

Analysis of Factors Influencing Green Growth in ASEAN Countries

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ABSTRACT

Climate change is becoming an increasingly extreme challenge faced globally. As a result, green growth is built on the principle of sustainable economic expansion, rather than economic development based on excessive exploitation of natural resources and the environment. The purpose of this research is to examine the impact of renewable energy, green trade, and green financing on green growth in ASEAN countries. This research uses a quantitative approach with secondary data which is analyzed using the multiple linear regression method, and hypothesis testing is carried out simultaneously and partially using E-Views 12. The results of the research show that renewable energy, green trade, and green financing have a partial and simultaneous effect on green growth.

INTRODUCTION

In recent decades, the issue of global climate change has become more urgent. Emissions of CO₂ and other greenhouse gases are the main cause of global warming and have a detrimental impact on the environment and human life. Sarwati et al., (2022) revealed that as a form of world awareness of this problem, the concept of sustainable development began to be developed in the 21st century, namely development that does not sacrifice the next generation to meet their needs.

The terms "green economy" and "green growth" are multifaceted and interdisciplinary, and a number of organizations are building methods to track, evaluate, and share the ways in which nations are making economic transitions that are more environmentally friendly. (GGGI, 2020). The Global Green Growth Institute launched an index that is the first metric for green growth explicitly linked to sustainable development.

According to Yusma & Rosalia (2023), The Association of Southeast Asian Nations (ASEAN) is confronted with significant obstacles concerning the forthcoming energy scenario and the effects of the energy shift on it. Whereas in 2020, renewable energy made up just 14.2% of the country's total primary energy supply. With nearly 80% of ASEAN's current energy coming from fossil fuels (oil, coal, and natural gas), using clean fossil fuels in conjunction with clean technology is essential to lowering ASEAN's emissions.

Economic growth has led to increased energy consumption, resulting in higher living standards for the population and worsening environmental quality.

Green growth is crucial for mitigating environmental degradation, including health issues for humans, animals, and marine life, low agricultural productivity, global warming, rising sea levels, melting glaciers, water scarcity, extreme weather, and unpredictable rainfall. Thus, in recent years, the contribution of technological innovation and renewable energy has grown significantly. (Wei et al., 2023). A study conducted by Tawiah et al., (2021) also mentioned energy-related factors, it was found that energy consumption harmed green growth, but renewable energy consumption significantly increased green growth. Similar research conducted by Leonardo et al., (2023) said that renewable energy can help to mitigate the environmental damage caused by carbon emissions.

Meanwhile, economic growth driven by trade expansion can have a clear direct impact on the environment, increasing pollution or degrading natural resources. Research by Zafar et al. (2019) show that trade openness leads to worsening green growth because trade openness is significantly and positively associated with CO₂ emissions in both the short and long term leading to degradation. Green trade is one strategy for achieving sustainable development. (Mahajan et al., 2023).

Meanwhile, Liu et al. (2023) show that green financing significantly increases the positive influence on the efficiency of green economic development. The government needs to apply green economy principles to the implementation process to realize micro and macro development processes

(Mahrani Rangkuty, 2023). Therefore, the role of green finance in promoting renewable energy transition for energy security in Asian economies is important for green growth (Sachs et al., 2019).

This research was created to answer what factors can influence green growth in ASEAN countries. Based on several previous explanations, researchers chose several factors to examine their influence on green growth, such as renewable energy, green trade, and green financing. Therefore, this research aims to determine the influence of renewable energy, green trade, and green financing on green growth in ASEAN countries.

LITERATURE REVIEW

Green Growth

The Organization for Economic Cooperation and Development (OECD) defines green growth as a paradigm shift from our current approach to economic growth, emphasizing how nations can use their natural resources sustainably to meet their social and economic objectives. Green growth encompasses not only economic growth but also other forms of progress, such as enhanced human well-being and social equity, in order to fully capture all facets of economic performance.

According to the Asian Development Bank (ADB), low-carbon green growth is a pattern of development that fosters economic expansion by fostering the development of new environmentally friendly goods, sectors of the economy, and business ventures that enhance people's quality of life.

The Green Growth Index is based on the interconnection between four dimensions of green growth, which are defined by four sustainability concepts: low-carbon economy, health ecosystem, inclusive growth, and resilient society, according to the report "Green Growth Index 2022: Measuring performance in achieving SDG targets." A low-carbon economy is supported by the efficient and sustainable use of resources, which also helps to preserve natural capital.

Renewable Energy

Energy is defined by scientists as the capacity for work. Both non-renewable and renewable energy sources can be utilized to create secondary energy sources like electricity and hydrogen or to serve as primary energy sources for the production of useful energy like heat. (EIA, 2023). According to the United Nations, renewable energy is energy produced from natural sources that is replenished faster than it is consumed.

Most studies have found a positive and significant effect of energy consumption on CO₂ emissions (M. M. Alam et al., 2016). This is because until now the energy used is still dominated by fossil fuels, which are known to have high carbon content. In developed countries, renewable energy consumption is associated with increased green growth, while in developing countries, renewable energy consumption also leads to increased green growth (Tawiah et al., 2021).

Muhammad & Khan (2019) states that renewable energy consumption does not have a significant effect on environmental degradation. This is inversely proportional to research conducted by Majeed & Luni (2019), in this research it was stated that renewable energy consumption has a positive role in improving environmental quality. The positive long-run coefficient of energy use confirms that increasing energy consumption is associated with increasing pollution, indicating that energy use is the main driver of CO₂ emissions in (Goswami et al., 2023).

Green Trade

Trade is an important factor for economic growth, as well as environmental issues. Trade openness is likely to have a negative or positive impact on the environment due to its different effects and composition. Trade openness has been a focus in recent literature on environmental quality, yet various studies have come to different conclusions (Khan et al., 2021). Meanwhile, other research that examines the relationship between trade and economic growth using 15 Asian countries, proves that the two have a significant relationship (K. J. Alam & Sumon, 2020)aa. According to Dou et al.'s (2021) investigation into the relationship between trade and environmental quality, imports are driving up CO₂ emissions while exports have less of an impact on environmental quality. Green trade refers to trade practices that are environmentally friendly and do not cause ecological harm. It involves the trade of clean energy, green products, and services that contribute to a sustainable future. Economic expansion, environmental sustainability, and social development are all significantly impacted by green trade. This is because green trade has the ability to encourage the shift to a low-carbon economy, lessening the detrimental effects of economic growth on the environment. (Mahajan et al., 2023).

Green Financing

Green finance refers to a set of financial instruments and strategies designed to promote environmental sustainability and the transition to a low-carbon economy (Ye & Dela, 2023). According to Y. Liu et al. (2023), The flow of social capital towards low-carbon products, environmental protection, and energy-saving industries is largely determined by green financing. It also encourages companies to modernize their technologies and undergo an industrial revolution. The goal of green financing, according to the United Nations Environment Program (UNEP, 2023), is to increase the amount of money invested in sustainable development priorities by the public, private, and nonprofit sectors.

According to Zhang (2023), green financing can improve environmental quality by supporting companies using environmentally friendly organizational approaches and policies that encourage more sustainable economic development. Thus, green financing can play an important role in facilitating sustainable economic growth and climate change mitigation (Fu et al., 2023).

Research hypothesis :

1. Renewable energy, green trade, and green financing Simultaneously affect green growth in ASEAN.
2. Renewable Energy affects Green Growth in ASEAN countries
3. Green Trade affects Green Growth in ASEAN countries
4. Green Financing affects Green Growth in ASEAN countries

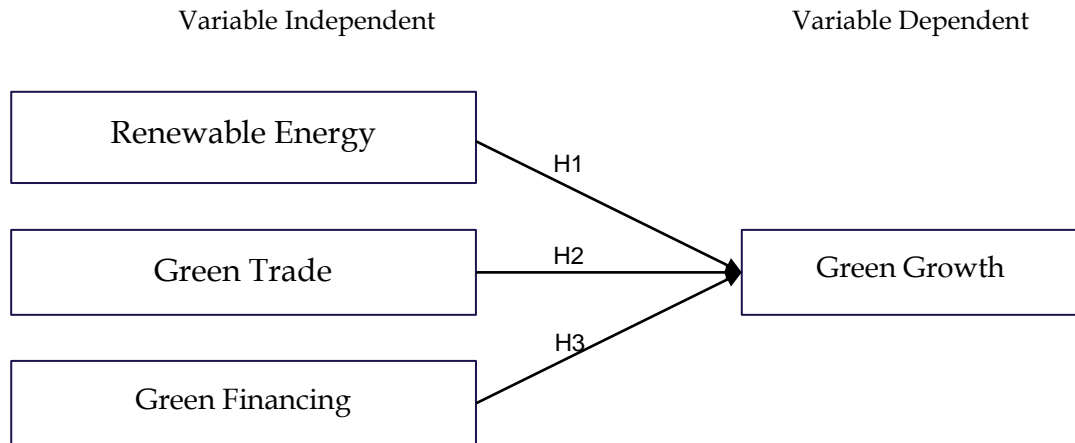


Figure 1. Conceptual Framework

METHODOLOGY

This research is a type of quantitative research. This study uses multiple linear regression panel data for analysis. It is a type of regression analysis used to estimate the value of a dependent variable that is affected by multiple independent variables. The population of this study consists of 6 (six) countries in the Southeast Asian region, such as Indonesia, Malaysia, Philippines, Singapore, Thailand, and Vietnam. The research data period used is from 2018-2022. The variables used in the study consisted of 4 variables, green growth as a dependent variable, renewable energy, green trade, and green financing as an independent variable. To process the data, this research uses E-Views 12 software.

RESEARCH RESULT

Normality Test

The probability value of JB is 1.894140, which is greater than the probability value of 0,05, according to the test output. It can be said that the research's data were distributed normally.

Multicollinearity Test

Based on the results of the multicollinearity test, the value of the centered VIF renewable energy is 1.829927; the value of the centered VIF green trade is 2.015257; and the value of the centered VIF green financing is 1.660920. In order for each independent variable to have a value-centered VIF less than 10 in the regression equation. Regression models avoid multicollinearity issues as a result.

Heteroscedasticity Test

Based on the test results, the probability of all variables is greater than 0.05, so it can be concluded that there is no heteroskedasticity issue in the regression model.

Multiple Linear Regression Test

Table 1 Multiple Linear Regression Result

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	51.33609	2.746339	18.69256	0.0000
LOG_RE	1.743495	0.577610	3.018464	0.0056
LOG_GT	0.860253	0.292000	2.946070	0.0067
LOG_GF	0.490449	0.109520	4.478171	0.0001

This study's multiple linear regression model is based on the table above and is as follows:

$$Y = \alpha + \beta_1 \text{LOG_RE} + \beta_2 \text{LOG_GT} + \beta_3 \text{LOG_GF} + e$$

$$Y = 51.33609 + 1.743495 \text{LOG_RE} + 0.860253 \text{LOG_GT} + 0.490449 \text{LOG_GF} + e$$

From the results of the multiple linear regression, it can be interpreted as:

1. The constant value (α) of 51.33 indicates a unidirectional influence between the independent and dependent variables. This indicates that if all independent variables, including renewable energy (X1), green trade (X2), and green financing (X3) have a value of 0 or do not change, the value of economic growth is 51.33.
2. The renewable energy variable's regression coefficient is positive, at 1.743495. This number demonstrates how renewable energy has a positive impact on green growth. This indicates that a 1% increase in the renewable energy variable will result in a 1.743495 increase in the green growth variable. Assuming that all other factors stay the same.

3. The green trade variable's regression coefficient is positive, at 0.860253. This number demonstrates how green trade has a positive impact on green growth. This indicates that a 1% increase in the green trade variable will result in a 0.860253 increase in the green growth variable. Assuming that all other factors stay the same.
4. The green financing variable's regression coefficient is positive, at 0.490449. This number demonstrates how green financing has a positive impact on green growth. This indicates that a 1% increase in the green financing variable will result in a 0.490449 increase in the green growth variable. Assuming that all other factors stay the same.

Based on the t-test, all independent variables (Renewable Energy, Green Trade, and Green Financing) partially influence Green Growth in ASEAN countries, with different significance levels. The probability value of the renewable energy variable is 0.0056. This value is less than the 0.05 significant value. The data indicates that green growth in ASEAN countries is positively impacted by renewable energy to a partially significant extent. In other word, when renewable energy increases so does green growth.

The probability value of the green trade variable is 0.0067. This value is less than the 0.05 significant value. The data indicates that green growth in ASEAN countries is positively impacted by green trade to a partially significant extent. In other word, when green trade increases so does green growth.

The probability value of the green financing variable is 0.0001. This value is less than the 0.05 significant value. The data indicates that green growth in ASEAN countries is positively impacted by green financing to a partially significant extent. In other word, when green financing increases so does green growth.

Table 2 F Test and Determination Coefficient Test Result

R-squared	0.701237
Adjusted R-squared	0.666765
S.E. of regression	0.443638
F-statistic	20.34187
Prob(F-statistic)	0.000001

Based on the table above, it can be seen that the F statistic is (20.34187) while the probability value of the F-statistic is 0.000001. This shows that the F-statistic value is greater than F-table (2.93402989), so it can be concluded that the independent variables (renewable energy, green trade, green financing) simultaneously influence the dependent variable, namely green growth.

Meanwhile, the results of the coefficient of determination test (Adjusted R²) show a value of 0.666765. This means that the independent variables (renewable energy, green trade, and green financing) influence the independent

variable (green growth) with a value of 66.67%. Meanwhile, the remaining 33.33% is explained by other variables.

DISCUSSION

The results of this research can be summarized that the variables renewable energy, green trade, and green finance have a positive effect on expected green growth. This research is in line with H. Liu et al. (2022) who states that decreasing the efficiency of energy use hinders environmentally friendly economic growth. However, the efficiency of energy use has increased, which in turn increases green growth which is described by green total factor production. Green energy contributes positively to economic growth by reducing reliance on insufficient resources such as gas, coal, and fuel, thus encouraging environmental sustainability (Ahmed et al., 2022).

In the same research, Ahmed et al. (2022) stated that increasing environmentally friendly trade benefits South Asian countries' economic growth by reducing GHG emissions, increasing energy efficiency, advancing industrial activities, and encouraging economic progress. Export trade can influence green economic growth both directly and indirectly by influencing the relationship between resources and green economic growth (H. Liu et al., 2022).

This finding emphasizes the importance of environmentally friendly finance, human resources, globalization, and economic growth in the context of environmentally friendly growth. Increased financing for the environment and improved human resources contribute positively to environmentally friendly growth in OECD sample countries (Tufail et al., 2024). D. Liu et al. (2023) demonstrate that green financing significantly enhances the positive impact on environmentally friendly economic development.

CONCLUSIONS

The conclusion is renewable energy, green trade, and green financing significantly positively impact the green growth of ASEAN countries based on the analysis of the factors affecting ASEAN's green growth. The following conclusions can be drawn from the results of the hypothesis test:

- a. The renewable energy variable contributes positively to green growth. This indicates that a 1% increase in the renewable energy variable will result in a 1.743495 increase in the green growth variable.
- b. The green trade variable contributes positively to green growth. This indicates that a 1% increase in the green trade variable will result in a 0.860253 increase in the green growth variable.
- c. The green financing variable contributes positively to green growth. This indicates that a 1% increase in the green financing variable will result in a 0.490449 increase in the green growth variable.

ADVANCED RESEARCH

In this research, there are several limitations, including:

1. There is minimal data available for this research so future researchers can use research objects from other countries that have more complete data.
2. There is not much research and literature for this research, so suggestions for future researchers can research other variables that influence the green growth variable.

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