and significant effect on economic growth (GRDP). Where it shows that if labor productivity increases by 1%, it will increase economic growth (GRDP) by 0.717%, assuming other factors are constant.

Previous research results by Fitri et al. (2015) Partially, labor productivity has a significant and positive effect on economic growth in West Sumatra. Based on research by Artina et al. (2020) Labor productivity has a positive and significant effect on economic growth in 34 provinces in Indonesia in 2009-2018. Increasing productivity basically cannot be done in one function of the operational section alone, but must be carried out in an integrated manner throughout the company. Productivity has an important meaning in improving labor welfare. so that there will be an increase in income and economic growth. This is because productivity is the power to produce goods and services.

Direct Expenditure, Foreign Direct Investment and Labor Productivity on Economic Growth (GRDP) through Environmental Quality Index

The regression estimation results continued with the sobel test in this study show the results that the environmental quality index variable as an intervening variable that mediates or mediates the relationship between the influence of the independent variables, namely direct expenditure, domestic investment and labor productivity on the dependent variable, namely economic growth (GRDP). Where the results of the sobel test concluded that there was no indirect effect for direct expenditure, domestic investment and labor productivity on economic growth through the environmental quality index.

This means that the environmental quality index cannot mediate the relationship between direct expenditure, foreign direct investment, and labor productivity on economic growth. The results of this study are not in accordance with the specified hypothesis. Where the sobel test results concluded that there was no indirect effect.

Conclusion

Direct expenditure has a negative and significant effect on the environmental quality index, while domestic investment (PMDN) and labor productivity have a positive and significant effect on the index in four provinces in Kalimantan. Together, direct expenditure, foreign direct investment, and labor productivity have a significant effect on the environmental quality index in the four provinces in Kalimantan. The environmental quality index has a negative but insignificant effect on economic growth, which is contrary to the hypothesis and reflects a trade-off. Any increase in the environmental quality index tends to decrease economic growth. Direct expenditure has a positive but insignificant effect, while foreign direct investment and labor productivity have a positive and significant effect on economic growth in this region. Together, direct expenditure, foreign direct investment, labor productivity, and environmental quality index have a significant effect on economic growth in Kalimantan. There is no indirect effect of direct expenditure, FDI, or labor productivity on economic growth through the environmental quality index in this region.

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