

Research Article

The influence of economic growth, energy consumption, poverty and population on Indonesia's environmental quality index

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Abstract. The quality of the environment is very important for the sustainability of a country's economic development, and the environment is influenced by macroeconomic indicators. This study aimed to analyze the effect of economic growth, energy consumption, poverty and population on Indonesia's quality of environment index. The data used in this research were secondary data and multiple linear regression was used to analyze the data. Based on the results, energy consumption and population have a significant effect on the index of the quality of the living environment in Indonesia. Meanwhile, the variables of economic growth and poverty have a partially insignificant effect on this index. So the results provide empirical evidence that environmentally friendly energy consumption actions have been well managed. The population was found to have a negative effect on environmental quality, perhaps partly due to irresponsible exploitation by residents where natural resources have become an easy choice for fulfilling needs. These actions must be recognized as damaging the environment and threatening the survival of life.

Keywords: environmental quality index, economic growth, population, poverty, energy consumption

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1. INTRODUCTION

Macroeconomic indicators have a direct impact on environmental quality, both in the long and short term. This is in line with research that has been carried out in several countries over a certain period of time,[1]. Indicators of economic growth will increase in line with the development of the economic sector. The development of this economic activity has an impact on the environment.

Indicators of the level of energy consumption of the population in a country also affect the quality of the environment in addition to other indicators. Energy consumption has now become one of the primary human needs because almost all sectors require

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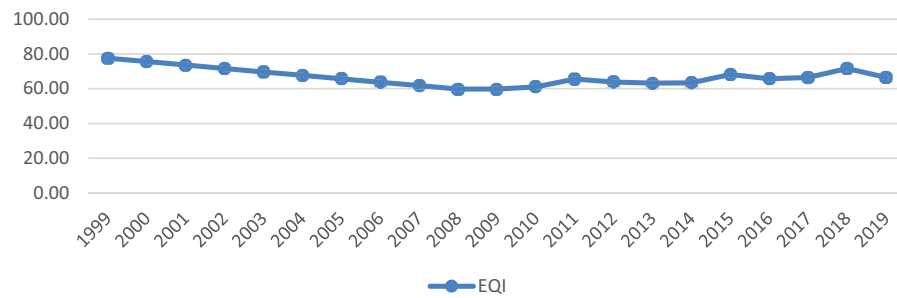
energy, including households, companies/factories, government and non-government institutions, health and education facilities. Every year electricity consumption continues to increase, this causes a scarcity of energy sources and increases in market prices. So it takes awareness and efforts from humans to make efforts to save electrical energy. The more energy needs, the greater the exploitation of natural resources. Not infrequently the exploitation of energy sources is carried out without regard to its impact on environmental damage.

Poverty is an economic indicator that also affects the quality of the environment. Poverty is recognized also affects the quality of the environment. To meet basic needs, it is not uncommon for poor groups to exploit natural resources excessively and do not pay attention to the impact of these actions on the environment.

Another macro indicator that also affects environmental conditions is the population. The limitations of the earth's natural capacity and the ability of natural resources to provide for the needs of the population are problems that must be considered. The population can be a resource that is able to empower the economy with positive activities carried out, but the opposite can also happen. The denser the population, the greater the pressure on the environment, which will eventually lead to a decrease in environmental quality. So the number of people with activities to fulfill their needs in terms of the availability of resources needs to be a serious concern in the context of achieving sustainable development.

Environmental studies conducted mainly in Indonesia have tried to examine the relationship between economic variables and the environment in the form of pollution and disaster levels. No studies have been found that use environmental quality index indicators in relation to macroeconomic indicators. The quality of the environment in a country is closely related to macroeconomic indicators. The economic approach is one approach that can be used to overcome the problem of environmental damage and scarcity of natural resources.

This study should be carried out comprehensively so that the direction of development carried out can realize sustainable development. So this study tries to fill the research gap in environmental studies in relation to macroeconomic indicators. The study tries to examine how the influence of economic growth, energy consumption and poverty as well as population on the environmental quality index in Indonesia.



Source: Central Statistics Agency, 2021

Figure 1: Environment quality index 1999 - 2019.

2. LITERATURE REVIEWS AND HYPOTHESIS

2.1. Environmental Quality Index

Environmental quality is an environmental condition that can provide optimal support for human survival in an area. Environmental quality is characterized by an atmosphere that makes people feel at home living in their own place. Various necessities of life are met from basic or primary needs, including food, drink, housing, to spiritual or spiritual needs including education, security, and means of worship.

Environmental quality can be measured by the level of carbon dioxide emissions (CO₂), where CO₂ affects the level of pollution. Increased CO₂ emissions are the impact of human activities in the process of meeting their needs. This is expected to increase further. This increase in CO₂ emissions is thought to be due to the growth of economic activity that encourages industrial development and the level of consumption of a country.

The Indonesian Ministry of Environment and Forestry (2017) developed an indicator of environmental quality known as the environmental quality index (IKLH). This index is used to assess the performance of environmental quality improvement programs. IKLH is information material to support the policy-making process related to environmental protection and management. Since 2009 the province-based environmental quality of Indonesia has been developed which is a modification of the Environmental Performance Index (EPI). The IKLH framework adopted is that developed by Virginia Commonwealth University (VCU).[2].

From the graph above, it can be seen that Indonesia's environmental quality index has tended to increase since the 2009 period. This is presumably due to improving macroeconomic indicators and increasing public awareness of the need to maintain a good environment.,Different things were found in the 1999 period since the economic

crisis, which make the economic life of the community worse and the development slowdown.

2.2. Economic growth and environmental quality

The environmental quality index is largely determined by many things, one of which is economic growth. Rapid economic growth is generally followed by environmental damage. Economic growth that only pursues economic growth targets, and does not pay attention to the quality of economic growth achieved often causes many negative things. The negative impacts that occur include environmental damage, this gives an indication of the low environmental quality index.

Strictly speaking, from the results of the study it was found that economic growth demands an increase in the production of goods or services so that the needs of the community can be met and can reach the needs of the wider community. But in reality, economic growth has a negative externality on environmental damage in the long term [3]. Economic growth causes a decrease in natural resources and causes environmental damage due to the actions of the production and consumption processes.

Environmental Kuznets Curve (EKC), [4] shows that there is a significant relationship between the rate of economic growth and environmental degradation. This condition indicates that an increase in the value of national income, especially the agricultural sector, will lead to a worsening of the quality of the environment or in other words this will cause a decrease in the Environmental Quality Index. (IKLH). Economic growth at low income levels (before the turning point of the curve) will increase environmental degradation, but at higher income levels (after the turning point of the curve) economic growth will provide improvements in environmental quality. In the early stages of development in a country that is still developing industry to increase output, this causes air pollution to also increase. But countries that have increased economic growth will have the ability to control pollution. Once the country is successful in developing methods and procedures to control pollution, pollution levels can be contained and even reduced in line with economic growth. State capabilities will also be used to improve air quality. In the end, the state will develop environmentally friendly technology so that pollution can be reduced. When a country experiences increasing growth, the problem of air pollution increases rapidly. This occurs before stabilization or control of air pollution has not been implemented, this is also in line with the findings [4]. So countries with good economic capabilities improve air quality or excessive pollutant emissions, control

the operation of technology that is less efficient and relatively dirty. This explains the shape of the EKC like an inverted “U”

So development has a positive impact in the form of increasing the standard of living and welfare of the community, but on the other hand it has a negative impact in the form of pollution which must be handled from the use of uncontrolled resources due to the production and consumption processes before reaching an established economic condition. Thus, the increase in high economic growth turned out to be very expensive with increasing pollution and environmental damage. This deteriorating environmental condition can become an obstacle in creating sustainable economic development so that the concern of all parties is needed.

2.3. Effect of energy consumption on environmental quality

The increasing world energy consumption, especially the use of fossil fuels causes CO₂ emissions to become the main cause of global warming ([5]. In 2011, GHG CO₂ emissions were 83% while the other 93% were CO₂ emissions originating from the energy sector.

Based on research [6] shows results that energy consumption affects CO₂ positively and significantly below 1%. This means that if energy consumption increases by 1 kg of oil equivalent per capita, then CO₂ will increase. Energy consumption affects CO₂ emissions significantly in the short and long term. Thus, the higher the energy consumption, the higher the level of CO₂ emissions. This of course will give an indication of the worsening quality of the environment or a decrease in the value of the environment IKLH.

However, energy consumption and air pollution are factors driving output levels and the economy in urban areas. There is a significant relationship between energy consumption and air pollution in urban areas. An increase in output will result in environmental pollution, this is a strong reason for the need for an environmentally friendly energy use policy [7]. The study also found that in the long term there is a positive and significant relationship between electricity consumption and CO₂ emissions[8]. The industrial sector with its capital causes the global ecology to no longer have the capacity to support growth, giving rise to the concept of a green economy which is the pillar of sustainable development.

The development of renewable energy is expected to reduce the potential adverse effects of fossil and

electricity consumption on environmental damage. Renewable energy tends to minimize the level of environmental damage due to the consumption of energy derived from fossils and electricity. Thus, significant expansion and consumption of renewable energy can contribute to poverty reduction and safeguard environmental quality.

2.4. Poverty and Environmental Quality

Poverty and the environment are two crucial phenomena that are difficult to separate. There is a negative impact of poverty on environmental quality, which means that the more poor people in a certain area, the worse the environmental quality in that area. Irresponsible exploitation of natural resources and not thinking about the negative impact on the environment will tend to happen more and more. Of course this will ultimately lead to low environmental quality. Poverty reduction at the household level will have an impact on the quality of the environment[9].

Poverty is one of the triggers for extraordinary environmental pressures. Environmental damage is difficult to avoid when the population is still in poverty. The intensity of the use of resources is getting higher because the utilization of natural resources does not require high technology and higher education, for the community this is the only place to depend for survival in poor conditions. The number of poor people will not be reduced significantly without economic growth that benefits the poor. Stimulating economic growth is a must if you want to immediately solve the problem of poverty. Strictly found in research [10], Poverty has a negative impact on the environment.

The problem of poverty and environmental damage remains a top priority in achieving sustainable development targets. In a study in African countries, it was found that increasing poverty and income inequality contributed to an increase in CO₂ emissions. In addition, increasing poverty has a detrimental effect on environmental pollution in Sub-Saharan African countries [11].

2.5. Influence of Population on environmental quality

A high population can provide sufficient manpower to support the economy, thereby expanding the domestic market. This means producers can increase their wealth. Furthermore, high population growth will encourage competition in the market which will then produce innovations and new technologies. This indicates that there is a positive influence of the population on the environment.

But on the other hand it was also found that rapid population growth is the main driving force for air pollution, in particular, in big cities which attract foreign investment and migrant workers. As the population increases, the amount of CO₂ emissions also increases. This will lead to an increase in community activity and energy consumption will also increase. Human growth from year to year increases CO₂ emissions. The increase in population also tends to the rate of change in the physical condition of the environment which is deteriorating.

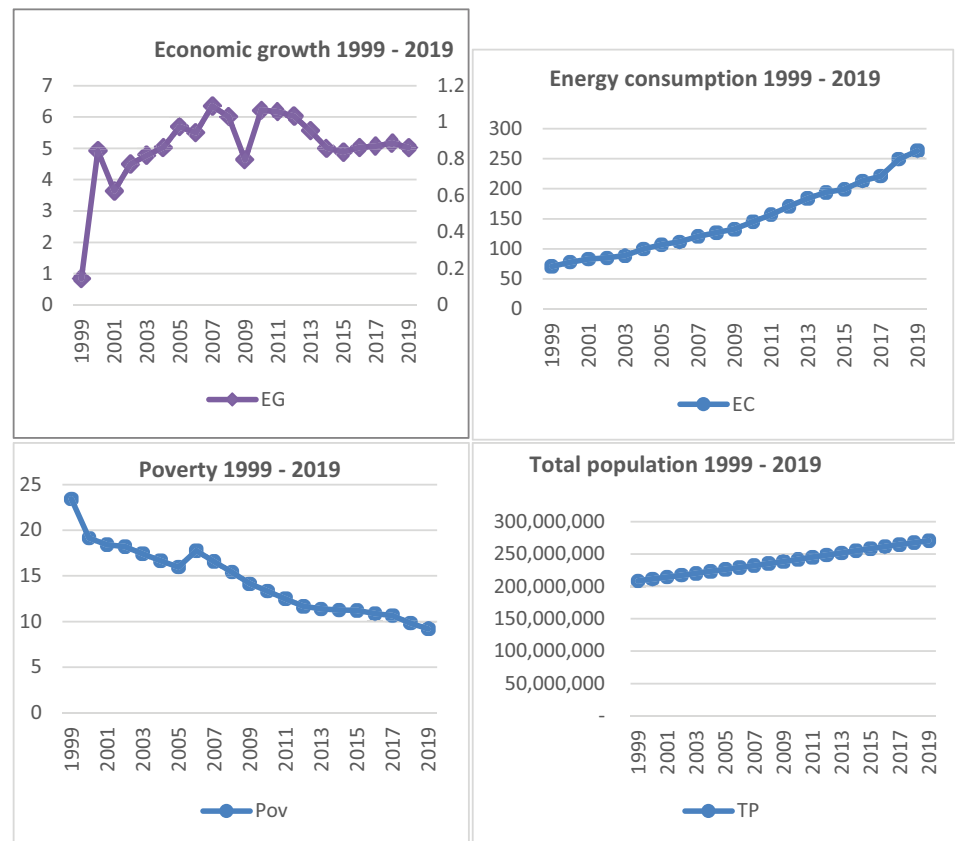
Peningkatan aktivitas perkotaan yang tinggi juga berpotensi untuk menghasilkan gas CO₂. Gas CO₂ merupakan salah satu penyebab terjadinya efek rumah kaca dan pemanasan global. Untuk itu konsentrasi gas CO₂ di atmosfer perlu dikendalikan. The industrial sector that causes global ecology no longer has the capacity to support growth. Overall, it is found that population growth and consumption of non-renewable energy contribute to environmental degradation [11]

Studies on the impact of population on the environment have been carried out for a long time. Analysis from various countries found that there is strong collinearity between population, income, and other factors. The change in urban land use reinforces the finding that areas with high population growth also have a sizeable effect on carbon dioxide (CO₂) emissions and increased urban land use.[12].

The graph below shows the trend of changes in macroeconomic data which includes economic growth, energy consumption, Poverty and Total population, from the graph it can be seen that these macro indicators tend to experience a changing trend towards improvement, such as the population which tends to increase with a declining population growth rate. This is in line with the graph of the environmental quality index in graph 1. Above, which tends to show an upward trend, or the quality of the environment, which has been improving at almost the same time.

3. RESEARCH METHOD

The types of data in this study are secondary data and literature studies from various references such as literature and journals related to research. The analytical method used in this research is the ordinary least squared method of analysis in the form of multiple linear regression. In conducting this analysis, the authors set the Environmental Quality Index (EQI) as the dependent variable, while for the independent variables, namely; Economic Growth (EG), Energy Consumption (EC), Poverty (P), and Total Population (TP) by looking at the extent to which the independent variable affects the dependent



Source: central statistics agency, 2021

Figure 2: Indikator makro ekonomi Indonesia tahun 1993-2019.

variable. To see the extent of the relationship between the dependent variable and the independent variable. Then the research model that will be analyzed in this study is as shown in the following equation::

$$EQI = \beta_0 + \beta_1 EG + \beta_2 EC + \beta_3 P + \beta_4 TP + \varepsilon$$

Dimana :

IKLH = Environmental quality index

PE = Economic growth

KE = Energy Consumption

KM=Poverty

JP = Total population

β_0 = Constanta

$\beta_1.. \beta_4$ =Coefficient

ε = error

TABLE 1: Resume of panel regression data processing results

Independent Variable	Coefficient
EG	-0.001242 (-0.523717)
EC	0.453886 (7.118418)***
P	-0.193275 (-0.346912)
TP	-1.54E-06 (-6.071428)***
C	372.4725
R ²	0.868146
Prob. (F-stat)	0.000001

Sumber: Source: Processed Research Data The value of tstat*** Is notation for significant level at 0.01 . level

4. RESULTS & ANALYSIS

After processing the data using multiple linear regression where the classical assumption test has previously been carried out, then the results of this data processing can be believed not to violate the provisions in the classical assumption test. So that the results obtained can be believed to meet the ordinary least squared rule. From the results of data analysis, the following results can be obtained:

Based on the t-test in table 1, we can see that the variables of energy consumption and population have a significant effect on the environmental quality index in Indonesia. Meanwhile, the variables of economic growth and poverty are not significant to the index of environmental quality in Indonesia. Based on the estimation results, it can be seen that the coefficient of determination (R-Squared) obtained is 0.86. Where it means that 86 percent of the variation in the rise and fall of Indonesia's IKLH is influenced by variables in the model, while the remaining 14 percent is influenced by other variables outside the model. Based on the estimation results, the probability value of Indonesia's F statistic is 0.000001 percent. This means that the variation in the IKLH value is significantly influenced by the variation in the value of the independent variable.

4.1. Result Implication

This study shows a negative relationship between economic growth and environmental quality although the relationship is not significant. This finding is in line with research conducted in Nigeria, namely that there is a relationship between CO2 emissions and economic growth. Appropriate environmental policies are needed to prevent adverse economic growth. In this case, it is recommended that clean energy resources make a greater contribution to the country's energy paradigm as a solution. This will lead

to higher energy efficiency, which will help the country to maintain a good level of economic growth and environmental consumption that does not harm the environment. [13] as well as the findings [14].

Energy consumption is positively and significantly related to the environmental quality index, which means that if energy consumption increases, the environmental quality index will also increase. The results of this study are in line with research [15] that the energy use variable has a causal relationship with the environment. Based on the test results show that economic growth has no effect on the environmental quality index but has a positive relationship. At the beginning of development or economic growth there is a decline in environmental quality, but when economic conditions improve, economic growth increases, environmental conditions improve, environmental quality improves. this is in line with the opinion[16]. When economic conditions improve, it will be followed by awareness and responsibility for the environment as well as the use of clean technology and the latest energy, so as to reduce the impact of environmental damage or improve environmental quality. The development of good environmentally friendly technology and increasingly stringent environmental regulations have resulted in a better quality of the living environment.

Based on the test results, it was also found that poverty was negatively and not significantly related to the environmental quality index. Based on research results [11] show that there is a negative and insignificant impact of the incidence of poverty on the environmental quality index. The more poor people, the worse the environmental quality in the area. Environmental degradation and poverty that occur in the long term will cause many impacts such as environmental damage and health problems. Poverty will force people to do anything to fulfill their basic needs, including illegal activities, such as: illegal logging that can cause environmental damage.

Poverty is one of the triggers for extraordinary environmental pressures. Environmental damage is difficult to avoid when the population is still in poverty. The intensity of resource use is getting higher because it is the only place to depend for survival in poor conditions. The number of poor people will not be reduced significantly without economic growth that benefits the poor. However, this case in Indonesia during the analysis period was found to have no significant relationship, this condition is thought to be due to shrinking natural resources, diminishing land ownership due to land conversion and environmental protection regulations which are being firmly enforced by the government. .

Based on the results of the subsequent data processing, it was found that the population had a negative and significant effect on the environmental quality index. This means that an increase in population density can reduce the quality of the environment in Indonesia. The negative impact of population density on the environment can be seen from the increasing human needs. Human needs are faced with the fact that natural resources have a limited carrying capacity. High population density will reduce green open space which functions to produce oxygen. In addition, the results of this study also support Malthus's opinion that population growth will put pressure on the environment as a provider of resources. This is in line with what was found by [17], who found that the population had a negative effect on the environment and decreased productivity due to the effects of pollution on health where the same thing was found by [18]. However, this finding is different from the findings [11] where there is a positive relationship between the quality of the environment and the population, the population is able to become a catalyst or agent that improves the environment because of the awareness of the need for environmental quality that is starting to become high in the population.

5. CONCLUSION

Awareness of the use of environmentally friendly energy can reduce the impact of environmental damage and the use of clean technology is a community need. Awareness of the need for a good environment, to ensure the sustainability of life is the capital to maintain a good quality environment.

Sustainable development goals can be realized if it is also supported by population control. This is in view of the adverse effects caused by the population on the environment due to the actions of economic activities in the form of utilization of natural resources. Economic pressures sometimes also result in land conversion and increased activity with negative externalities arising from the production process. This becomes urgent to do.

It is hoped that industrial entrepreneurs will not pollute the environment.

surrounding areas, one of which can be recycled. And the government needs to limit the construction of factories around community settlements by creating special industrial areas in certain areas in order to reduce the negative effects of industrial sector waste. .

These environmental changes require policies that are pro-poor and comprehensive in all aspects. Even though environmentally sound development policies that place the poor actively not only as objects of development but as subjects of development. Only by reducing poverty can the pressure on the environment be reduced through environmentally sound development policies. There is a need for business sustainability that reflects the company's efforts to reduce its negative impact on the social, environmental and economic fields. which ultimately contributes to the national economy and the realization of sustainable development[19].

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