



Measuring the Impact of Economic Development on Environmental Degradation: an Empirical Analysis in Indonesia

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Abstract

This study aims to analyze the effect of economic growth, human development index, population density, land transportation and housing percentage on environmental quality in Indonesia. This research is a quantitative study with the data used is secondary data in the form of provincial panel data in Indonesia for the 2015-2019 period which is sourced from the Central Statistics Agency and also the Ministry of Environment. The data analysis technique used in this research is panel data regression analysis. Based on the results of panel data regression analysis, it can be explained that the variable economic growth has a negative and significant effect on the environmental quality index in Indonesia with a coefficient value of -0.013256. The human development index variable has a positive but not significant effect on the environmental quality index in Indonesia with a coefficient value of 0.045169. The population density variable has a negative and significant effect on the environmental quality index in Indonesia with a coefficient value of -1.214671. The land transportation variable has a negative and significant effect on the environmental quality index in Indonesia with a coefficient value of -2.142561. The land transportation variable has a negative and significant effect on the environmental quality index in Indonesia with a coefficient value of -1.134162. The government as the competent authority in policy formulation must start from an early age paying attention to environmental elements in future development planning. The community needs to increase their awareness in preserving the environment by participating in efforts to reduce pollution and pollution by carrying out environmentally friendly activities.

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INTRODUCTION

Recently, the issue of environmental damage has become a concern in various countries, including Indonesia. Economic development that often ignores negative impacts on the environment is still happening. Along with increasing economic growth, environmental damage that occurs is also increasing. Environmental degradation in Indonesia is getting worse day by day. Although efforts to prevent environmental degradation have been carried out, the results have not been maximized. Economic development activities whose aim is to improve people's welfare often only look at it from the point of view of progress in the

economic field. In fact, the development efforts that have been carried out have provided negative externalities for the environment. The existence of a healthy environment is actually an indicator of community welfare. Therefore, economic development should also be followed by environmental development. Indonesia is a developing country that continues to strive to improve its economy. Unfortunately, the economic development efforts carried out have an impact on environmental degradation. The environmental quality index in Indonesia during the 2015-2019 period on average was still in a moderate position as can be seen in the image below:

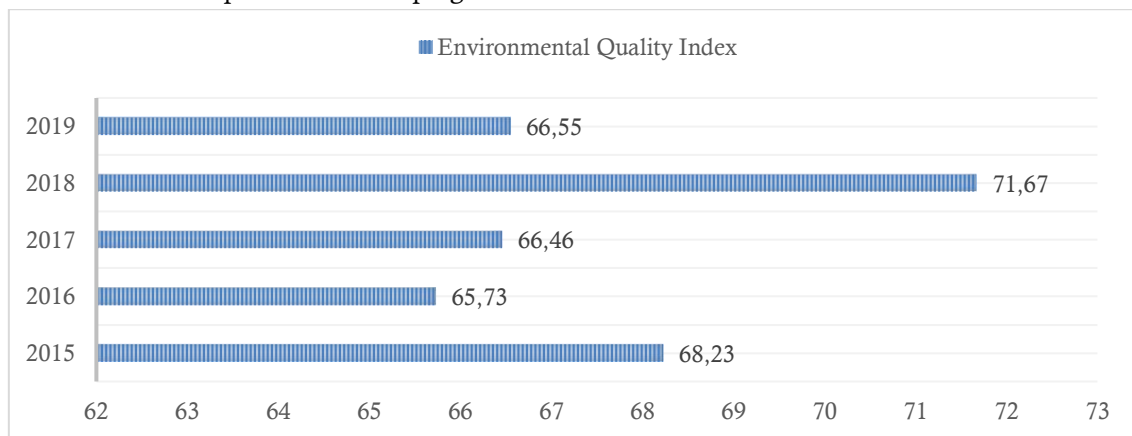


Figure 1. Indonesian Environmental Quality Index, 2015-2019 Period

Source: Ministry of Environment, 2022

The environmental quality index is an initial description or indication that gives a quick conclusion about a condition and environmental quality in a certain space and period. Based on Figure 1, it can be explained that the environmental quality index in Indonesia during the 2015-2019 period fluctuated. However, the environmental quality index in 2019 was lower than in 2018. This condition illustrates that there is an increase in environmental degradation in Indonesia in 2019. Economic growth is one of the targets in development. The relationship between economic growth and environmental quality is explained by the Environment Kuznets Curve (EKC) hypothesis (Dogan et al, 2020). EKC explained that economic growth will initially increase environmental damage due to natural exploitation and high pollution. But over time, the increase in economic

growth will be followed by an increase in environmental quality if the right policies are taken (Jimenez, et al., 2019; Bibi & Jamil, 2021; Isik et al, 2021).

In addition to economic growth, the quality of the environment is also influenced by the human development index. The quality of human resources is an important factor in preserving nature. The higher the quality of human resources, the higher the awareness in preserving nature. Vice versa, the lower the quality of human resources, the lower the awareness in preserving the environment. The quality of human resources can be reflected by the human development index. The Human Development Index is an average number of main successes in human development in a country which is seen from longevity and health, has knowledge and a good standard of living. When the human development index in a country is high, it

is possible that the quality of the environment in that country will also get better.

Density of population in a country is also one of the causes of declining environmental quality. As population density increases every year, it will have an impact on the quality of the existing environment, and result in increased human demand for goods and services, resulting in various types of waste ranging from liquid waste which will have an impact on water quality, to solid and gaseous waste that will cause pollution. affect air and soil quality. This is supported by research according to (Jayanti, 2017).

Transportation has an important role in supporting community movement activities in a country. In the modern era like today, the existence of transportation is needed to support community activities. Land transportation is one of the most frequently used transportation by the community. Ironically, the majority of existing land transportation can cause high pollution due to the use of fuels that are not environmentally friendly. Transportation is the biggest source of pollution caused by motorized vehicle activities. In the research of Jati et al (2017) it is explained that the exploitation of high fuel oil without good pollution control can cause environmental damage due to pollution caused.

Housing is a place where people live that can protect themselves from various natural activities. On the one hand, the function of housing is indeed very important as a place to live. But on the other hand, the increasingly massive housing development as has happened so far has had a negative impact on the quality of the environment. An increase in the percentage of housing will have an impact on the quality of the environment because in addition to changing its function to green land, and absorption into a place to live, it will also have an impact on increasing slum settlements if they do not have good basic facilities and infrastructure (Yuliastuti & Fatchurochman, 2012). In addition, the use of electrical energy will increase, the use of sand and cement, house tiles, and gas will eventually have an impact on environmental pollution. Based on the problems described previously, this study aims to analyze the effect of economic growth, human development

index, population density, land transportation and housing percentage on environmental quality in Indonesia.

The Environmental Kuznets Curve (EKC) hypothesis was proposed by Grossman & Krueger in 1995. This hypothesis explains the relationship between economic growth and environmental damage which forms an inverted U-curve model. The curve model is formed because economic growth initially increases environmental damage, but in the long run, economic growth itself is able to reduce environmental damage (Grossman & Krueger, 1995). This hypothesis is known as EKC because of its similarity to the inverted Kuznets U Curve which explains the relationship between income inequality and economic growth.

The production process in a country that is carried out continuously will result in environmental degradation both soil, water, and air pollution (Koonthar et al (2021). However, economic growth at a certain point will make people aware that the need for good environmental quality becomes a This point is called the turning point where economic growth will reduce environmental degradation (Shaharir & Alinor, 2013). The stages that occur in the relationship between economic growth and environmental quality, it can be seen that the EKC stages are divided into three. The first explanation of the relationship curve The U-inverted Kuznet is the stage of economic growth through the transition from agriculture to industry, then post-industrial with a service-based economic system. Environmental damage tends to increase due to changes in economic structure from rural to urban, and from agriculture to industry as mass production, and consumption growth .It is k then declined with the second economic structure change from energy-based heavy industry to technology-based industry and services (Panayotou, 1993).

In the first stage of industrialization, pollution increased rapidly as people were more interested in jobs and income than in clean air and water. In this regard, the community is too poor to pay for environmental control and regulation is irresponsible. At low income levels, the country will switch from agriculture to industry and

pollution intensity rises as waste from growing production and mass consumption. This is due to greater use of natural resources, more polluting emissions, and demands for increased output. Meanwhile, at high income levels, the progress of economic development is dominated by the post-industrial or service economy. At this stage, environmental awareness increases, spending on the environment is higher, technological efficiency, and the demand for environmentally friendly goods/services increases (Mrabet, Achairi, & Ellouze, 2014). The movement of the curve that is starting to balance brings the industrial sector to be cleaner, people value the environment more highly, and regulation becomes more effective (Dasgupta et al., 2002). Empirical evidence believes in the regression form of environmental quality in relation to income and other variables. This empirical relationship argues that economic growth by itself is the antidote to the environmental damage that occurs.

Various opinions put forward his theory of the notion of externality. Externality can be interpreted as a direct effect of the activities of a person or company on the welfare of other people or other companies both on production and consumption, which in this case is not regulated by market prices (Pyndyck & Rubinfeld, 2006).

Meanwhile, according to Fisher (2000) says that externalities occur when one activity of economic actors (both production and consumption) affects the welfare of other economic actors and events that occur outside the market mechanism. So when an externality occurs, the private choices by consumers and producers in private markets generally do not produce something that is economically efficient. Based on the above understanding, it can be explained that from a theoretical perspective, externalities occur because of the difference between the social marginal and private cost of an item.

Externalities arise basically because of human activities that do not follow environmentally sound economic principles. From an economic perspective, externalities and inefficiencies arise because one or more of the principles of efficient resource allocation are not met. Characteristics of public goods or resources,

market imperfections, government failures are conditions where the elements of the right to think or exploit resources are not fulfilled. As long as all these factors are not handled properly, then these externalities and inefficiencies are inevitable. If this is allowed, then this will have an unfavorable impact on the economy, especially in the long term.

According to (Ministry of Environment and Forestry, 2018) the Environmental Quality Index is an information conclusion that contains environmental conditions within a certain period of time, usually 1 (one) year, after which the index number will be translated to a good condition or vice versa. The further the index number is from 100, it means that efforts to protect and manage the environment must be further suppressed.

Meanwhile, according to (Federal Environment Agency, 2007) the environmental quality index is a score to be interpreted into several categories, and measures how the country is in compliance with environmental policies or the success of environmental policies. The purpose of measuring the environmental quality index is to improve the conditions for success in environmental policies.

According to (Ministry of Environment and Forestry, 2018) the concept of the Environmental Quality Index (IKLH) in Indonesia adopts the concept of the Environmental Quality Index (EQI) developed by Virginia Commonwealth University (VCU). The environmental quality index is calculated at the provincial level in order to produce a national environmental quality index. The indicators used to calculate the environmental quality index are river water quality, air quality, and forest cover. In calculating the overall Environmental Quality Index (IKLH) in the province, a calculation method is needed for each indicator where each indicator has a different formula.

Development and economic growth are two things that cannot be separated. Development determines sustainable development efforts and does not destroy native resources, while the theories and growth models produced are used as the basic guidelines for the country. Development is a process of continuous change towards improvement in all areas of people's lives by

standardizing on a set of values that lead them to achieve the desired state and level of life. Regional economic development is process-oriented. That is a process that involves the formation of new institutions, development of alternative industries, improvement of the capacity of the existing workforce to produce better products, identification of new markets, and transformation of knowledge (Adisasmita, 2005).

Regional economic development is a process in which local governments and their communities manage existing resources and form a partnership pattern between local governments and the private sector to create new jobs and stimulate the development of economic activity (economic growth) in the region (Arsyad, 1999). Regional economic development is a function of natural resource potential, labor and human resources, capital investment, development infrastructure and facilities, transportation and communication, industrial composition, technology, economic situation and inter-regional trade, regional development funding and financing capabilities, entrepreneurship, institutions area and development environment at large..

Adam Smith (1937) divides the stages of economic growth into five successive stages, namely: the hunting period, the breeding period, the cultivation period, trade and the last is the industrial stage. According to Adam Smith's theory, society will move from a traditional society to a modern capitalist society. In the process, economic growth will be increasingly driven by a system of division of labor between economic actors. In this case, Adam Smith views work as one of the inputs for the production process. The division of labor is the central point of discussion in Adam Smith's theory, with efforts to increase labor productivity.

In economic development, capital plays an important role. According to Adam Smith's theory, the accumulated capital will determine the fast or slow economic growth that occurs in a country. The capital is obtained from savings made by the community. By accumulating capital generated from savings, economic actors can invest it in the real sector, in an effort to increase revenues. It should be noted that capital accumulation and

investment are highly dependent on people's saving behavior, while on the other hand the people's ability to save is determined by the ability to control and explore existing resources.

Harrod-Domar's theory of economic growth (1964) states that the economy basically has to reserve or save a certain portion of its national income to add or replace damaged capital goods (buildings, tools and even raw materials). However, to refer to economic growth, new investment is needed which is a net addition to the reserve or capital stock, (capital stock). If it is assumed that there is a direct economic relationship between the total capital stock (K), and total GDP (Y).

According to the growth theory of Neo Classical Traditional, output growth always comes from one or more of 3 (three) factors, namely an increase in the quality and quantity of labor, additional capital (savings and investment) and technological improvements (Todaro, 1969).

The new growth theory, which is basically a theory of endogenous growth, provides a theoretical framework for analyzing endogenous growth because it considers GNP growth as a result of long-run equilibrium. The basic motivation of the new growth theory is to explain differences in the observed growth rates. More specifically, endogenous growth theorists try to explain and are considered to be exogenously determined by Solow's (1956) version of the neoclassical growth equation. The difference between the endogenous growth model and the neoclassical model is that it assumes that public and private investment in human capital data results in external savings and increased productivity that resists the tendency of diminishing returns. Endogenous growth theory tries to explain the increasing returns to scale and long-term growth patterns between countries.

Economic development and economic growth synergize with each other in achieving national development goals. However, if these two aspects do not pay attention to environmental sustainability, new problems will arise in the future. The existence of technological advances that are not environmentally friendly can endanger their natural habitat. Production process activities are not environmentally friendly as an effort to

increase output, besides being able to increase income, it will also generate quite large social costs.

The definition of the human development index according to the Central Bureau of Statistics is a summary measure of the average success of human development including a long and healthy life, knowledge and a decent standard of living. Long life and healthy life can be described by life expectancy at birth, namely the number of infant mortality rates. Knowledge or education can be described through the average length of school and the expected length of schooling, and the population aged 25 years and over who take formal education. Meanwhile, a decent standard of living can be measured through per capita expenditure and purchasing power.

Another definition according to the United Nations Development Program (UNDP) is the human development index is human development through the development of human capabilities, where humans actively participate in the process of forming their lives and human development must influence the processes that shape their lives. This means that human development is not only seen from the point of view of economic growth, but also from the process of human development itself. The three basic dimensions of the human development index are life expectancy at birth and the ability to live a long life, the ability to acquire knowledge and length of schooling, and the national income burrito per capita which describes the ability to have a decent life.

It can be concluded that the human development index is measured based on 3 (three) indicators, namely long life in terms of life expectancy, a person's knowledge as seen from literacy data and length of schooling for adults aged 25 years and over or who are taking formal education. , as well as people's living standards based on purchasing power. Samimi, et al (2011) explain that there is a positive and significant relationship between the environmental quality index and the human development index in all samples of developed countries. Whereas in developing countries, it shows that a high human development index does not necessarily improve the quality of the environment, therefore there is a

need for awareness from the community and support from international organizations such as the United Nations.

Population density is a condition that is said to be more dense when the number of people in a certain space limit is increasing compared to the area of the room (Sarwono, 1992). Population density is the ratio between the total population and the area inhabited. Population density is an indicator of population pressure in an area. The density in an area compared to the area of land occupied is expressed by the number of inhabitants per square kilometer. The population used as the numerator can be in the form of the total population in the area, or certain sections of the population such as: residents of rural areas or residents who work in the agricultural sector, while the denominator can be in the form of the total area, agricultural area, or area. rural area. Based on the opinion of experts about population density, it can be concluded that population density is a condition in which the number of people in an inhabited area is increasingly dense. In this case, the area cannot meet the population's need for space in a settlement. Uncontrolled population density results in negative impacts on the environment such as increasingly limited basic resources, inadequate social and health facilities, and insufficient job opportunities for the existing workforce.

Population density can affect the quality of life of the population. In areas with high density, efforts to improve the quality of the population will be more difficult to do. This raises socio-economic problems, welfare, security, land availability, clean water and food needs. The biggest impact is environmental damage.

The literal definition of transportation is the physical transfer of people or goods from one place to another within a certain time by using or moving by humans, animals or machines. In general, transportation is divided into three namely land transportation, sea transportation and air transportation. According to Hadihardaja et al (1997), transportation is the transfer of passengers and goods from one place to another. In transportation there are two most important elements, namely movement and physical

displacement of goods or passengers with or without transportation equipment to other places. Broadly speaking, by looking at the medium of transportation, it can be divided into land, water and air modes. Furthermore, the land mode can be divided into road and rail modes.

The definition of land transportation according to the Directorate General of Information and Public Communication is the transfer of people and goods to other places using transportation means which can be humans, animals, bicycles, and motorbikes with the type of road used, namely footpaths, soil, gravel or asphalt, where The propulsion of the conveyance can be in the form of animals, humans, steam, diesel and fuel oil.

Land transportation activities are related to environmental problems related to changes in weather, decreased water quality, air quality, and soil quality. The emission of particulate matter in the form of dust from vehicle exhaust will have an impact on air quality, which produces sulfur dioxide and nitrogen dioxide emissions which will form an acidic atmosphere and create acid rain. So that the creation of acid rain which will cause environmental damage and decreased forest function (Tahzib & Zvijáková, 2012).

The definition of housing according to (Soesilowati, 2015) is a collection of houses that function as a place for humans to live and carry out their lives. Meanwhile, according to the Law of the Republic of Indonesia Number 11 of 2011, housing is a collection of houses that are part of settlements both in urban and rural areas complete with facilities, infrastructure as an effort to live in a house that is livable.

Another definition of housing according to (Keman, 2005) is a group of houses that have a function as a place to live or a place to live complete with environmental infrastructure such as drinking water supply, waste disposal, electrical energy, roads and other facilities to support economic activities. Decent housing must meet health requirements so that residents or families stay healthy. Healthy housing is a factor to improve health standards. The concept is oriented towards residential buildings, housing locations, use and maintenance of the residential environment and

also includes the provision of drinking water suitable for consumption and adequate facilities for cooking, washing, food storage and disposal of waste and human waste.

While the housing development aspect according to (Soesilowati, 2015) covers 3 (three) aspects, namely: human development, business development and environmental development, the purpose of human development is so that citizens have a healthy life, there are learning opportunities and have tolerance and respect for others. fellow. To achieve a healthy life, income or income is needed, so there is a need for alignment with business development. But human development and business development cannot be sustainable without being assisted by environmental development, where every citizen is encouraged to take care of the surrounding environment. Housing and settlement is a sustainable thing, because settlement is an area of housing accompanied by various facilities, infrastructure and environmental infrastructure. Yuliasuti & Fatchurochman (2012) in their research explain that if the land is built or housing, if the development is 0%, the quality of the environment will tend to decrease. So a minimum of 2 percent of land development is needed, accompanied by quality housing infrastructure.

RESEARCH METHODS

This research is a quantitative research with data processing in the form of numbers. The type of data used in this study is secondary data in the form of panel data sourced from the Central Statistics Agency and also the Ministry of Environment. There are six variables used in this study consisting of one dependent variable and five independent variables. The dependent variable used in this study is the Environmental Quality Index (Y), while the independent variables used in this study are Economic Growth (X1), Human Development Index (X2) Population Density (X3), land transportation (X4), and Housing (X5).

The data analysis technique used in this study is panel data regression analysis. Panel data regression analysis is a method that uses time-sequential structured data and cross section. The

advantages of using panel data include: 1) Panel data has an estimation technique that can explicitly address heterogeneity; 2) The existence of a combination of observations between the cross section and time series, it will provide more information, less collinearity between variables, has various variations, is more efficient, and has many degrees of freedom; 3) The results of the panel data study will be more suitable in learning the dynamics of change compared to a cross-sectional iterative study; 4) Panel data is very good, because it can measure and detect the impact in a simple way compared to cross section and time series studies; 5) In studying complex behavioral models, panel data will make it easier to learn; 6) Can minimize bias if individual/company aggregation is carried out in large-scale aggregation by making the data number in the thousands. The data analysis technique in this study uses panel data regression with the help of Eviews 10 software. The models used in this study are as follows::

$$EQI = \beta_0 + \beta_1GDP_{it} + \beta_2HDI_{it} + \beta_3PD_{it} + \beta_4LT_{it} + \beta_5HO_{it} + \epsilon \dots\dots\dots(1)$$

Information:

- EQI :Environmental Quality Index
- GDP :Economic Growth
- HDI : Human Development Index
- PD : Population Density

- LT : Land Transportation
- HO : Housing Percentage
- 0 :Intercept/constant.
- 1 2 3 4 5 : Variable regression coefficient.
- :error term.
- i :cross section (Province)
- t :time series (Year)

RESULTS AND DISCUSSION

This study uses panel data regression analysis techniques. The data analyzed is secondary data consisting of Environmental Quality Index (Y), Economic Growth (X1), Human Development Index (X2), Population Density (X3), Land Transportation (X4) and Housing (X5). In panel data regression analysis, there are three choices of models, including the common effect model, fixed effect model, and random effect model. To choose one model, a specification test is carried out. Model selection is done to find out the right model as a tool to analyze the data in this study. The initial step in the specification test is to compare the common effect model with the fixed effect model by using the chow test/likelihood test. Then the second stage is to compare the fixed effect model with the random effect model using the Hausman test. Based on the results of the likelihood ratio test (chow test), the following results are obtained:

Table 1. The results of the likelihood ratio test (chow test)

Redundant Fixed Effects Tests			
Equation: Untitled			
Test cross-section fixed effects			
Effects Test	Statistic	d.f.	Prob.
Cross-section F	8.236614	(33,150)	0.0000
Cross-section Chi-square	163.021407	33	0.0000

Source: Output Eviews 10

Based on the results of the Chow test, it can be explained that the probability of F is 0.0000 < = 5%. So it can be concluded that the selected model is a fixed effect model, this is because the probability value of the cross-section F is less than

, i.e. 0.0000 < 0.05 or a significant probability at = 5% which means accepting H1. After the Chow test, the Hausman test was carried out. The results of the Hausman test in this study are presented in the following table:

Table 2. Hausman test results

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	7.205671	4	0.3458

Source: Output Eviews 10

Based on the results of the Hausman test obtained a significance value of $0.2458 \geq 5\%$. These results indicate that the random effects model is better than the fixed effects model because the probability value is significant at $= 5\%$, which means rejecting H_0 and accepting H_1 . From the results of the Chow test and the Hausman test,

different results are obtained, it is necessary to do a lagrange multiplier. The test was conducted to select the best model between the common effect model and the random effect model. The results of the lagrange multiplier test are presented in table 1.3. as follows:

Table 3. Lagrange multiplier test results

Null (no rand. effect) Alternative	Cross-section	Period	Both
	One-sided	One-sided	
Breusch-Pagan	20.03742 (0.0000)	1.479470 (0.2239)	24.54728 (0.0000)
Honda	5.201356 (0.0000)	-1.216335 (0.8881)	2.536082 (0.0056)
King-Wu	2.120276 (0.0000)	-1.216335 (0.8881)	1.779820 (0.0376)
GHM	-- --	-- --	23.06781 (0.0000)

Significance = 5%

Source: Output Eviews 10

The table of the results of the lagrange multiplier test shows the Breush-Pagan (BP) probability value of 0.0000. The hypothesis is that if the Breush-Pagan (BP) probability is less than alpha ($0.0000 < 0.05$) then H_0 is rejected and H_1 is

accepted, so the correct model in the above results is the random effects model. The results of panel data regression using the random effects model are presented in the following table:

Table 4. The results of panel data regression with random effects

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	15.201467	8.752610	2.023147	0.00413
X1	-0.013256	0.067618	-2.023416	0.0318*
X2	0.045169	0.034178	0.126712	0.6134
X3	-1.214671	0.123571	-2.032357	0.0134*
X4	-2.142561	0.541681	-2.267192	0.0025*

X5	-1.134162	0.034163	-2.739132	0.0004*
R-squared	0.645024	Mean dependent var		0.201657
Adjusted R-squared	0.622354	S.D. dependent var		0.526542
S.E. of regression	0.312513	Sum squared resid		3.324197
F-statistic	6.232215	Durbin-Watson stat		2.723418

*Significant at = 5%

Source: Output Eviews 10, 2022

Based on the panel data regression output table above, it can be explained that the R-square value is 0.645024, this shows that the ability of the variables of economic growth, human development index, population density, land transportation, housing percentage can explain the quality of the environment in Indonesia by 64.5% . While the remaining 35.5% % is explained by other variables outside the model. Based on the estimation of the regression results, the following models can be arranged:

$$EQI = 15.201467 - 0.013256GDPit + 0.045169HDIit - 1.214671PDit - 2.142561LTit - 1.134162HOit + \epsilon$$

.....

(2)

Based on the results of the regression analysis above, it is found that the economic growth variable has a t-statistic < t-table, namely -2.023416 > 1.97539 and a probability > which is 0.0318 < 0.05 (alpha 5%), so H0 is accepted and Ha is rejected. The results of the test state that economic growth has a negative and significant effect on the quality of the environment in Indonesia. Based on these results, it can be explained that an increase in economic growth can reduce the environmental quality index.

The domestic human development index variable has a t-statistic < t-table which is 0.126712 < 1.97539 and a probability > which is 0.6134 > 0.05 (alpha 5%), so H0 is accepted and Ha is rejected. The results of the test state that the human development index variable has a positive effect on the quality of the environment in Indonesia but is not significant. Based on these results, it can be explained that an increase in the human

development index can increase the environmental quality index.

The population density variable has a t-statistic > t-table that is -2.032357 > 1.97539 and a probability < that is 0.0134 < 0.05 (alpha 5%), so H0 is rejected and Ha is accepted. The results of the test state that the population density variable has a negative effect on the quality of the environment in Indonesia and statistically, it can be concluded that population density has a significant effect on the quality of the environment in Indonesia. Based on these results, it can be explained that the increase in population density reduces the environmental quality index.

The land transportation variable has a t-statistic > t-table ie -2.267192 > 1.97539 and a probability < that is 0.0025 < 0.05 (alpha 5%), so H0 is rejected and Ha is accepted. The results of the test state that the variable land transportation has a negative effect on the quality of the environment in Indonesia and statistically, it can be concluded that land transportation has a significant effect on the quality of the environment in Indonesia. Based on these results, it can be explained that the increase in land transportation can reduce the environmental quality index.

The housing percentage variable has a t-statistic > t-table which is -2.739132 > 1.97539 and a probability < which is 0.0004 < 0.05 (alpha 5%), so H0 is rejected and Ha is accepted. The results of the test state that the percentage of housing has a negative effect on the quality of the environment in Indonesia and statistically, it can be concluded that the percentage of housing has a significant effect on the quality of the environment in Indonesia. Based on these results, it can be explained that an increase in the percentage of housing can reduce the environmental quality index.

Discussion

The Effect of Economic Growth on Environmental Quality

Based on the results of panel data regression analysis, it can be explained that the variable economic growth has a negative and significant influence on the environmental quality index in Indonesia. The coefficient value of -0.013256 indicates that if economic growth increases by 1 unit, the index of environmental quality in Indonesia will decrease by 0.013256. The results of this study are in line with the research by Febriana et al (2019) which explains that targeted economic growth by increasing economic activity per sector is able to have a significant negative effect on environmental quality.

These results are in accordance with the Environmental Kuznets Curve (EKC) Hypothesis which explains that economic growth in the short term can increase environmental damage. However, in the long term, when the income of the population is well established and welfare is high, economic growth will be able to reduce the environmental damage that occurs. Economic growth in general is aimed at improving people's welfare. However, this certainly should not rule out the preservation of environmental quality. Because the quality of the environment that is maintained can also improve the welfare of the community for both present and future generations. Economic activities that are extraction, fabrication and consumption will affect the ability of nature to provide natural resources. This means that the carrying capacity of the environment lies not only in the ability of the environment to fulfill human needs, but also in the ability to accept the burden of pollution in the development process and production activities. If the value of environmental damage is not taken into account by economic actors in carrying out their activities, then this kind of condition will result in continuous environmental damage.

The Effect of Human Development Index on Environmental Quality

Based on the results of panel data regression analysis, it can be explained that the human development index variable has a positive

but not significant effect on the environmental quality index in Indonesia. The coefficient value of 0.045169 indicates that if the human development index increases by 1 unit, the index of environmental quality in Indonesia will also increase by 0.045169. The results of this study are in line with research by Pambudi (2020) which explains that the human development index has a positive and significant impact on the quality of the environment.

One of the challenges of national and regional (regional) development in Indonesia is the issue of resource utilization for the economy and environmentally sound resource management. Regional resource development has a dual role in its role as a capital for economic growth and at the same time as a life support economy. In the context of sustainable development, the success of regional development is always associated with the carrying capacity of the environment as measured by the Environmental Quality Index. HDI development should not have a negative impact on the environment. Current government policies tend to be separate when they want to intervene on the HDI and also when they want to intervene in environmental aspects (Umami et al., 2019).

The Effect of Population Density on Environmental Quality

Based on the results of panel data regression analysis, it can be explained that the population density variable has a negative and significant influence on the environmental quality index in Indonesia. The coefficient value of -1.214671 indicates that if the population density increases by 1 unit, the index of environmental quality in Indonesia will decrease by 1.214671. The results of this study are in line with the research of Hardini (2011) and the research of Kustanto (2020). The results of these two studies explain that high population density can reduce the quality of the environment. High population growth in a country has caused a decrease in environmental quality through many developments, such as large-scale agriculture, migration of people to big cities and industrialization whose waste management is not in accordance with operational standards. Population growth supported by a consumptive

lifestyle and increasingly advanced technological developments have produced hazardous and toxic waste, which results in environmental damage (Liyanage & Yamada, 2017); Maizunati & Arifin, 2017).

The Effect of Land Transportation on Environmental Quality

Based on the results of panel data regression analysis, it can be explained that the land transportation variable has a negative and significant influence on the environmental quality index in Indonesia. The coefficient value of -2.142561 indicates that if land transportation increases by 1 unit, then the environmental quality index in Indonesia will decrease by 2.142561. The results of this study are in line with the research of Ofrial and Herianto (2020) and also the research of Gupito (2012) which explains that high transportation activities can cause environmental pollution so that environmental quality decreases.

The transportation sector plays an important role as transportation services in increasing Indonesia's economic growth. However, the Transportation Sector is also one of the sectors that contributes a high number of CO₂ emissions in Indonesia. Increased community activities and logistics distribution will certainly increase the pollution released by the burning of fuel for operating motor vehicles. This can cause acid rain which will then damage the environment. This phenomenon will continue to occur when people are not aware of the dangers of pollution caused by transportation activities using motorized vehicles.

The Effect of Housing Presentation on Environmental Quality

Based on the results of panel data regression analysis, it can be explained that the land transportation variable has a negative and significant influence on the environmental quality index in Indonesia. The coefficient value of -1.134162 indicates that if economic growth increases by 1 unit, the index of environmental quality in Indonesia will decrease by 1.134162. The results of this study are in line with research by ardi et al (2019) and research by Syamdermawan (2013) which explains that increasing housing

development activities will increase energy consumption demand and reduce green open space so as to reduce environmental quality.

Housing development can contribute to greenhouse gas emissions, especially CO₂ gas in quite a large amount. CO₂ emissions that are generated directly or indirectly, among others, come from energy used for various activities that can be grouped into domestic activities, transportation, solid and liquid waste and building materials for housing and environmental facilities and infrastructure. Changes in land use also affect the generation of CO₂ gas. High CO₂ gas content will have an impact on lowering air quality and damaging water and soil quality when acid rain occurs.

Increased housing development, especially in urban areas, has implications for high pressure on the use of urban space, so that spatial planning in urban areas needs special attention, especially those related to the provision of residential areas, public and social facilities, and open spaces.) in urban areas to cope with urban environmental conditions.

CONCLUSION

Based on the results and discussions that have been described previously, it can be concluded that the quality of the environment in Indonesia is still of concern because the current development efforts carried out by the government still have a negative impact on the environment. The high economic growth in Indonesia has an impact on the decline in environmental quality. This is because efforts to increase economic growth are carried out by boosting domestic production so that they tend to exploit natural resources and cause high pollution. The human development index in this study has a positive but not significant effect on the environmental quality index. As we know that the better quality of human resources will make people more aware of the importance of protecting the environment.

Population density is a variable that has a negative and significant effect on the environmental quality index. The high population density demands higher fulfillment. These

conditions make various industrial activities more dense so that the pollution and pollution produced is higher, thus reducing the quality of the environment. Land transportation is the variable that has the highest influence on the quality of the environment. Transportation is a sector that has an important role in supporting community activities and mobility. But behind these interests, the increasingly massive transportation movement causes pollution and pollution so that it has an impact on environmental quality degradation. The housing percentage variable is a variable that also has a negative and significant effect on the quality of the living environment. Housing development activities can actually reduce green open land and increase industrial activities to fulfill housing raw materials. This condition will have an impact on increasing pollution and will ultimately reduce the quality of the environment.

The government as the competent authority in policy formulation must start from an early age paying attention to environmental elements in future development planning. Economic development, which is actually aimed at increasing economic growth and people's incomes, must be in harmony with environmental sustainability. When the environment is maintained, economic activities that depend on natural resources will continue to exist for generations to come. The community needs to increase their awareness in preserving the environment by participating in efforts to reduce pollution and pollution by carrying out environmentally friendly activities. It is also appropriate for business actors to make business plans that are responsible for maintaining the preservation of the surrounding environment. This research is still limited to certain variables so that future research is expected to expand variables that are closely related to environmental quality such as investment and industrial activities.

REFERENCES

- Adisasmita, R. (2005). *Urban Economic Development*. Yogyakarta: Graha Ilmu.
- Ardi, M., Amir, F., & Rauf, B. A. (2019, December). *Improving the Quality of the Housing*

- Environment in Small Type House Residents in Soppeng Regency*. In LP2M UNM National Seminar.
- Arsyad, L. (1999). *Introduction to regional economic planning and development*. Publishing Agency of the Faculty of Economics (BPFE).
- Bibi, F., & Jamil, M. (2021). Testing environment Kuznets curve (EKC) hypothesis in different regions. *Environmental Science and Pollution Research*, 28(11), 13581-13594.
- Dasgupta, S., Laplante, B., Wang, H., & Wheeler, D. (2002). Confronting the Environmental Kuznets Curve. *Journal of Economic Perspectives*, 16(1), 147-168.
- Dogan, E., & Inglesi-Lotz, R. (2020). The impact of economic structure to the environmental Kuznets curve (EKC) hypothesis: evidence from European countries. *Environmental Science and Pollution Research*, 27(11), 12717-12724.
- Febriana, S., & Herman Cahyo Diartho, N. I. (2019). The relationship of economic development to the quality of the environment in the province of East Java. *Journal of Development Economics Dynamics*, 2(2).
- Fisher, W. H., & Hof, F. X. (2000). Relative consumption, economic growth, and taxation. *Journal of Economics*, 72(3), 241-262.
- Grossman, G. M., & Krueger, A. B. (1995). Economic growth and the environment. *The quarterly journal of economics*, 110(2), 353-377.
- Gupito, K. R., & KODOATIE, J. M. (2012). *The Relation of Per capita GRDP from Industry, Transportation, Agriculture and Forestry Sector to Environmental Quality Measured by Co Emissions (Case Study in: 30 Regencies/Cities of Central Java Province in 2009-2010)* (Doctoral dissertation, Faculty of Economics and Business).
- Hardini, D. A. (2011). *The Relationship Between Population Growth, Poverty and Economic Growth on Environmental Quality in Semarang City in 2001-2008* (Doctoral dissertation, Semarang State University).
- Isik, C., Ongan, S., Ozdemir, D., Ahmad, M., Irfan, M., Alvarado, R., & Ongan, A. (2021). The increases and decreases of the environment Kuznets curve (EKC) for 8 OECD countries. *Environmental Science and Pollution Research*, 1-9.
- Keman, S. (2005). Health of housing and residential environment. *Journal of Environmental Health Unair*, 2(1), 3947.

- Kustanto, A. (2020). Dynamics of Population Growth and Water Quality in Indonesia. *Journal of Economics and Development*, 20(1), 12-20.
- Liyanage, C. P., & Yamada, K. (2017). Impact of Population Growth on The Water Quality of Natural Water Bodies. *Sustainability (Switzerland)*, 9(8), 1–14. <https://doi.org/10.3390/su9081405>
- Maizunati, Mrabet, A., Achairi, R., & Ellouze, A. (2014). The Two-Way relationship between Economic Growth and CO2 Emissions. 2(6), 32–35.
- N. A., & Arifin, M. Z. (2017). The Effect of Population Changes on Water Quality in Indonesia. *Journal of Research and Development of Central Java Province*, 15(2), 207–215. <https://doi.org/https://doi.org/10.36762/litbangjateng.v15i2.417>.
- Ofriat, S. A. M., & Herianto, D. (2020). The Effect of Air Pollution Due to Transportation Activities for the People of Kuripan Village, Lampung. *SAKAI SAMBAYAN JOURNAL*.
- Pambudi, Andi Setyo. (2020). Analysis of the Relationship between the Human Development Index and the Environmental Quality Index. *MONAS: Journal of Apparatus Innovation Vol 2 No 1 (2020)*: 109-123.
- Panayotou, T. (1993). Empirical Test and Policy Analysis of Environmental Degradation at Different Stages of Economic Development. In *WORLD EMPLOYMENT PROGRAMME RESEARCH*.
- Pindyck, R. S., Rubinfeld, D., & Koh, W. T. (2006). *Microeconomics: An Asian Perspective*.
- Samimi, A., & Zarinabadi, S. (2011). Reduction of greenhouse gases emission and effect on environment. *Australian Journal of Basic and Applied Sciences*, 5(12), 752-756.
- Sangkawati, S., & Hadihardaja, J. Sustainable Water Resources Empowerment for Various Interests. *CIVIL ENGINEERING COMMUNICATION MEDIA*, 13(3), 117-127.
- Sato, R. (1964). The Harrod-Domar model vs the neo-classical growth model. *The Economic Journal*, 74(294), 380-387.
- Sato, R. (1964). The Harrod-Domar model vs the neo-classical growth model. *The Economic Journal*, 74(294), 380-387.
- Shaharir, b. M. Z., & Alinor, M. b. A.K. (2013). The Need for a New Definition of Sustainability. *Journal of Indonesian Economy and Business*, 28(2), 251–268.
- Smith, A. (1937). *The wealth of nations* [1776].
- Smith, A. (1937). *The wealth of nations*. modern libraries. New York, 423.
- Solow, R. M. (1956). A contribution to the theory of economic growth. *The quarterly journal of economics*, 70(1), 65-94.
- Syamdermawan, W., Surjono, S., & Kurniawan, E. B. (2013). The Effect of Green Open Space on Environmental Quality in Upper Middle Housing. *Technology and Vocational: Journal of Technology, Vocational and Teaching*, 35(1).
- Tahzib, B., & Zvijáková, L. (2012). Environmental impact of land transport. *Transfer inovácií*, 24, 70-77.
- Todaro, M. P. (1969). A model of labor migration and urban unemployment in less developed countries. *The American economic review*, 59(1), 138-148.
- Todaro, M. P. (1969). A model of labor migration and urban unemployment in less developed countries. *The American economic review*, 59(1), 138-148.
- Vaca-Jiménez, S., Gerbens-Leenes, P. W., & Nonhebel, S. (2019). Water-electricity nexus in Ecuador: The dynamics of the electricity's blue water footprint. *Science of The Total Environment*, 696, 133959.
- Yuliastuti, N., & Fatchurochman, A. (2012). The effect of the development of built-up land on the quality of the residential environment (case study: Educational Area of Tembalang Village). *Journal of Precipitation: Communication Media and Environmental Engineering Development*, 9(1), 10-16.