The Role of Green Budgeting on Environmental Quality on Indonesia

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Article Information	Abstract
	Law Number 32 of 2009 requires Regional Governments to allocate an adequate environmental protection and management budget. However, the allocation of green budgeting is less than 1% of the Regional Revenue and Expenditure Budget. This study aims to determine the effect of green budgeting, Human Development Index (HDI), Foreign Direct Investment (FDI), and population density on environmental quality in Indonesia from 2011-2020. The research method used is descriptive quantitative with panel data regression analysis techniques. Data were taken from 34 provinces in Indonesia from 2011 – 2020. The research variables are Environmental Quality, Green Budgeting, Human Development Index, Foreign Direct Investment, and Population Density. The data were obtained from the Central Agency of Statistics and the Ministry of Environment and Forestry Republic Indonesia using literature study data collection techniques. The data was processed using the Eviews 9.0 analysis tool, with the Fixed Effects Model as the best model. The finding shows that green budgeting has a positive but insignificant effect, Human Development Index (HDI) has a significant positive effect. In contrast, Foreign Direct Investment (FDI) and population density significantly negatively affect environmental quality in Indonesia.

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INTRODUCTION

Indonesia is one of the countries that echo the commitment to sustainable development. This commitment is supported through the National Medium Term Development Plan (RPJMN) 2010-2014, where development aims to improve environmental quality. One indicator to assess the environmental management performance in Indonesia is the Environmental Quality Index (Dotulong et al., 2020).
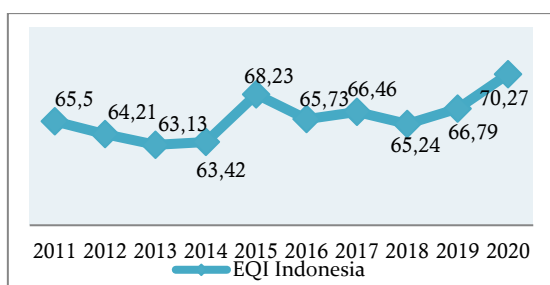

Figure 1. Environmental Quality Index of Indonesia, 2011-2020
Source: Ministry of Environment and Forestry Indonesia, 2021

Statistically, Indonesia's Environmental Quality Index (EQI) value in 2011-2020 tends to increase. The average value of Indonesia's EQI is 68.88 points and is 0.1 points above the RPJMN target. Based on the data from the Indonesian Ministry of Environment and Forestry, 2021, shows that 15 of 34 provinces still have an EQI value below the average of the National Environmental Quality Index, and some even fall into the alert category, such as DKI Jakarta Province. The Water Quality Index (IKA) component was 0.39 points below the target, and only eight provinces met the target. Likewise, the Land Cover Quality Index (IKTL) component is still 1.16 points below the target, and only nine provinces have met the target. The Air Quality Index (IKU) component is also 0.54 points below the target set in the National Medium-Term Development Plan (RPJMN). This shows that environmental development in Indonesia has not met the set targets. The issue of environmental quality is a critical discussion because it will affect the community's quality of life both now and in the future (Indriana et al., 2021).

Therefore, efforts are needed to improve the quality of the environment, especially in Indonesia.

Efforts to improve environmental quality are the responsibility of the community and the government as policy authorities and those who want prosperity (Masyruroh & Binyati, 2021). One of the government's roles in improving the quality of the environment in Indonesia is by providing a budget for the environment, or what is known as green budgeting. Green budgeting is an expenditure that can encourage economic growth but is beneficial for the environment (Russel & Benson, 2014). Green budgeting is a process in which three aspects of sustainable development, namely economic growth, ecological balance, and social progress, are brought together in one integrated policy (Lumbanraja, 2017).

The provision of Green Budgeting has its urgency for the environment. This budget is a form of state investment so that development activities do not harm the environment (Widiadi, 2017). Local governments can also use this environment-based budget to realize sustainable development at the local level (Faqih et al., 2017; Hariyati, 2020; Violeta, 2012). Green Budgeting is also considered effective in improving environmental quality (Orchidea et al., 2016).

The importance of providing an environmental budget is also a mandate of Law Number 32 of 2009 about Environmental Protection and Management which must be fulfilled that local governments are required to allocate an adequate budget for environmental protection and management activities as well as environmentally sound development programs (Law Number 32 of 2009). Under the WWF Indonesia Strategic Plan 2014-2018, Indonesia is also mandated to encourage the provision of green budgets in public policies so that indicators of achieving green budgets increase by 2 % in each priority province and district, as well as achieving the established Sustainable Development targets (Salam et al., 2015). The average green budget in Indonesia is still low and below 1 of the total provincial budget in Indonesia.
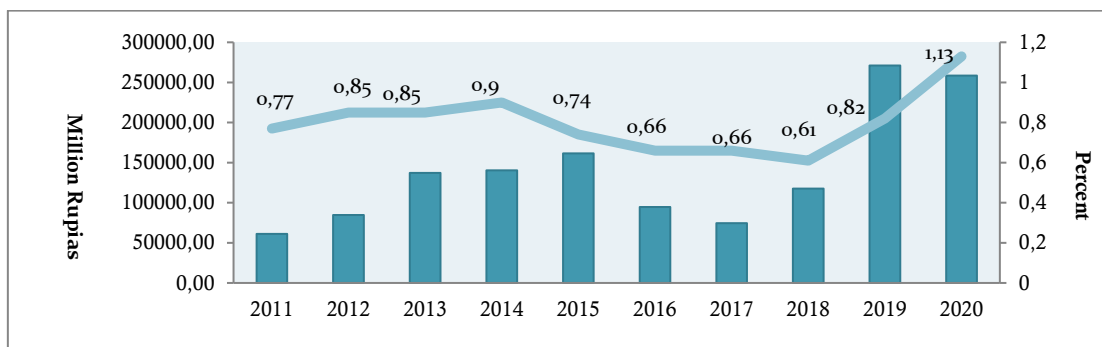
Figure 2. Green Budgeting Indonesia, 2011-2020
Source: Ministry of Environment and Forestry Indonesia, 2021

Figure 2 shows that the average value of Green Budgeting in Indonesia in 2011-2020 tends to increase statistically. However, the amount of the environmental budget is only 0.83%, where this Figure is still tiny, even below 1 % of the total Regional Revenue and Expenditure Budget. The environmental budget is also still 1.17% below the target set. The low environmental budget results in a low environmental management capacity to encourage the achievement of national priority targets in the environment (Rusli et al., 2020).

Human quality also participates in determining the environmental quality of a country or region (Pambudi, 2020). The Human Development Index reflects progress on the three central dimensions of human development: Education, Health, and Economic Capability (Suryani, 2018). The high level of education a person has, the more thoughts and ideas to overcome environmental problems (Hidayati & Zakianis, 2022). Higher human awareness can extend the life expectancy of humans. Humans will invest in improving the quality of the environment to prolong life (Mariani et al., 2009). The quality of human resources increases and the quality of the environment will also increase (Ramandhantie et al., 2020; Samimi et al., 2011).

Efforts to improve environmental quality also cannot be separated from the role of economic development. One crucial element of economic development is capital. Capital is usually obtained through investment activities. Investment is divided into domestic and foreign investment or foreign direct investment (FDI).

Foreign Direct Investment (FDI) positively influences economic growth (Ciobanu, 2020; Fazaalloh, 2022; Mariska et al., 2021). On the other hand, it can also impact the environment.

The impact of foreign investment on the environment still has different results. Several studies have stated that Foreign Direct Investment (FDI) will positively impact the environment (Liu, 2014; Demena & Afesorgbor, 2019; Ahmad et al., 2020; Firmansyah et al., 2020). Several studies have also shown that FDI will cause the Haven Pollution hypothesis to be valid (Omri et al., 2019; To et al., 2019; Munir & Ameer, 2020; Mehmood, 2021; Solarin et al., 2021; Çamkaya, 2022). Meanwhile, according to Marques & Caetano (2020); Manocha (2021); Muhammad & Khan (2021), foreign investment will have a positive effect on improving environmental performance in developed countries. However, foreign investment will harm the environment in countries with low, middle-upper, and middle-low income. An increase in foreign investment will increase environmental degradation, which is characterized by an increase in CO_2 emissions (Ali et al., 2020; Hao et al., 2018; Munir & Ameer, 2020; Sabir et al., 2020)

The relationship between FDI and environmental quality in developing countries supports the Haven Pollution hypothesis. This is because developed countries impose stricter environmental policies than focused developing countries, which distorts existing comparative advantage patterns. Thus, polluting industries shift their operations from developed countries to developing countries. FDI increases carbon

emissions by placing lower environmental standards in the countries where it invests (Munir & Ameer, 2020).

Environmental problems are not only caused by economic factors but also social factors. One of the contributors comes from the activities of citizens in the region or country itself. Indonesia is a country with a high population. The larger the low quality of human resources that accompanies the population will cause environmental degradation (Zulham et al., 2021). The higher the population, the higher the population density. High population density will pressure on the environment because of the limited environmental carrying capacity (Pujiati et al., 2015).

High population density will increase the need for clothing, food, and shelter. Activities to meet these needs produce waste that will pollute the environment, air, water, and soil. Along with the increase in population density, environmental degradation will also increase (Aida et al., 2022; Hussain et al., 2021; Pavlovi, 2021; Uzair et al., 2020). High population density can cause environmental damage. Nihayah et al. (2022) stated that activities to fulfill human needs cause significant pressure on the environment and cause environmental degradation or threats to sustainable development.

Environmental problems cannot be separated from the quality factor of human resources. One indicator to measure the success of human quality development is the human development index (HDI). According to Todaro (2006), human development is measured through education, health, and economic capacity. Quality residents make it possible to manage and process the potential of natural resources well, efficiently, and maximally while maintaining environmental sustainability so that the goals of Sustainable Development can be realized (Harmadi, 2020). Higher education will shape pro-environmental behavior, namely behavior that is aware of the importance of protecting the environment (Marshall et al., 2017) .

Research on government expenditures for environmental improvement has been conducted, such as the study by Zhang et al.

(2017) on 106 cities in China during the period 2002-2014, Zeraibi et al. (2021) on 31 provinces in China during the period 2007-2017, and Donkor et al. (2022) on the North African and Southern African (NASA) republics from 2000-2016. These studies examine the relationship between government expenditures and other variables such as FDI, energy consumption, and economic growth concerning the environment. However, the link between human resource quality and the environment has not been explored. This is crucial, considering that the success of environmental improvement depends on society's awareness (Harmadi, 2020; Marshall et al., 2017).

Therefore, this research analyzes the role of human resources, green budgeting, foreign investment, and population density in environmental quality to achieve sustainable development. This research is significant because environmental problems in developing countries require immediate treatment. It is necessary to know the role of environmental budgets and other variables to determine the planning and to solve the right target. Based on previous theory and research, the hypothesis was made that green budgeting and the quality of human resources have a positive effect on environmental quality. Meanwhile, foreign investment and population density had a negative impact on the quality of the environment in Indonesia.

RESEARCH METHODS

This quantitative research processes data in the form of numbers, the results of which are statistical analysis that aims to determine the hypothesis test that has been determined. This study uses secondary data from the Central Statistics Agency and the Ministry of Environment and Forestry of the Republic of Indonesia. The data analysis technique in this study uses panel data regression using the E-views 9 program as an analytical tool. Time-series data were used for 2011-2020, and cross-sectional data are 34 provinces in Indonesia. The dependent variable in this study is Environmental Quality. At the same time, the

independent variables used are Green Budgeting, Human Development Index (HDI), Foreign Direct Investment (FDI), and Population Density.

There are three models commonly used when using panel data regression results in research, namely the Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM). Meanwhile, the Chow, Hausman, and Lagrange Multiplier tests were conducted to select the estimation model. After the model selection is made, a feasibility test of the model is carried out to test the error or truth of the research hypothesis that has been determined. The statistical test consists of the coefficient of determination test, the joint significance test, and the partial significance test (Gujarati, 2013). The general model of the OLS panel can be written as in Equation 1:

$$y_{it} = \beta_0 + \beta_{it}x_{it} + \varepsilon_{it} \quad ....(1)$$

Equation 1 can be derived into a research model, as shown in Equation 2.

$$EQI_{it} = \beta_0 + \beta_1 LnGB_{it} + \beta_2 HDI_{it} + \beta_3 LnFDI_{it} + \beta_4 LnPD_{it} + \varepsilon_{it} \quad ....(2)$$

Where, EQ_{it} Is Environmental Quality province i in year t; β is the measured parameter; x is a set of variables that affect y atau EQ, including Green Budgeting (GB), Human Development Index (HDI), Foreign Direct Investment (FDI), Population Density (PD); β_0 Moreover, ε are constants and error terms, respectively.

RESULTS AND DISCUSSION

This study analyzes the effect of green budgeting, HDI, FDI, and population density on environmental quality in Indonesia with panel data regression analysis. To get the best model to be used, it is necessary to analyze the selection of the model through the Chow Test, Hausman Test, and Lagrange Multiplier Test. The first test is the Chow test. It used to choose between CEM and FEM. The second test is the Hausman test. It is also used to choose between FEM or REM. The last test is Lagrange Multiplier (LM) which is chosen CEM or REM. The results of the three-panel data estimation models can be seen in Table 1.

Table 1. Estimation Results of Panel Data Model with Common Effect Model, Fixed Effect Model, and Random Effects Model.

No	Variable		Models		
			Pooled OLS (CEM)	Fixed Effect Model (FEM)	Random Effect Model (REM)
1	C	(prob.)	(22.5845) (0.0000)*	3.9313 (0.0001)*	7.7691 (0.0000)*
2	LnGB (prob.)		-0.1898 (-0.8495)	1.0414 (0.2985)	0.9303 (0.3529)
3	HDI	(prob.)	-1.48964 (-0.1373)	4.6154 (0.0000)*	3.6374 (0.0003)*
4	LnFD (prob.)		-1.7739 (0.0770)***	-2.5735 (-0.0105)*	-1.5575 (-0.1203)
5	LnPD	(prob.)	-22.2993 (-0.0000)*	-2.0965 (-0.0369)**	-11.2209 (-0.0000)*
6	Constanta		99.0923	55.92220	60.8439
7	R^2		0.75	0.88	0.28
8	Adj R^2		0.74	0.86	0.27
9	Durbin-Watson Statistic		0.8452	1.5547	1.2823
10	F-Stats		245.0643	59.1233	32.2442
11	Prob (F-Stats)		0.0000	0.0000s	0.0000

Note: *Significance to α=1%; **Significance to α=5%; ***Significance to α=10%.
Source: Data Processed, 2022

A Chow test was conducted to choose between CEM and FEM. There are criteria for determining the model to be selected when conducting the Chow Test, namely by looking at the probability value of Cross-Section F. If the probability of Cross-Section F < 0.05, the model chosen is the Fixed Effects Model. On the other hand, if the probability value of Cross-Section F > 0.05, the model chosen is the Random Effect Model. The results of the Chow test are shown in Table 2.

Table 2. Chow Test Results

Effect Test	Statistics	Prob.	Results
Cross-section F	9.674516	0.0000	Fixed Effect Model (FEM)

Source: Data Processed, 2022

The probability value of Cross-Section-F is 0.0000 (Table 2). The probability value is smaller at the $\alpha = 0.05$. This means that H0 is rejected and H1 is accepted, so it can be concluded that the better model is FEM.

Hausman test was conducted to choose which model is better, between FEM or REM. There are criteria to determine which model to choose when conducting the Hausman test, which is in decision-making by looking at the random cross-section probability value, which is significant at $\alpha = 0.05$. If the probability value of random cross-section < $\alpha = 0.05$, the model chosen is FEM. On the other hand, if the probability of a random cross-section > $\alpha = 0.05$, then the Random Effects model (REM) is

chosen. The results of the Hausman test can be seen in Table 3.

Table 3. Hausman Test Result

Test Summary	Chi-Sq. Statistics	Prob.	Results
Cross-section random	20.096640	0.0005	Fixed Effect Model (FEM)

Source: Data Processed, 2022

Hausman test results obtained a random cross-section probability value of 0.0005 which is significant at 1% (Table 3). This shows that the probability value is smaller than the $\alpha = 0.05$. This means that H0 is rejected and H1 is accepted, so it can be concluded that the best model is the Fixed Effect Model (FEM). FEM was chosen as the best model. There is no need to proceed with the Lagrange Multiplier (LM) test.

Table 4 shows the Fixed Effect Model estimation results with the Generalized Least Square method. The Regression coefficient values for each research variable are as follows:

$$EQI = 55.92220 + 0.222573\,(LnGB) + 0.874428\,(HDI) - 0.521864\,(LnFDI) - 10.10745\,(LnPD) + e_{it} \quad \text{.................................... (1)}$$

The coefficient value is 55.92220, meaning that if the variables of green budgeting, human development index (HDI), foreign direct investment (FDI), and population density are considered constant or zero, then the environmental quality in Indonesia is 55.92 points.

Table 4. Result of Fixed Effect Model (Cross Section Weighted)

Variable	Coefficient	Std. Error	t-statistic	Prob.
C	55.92220	14.22485	3.931304	0.0001*
Ln_GB	0.222573	0.213716	1.041445	0.2985
HDI	0.874428	0.189456	4.615474	0,0000*
Ln_FDI	-0.521864	0.202781	-2.573539	0,0105**
Ln_PD	-10.10745	4.820897	-2.096592	0,0369**
R^2	0.878694	F-Stats	59.12333	
Adj. R	0.863832	Prob (F-Stats)	0.00000	

Note: *Significance to α=1%; **Significance to α=5%; ***Significance to α=10%.
Source: Data Processed, 2022

Table 4 shows that the coefficient of determination (R2) is 0.878694. The Environmental Quality (EQI) variable can be explained by variations in the set of independent variables, namely Green Budgeting (Ln_GB), Human Development Index (HDI), Foreign Direct Investment (Ln_FDI) and Population Density (Ln_PD) of 87.86%, while other variables outside the model explain the remaining 12.13%.

The results of the F-Statistic test with the Fixed Effect Model (Cross Section-Weights) obtained the F-Statistic coefficient value of 59.12333 with the F-Statistic probability value of 0.00000. The F-Table value with (df1 (denominator) = K-1) 4 and (df2 (number) = N-K) 335 obtained the F-Table value of 2.398606. The regression results in Table 4.8 show that the F-statistic > F-Table (59.12333 > 2.398606) and the probability value of the F-Statistic is smaller than the level of = 5%. It can be concluded that the variables of Green Budgeting (Ln_GB), Human Development Index (HDI), Foreign Investment (Ln_FDI), and Population Density (Ln_PD) together have an effect on the variable of Environmental Quality (EQI) in Indonesia for the period 2011-2020.

The t-statistic test was conducted to determine whether the independent variables in the study had a partial effect on the dependent variable, namely Environmental Quality. The t-statistic test is done by comparing the t-statistic and t-Table values. The t-Table value with K = 5 and N = 340 (df = N-K = 335) with alpha 5% one-way obtained a value of 1.96707. The results of the t-statistic test can be seen in Table 5.

Table 5. T-Statistic Test Result

Variable	t-statistic	Prob.	t-Table	Conclusion
Ln_GB	1.041445	0.2985	1,96707	Not Significant
HDI	4.615474	0,0000*	1,96707	Significant
Ln_FDI	-2.573539	0,0105**	1,96707	Significant
Ln_PD	-2.096592	0,0369**	1,96707	Significant

Note: *Significance to α=1%; **Significance to α=5%; ***Significance to α=10%.
Source: Data Processed, 2022

The Green Budgeting variable (Ln_GB) has a t-statistic value of 1.041445, where this number is smaller than the t-Table value of 1.96707 with a probability of 0.2985 which is not significant at the level of α = 5%. It can be interpreted as the result of accepting H0 and rejecting H1. The green budgeting variable partially has a positive but insignificant effect on Indonesia's Environmental Quality (EQI).

The green budgeting variable is not significant because the low budget for the environment in the province, which is still far from the ideal budget, causes the role of green budgeting to be not optimal in improving the quality of the environment in Indonesia. The mandate of Law No. 32 of 2009 concerning Environmental Protection and Management states that the Government and finance are obliged to allocate an adequate budget for environmental protection and management activities.

The absence of a quantitative %age of allocation causes the environmental allocation not to have a definite and clear standard so that the view of this regulation becomes multi-perspective. According to Hariyati (2020), the lack of clarity regarding the environmental budget is a problem that causes the implementation of green budgeting in Indonesia to be not optimal. The budget allocation for the environmental sector is still relatively small compared to the overall Regional Revenue and Expenditure Budget. In environmental-based budgeting, there is a lack of community participation and a lack of stakeholder commitment. This is owing to a shared understanding of environmental budgeting and inconsistencies between the Regional Medium Term Development Planand the Regional

Revenue and Expenditure Budget (Faqih et al., 2017).

This result contradicts a study by Orchidea et al. (2016) that applying environmental function funds positively and significantly affects environmental quality in Indonesia. Ercolano (2018) also states that the Environmental Performance Index (EPI) positively correlates with public spending on environmental protection. When spending on the environment increases, the EPI will also increase.

This study aligns with Fernandez (2018), which examines the relationship between regional and national environmental policies in Spain from 1995 – 2014 with a quantitative approach to the Fixed Effect model, stating that Environmental Expenditures (spending on the environment) are not significant to the environment because the main focus of spending is social security, health, and education. Likewise, in Indonesia, the low Green Budgeting is caused by the Indonesian government's lack of awareness of environmental protection due to lack of awareness of the importance of environmental protection. The minimal environmental budget evidence this compared to the social protection, health, and education budget.

Table 6. Indonesian State Budget 2020

Budget Type	%age	Quantity
Environmental Protection	0,9	16,7 trillion
Education	20	492,5 trillion
Social Protection	15,5	387,3 trillion
Healthy Protection	5	123,3 trillion

Source: Ministry of Finance of the Republic of Indonesia, 2021

Table 6 shows that the budget for environmental protection is very small, even below 1% of the APBN. In fact, according to the WWF Indonesia Strategic Plan (Renstra) 2014-2018, Indonesia is mandated to encourage the existence of a green budget in public policies so that the indicator for achieving green budgets increases by 2% in priority provinces and districts

has been established, to achieve sustainable development goals (Salam et al., 2015).

The results of this study are also in line with Karnila (2019), who states that the low allocation of funds for environmental functions, which is below 1 %, is not proportional to the total damage related to development activities that cause climate change of 2.4 %, plus damage due to degradation. Natural resources by 2.4 % and 1.1 %, so the total damage is 3.5 %. Hao et al. (2019) also stated that if the level is 3.1 or 3.6 %, environmental spending will positively impact the environment.

According to research by Hariyati (2020), the implementation of green budgeting was not optimal. This was due to budget constraints, low leadership commitment, the absence of rules regarding the minimum limits for green budget allocations, lack of awareness, and community involvement. The government can increase the provision of adequate green budgeting following the WWF Indonesia Strategic Plan 2014-2018, which is at least 2% of the Regional Revenue and Expenditure Budget. There needs to be a more systematic arrangement regarding determining the amount of the environmental budget that must be issued by each region so that the environmental budget can be appropriately on target.

The Human Resources Quality (HDI) variable has a t-statistic value of 4.615474, where the term is greater than the t-Table value (1.96707) with a significant probability of 0.0000 at the $\alpha = 5\%$. This means that the results reject H0 and accept H1. It can be concluded that the Human Development Index variable partially has a positive and significant influence on the Environmental Quality (EQI) in Indonesia.

The human development index (HDI) has a positive and significant effect on environmental quality in Indonesia, with a coefficient of 0.874428207083 with a probability value of 0.0000. This means that every 1 % increase in Indonesia's human resource quality index will increase the environmental quality index by 0.0087 %, assuming ceteris paribus. Human development theory by Todaro (2006) states that human capital as measured through

education and health, the higher a person's education is, the more likely he or she will have ideas and innovations to create or develop cleaner and environmentally friendly technologies, to reduce the rate of degradation and improvement of environmental quality that can improve human well-being and extend life expectancy.

These results support the research of Oktavilia et al. (2018) state that the quality of human resources and the quality of the environment have a unidirectional (positive) relationship. Similarly, Sumargo et al. (2021) state that HDI significantly affects EQI. The result aligns with Zulham et al. (2021) that the low Human Development Index and faster population growth will increase environmental degradation.

Karnila (2019) also states that the Human Development Index (HDI) has a significant positive effect on the environmental quality index in Indonesia. The higher the education level of people, caused the concern for the environment is better than before. Hidayati & Zakianis (2022) stated that HDI has a significant positive effect on environmental quality. This happens because the higher the level of education, the more innovations to overcome environmental problems.

The positive relationship between the quality of human resources and the quality of the environment can be attributed to the three main components of the human development index, namely education, health, and a Proper standard of living. First, from the aspect of education, awareness of the importance of environmental quality is determined by a person's level of education. The level of education will shape pro-environmental behavior, namely behavior that is aware of the importance of maintaining a sustainable environment (Marshall et al., 2017). Education can also give birth to various innovations as a form of concern for the environment by creating environmentally friendly technologies.

The Proper Living Standard component is assessed from per capita income. When a person's income increases, spending on managing the environment is expected to increase. On the other hand, if a person is in poor condition or has a low standard of living, his priority needs are not for good environmental quality but for meeting needs such as clothing, food, and housing. Often people who are squeezed economically live in slum areas and create a slum environment as well. According to Zulham et al. (2021), poor people influence bad behavior on environmental quality. People with low incomes also have the potential to extract unplanned natural resources.

The Foreign Direct Investment Variable (Ln_FDI) has a t-statistic value of -2.573539, where this value is greater than the t-Table value (1.96707) and a probability value of 0.0105 which is significant at the level of = 5%. This means that the results reject H0 and accept H1. It can be concluded that the foreign investment variable partially has a negative and significant effect on Indonesia's Environmental Quality (EQI). The coefficient of the foreign investment variable has a value of -0.521864448707 with a probability value of 0.0105. This shows that every 1 % increase in investment in Indonesia will reduce environmental quality by 0.52 % with the ceteris paribus assumption.

The finding aligns with the pollution haven hypothesis conducted by Cole & Elliott (2005). Developed countries will apply dirty (unfriendly) industries to countries with low environmental standards. Results like this are with the research of Sabir et al. (2020), which stated that FDI causes short- and long-term environmental degradation. This is due to less than optimal and inefficient use of natural resources. Besides, bureaucrats are always prone to accepting bribes and allowing activities that damage the environment.

Research by Uzair et al. (2020b) also states that FDI has a positive effect on environmental quality in developed countries, while in developing countries, FDI has a negative on the environment. Çamkaya (2022) shows that the Heaven Pollution Hypothesis occurs in the long term. This means that foreign direct investment has a negative effect on environmental quality in developing countries in the long run. This is

because global companies seek to reduce production costs by transferring pollutants to sectors in developing countries. Nihayah et al. (2022) also found that FDI impacts CO2 emissions in the short term.

There is a negative effect between foreign direct investment and environmental quality in Indonesia. This is because incoming investment funds mainly finance national development, aiming to increase regional economic growth. The negative impact of FDI on environmental quality in developing countries such as Indonesia also supports the Haven Pollution hypothesis. Developed countries enforce stricter environmental policies, while developing countries do not apply strict environmental policies (Neequaye & Oladi, 2015). The country's main priority is the ease of investment to compete with developed countries. Industries with high pollution levels are primarily carried out in developing countries.

FDI leads to increased investment and industrial projects in developing countries, but developing countries cannot guarantee stricter environmental standards to attract investors (Munir & Ameer, 2020). Indonesia also has an environmental standard known as AMDAL. However, in the Omnibus law, ratified in 2020, the government provided a new regulation related to AMDAL with simplified conditions, but this regulation was weakened to attract foreign investors.

A study by Aida et al. (2022) states that foreign investment significantly negatively affects environmental quality. This is because the realization of foreign investment in Java is still dominated by sectors that are not environmentally friendly. In addition, the benefits of FDI are not directly utilized for environmental improvements, for example, by changing production machines to become more environmentally friendly. Until now, the realization of foreign investment in Indonesia is still dominated by industries that are not environmentally friendly, including the metal industry, chemical and pharmaceutical industry, electricity, gas and water industry, transportation industry, housing industry, and mining sector.

These sectors rank the highest from year to year. Industries that are not environmentally friendly cause emissions in Indonesia (Munir & Ameer, 2020).

The population density (Ln_PD) has a t-statistic value of -2.096592 (absolute), where this value is greater than the t-Table value (1.96707) and a significant probability value of 0.0369 at the level α = 5%. This means that the results reject H0 and accept H1. It can be concluded that the population density variable partially has a negative and significant effect on the quality of the environment (EQI) in Indonesia. The population density variable coefficient is -10.1074545757, with a probability value of 0.0369. This shows that every 1 % increase in population density in Indonesia will reduce environmental quality by 10.1075 %.

This study follows the theory of population growth. Malthus states that the population growth rate increases based on a geometric series, while food production is based on an arithmetical basis. The impact in the long-term human will experience a natural resource crisis. Human needs are not limited because of the limited environmental resources, so the higher the population density, it will cause degradation and a decrease in environmental quality.

This research is in line with Audi & Ali (2017). Population density has a positive and significant relationship with environmental degradation. The study by Rahman (2020) also states that population density positively and significantly affects environmental degradation. This is because the increase in population density puts pressure on the exploitation of natural resources, contributing to environmental degradation.

The negative effect between population density and environmental quality in Indonesia is also due to the high number of people in Indonesia not being matched by the high quality of human resources, so that the higher population density will damage the environment. The larger the population is accompanied by low awareness of environmental quality, environmental quality will decrease (Zulham et al., 2021).

According to Nihayah et al. (2022), a high level of urbanization can lead to rapid population growth that leads to agglomeration and will be followed by human efforts to meet their needs. Higher urbanization will increase population density. The higher the population density, the need for clothing, food, and housing will also increase. For example, the need for housing, the higher the population density in an area, the need for houses also increases, where houses need land, while the land is limited in number compared to the need for land. As a result, many functions of green land have been turned into settlements.
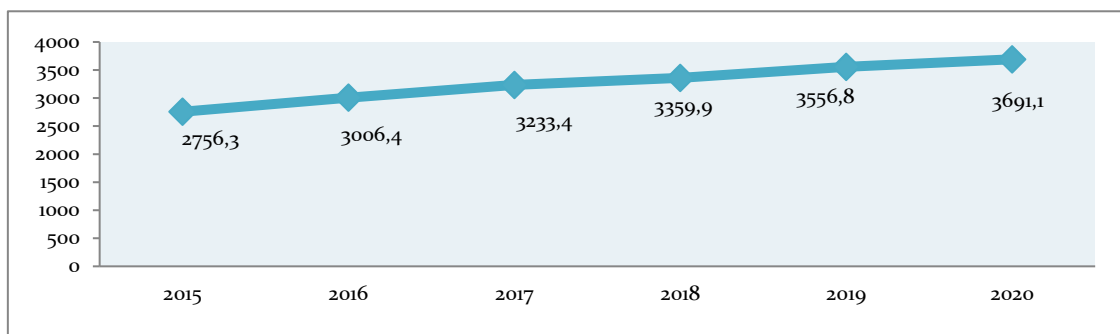

Figure 3. Area of Settlement Land Cover in Indonesia (Thousand Ha), 2015 - 2020
Source: Central Statistics Agency of Indonesia, 2021

Figure 3 shows that land for settlement continues to increase along with Indonesia's population density from 2015 – 2020. This shows a decrease in green land cover because the land used for settlement was previously used for agricultural land or forests. The reduction of green land is one indicator of environmental damage. The reduction of green land is one indicator of environmental quality degradation. This is because the reduced green land will cause the trees that help reduce air pollution to no longer exist. Air pollution can be a trigger for global warming and climate change.

Wafiq & Suryanto (2021) reveals that the relationship between population density and environmental quality is negative and significantly affects environmental quality in Indonesia. Population density will increase the need for industry, housing, and transportation, worsening environmental quality. The higher the population density, the higher the mobility of the population. This will undoubtedly increase the fulfillment of transportation needs which are also getting higher.
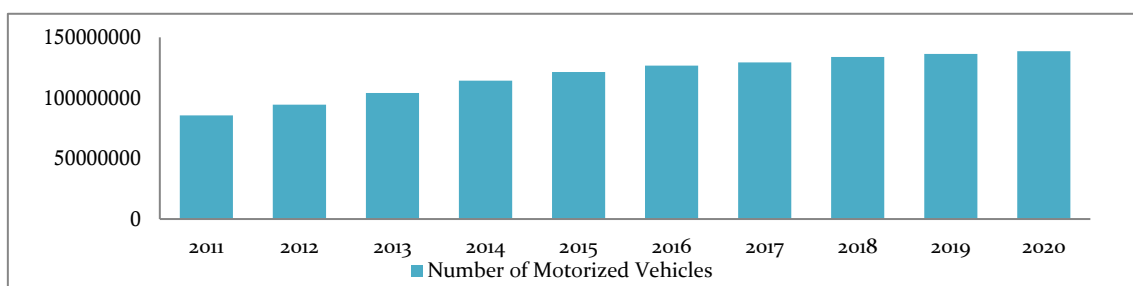

Figure 4. Number of Motorized Vehicles in Indonesia, 2011 – 2020 (Million units)
Source: Indonesian Central Statistics Agency, 2021.

Figure 4 shows that the number of motorized vehicles in Indonesia has increased from 2011 – 2020. The high mobility of the population in Indonesia causes a high number of motorized vehicles. The high number of motorized vehicles will contribute to air and noise pollution, which can reduce environmental quality. The high pollution from energy produced by motorized vehicles will also

contribute to CO2 emissions, damaging the environment.

The high population density in an area can reduce the quality of the environment, for example, activities to meet consumption needs. Consumption activities will demand increased industrial activities in producing goods and services. These consumption and production activities generate waste/garbage. Based on data from the Ministry of Environment and Forestry Indonesia, in 2019, waste generation in Indonesia was 29,173,361.42 tons in 2020, then increased to 32.197,209.74 tons. This waste pollutes the soil and water environment, which can reduce environmental quality.

In addition, high population density is also one of the factors causing poverty, where poverty can cause a decrease in environmental quality (Fabuanmartins & Osuagwu, 2020; Masron & Subramaniam, 2018; Solarin et al., 2021), according to Tasri et al., (2022) state that disadvantaged communities tend to be uncontrollable in exploiting nature such as forest encroachment, and are irresponsible because of the pressure of need. Setyadharma et al. (2020) state that decreasing poverty and improving the quality of the environment cannot do at the same time. This means that when people are poor or have a low standard of living, improving the quality of the environment will be challenging.

CONCLUSION

Green Budgeting has a positive but insignificant effect on Indonesia's environmental quality. The insignificant ness of this variable occurs due to the low environmental budget in the province, which is still far from the ideal budget. The role of green budgeting is not optimal in improving Indonesian environment quality. The Human Development Index significantly positively affects environmental quality in Indonesia. Foreign Direct Investment proven negatively affects the environmental quality in Indonesia. Population Density has a significant and negative effect on environmental quality in Indonesia. Systematic regulation is needed to determine the amount of the environmental budget each region should spend

so that the environmental budget can be on target. Establish stricter regulations for industries contributing to high pollution and reward companies using environmentally friendly technologies. It is expected to be able to improve the quality of the environment in the region.

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