Does the “Environmental Kuznets Curve” Phenomenon

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Does the "Environmental Kuznets Curve" Phenomenon Happening in High, Medium, and Low Income Countries?

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ABSTRACT

The most significant reduction in environmental quality is thought to have occurred in low-income countries, while low environmental degradation occurred in those high-income countries. Using the cluster purposive sampling technique, countries from 5 continents were examined to see if they had complete data and represented three categories. Seventy-eight countries were found to meet these requirements and were then used as research samples from 2015 to 2019. The Data Panel Regression technique was used to analyses the data. This study is expected to be able to produce policies in the form of a sustainable environmental management model that continues to support economic growth. This study proved that the Environmental Kuznets Curve (EKC) phenomenon applies from 2015 to 2019 in high-income countries, and population growth rates have a significant negative impact on Carbon Dioxide (CO_2) emissions. This means that the more prosperous a country, the less the environmental degradation, while in low-income countries, carbon emissions increase when economic growth increases. In developing countries, as the population increases, environmental degradation increases, while in low-income countries the amount of carbon emissions is affected by economic growth and population. Some compensate and subsidies low-income countries which are able to care for their environment.

Keywords: Environment Degradation; Emission; Environmental Kuznets Curve; Sustainable Development
JEL Classifications: O44, Q43, Q56, Q58

1. INTRODUCTION

The issue of environmental degradation is more common in developing countries, but this statement is still debatable. This statement is thought to be due to high population growth rates, low economic growth rates, lack of infrastructure also public awareness. This environmental issue is a worldwide concern because it is considered in the case of global warming and human survival as a whole. Hence, the Factor Endowment Hypothesis (FEH) theory states that rich countries are very concerned about this problem by being willing to pay more to protect the environment (Marton and Hagert, 2017). Increased environmental damage will turn against humans because the impact will be reduced production and decreased capital and labor productivity (Borhan et al., 2012). Changes will follow environmental degradation in climate patterns, such as increased rainfall, changes in storm intensity, and melting of polar icebergs. Climate change will cause considerable losses to human life, such as a clean water crisis, damage to coastal area infrastructure, decreased agricultural productivity, and increased frequency of diseases transmitted by mosquitoes (Irmansyah, 2004). Environmental degradation can be suppressed if the process of industrialization and population growth is managed wisely.

One of the indicators showing a decrease in environmental quality is the increase in CO_2 emissions. According to the World Resource Institute-WRI (2019) report in 2016, ASEAN countries contributed about 7.35% to the addition of CO_2 emissions from the whole world produced. In the Kyoto Protocol, six emissions have a significant impact on the environment, namely CO_2 (carbon dioxide), CH4 (methane), N_2O (nitrous oxide), HFC (hydrofluorocarbons), PFC (perfluorocarbons), and SF6 (sulfur

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hexafluoride), and CO_2 emissions. CO_2 is the most prominent and rapidly increasing emission. The average CO_2 emission in 2020 was 412.5 parts per million (ppm), an increase of 2.6 ppm from the previous year and the highest increase in the last 65 years (Lindsey, 2020). According to (Eiteman et al., 2001), 80% of global CO_2 emissions come from human activities such as burning vehicle fuels, power plants, construction operations, and industry.

Rapid population growth will increase the demand for food and high energy and water consumption. The increasing demand for natural resources tends to over-exploit the environment, impacting short term and long term (Kolstad and Krautkraemer, 1993). An increase in population will cause an increase in the amount of CO_2 emissions due to increased energy use (Khusna and Kusumawardani, 2021). (Mantra, 2003) argued that population is one of the factors causing environmental degradation, which will reduce the level of productivity of agricultural land for food production per capita.

Environmental damage is also inseparable from the process of globalization, one of which is an investment. Growth of economics and foreign investment inflow tends to increase CO_2 emissions (Omri et al., 2014). Besides being able to have a positive impact as an engine of economic growth, investment is also suspected that it can worsen environmental quality through the application of technologies that are not environmentally friendly even it can shorten the life expectancy (Hendrawaty et al., 2022). The World Bank in 2021 reported that foreign investment entering developing countries has increased number, and the inflow of this investment is suspected to affect the level of environmental pollution in that country. The pollution halo hypothesis states that investment will reduce environmental pollution by contributing to new energy-saving technologies or production methods. It increases renewable energy in the host country, increases productivity and energy efficiency, and provides management skills (Kızılkaya, 2017). (Ren et al., 2014) a study in China also found that foreign investment inflows exacerbated CO_2 emissions. Their study that FDI increases not only economic growth but also energy consumption. Research conducted by (Tang and Tan, 2015) in Vietnam from 1976 to 2009 revealed that CO_2 and FDI are correlated with each other, and according to (Zhang and Zhou, 2016), the correlation is negative. It means that the inflowing of FDI reduces emissions. This opinion is evidenced by the research they did according to the study by (Zhang and Zhou, 2016) in China from 1995 to 2010, foreign investment contributed to reducing CO_2 emissions. In energy, economics book claims that in developing countries, FDI and financial market development are expected to transfer clean technology with low emissions (Batten and Vo, 2009).

Simon Kuznets criticizes the development model, which is only oriented toward economic development. According to the EKC hypothesis, pollution levels increase as the country grows, reducing income growth. Therefore, there is a threshold level economic growth beyond a further increase that can increase the environmental impact of the early stages of economic development (Kızılkaya, 2017). The Curve of Environmental Kuznets draft also tells the quality of the environment, which CO_2 emissions can count, deteriorates in the early stages and the improvement in later life for the economic growth (Dinda, 2004). The Curve of Environmental Kuznets hypothesis rarely happened in countries. Some research in growing countries shows that the Curve of the Environmental Kuznets hypothesis is not proven, so environmental degradation is directly proportional to economic growth (Al-Mulali et al., 2015). (Iwata et al., 2010) confirmed that the EKC hypothesis (Acaravcı and Ozturk, 2010) and (Jalil and Mahmud, 2009) also found that carbon emissions are influenced by GDP and energy consumption in the long term. There are two different views on environmental degradation that occur in several countries in the world. Empirically, foreign investment inflows and GDP growth tend to increase environmental degradation in low-income countries, as reflected in increased CO_2 emissions due to population pressure. High-income environmental degradation is getting lower due to the very selective incoming investment and the high awareness and concern of the population on the environment.

Based on the explanation and previous researches, we interested in analyzing whether the Kuznetss Theory still applies in 3 categories of countries, namely in high, middle, and low income countries, according to the categories made by the World Bank and whether there are differences in the magnitude of the effect of population, investment and growth GDP against the level of environmental damage as proxied by CO_2 emissions. The goal of this study is to prove whether does phenomena of EKC occur in high, middle, and low income countries and determine the effect of population size, foreign investment and economic growth on environmental quality degradation in CO_2 emissions in high, middle, and low income countries.

2. LITERATURE REVIEW

2.1. Government Intervention in Public Goods

Government intervention in determining the price of public goods with no market involves making regulations and pro-environmental budget policies. Government policies in the environmental sector are useful for the public interest of environmental preservation and the degree of government intervention in environmental quality protection from environmental quality standards. The target standard is usually determined by taking into account the effect of the pollutant on a particular environmental medium, such as water, air, or soil (Ogus, 2004). Environmental quality standards describe the extent to which how still tolerate damage due to waste/pollution.

2.2. Environmental Degradation

Environmental degradation will reduce the productivity of natural resources to encourage an increase in production costs. Destruction of soil, water sources, and forests through inefficient and unplanned production methods can significantly reduce productivity, especially in the long term, however, these negative excesses are often eliminated when obtaining a high GNI. Therefore, the current performance measurement must also consider quality and environsiderbility (Todaro and Smith, 2009). The calculation of GNI must be corrected to become NNI (sustainable net national income) or sustainable net national product. This is the total amount consumed without eroding social capital, where NNI = GNI-DM-DN, NNI is Net National

Income, DM is depreciation of manufacturing capital assets, and DN is depreciation of environmental capital expressed in monetary units years.

The amount of Ei emission depends on energy consumption, sulfur content, and the technology used to remove sulfur emissions. Reducing sulfur emissions is possible but comes at a cost. The total cost to issue Ci is as follows: $Ci = Ci(Ei) + Ci(Di)$, $i = 1,2,...n$, in which Ci(Ei) is a decreasing control cost function on Ei, and Ci(Di) is a loss cost function.

2.3. Emissions of Carbon Dioxide (CO_2)

Waste, emissions, and environmental quality have different meanings, as distinguished by (Field and Olewiler, 2015). Total emissions produced are the sum of various sources according to time, type and location. Emissions are released into the environment through water, soil, and air media, which can naturally handle these emissions. Emissions that natural systems cannot process can affect environmental quality. Environmental quality is the number of pollutants (emissions) that have a negative impact on the environment, for example, the concentration of sulfur (SO_2) in the air.

2.4. Relationship between Population and Environment

Residents play a role as a driving factor for environmental damage, and eventually, residents will also receive the consequences of environmental damage. The limit to growth contains the relationship between environmental variables, namely: population, agricultural production, industrial production of natural resources, and pollution (Mantra, 2003). When the supply of natural resources is abundant, per capita food, manufactured goods, and population will increase rapidly. This growth will eventually slow down as supplies of natural resources are depleted by 2100, followed by hunger and pollution. Humans must limit their growth and use natural resources balanced to avoid this.

2.5. Foreign Investment

The country needs investment, while the company's goals are inseparable from foreign investors (Ambarsari and Purnomo, 2005). According to, the motives underlying foreign investment activities are strategic, behavioral, and economic motives. Strategic motives include market seeking, knowledge-seeking, and political security seeking. Using FDI, especially profitability includes using foreign production factors, raw materials, and technology, behavioral motives such as external environmental stimuli and individual obligations, and economic motives by maximizing long-term profits and stock price.

2.6. The Relationship between Foreign Direct Investment (FDI) and Environment Quality

FDI is not only a crucial factor for economic growth but it also at risk of causing environmental degradation. The negative effect of FDI on the environment is explained in the pollution haven hypothesis or the pollution haven effect, when industrialized developed countries plan to build factories or offices abroad, they tend to look for cheaper options for resources and human resources. Work, to meet the land and material access needed. Usually, industrialized countries relocate to countries with less stringent environmental regulations, such as developing countries (Levinson and Taylor, 2004).

2.7. Economic Growth

The economy's growth shows how far too much economic activity generates income within a certain period, wherein economic activity will use the factors of production to produce products. The economy is considered high growth when all real rewards for using factors of production in a given year are higher than the previous year. The principal capital of economic growth is a technology that produces more efficient, massive, and many types of production (Romer, 1990).

2.8. Relationship between Economic Growth and Environmental Quality

Economic development activities exploit natural resources to improve people's lives and take few concrete steps to preserve the raw materials. The level of pollution in a country can be determined by the ability of the environment to bear the burden of pollution. Therefore, the ability of the environment to take responsibility of environmental pollution without having to cause negative impacts is stipulated in the environmental quality standards. This quality standard is then used as a reference for assessing the environmental impact of each development activity, adjusted to the nature and potential of different countries. According to (Panayotou, 2000), economic growth has an impact on environmental degradation, when a country experiences rapid growth, the problem of air pollution is also increasing rapidly, and the number of polluters will increase when economic activity is more significant. There are two reasons for environmental degradation. First, the limited capacity of the environment to absorb waste generated by economic activities, and second, limited non-renewable natural resources. This affects the choice between economic growth and the environment.

2.9. Kuznets Theory

The assumption of Kuznets relates to the per capita income of the country's environment is known as EKC. His assumption shows the attention will be directed toward increasing the country's income if it is still relatively low, either through production or investment that encourages income growth, excluding issues of environmental quality Income growth is followed by increasing the pollution and then it declines again if income growth conditions persist. This assumption is from the amount for the quality of the environment, which improves social control and government rules therefore, people are more prosperous (Mason and Swanson, 2002).

It will give a big contribution to the national products if the country's income improves in line with economic development, manufacturing products. To conclude, industrialization starts in small industries and continues in large industries. The increment of using the natural resources and degradation of environment intensification degradation is the phase of middle-income level, the development phase dominates industrialization by increasing the share of its internal social items when industrial activity grows steadily. In this case, the utility of uncooked materials will

decrease, and the elimination of waste per unit of production will increase.

2.10. Hypothesis Construction

1. The KEC phenomenon indeed cursors in high and low income countries
2. It is suspected that population, FDI, and economic growth affect the level of CO_2 emissions in a country
3. The population increases CO_2 emissions higher in low-income countries than in high-income countries
4. Investments that enter a country increase CO_2 emissions higher in low-income countries than high-income countries
5. GDP growth increases CO_2 emissions more in low-income countries than in high-income countries.

3. MATERIALS AND METHODS

This research is descriptive quantitative. The research area is in countries around the world that are on 6 continents. Of the 198 countries, only 73 countries have complete data representing 6 continents. Then the 73 countries are grouped into 3 categories based on the criteria for the level of per capita income made by the World Bank, namely countries with high per capita income, middle, and low income countries. The data used include: data on CO_2 Emissions, Population, FDI data, GDP Growth Data all sources World Bank.

3.1. Population and Sample

The population in this study is 198 countries representing 6 continents, namely the countries in Asia, Europe, America, Africa, and Australia, consisting of high-income countries, medium and low. Sample selection using cluster purposive sampling method, with criteria:

1. The country represents the continents of Asia, Africa, Australia, Europe, Africa, and America
2. The country represents high, middle, and low income countries
3. Data is available at the World Bank, namely in WDI and WGI
4. So that a total sample of 73 countries was selected, which had the complete data with the following details: 18 countries represent countries on the Asian continent, 4 countries represent the Australian continent, 18 countries represent the Americas, 22 countries represent the European continent and 11 countries representing the African continent.

Table 1: Statistic descriptive

Variable	Countries		
	Low income	Middle income	High income
Carbon Emission (metric ton)	1.118493	4.013283	8.787946
Population (billion)	40.469.921	37.060.079	100.206.055
FDI ($million)	541.886.909	4.018.892.355	2.308.834.676
Economic growth (percent)	−1.595%	−0.657%	+0.045%

Table 2: Data panel regression for all countries (73 countries sample)

Variable	Coef.	t	Sig.
Constant	4.714695	1.682883	0.0946
Population	0.000000038	0.0080242	0.9362
FDI	0.000000000274	1.884251	0.0616**
Economic Growth	0.029592	4.377377	0.000*
F	212.8612		0.000
Adj. R^2	0.86478		

*df 5%, **df 10%

3.2. Definition of Operational Variable

3.2.1. Environment quality

The environmental quality in this study will be proxied using the Emission level measure CO_2, which comes from all activities that emit gases and methane or so-called greenhouse gases. This type of gas can change the environment is getting worse, which is accelerating climate change. Many researchers use this and the World Bank uses CO_2 indicator units of metric tons per capita ($MtCO_2$). Population counts all residents residing in countries according to the above categories, regardless of legal status or nationality. Data population sourced from the World Bank.

3.2.2. Foreign investment

Foreign investment in this study uses the value of FDI, which is the net inflow of investment made by a company from countries to invest their capital for an extended period in companies in other countries (World Bank, 2021), in the form of Inward and outward flows and stock, expressed in units of million US dollars (US$). Data obtained from the World Bank.

3.2.3. Economic growth

Economic growth is the GDP growth rate at market prices by currency constant local money. The aggregate is based on the 2010 stable US dollar. Units measure of economic growth is the percentage (consistent) sourced from the World Bank.

3.3. Data Analysis

Data analysis begins with forming 4 equation models as follows:

$$CO2_{it\,all} = \beta_0+\beta_1 POP_{it}+\beta_2 FDI_{it}+\beta_3 PDBG_{it}+\mu_{it} \quad (1)$$

$$CO2_{it\,high} = \beta_0+\beta_1 POP_{it}+\beta_2 FDI_{it}+\beta_3 PDBG_{it}+\mu_{it} \quad (2)$$

$$CO2_{it\,moderate} = \beta_0+\beta_1 POP_{it}+\beta_2 FDI_{it}+\beta 3 PDBG_{it}+\mu_{it} \quad (3)$$

$$CO2_{it\,low} = \beta_0+\beta_1 POP_{it}+\beta_2 FDI_{it}+\beta_3 PDBG_{it}+\mu_{it} \quad (4)$$

where:

CO_2: Carbon Dioxide Emission ($MtCO_2$)

POP: Population (Total)

FDI: Foreign Direct Investment (US$)

PDB: Economic Growth (%)

β0: Intercept or Constanta

β1, β2, β3: Regression Coefficient on each independent variable

i: 1, 2, 3.,30 (cross-section countries data)

t: 1, 2, 3, 4 (time series data, period 2018-2021)

e: disturbance error.

The data processing technique uses a panel data regression analysis model covering 73 countries during the observation period. The methods and steps used for panel data regression use three test

approaches: the CEM or Common Effect Model, FEM or Fixed Effect Model, and REM or Random Effect Model, followed by Chow Test and Haussman Test. OLS assumption test is also carried out in the form of autocorrelation, multicollinearity, and heteroscedasticity test.

3.4. Hypothesis Test

T-statistical test (Partial Test) was used to determine the significance of the effect of the independent variable on the dependent variable partially (individually). This study uses a one-way test with a significance level of = 5% with the following hypothesis:

- Hypothesis 1: High-income countries have lower levels of carbon emissions than middle and low-income countries
- Hypothesis 2: There are differences in the magnitude of the influence of the factors that affect the level of carbon emissions in high, middle, and low income countries.

3.5. Coefficient Determination (R2)

The coefficient of determination test is used to measure the percentage of variation in the total independent variables that the regression model can explain. The model is better if the R2 value is close to 1 or 100%. Suppose the value of R2 is small or close to zero. In that case, it means that the ability of the independent variables to explain the dependent variables is minimal because there are other factors outside the model that are not observed, and vice versa.

4. RESULTS AND DISCUSSION

The research sample includes 73 countries representing 5 continents, namely 18 countries from the Asian continent, 4 countries representing Australia and Oceania, 18 countries from the Americas, 22 European countries, and 11 African countries. These countries represent 23 developing countries mostly from Africa, Asia, and America, 27 developing countries, and 23 developed countries, mostly from Europe, North America, Asia, and Australia. The research period from 2015 to 2019 and 2020 was not observed because average data due to the covid-19 crisis was not relevant. The results of descriptive statistics illustrate that currently, in developed countries, the level of CO_2 carbon emissions is higher than the level of emissions in developing and developing countries. The average CO_2 emission in developed countries is 8.7878 metrics per capita, while in developing and poor countries it is only 4.0132 and 1.118 metrics per capita, respectively. The high level of carbon emissions in developed countries is due to the high population. The average population in developed countries is 100 million, while in developing and poor countries the average is 37.06 million and 40.46 million, respectively. However, foreign investment entering developing countries far exceeds developed countries. Investment in developed countries began to experience saturation.

Factors that drive high levels of CO_2 carbon emissions in developed countries (as shown on Table 1) compared to poor and developing countries are because developed countries have the largest population, complete and modern infrastructure in terms of quality and quantity, also equipped with social, public, and trade facilities, all of which require a lot of land and energy. The number of foreign investment activities that enter developed countries is the second largest after developing countries or amounting to $ 2.3 million billion, which also requires a lot of energy and natural resources. Most of the energy needed by these facilities and infrastructure is met from fossil fuels and land and forest use. High energy use will result in increased emissions as well. Referring to this condition where developed countries are the world's largest emitters, these countries are very interested in reducing CO_2 emissions, including many offers of compensation for developing countries and poor countries that can maintain forests and preserve the surrounding environment. In contrast, in poor countries, many rely on the engine of growth from the natural resource sector, agriculture which tends to use conventional technology so that emission levels are still low. Still, due to population explosion and teaching growth and food supply, there is a tendency to increase the growth of carbon emissions.

From the results of data processing using the longitudinal data regression method as shown on Table 2, it was found that in all countries, both developed, developing, and poor, CO_2 emission levels were significantly affected by the economic growth of 0.029%, and the amount of incoming foreign investment (FDI), but for FDI affects the number of carbon emissions in the world at the 10% degree of freedom level. It was also found that population does not affect CO_2 carbon emissions in both developed, developing, and poor countries. The description above is shown in the table below.

In general, almost all countries, impoverished countries, in pursuing economic growth and the welfare of their people, tend to utilize abundant natural resources very massively and tend to sacrifice the environment. Keep production capacity high. The full-day operation of the industrial sector in pursuit of growth targets tends to produce high pollution. Foreign investment that enters poor and developing countries is also dominated by the intention of a quick return on capital rather than the motivation to participate in protecting, preserving, or improving the environment. This phenomenon is by the theory put forward by Kuznets in the Kuznets Environment Curve (KEC) that environmental degradation will be higher in poor countries than in rich countries, while in developed countries, due to increased awareness supported by high levels of education, environmental damage is reduced which results in reduced environmental damage Indicated by reduced CO_2 carbon emissions despite increasing economic growth.

4.1. High Income Countries

On average, the amount of CO_2 emissions in developed countries is the highest (Table 3) but the annual growth in the number of emissions is because the population is aware that they have to reduce it. Because of this high awareness, the increasing

Table 3: Estimation in high-income countries

Variable	Coef.	t-test	Sig.
Constanta	2.873003	1.583720	0.1223
Population	0.537779	0.165075	0.8706
FDI	0.013669	0.466249	0.6463
Economic Growth	−0.018761	2.095757	0.0497*
F	10.4		0.0000
Adj. R^2	0.079508		

Table 4: Estimation of low-income countries

Variable	Coef.	t-test	Sig.
Constanta	1.674104	1.386057	0.1732
Population (person)	0.455600	6.751047	0.0000
FDI (US $ milar)	0.428103	5.428201	0.0000
Economic Growth (%)	0.040673	1.974303	0.0551
F	19.94		0.0000
Adj. R^2	0.56		

Table 5: Estimation of middle income countries

Variable	Coef.	t-test	Sig.
Constant	0.973178	0.902089	0.4018
Population (milion)	0.212584	3.100543	0.0211*
FDI ($ milion)	0.063286	1.484601	0.1882
Economic Growth (%)	0.004728	0.073667	0.4891
F	5.839		0.03265
Adj. R^2	0.617		

economic growth will be negatively correlated with the amount of CO_2 emissions. Through Research and Development (R/D), the government and the private sector strive to continue to develop technologies that are low in carbon dioxide. The higher the economic growth, the lower the level of CO_2 emissions. Developed countries are proven to emit more carbon emissions compared to developing countries or poor countries, this happens because of the use of more fossil fuels such as for household needs such as electricity and others, as well as the needs of the community and more significant industry. Developed countries should be more responsible for polluting the world's carbon emissions due to higher fuel use and pollution. Cause Developed countries have high levels of carbon emissions due to their larger population. The average population in developed countries is 100 million, while it is only 40 million in poor countries. With a large population, the need for living necessities for energy, such as household needs, transportation, and other needs, increases the emission of carbon emission pollution. High carbon emissions are also needed by industry and the economy so that the economic growth of developed countries is higher than that of poor and developing countries. The behavior of developed countries that pursue prosperity and economic growth is increasingly using fuel that emits carbon emissions.

In developed countries with higher economic growth, the level of investment is also higher because of the well-established infrastructure that makes it easy to do business; this increases the expenditure of carbon emissions in developed countries compared to poor countries.

4.2. Low Income Countries

Partially, in poor countries represented by 23 countries, it is interesting to find that the level of carbon emissions is influenced by population, foreign investment inflows, and economic growth. People in poor countries still use technology that produces high carbon emissions to meet their daily needs. Old, less feasible, and non-massive modes of transportation will increase carbon emissions from vehicles. Likewise, the existence of old production machines is inefficient and produces more exhaust gases. The target of pursuing community welfare and economic growth is due to population pressure. It is evident from the results of the study that in poor countries the level of carbon emissions is significantly affected by population, a 1% increase in population will increase CO_2 emissions by 0.45%, the highest compared to the increase in economic growth and the amount of foreign investment entering. Therefore, investors from developed countries tend to ignore the use of environmentally friendly technologies. The rate of population growth must be managed properly so that the growth of carbon emissions can also be driven so that it does not damage nature and disturb the balance of nature. Development in poor countries that still rely a lot on natural resources will increase carbon emissions which can be seen from the level of investment significance and economic growth on the level of carbon emissions (Table 4).

Seeing this condition, developed countries must help poor countries manage carbon emissions because the level of absorption (absorption) of the carbon emissions produced can be carried out by the large number of forests that are still widely spread in poor and developing countries and have not yet been developed Optimally explored. Developed countries must provide compensation to countries that maintain their forests as the world's lungs. These countries are sacrificing not to carry out the industrialization process on a large scale by keeping their forests sustainable as the lungs of the world in the hope of helping developed countries that have run out of land. With high emission levels as the lungs of the world.

4.3. Middle Income Countries

In developing countries, carbon emissions are higher than in poor countries but lower than in developed countries as found statistically on Table 5. The study results found high carbon emissions in this developing country because it is influenced by the population. Meeting the energy needs of the population uses fossil fuels and a rapidly growing industry with a lot of incoming investment. Land and energy are needed to meet the population's supply. The forest area as the world's lungs has decreased significantly in developing countries. Economic needs and the household life in developing countries require energy, transportation, and space needs that increase fuel and land use. To reduce world carbon emissions, developed countries must also provide technical assistance and compensation so that population growth in developing countries does not cause pollution and high carbon emissions. Developing countries need to get the world's attention to help control the population.

4.4. Population Effect on Carbon Dioxide (CO_2) Emission Level

Residents play a role as a driving factor for environmental damage, and ultimately residents will also receive the consequences of environmental damage. The study results found that in developing and poor countries, population growth will lead to increased levels of CO_2 emissions. This occurs significantly in poor and developing countries. Population growth in both categories of this country is relatively high between 1% and 2% per year. According to (Suparmoko, 1997), population growth will cause the demand for goods and services to increase, which must be met by increasing the use of natural resources which in doing so through forest fires, fuels from fossils, forest defoliation, and to produce

the chlorofluorocarbons (CFCs) all of which cause an increase in the amount of CO_2 emissions due to increasing energy use (Khusna and Kusumawardani, 2021). (Mantra, 2003) argued that population is one of the factors causing environmental degradation, which will reduce the level of productivity of agricultural land for food production per capita. To avoid further environmental damage, humans must limit their growth, although, in the end, this population growth will slow down itself along with the depletion of natural resource supplies, which are projected to be exhausted by 2100, followed by hunger and pollution. developing and poor countries to reduce carbon emission levels by controlling population growth, including the provision of energy-efficient residential, office, and commercial facilities.

4.5. The Effect of Direct Investment That Enters a Country on the Level of Carbon Dioxide Emissions

In low-income countries that are needed investment to pursue economic growth, create job opportunities and complement the infrastructure, foreign investment inflows tend to be uncontrolled by environmental protection regulations. Foreign investors will tend to exploit resources, nature and the environment. This will spur an increase in carbon emissions. This supports the rent-seeking theory where foreign investors tend to implement the motive of exploiting natural resources to return their capital when the government does not strictly regulate it. According to (Eiteman et al., 2001), foreign investors entering poor countries tend to be economically motivated, pursuing profits to maximize long-term profits by exploiting natural resources. Another reason for using FDI is usually profitability, for example, the use of foreign factors of production, raw materials, or technology. For this reason, investors from developed countries must have a moral and social responsibility to poor countries by investing and transferring environmentally friendly technology. It is different in developed and developing countries, with high public awareness and well-established economic growth, so incoming foreign investment is very selective, primarily related to environmental conservation.

4.6. The Effect of Economic Growth on Carbon Dioxide Emissions

In high and low income countries, the level of CO_2 emissions is affected by economic growth, but in the opposite direction. This means that in the higher incomes countries with increasing welfare of the people as reflected by their economic growth, the lower the carbon emissions produced, on the contrary, the lower the income of countries, the higher the carbon emissions released into the air. This phenomenon illustrates that the KEC occurs, wherein in developed countries the higher the income, environmental degradation decreases, on the other hand, the poorer a country, the higher the environmental damage. Developed countries must provide compensation to countries that maintain their environment.

5. CONCLUSION

Environmental Kuznets Curve (EKC) phenomenon happened, in which the higher the income country, the less the environment is degraded, on the contrary, the poorer a country is, the higher the environmental damage occurs. In developed countries, only economic growth is significant to the level of carbon emissions, and the effect is negative, meaning that an increase in economic growth will reduce the level of carbon emissions. In developing countries, the population is a factor in increasing carbon emissions, while in low income countries, apart from the population, foreign investment inflows and economic growth exacerbate CO_2 levels.

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