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Effects of Poverty, Income Inequality and Economic Growth to Environmental Quality Index (EQI) in 33 Province in Indonesia 2014-2019

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ABSTRACT

Shifting from the agriculture sector to the service sector has made Indonesia's economy rapidly grow and therefore a degradation in environmental quality. The degradation of the Environmental Quality Index (EQI) in 2019 is mostly caused by an increasing water pollution level. Income inequality and poverty in Indonesia is a problem that also causing the EQI degradation. There are 2 purposes of this article which are (1) to find out the effect of income inequality, poverty, and economic growth toward EQI (2) to find if there is causality between economic growth and EQI. The approach used in this article is a quantitative approach with a type of data is secondary data. This article used panel regression with Random Effect Model (REM) by combining cross-section data from 33 provinces in Indonesia and time-series data from 2014 – 2019. The causality between economic growth and EQI is calculated by using Granger Causality. The result shows that (1) economic growth and income inequality have a negative significant relationship toward EQI, but poverty hasn't affect to EQI (2) There is no causality between economic growth and EQI because EQI can not affect economic growth.

1. Introduction

The shift in the direction of economic development from the agricultural sector to the industrial sector is one result of the rapid pace of development. The rapid pace of development has an impact on the environment whose quality is decreasing. This decrease in quality does not only come from economic activities but also production and consumption activities carried out by individuals or groups. Development that is dedicated to the welfare of the community will only lead to the destruction of the living system of a living being if it is not carried out properly.

Indonesia is still experiencing problems such as river water pollution, flooding, damage to marine life, global warming, air pollution, illegal logging, and abrasion are problem that still need attention to be resolved. Environmental protection cannot be achieved if the government does not make policies that should be adhered to. Many government policies are aimed at improving the environment in Indonesia, but in the end, these policies have not been able to run well. Fauzie (2019) explained that there are still many governments that are not on target in terms of policy implementation.

According to the EQI indicator reference, in the environmental quality assessment issued by the Ministry of Environment and Forestry (KLHK), Indonesia in 2019 decreased from 71.67 in 2018 to 66.55 in 2019. One of the causes of the decrease in EQI is water quality, which decreased from 72.77 in 2018 to 52.62 in 2019. The drastic decrease in water quality was due to pollution from industrial waste, household waste, agricultural waste, and wood processing waste.

According to the Ministry of Environment and Forestry (2018) the categories in the EQI are divided into 6: (1) Very Good, (2) Good, (3) Fairly Good, (4) Less Good, (5) Very Poor and (6) Alert. Based on EQI data released by KLHK, Indonesia has various EQI categories. Based on the islands, Papua Island has the highest EQI, which is 82.88 units, and has a very good category (Kartiasih & Pribadi, 2020), this is because in Papua the condition of land covers is still very high compared to other islands. Meanwhile, the lowest position was Java Island, which is 52.64 units and occupied the poor category. Java Island got a last rank because it is the center of economic activity. Most of the population lives and settles on the island of Java, so everything is concentrated on the island of Java (Nengsih, 2015).

The decrease in environmental quality occurs due to the impact of economic activities, one of which is economic growth. Yameogo et al., (2021) and Kartiasih & Pribadi (2020) who have conducted studies that economic growth affects environmental quality. During 2014 – 2019 in Indonesia, the increase and decrease in economic growth and environmental quality have a positive relationship, if economic growth increases, the environmental quality will also increase, and vice versa. Nasreen et al., (2017) have proven that there is a two-way relationship between economic growth and environmental quality also in developing countries, namely Bangladesh.

Poverty also have impact of environmental degradation. Based on the research of Kartiasih & Pribadi, (2020) and Pratama (2013) which concluded that there is a significant relationship between environmental degradation and poverty in Indonesia. The poor are considered to be very dependent on the environment and natural resources to sustain their lives. As a result, the environment and natural resources are exploited without considering sustainability. On the other hand, according to Baloch et al., (2020) poverty and environmental change are important things that must be addressed if you want to realize sustainable development. According to Sugiyarto et al., (2015) poverty is closely related to income inequality. As research conducted by Ridena (2020), that the decline in environmental quality is the cause of significant income inequality.

This study aims to see what factors affect the quality of the environment in Indonesia during 2014-2019. In addition, this study also looks at the two-way relationship between economic growth and environmental quality. This two-way research is shown to see how the variables influence each

other because based on data the increase and decrease in environmental quality and economic growth from 2014 to 2019 go hand in hand.

2. Literature Review

Environment according to Suparmoko (2016) is a combined physical and institutional condition. Physical condition is defined as the state of natural resources such as land, energy, air, water, flora, and fauna. The institution itself is defined as a man-made environment that is usually carried out such as when making decisions about the use of the environment. The goodness or badness of an environment in Indonesia is regulated in a Quality Index that is both national and city/district. In 2019, the quality of the environment in Indonesia decreased due to economic activities. Rapid economic changes have unwittingly led to a decline in the quality of the environment. The decline in the quality of the environment such as the reduction of forest land due to land clearing, air pollution that is getting worse due to the number of public transportations, and water pollution due to indiscriminate dumping of waste into rivers.

The decline in environmental quality is caused by economic growth, many studies have looked at the effect of economic growth and environmental quality. Like (Nasreen et al., 2020) economic growth in developing countries including Indonesia has a positive influence on environmental quality. In contrast to Kartiasih & Pribadi (2020) in Indonesia and Yameogo et al., (2021) in Africa, economic growth has a negative relationship with environmental quality. The two-way relationship between economic growth and environmental quality was also investigated by (Nasreen et al., 2017), (Nasreen et al., 2020), and (Omri et al., 2014).However, it is different in Pakistan that there is only a one-way relationship between economic growth and environmental quality (Nasir & Rehman, 2011).

The decline in environmental quality can also be influenced by the existence of poverty in an area. Poverty according to BPS and the Ministry of Social Affairs is the inability to meet the minimum basic needs of an individual to live a decent life. A condition of society that is less than the standard value line can also be called poverty. The standard value line or better known as the poverty line or poverty limit. Kartiasih & Pribadi (2020) conducted research in Indonesia explaining that poverty has a negative effect on environmental quality, the same as (Shanty et al., 2018) and (Lubis, 2015). Meanwhile, the results of a study from Laswinia & Chamid (2016) in Indonesia and Baloch et al., (2020) in Africa, poverty has a positive influence on environmental quality.

Poverty has a relationship with income inequality (Sugiyarto et al., 2015). A difference exists in the level of prosperity of a population who is rich and poor, then that is what is called income inequality. Inequality exists as a result of the relative living standards of different communities, besides that there are also gaps between regions such as differences in available resources and production factors. Income inequality causes the rich to confuse the environment with factory waste or the fumes of their private vehicles, while the poor make it confusing by living around riverbanks and opening land cover carelessly. This is the same as Ridena (2020) who conducted research, that income inequality significantly reduces environmental quality. In other countries such as China and Pakistan studied by Hao et al., (2016) and Hassan et al., (2015) that income inequality has a negative effect on the quality of the existing environment. In contrast (Yang et al., 2020) that income inequality does not affect existing environmental conditions.

3. Research Method

This study will explain the results of the study using panel data regression. The analysis tool uses an application from the Eviews 10 software with time-series data of 6 years during 2014-2019 and a cross-section of 33 provinces. The data used is secondary, meaning that the data obtained by the researcher from the research subject is already available from the source, which can be in the form of

documentation data or report data. The data in this study were obtained from the Central Statistics Agency (BPS) of Indonesia and the Ministry of Environment and Forestry which are secondary.

This study explains what variables can affect the environmental quality index. Based on the differences in previous studies, the research uses poverty, income inequality and economic growth as independent variables and the environmental quality index acts as the dependent variable. The two-way relationship between economic growth and the environmental quality index will also be discussed in this study. In this two-way relationship using the Granger causality test to see how the relationship between the two is:

Table 1. Description of Research Variables

No.	Variables	Information	Data Source
1.	Economic	Growth GRDP growth per capita based on growth rate in percent, data per 33 provinces in Indonesia.	Central Bureau of Statistics, (Kartiasih & Pribadi, 2020)
2.	Poverty	Poverty is seen based on the number of poor people, data per 33 provinces in Indonesia.	Central Statistics Agency (BPS), (Ridena, 2020)
3.	Income Inequality	There is a difference in income which is measured using an index, namely the Gini Index, data per 33 provinces in Indonesia.	Central Bureau of Statistics (BPS), (Hao et al., 2016)
4.	EQI	Measurement of environmental quality based on index, data per 33 provinces in Indonesia.	Ministry of Environment and Forestry, (Febriana et al., 2019)

Economic growth has a very influential role in increasing a country's income and can see how far the country has progressed. GRDP is a macroeconomic indicator, to see a situation in the economy in a regional coverage in a certain period, GRDP is usually the benchmark. The growth rate per capita of ADHK GRDP is used to see the overall economic growth (Wartono & Firmansyah, 2013). The poverty variable is used because it is used to see how many poor people are per province in Indonesia. Poverty here is seen as an inability to meet economic needs such as basic needs, namely food and non-food, from the expenditure side, it is usually the benchmark. The next variable is income inequality, which is used to see how the condition of income inequality in Indonesia is. The difference in income between the rich and the poor is called Income Inequality. Income inequality in Indonesia is measured by the Gini Index.

EQI can be called a national environmental performance indicator. The Ministry of Environment and Forestry (2018) states that in EQI there are three indicators in its calculation, namely: (1) Water Quality Index (IKA), has several references in its calculation such as: DO, BOD, nitrate, pH, total phosphate, etc.; (2) Air Quality Index (IKU), the parameters used to measure are nitrogen and sulfur dioxide; and (3) the referenced Land Cover Quality Index (IKTL) used with the amount of land cover and vegetation dynamics in Indonesia. EQI calculations based on the Ministry of Environment of the Republic of Indonesia can cover the province as well, the calculation is applied to EQI in the province is by using the following formula:

$$IKLH\ PROVINSI = (30\%\ x\ IKA) + (30\%\ x\ IKU) + (40\%\ x\ IKTL) \quad (1)$$

This study, using a linear equation to see how the relationship between the dependent and independent. The model to be used is as follows:

$$Y = \alpha + \beta_1 X_{1it} + \beta_{2it} X_{2it} + \beta_{3it} X_{3it} + \varepsilon_{it} \quad (2)$$

Description:

Y : EQI (Environmental Quality Index)
X1 : Poverty
X2 : Gini Index
X3 : Growth Rate of GRDP per capita
ε : Residual (error term)

According to Rosadi (2011), the panel data regression generally has three estimation model approaches, namely the Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM). CEM is the simplest approach because in this approach it only combines time-series and cross-section and then estimates using the Ordinary Least Square Pooled (OLS Pooled) method. FEM assumes that differences between individuals can be accommodated from differences in intercepts, this estimation model is often also called the Least Squares Dummy Variable (LSDV) technique. REM estimates panel data in which disturbance variables may be interrelated over time and between individuals, this model is also called the Error Component Model (ECM) or Generalized Least Square (GLS) technique.

To determine which approach to choose, the Chow test, Hausman test, and Lagrange Multiplier test are carried out. The next step is a statistical test, used to see several objectives such as (1) t-statistical test to see the effect between variables, (2) F-statistical test serves to see how all variables affect simultaneously, and (3) R2 test gives information related to how much the dependent variable affects.

In looking for a two-way causality relationship, the first step that must be considered is to find the optimum lag. This optimum lag is determined to determine the amount of lag that will be used in the Granger causality estimation. The lag value can be seen from the Akaike Information Criterion (AIC) and Schwarz Bayesian Criterion (SBC) values. The optimum lag chosen is the one that has the smallest value in the overall lag that has been tested. The selected lag can then be used in the Granger causality test.

The causality test has a function to determine whether this research has a reciprocal relationship or not (Nachrowi & Usman, 2006). According to Kuncoro (2003), the Granger causality test is the most popular test among other causality tests. The F test can be seen to determine the presence or absence of causality, but it can also be seen from the Prob value.

The Granger Causality Test has four hypotheses, including:

a) If 0 and = 0 it means that there is a relationship one-way between X and Y.
b) If = 0 and 0 it means that there is a relationship one-way between Y and X.
c) If = 0 and = 0 it means that they influence each other or are two-way.
d) If 0 and 0 it means that they do not affect each other.

4. Results and Discussion

Several variables used in this study are EQI as the dependent variable, then poverty, income inequality, and economic growth as independent variables. Before determining the model, it is necessary to select an appropriate model estimate which will later be used in the panel regression of this study. Model selection between CEM, FEM, and REM using several tests, the results of these tests are:

a. Chow test

In selecting the CEM and REM models, this test is needed to see which model will be used. The hypothesis that will be used in this study:

H0 = the common effect model is better than the fixed effect model

H1 = the fixed effect model is better than the common effect model

Furthermore, for the guidelines used in decision making and Chow test conclusions, namely:

a) If the Probability value > 0.05 means that H0 is accepted, the common effect model is better to use.
b) If the probability value < 0.05 means that H0 is rejected, it is better to use the fixed effect model and continue with the Hausman test.

Table 2. Test Results Chow

Effects Test	Statistics	df	Prob.
Cross-section F	20,859	(32.162)	0.000
Cross-section chi-square	323.378	32	0.000

Source: Secondary data processed (2021)

The results of the Chow test stated that the Prob value was 0.0000 < sig. 0.05 so that the accepted hypothesis is H1 which means that the Fixed Effect Model is more suitable to be used.

b. Hausman test

After the FEM model is selected, the next step is to determine the FEM or REM model that will be used later using this test. The hypothesis that will be used in this study:

H0 = the random effect model is better than the fixed effect model

H1 = the fixed effect model is better than the random effect model

Furthermore, for the guidelines used in decision making and Hausman test conclusions, namely:

a) If Chi-Square value > 0.05 means that H0 is accepted, the random effect model is better to use.
b) If the Chi-Square value < 0.05 means that H0 is rejected, the fixed effect model is better used.

Table 3. Hausman Results

Test Summary	Chi-sq statistic	Chi-sq df	Prob.
Cross-section Random	0.623	3	0.8911

Source: Secondary data processed (2021)

The results of the Hausman test above, state the value of probability is 0.8911 > 0.05 or its significance value. This means that the model to be chosen is REM. Furthermore, looking at the panel regression equation using REM can be seen in table 4.

Table 4. Results of Random Effect Model

Variable	Coefficient	Probability
C	106.109	0.000
LnPoverty	-3.570	0.783
Gini	-46.567	0.002
Growth Rate	-0.038	0.014
R^2	0.077	
Adj. R^2	0.063	

Source: Secondary data processed (2021)

The number of observations used is 198, where the dependent variable (C) uses the Environmental Quality Index. Observation data per province in annual form. P < 0.05.

$$Y = 106.109 - 3.57X_{1it} - 46.567X_{2it} - 0.038X_{3it} + \varepsilon_{it}$$

The Effect of Poverty on Environmental Quality Index

The results of the analysis using the Random Effect Model method have a negative relationship on the poverty variable and the EQI is not even significant. The coefficient value of -3.570 means that when there is an increase in poverty at the 1 percent level, the EQI will decrease by 3.570 units. The results of the above hypothetical equation as done by previous researchers (Kartiasih & Pribadi, 2020), (Shanty et al., 2018), and (Lubis, 2015). The common property resource theory explains that poor people tend to love natural resources for their survival and cause environmental degradation (Kartiasih & Pribadi, 2020). As the number of poor people increases, the EQI will decrease due to uncontrolled natural resources. The cause of poverty is the influence of poor people who have

nowhere to live to build buildings on the banks of the river, this can pollute the river so that the water quality will decrease. As of 2019, the water quality index has decreased due to high river pollution.

The Effect of Income Inequality on the Environmental Quality Index

The results of the analysis using the Random Effect Model have a negative relationship on the income inequality variable on EQI and are significant. The coefficient value of -46.567 means that when an increase in income inequality increases by 1 percent, the EQI will decrease by 46.567 units. The results of the above hypothetical equations were as carried out by previous researchers (Kartiasih & Pribadi, 2020), (Hao et al., 2016) in China, and (Hassan et al., 2015) in Pakistan. Environmental quality will decline dramatically as income inequality widens (Hao et al., 2016). According to income inequality is bad for health and the environment, and countries with high-income inequality can implement distributive policies to avoid its negative impact on health (Hunter & Killoran, 2004).

Effect of Economic Growth on Environmental Quality Index

The results of the analysis using the Random Effect Model method have a negative relationship on the variable economic growth to EQI and significant. The coefficient value of -0.038 means that if there is an increase in economic growth that rises at the level of 1 percent, the EQI will decrease by 0.038 units. The results of the above hypothetical equations are carried out by previous researchers (Kartiasih & Pribadi, 2020) in Indonesia and (Yameogo et al., 2021) in Africa. According to the Environment Kuznets Curve Hypothesis (EKC), there is a negative effect of economic growth on environmental quality, especially in developing countries (Kartiasih & Pribadi, 2020). This happens because of the encouragement of industrial processes in developing countries. The industrialization process produces residues that are released into the environment, causing environmental degradation (Homas et al., 2000).

Causality Relationship between Economic Growth and Environmental Quality Index

Before testing the two-way causality relationship, it is necessary to pay attention to the lag that will be used. Lag distribution is a model that considers the half-life that is included in linear regression. The determination of LAG is carried out to determine the amount of lag used in the estimation of Granger causality. The conditions for using the optimum lag can be seen from the Akaike Information Criterion (AIC) value.

Table 5. Results of Determination of LAG

	Akaike Info Criterion
LAG 1	6,380
LAG 2	6,298
LAG 3	6,258
LAG 4	6,570

Source: Secondary data processed (2021)

From the results above, LAG 3 is the smallest LAG, which will be used in the Granger causality test is LAG 3.

The next step after the lag value is known, then do a causality test. The causality test is used to find out how the two-way relationship is on the variables, namely Economic Growth and the Environmental Quality Index. Through this test, it can be seen that there is a two-way, one-way, or no relationship between the two. Furthermore, the guidelines used for decision making and Hausman test conclusions are:

a. If the P-value > 0.05, it means that there is no causal relationship between economic growth and environmental quality.

b. If the P-value <0.05, it means that there is a causal relationship between economic growth and environmental quality.

Table 6. Granger Causality Test Results

Relationship between	P-value	Causality Results
Economic Growth and EQI	0.013	There is
EQI and Economic Growth	0.640	There is no

Source: Secondary data processed (2021)

Granger causality test in Table 6 above, carried out using Lag 3, it can be seen that there is a relationship if the prob value <0.05. From these results, equation one has a probability value of 0.013 < 0.05, so H1 is chosen, meaning that economic growth affects EQI. In the second equation, the probability is 0.640 > 0.05 then the chosen H0 is accepted, meaning that EQI does not affect Economic Growth.

Determination of whether there is a two-way relationship or not on the variables using a causality test. The level of significance or confidence in this test uses the number 0.05 or 5 percent and lag 3 is used as a determinant of the length of the lag. Research using the Granger Causality Test results in the p-value in equation one being 0.013 <0.05, so there is a relationship between economic growth and EQI. In the second equation, the p-value is 0.640 > 0.05, so the EQI relationship cannot affect economic growth. It can be concluded that rejecting a two-way relationship but there is a one-way relationship, namely, economic growth affects the environmental quality index, this is the same as previous research (Nasir & Rehman, 2011) and (Nasreen et al., 2017) in Europe and Central Asia. Economic growth has an impact on the quality of the environment, while not vice versa. Developments in developing countries still have a considerable influence on environmental quality. The shift to the industrial sector causes an influence on the quality of the existing environment, waste, and smoke from industrial products cause economic growth to affect the quality of the environment.

5. Conclusion

Based on the results of the regression analysis between poverty, income inequality, and economic growth as independent variables and environmental quality as the dependent variable in the 33 provinces in Indonesia in 2014-2019 above, using the Random Effect Model, the results obtained are:

The Effect of Income Inequality on the Environmental Quality Index shows that when income inequality increases, the environment quality in Indonesia will decrease, this can be called a significant negative effect. Other variables in this study are considered to be fixed or have no effect.

The Effect of Economic Growth on the Environmental Quality Index shows that when economic growth increase, the environment quality in Indonesia will decrease. These results indicate that there is a significant negative relationship between variables. Other variables in this study are considered to be fixed or have no effect.

In this causality study, there is a one-way relationship between economic growth and EQI. This means that economic growth causes EQI, conversely EQI does not cause economic growth. Although economic growth and environmental quality rises together, only one of them has an effect, this result is different from Bangladesh (Nasreen et al., 2017) which has a two-way effect or causality.

References

Baloch, M. A., Danish, Khan, S. U. D., Ulucak, Z. Ş., & Ahmad, A. (2020). Analyzing the Relationship between Poverty, Income Inequality, and CO_2 Emission in Sub-Saharan African Countries. *Science of the Total Environment*, 740. https://doi.org/10.1016/j.scitotenv.2020.139867.

Fauzie, H. R. (2019). Peran Pemerintah dalam Implementasi Kebijakan Lingkungan di Kabupaten Sidoarjo. *Jurnal Politik Muda*, *7*(2), 52–63.

Febriana, S., Diartho, H. C., & Istiyani, N. (2019). Hubungan Pembangunan Ekonomi terhadap Kualitas Lingkungan Hidup di Provinsi Jawa Timur. *Jurnal Dinamika Ekonomi Pembangunan*, *2*(2).

Hao, Y., Chen, H., & Zhang, Q. (2016). Will Income Inequality Affect Environmental Quality? Analysis Based on China's Provincial Panel Data. *Ecological Indicators*, *67*, 533–542. https://doi.org/10.1016/j.ecolind.2016.03.025.

Hassan, S. A., Zaman, K., & Gul, S. (2015). The Relationship between Growth-Inequality-Poverty Triangle and Environmental Degradation: Unveiling the Reality. *Arab Economic and Business Journal*, *10*(1), 57–71. https://doi.org/10.1016/j.aebj.2014.05.007.

Homas, V., Dailami, M., Dhareshwar, A., Kaufmann, D., Khisor, N., Lopez, R., & Wang, Y. (2000). *The Quality of Growth - Kualitas Pertumbuhan (Issue September)*. Jakarta: PT. Gramedia Pustaka Umum.

Hunter, D. J., & Killoran, A. (2004). *Tackling Health Inequalities: Turning Policy into Practice? March*. London: Health Development Agency.

Kartiasih, F., & Pribadi, W. (2020). Environmental Quality and Poverty Assessment in Indonesia. *Journal of Natural Resources and Environmental Management*, *10*(1), 89–97. https://doi.org/10.29244/jpsl.10.1.89-97.

Kementerian Lingkungan Hidup dan Kehutanan (KLHK). (2018). *Indeks Kualitas Lingkungan Hidup Indonesia (IKLH) 2018*. Jakarta: Kementerian Lingkungan Hidup dan Kehutanan Republik Indonesia.

Kuncoro, M. (2003). *Metode Riset Untuk Bisnis & Ekonomi*. Jakarta: Erlangga.

Laswinia, V. D., & Chamid, M. S. (2016). Analisis Pola Hubungan Persentase Penduduk dan Sosial di Indonesia Menggunakan Regresi Spasial. *Jurnal Sains dan Seni ITS*, *5*(2), 1–6.

Lubis, A. A. (2015). Analisis Dampak Sektor Industri Manufaktur, Kemiskinan dan Belanja Pemerintah Bidang Lingkungan terhadap Kualitas Air di Indonesia. *Jurnal Quantitative Economics*, *04*(02), 100–111. https://doi.org/10.24114/qej.v4i2.17465.

Nachrowi, N., & Usman, H. (2006). *Ekonometrika Pendekatan Populer dan Praktis untuk Analisis Ekonomi dan Keuangan*. Jakarta: Lembaga Penerbit Universitas Indonesia.

Nasir, M., & Rehman, F. (2011). Environmental Kuznets Curve for Carbon Emissions in Pakistan: an Empirical Investigation. *Energy Policy*, *39*(3), 1857–1864.

Nasreen, S., Anwar, S., & Ozturk, I. (2017). Financial Stability, Energy Consumption and Environmental Quality: Evidence from South Asian Economies. *Renewable and Sustainable Energy Reviews*, *67*, 1105–1122. https://doi.org/10.1016/j.rser.2016.09.021.

Nasreen, S., Mbarek, M. Ben, & Atiq-ur-Rehman, M. (2020). Long-run Causal Relationship between Economic Growth, Transport Energy Consumption and Environmental Quality in Asian Countries: Evidence from Heterogeneous Panel Methods. *Energy*, *192*, 116628. https://doi.org/10.1016/j.energy.2019.116628.

Nengsih, S. R. (2015). Pembangunan Model Distribusi Populasi Penduduk Resolusi Tinggi untuk Wilayah Indonesia Menggunakan Sistem Grid Skala Ragam. *Jurnal Ilmiah Geomatika. 21(1)*, 31-36.

Omri, A., Nguyen, D. K., & Rault, C. (2014). Causal Interactions between CO_2 Emissions , FDI , and Economic Growth : Evidence from Dynamic Simultaneous-Equation. *Economic Modelling 42*(38), 2–9.

Pratama, Dicko S. (2013). *Pengaruh Degradasi Lingkungan terhadap Kemiskinan Indonesia Tahun 2011*. Jakarta: Sekolah Tinggi Ilmu Statistik.

Ridena, S. (2020). Kemiskinan dan Lingkungan: Perspektif Kemiskinan di Perkotaan dan Pedesaan. *Jurnal Litbang Sukowati*, *5*(1), 39–48. https://doi.org/10.32630/sukowati.v5i1.196.

Rosadi, D. (2011). *Analisis Ekonometrika dan Runtun Waktu Terapan dengan R.* Yogyakarta: Andi Offset.

Shanty, O., Dita, W. P., Firmansyah, & Sugiyanto, F. X. (2018). The Relationship between Environmental Degradation, Poverty and Human Quality in Indonesia. *E3S Web of Conferences*, *73*, 4–6. https://doi.org/10.1051/e3sconf/20187310020.

Sugiyarto, Mulyo, J. H., & Seleky, R. N. (2015). Kemiskinan dan Ketimpangan Pendapatan Rumah Tangga. *Agroekonomi*, *26*(2).

Suparmoko, M. (2016). *Ekonomi Sumber Daya Alam dan Lingkungan in: Peranan Sumber Daya Alam dan Lingkungan dalam Pembangunan*. Jakarta: Universitas Terbuka.

Wartono, T., & Firmansyah. (2013). Analisis Pertumbuhan dan Perubahan Struktur Ekonomi Produk Domestik Regional Bruto (PDRB) Kabupaten Blitar 2008-2011. *Jurnal Ilmiah Prodi Manajemen Universitas Pamulang*, *01*(02).

Yameogo, C. E. W., Omojolaibi, J. A., & Dauda, R. O. S. (2021). Economic Globalization, Institutions and Environmental Quality in Sub-Saharan Africa. *Research in Globalization*, *3*, 100035. https://doi.org/10.1016/j.resglo.2020.100035.

Yang, B., Ali, M., Hashmi, S. H., & Shabir, M. (2020). Income Inequality and CO_2 Emissions in Developing Countries: The Moderating Role of Financial Instability. *Sustainability (Switzerland)*, 12(17). https://doi.org/10.3390/SU12176810.