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JOURNAL

The Effect Of Gross Regional Domestic Product, Total Motor Vehicle And Population Density On Environmental Quality In Java Island In 2011-2022

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Abstract:
The objective of this study is to determine the influence of regional gross domestic product, the number of motor vehicles, and population density on the quality of the environment in Java Island from 2011 to 2022. The research method employed in this study is in the form of panel data from 2011 to 2022 in six provinces on Java Island with the Fixed Effect Model (FEM) method. Data is presented annually and obtained from the BPS and the Environmental Quality Index in the provinces of Java Island. Based on the results of partial analysis, the quality of the environment is strongly influenced by the variables of regional gross domestic product, the number of motor vehicles, and population density, as indicated by the probability values smaller than (0.05). Simultaneously, all research variables have a significant effect on environmental quality, with an influence shown by the Adjusted R-squared value of 72.33%, while the remaining 26.67% is influenced by other factors outside the model.

Keywords: *Environmental Quality, Gross Regional Domestic Product, Total Motor Vehicle, Population Density*

Background

Over time, the environmental quality continues to deteriorate due to the excessive exploitation of natural resources, extensive deforestation for plantations and settlements, disposal of industrial waste, increased mobility in transportation, and various other factors. The primary challenge in the process of economic development is to strike a balance between advancing economically and making efforts toward environmental conservation (Sukendar, 2013). Economic development that neglects either of these aspects has the potential to give rise to environmental issues in the future. If economic development solely prioritizes profit and neglects the consideration of the sustainability of nature and the environment, it not only negatively impacts nature but also has the potential to adversely affect humans (Nikensari et al., 2019)

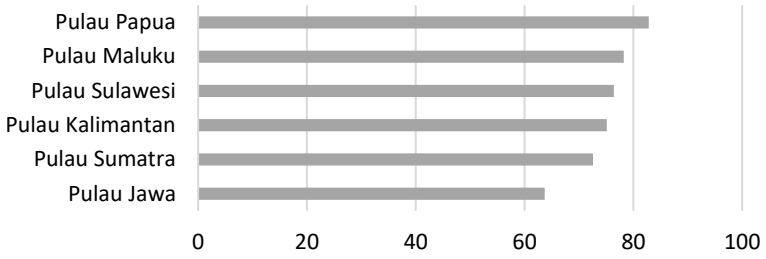
For Indonesia, the environmental quality index is closely related to the need for introducing sustainable development goals in the National Development Plan, as stipulated by Presidential Regulation No. 43 of 2014 and the Government Work Plan (RKP) for the year 2015, which includes objectives and policy directions related to Strategic Issue 25, focusing on Economic Improvement (Ministry of Environment and Forestry). The Environmental Quality Index (IKLH) is also used as a

performance indicator for regional programs aimed at enhancing environmental quality. Furthermore, the IKLH serves as supporting information for decision-making processes in the field of environmental protection and management (Bella Kusuma Dewi & Laila Fitria, 2022)

Economic growth on the island of Java consistently shows improvement each year. Increased economic growth is a desirable outcome for every country, as it enables the nation to enhance the standard of living for its citizens and serves as an indicator of success in the development of a country. To assess economic growth in a specific region, one can examine the Gross Regional Domestic Product (PDRB) of that area. According to Muta'ali (2015) in the book 'Environmental Status of Indonesia in 2020,' PDRB is an indicator that measures the success of regional governments in utilizing available natural resources and can be used as crucial information for planning and decision-making.

The island of Java and its status as the center of government have led to rapid growth in the transportation and industrial sectors. Based on the Environmental Quality Index data over the last ten years, it is evident that air quality on the island of Java is the lowest among all islands in Indonesia. The main factors contributing to this are the high population density on the island of Java and its status as the center of government, resulting in rapid growth in the transportation and industrial sectors.

Figure 1. IKLH Level of Islands in Indonesia



Source: BPS (2022)

The island of Java covers an area of 128,297 square kilometers. This island is divided into several provinces, including Central Java, East Java, West Java, DKI Jakarta, Banten, and the Special Region of Yogyakarta. Interestingly, based on census results, it is evident that the population distribution in Indonesia is still concentrated on the island of Java. Although it only contributes about 7 percent of the total area of Indonesia, Java accommodates 151 million inhabitants or approximately 56.1 percent of the entire population of Indonesia. Areas with very high population density will have various higher needs, such as housing, access to clean water, and air quality (Dewi & Fitria, 2022).

The primary concern currently in driving global economic growth is the issue of the environment. Advanced countries recognize that efforts to enhance economic growth and development have a direct impact on environmental damage and can affect the survival of humanity. Thus, the endeavor to harmonize economics and the environment is crucial for achieving sustainable development. The integration process entails creating frameworks and policy directions centered on collaboration and the active involvement of development stakeholders to efficiently manage resources. To ensure that development promotes economic growth without causing notable environmental harm, the adoption of the sustainable development concept is essential. This concept revolves around sustaining economic growth while conserving the utilized natural resources, coupled with strategies for seamlessly incorporating the environment into economic development (Burhanuddin, 2016).

THEORETICAL FRAMEWORK

Environmental Quality Indeks

In Indonesia, the evaluation of environmental quality utilizes a parameter known as the Environmental Quality Index (IKLH). According to the Ministry of Environment and Forestry (2019), IKLH is an indicator that assesses the performance of environmental management on a national scale. Information generated from IKLH can serve as the basis for policymaking related to environmental protection and management. The national IKLH value reflects the level of environmental management performance across the entire country. IKLH also represents a generalization of IKLH values in each province in Indonesia, with the Provincial IKLH serving as a measurable performance indicator for each district/city within that province.

Gross Regional Domestic Bruto

Gross Regional Domestic Product (GRDP) is the sum of the value added generated by all production activities within the regional economy (BPS, 2013). GRDP serves as one of the measurement tools used to evaluate the economic conditions and performance of economic development in a province, regency, or city within a specific period, both at current prices and constant prices. GRDP at current prices depicts the value added of goods and services calculated using the prevailing prices each year. On the other hand, GRDP at constant prices indicates the value added of goods and services calculated using prices from a specific base year. GRDP at current prices can be utilized to observe shifts and the economic structure. GRDP at constant prices is used to determine economic growth over a period (year to year or quarter to quarter) (Logaritma, 2020).

Motor Vehicle

In the previous regulation, Article 1 paragraph (3) of the Government Regulation of the Republic of Indonesia Number 74 of 2014 states that motor vehicles are any vehicles propelled by mechanical equipment in the form of an engine, excluding vehicles running on tracks. Motor vehicles are defined as any vehicle propelled by engine equipment and operated on public roads (Mattews & Suharta, 2020). Motor vehicles encompass any vehicle with an engine, such as motorcycles, cars, trucks, and others. Motor vehicles are a type of land vehicle propelled by an engine, typically requiring the use of petroleum fuel (Cucumandalin, 2023)

Population Density

Sarwono (1992) defines population density as the condition when the number of people within a specific spatial boundary significantly increases compared to the area's size. Population density is the ratio between the population and the inhabited area. According to information from the BPS (Central Statistics Agency), population density is the number of people within each unit of area or reflects the population count per square kilometer of the area. In other words, population density is calculated by dividing the population of a certain area by its total area.

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METHOD

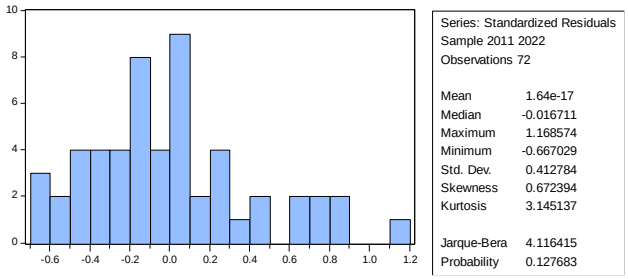
This study employs a quantitative method. The quantitative method is a research approach that can be interpreted as a research method based on the philosophy of positivism to examine several populations or samples, analyzing quantitative data with the aim of testing predetermined hypotheses (Sugiyono, 2019). The data used in this study utilizes panel data in the form of time series during the period 2011-2022 and across sectors from 6 provinces on the island of Java.

RESULT

Classic Assumption Test

Normality Test

Figure 2. Normality Test Results



Source: Output Eviews 12

According to the normality test results, the calculated Jarque-Bera probability reaches 4.116415 > 0.05, indicating that the data has a normal distribution.

Multicollinearity Test

Table 1. Multicollinearity Test Results

	PDRB	JUMLAH_T...	KEPADATA...
PDRB	1.000000	0.524042	0.123754
JUMLAH_T...	0.524042	1.000000	0.470940
KEPADATA...	0.123754	0.470940	1.000000

Source: Output Eviews 12

According to the calculations in Table 1, there is no strong correlation value among the independent variables, all of which are below 0.90. Thus, it can be inferred that this study does not exhibit multicollinearity among the independent variables.

Heteroscedasticity Test

Table 2. Heteroscedasticity Test Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	12389.86	5737.500	2.159453	0.0346
PDRB	-0.012171	0.010846	-1.122224	0.2677
JUMLAH_TRANSPORTASI	-4.86E-06	4.84E-05	-0.100377	0.9204
KEPADATAN_PENDUDUK	1.691641	6.250631	0.270635	0.7879

Source: Output Eviews 12

According to the test outcomes, when the probability value of the independent variable > 0.05, it indicates the absence of heteroscedasticity symptoms.

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Hypothesis Testing

Panel Data Regression Analysis

The panel data regression equation used by the researcher aims to estimate the dependent variable when the independent variable increases or decreases. The outcomes of the Fixed Effect Model (FEM) panel data regression model conducted by the researcher are presented here.

Table 3. Heteroscedasticity Test Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.443273	0.603326	7.364633	0.0000
PDRB	0.500322	0.175632	2.848693	0.0051
JUMLAH_TRANSPORTASI	-0.348490	0.132550	-2.629109	0.0096
KEPADATAN_PENDUDUK	-0.923787	0.335560	-2.752976	0.0067

Source: Output Eviews 12

Based on the results of data processing, the following results are obtained:
Y= 4.443273 + 0.500322 (X1) – 0.348490 (X2) - 0.923787 (X3).

Based on the regression equation, it can be concluded as follows. If Gross Regional Domestic Product, Number of Motor Vehicles, and Population Density are 0, then Y (Environmental Quality Index) is 4.443273. If X1 (Gross Regional Domestic Product) increases by 1%, then Y (Environmental Quality Index) will increase by 0.500322%. If X2 (Number of Motorized Vehicles) increases by 1%, then Y (Environmental Quality Index) will increase by 0.348490%. If X3 (Population Density) increases by 1%, then Y (Environmental Quality Index) will increase by 0.923787%

T test

According to the t-statistic test results presented in Table 3, the probability values for Gross Regional Domestic Product, Number of Motor Vehicles, and Population Density are all less than 0.05. This signifies the statistical significance of the test.

F Test

Table 4. Heteroscedasticity Test Results

R-squared	0.771180	Mean dependent var	0.307937
Adjusted R-squared	0.723310	S.D. dependent var	0.302062
S.E. of regression	0.229386	Akaike info criterion	0.121594
Sum squared resid	1.525918	Schwarz criterion	0.586036
Log likelihood	8.568119	Hannan-Quinn criter.	0.289522
F-statistic	3.862737	Durbin-Watson stat	2.012799
Prob(F-statistic)	0.002090		

Source: Output Eviews 12

By examining the table test, it is evident that the F-count probability value is 0.002090. When calculated at a 95% confidence level with an alpha of 0.05, this probability value is less than 0.05. Consequently, it can be concluded that the three independent variables collectively have a significant impact on the dependent variable.

Coefficient of Determination

From the table aboveat Table 4, the Adjusted R-squared value is noted as 0.723310. This value represents the adjustment of R-squared considering the number of independent variables. In the current study, the obtained Adjusted R-squared is 0.723310. This signifies that approximately 72.33% of the variance in the dependent variable, the Environmental Quality Index, can be explained by the independent variables, namely GRDP, Number of Motor Vehicles, and Population Density, while the remaining 26.67% is influenced by other factors outside the model.

DISCUSSION

GRDP on Environmental Quality in Java Island

GRDP has a negative influence on the Environmental Quality, as stated by the t-test result with a value of 2.848693 and a significance of 0.0051, which is smaller than the 0.05 significance level. This means that the hypothesis can be accepted, indicating a positive and significant influence between GRDP and the level of environmental quality in Java Island.

The results obtained at the first hypothesis testing stage explain that when GRDP increases in Indonesia, the quality of the environment will increase. Endri Hermawan (2021) explained, that GRDP growth will have a positive impact on the environment provided that the implementation of laws and regulations related to the environment in all economic sectors is carried out effectively. This is expected to produce output that continuously improves the quality of the environment in Java Island.

Number of Motor Vehicles on Environmental Quality in Java Island

The number of motor vehicles has a negative effect on the Environmental Quality, as indicated by the t-test result with a value of -2.629109 and a significance of 0.0096, which is higher than the 0.05 significance level. This means that the hypothesis is accepted, indicating that there is a negative and significant influence between the number of motorized vehicles and the level of environmental quality in Java Island.

The results obtained in the second hypothesis testing stage explain that when the number of motorized vehicles decreases in Indonesia, the quality of the environment will improve. This is because an increase in the number of motorized vehicles leads to air pollution due to the emissions produced by the vehicle's fuel residues (Sugiyanto, 2011). Therefore, it is essential for humans to innovate by developing motorized transportation fuels that are environmentally friendly.

Population Density on Environmental Quality in Java Island

Population density has a negative impact on the Environmental Quality, as indicated by the t-test result with a value of -2.752976 and a significance of 0.0067, which is smaller than the 0.05 significance level. This means that the hypothesis can be accepted, indicating a negative and significant influence between population density and the level of environmental quality in Java Island.

This is supported by the theory used in this study, that areas that have a high population density will have a number of greater needs, such as the need for housing land, access to clean water sources, and maintenance of air cleanliness, which has an impact on the environment.

CONCLUSION

Based on the results of research that has been conducted by researchers on The Effect Of Gross Regional Domestic Product, Total Motor Vehicle And Population Density On Environmental Quality In Java Island In 2011-2022. Producing several conclusions:

1. Gross regional domestic product has a positive and significant effect on Environmental Quality in Jawa Island;
2. Total Motor Vehicle has a negative and significant effect on Environmental Quality in Jawa Island;
3. Population Density has a negative and significant effect on Environmental Quality in Jawa Island.
4. Simultaneously, gross regional domestic product, total motor vehicle and population density on environmental quality in Java Island.

From these results it can be said that environmental quality is strongly influenced by the variables of the gross regional domestic product, total motor vehicle and population density.

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