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Corruption, Development, and Deforestation: An Evidence From Southeast Asian Countries

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Abstract

This study aims to analyze the determinants of deforestation in Southeast Asian Countries. The variables used in this research are economic growth, total population, foreign direct investment, and corruption index. This research uses secondary data obtained from the World Bank, Rainforest Mongabay, and Trading Economics with a time range of 2011-2020. The method used in this analysis is panel data regression. This research found that economic growth, total population, foreign direct investment, and corruption index are positive and significantly affect deforestation in Southeast Asia. This evidence became a concern for the government in responding to this, considering that deforestation is a phenomenon that cannot be ignored.

Keywords: corruption, deforestation, economic growth, FDI

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1. INTRODUCTION

Nowadays, the development process is seen as a reform that is multidimensional in the environmental aspect, not only focusing on structural problems such as infrastructure provision, poverty alleviation, and job creation but also starting to expand on environmental mitigation (Helda et al., 2018). The ideal development is one that includes problems that are multidimensional in nature, namely sustainable development. The sustainable development in question is that all economic activities must be able to run simultaneously with the environment to create an ecological balance. This is because development should have a welfare effect not only from the point of view of economic growth but also from another angle that is no less important, namely the quality of the environment, which will affect the quality of life of the community (Ariesta, 2016). However, in reality, a lot of economic development that is carried out is often only in pursuit of income, without regard to environmental problems, so environmental damage appears as a result.

Economic growth is the main goal of the development process in many developing countries such as Indonesia. Positive economic growth is in line with population growth which at the same time will encourage high demand for land (Isnaini, 2019). According to Achard et al. (2002), The high use of land to support economic activities has the potential to pose a major threat to forest sustainability in a country. As a developing country, Indonesia requires a lot of land expansion to expand its economic sector, especially in the industrial sector. Land conversion, encroachment, illegal logging, and illegal trade of flora and fauna are some of the activities that threaten forest sustainability. So that one of the main problems that arise in the development process in Indonesia is deforestation and forest degradation as a result of the high demand for land, which is exacerbated by errors in the management of available forest land. By the government and the forestry service (Dariono et al., 2018).

In its development, the state development paradigm has referred to the concept of sustainable development and a green development mechanism (Houghton et al., 2012). Governments and various institutions in the world have sought a development model that is able to tackle pollution due to carbon emissions, one of which is caused by the continued reduction of forest land, one of which is from REDD+ (Reducing Emissions from Deforestation and forest Degradation) in Carr (2009), resulted in a commitment to reduce the impact of carbon emissions and deforestation as a result of the development process. The reality of the existing development process in developing countries is far from the Green and Sustainable principles. This condition still occurs due to the objective of the development itself. The recent development process only focuses on creating welfare and increasing resident income but ignores environmental quality. As empirical evidence, research conducted by Gonçalves (2010), in Brazil the development and economic growth process has resulted in high deforestation, especially in the Amazon forest area. This fact is reinforced by research conducted by Rijal et al. (2016), who also found the same empirical study in Sumatra, Indonesia, which found the same thing.

Basically, there have been several previous studies that tried to analyze the factors causing the decline in forest area in various parts of the world, one of which was carried out by Rudel (2013), who found that there were differences in the causes of deforestation in Africa with deforestation in Asia and America. According to him, in Asia and Latin America, rapid deforestation and forest degradation tend to be caused more by the clearing of agricultural land, plantations, and livestock on a large scale. However, on the contrary, in Africa, especially in the Congo and Kinshasa regions, deforestation is caused by poverty and the need for small-scale agricultural areas to meet food needs. From these findings, it becomes empirical evidence that deforestation is a structural problem, so economic, social, and demographic conditions must also be considered to explain the main causes of massive deforestation.

Economic growth is the goal of economic development that can be achieved, one of which is through infrastructure development. A country can create new job opportunities through infrastructure development, increase connectivity between economic sectors, and ultimately reduce unemployment and poverty rates (Geist and Lambin, 2002). However, a development dilemma that occurs in both developed and developing countries is the issue of land use, and limited land makes the development process often hampered. According to Lambin and Meyfroidt (2011),

forest areas are one of the options for land clearing in realizing economic development through infrastructure development. The increasing development of infrastructure such as the industrial sector, bridges, toll roads, and other supporting infrastructure has resulted in more and more land being needed, which, if the land starts to run out, will trigger higher land clearing motives.

Furthermore, the increasing rate of development and economic growth will encourage people to improve their quality of life and consumption further, as many development planning and economic experts believe (Sunderline, 2003). Efforts to meet the necessities of life will ultimately encourage the greater need for land tenure and economic resources for both residential areas and other economic resources such as agricultural land, plantations, livestock, and mining, contributing to the reduction of forest area.

Some studies focus more on studies in the form of clearing forest areas and deforestation due to population variables (demography). Many experts have found a link between increasing population numbers and decreasing forest area driven by the motive of the need for residential land. Research conducted by Samsuri et al. (2014) shows that the population growth rate is the main driver of forest clearing and deforestation. Undeniably, the need for residential land, small-scale agriculture, and plantations is one of the driving forces for the population to clear forest areas, which is often done by burning forests. Finding from Rijal et al. (2016) also found that the variables causing damage to forest areas in the Kampar and Indragiri Hulu areas are apart from small-scale agriculture and plantations.

Furthermore, Foreign Direct Investment (FDI) may impact developing countries positively and negatively (Demena and Afesorgbor, 2020). The government in developing countries often sacrifices the interest of the environment to boost economic growth. Hence, it becomes crucial to have good policy in managing foreign investment inflows as well as maintaining environmental qualities. The policymaker should consider creating a sustainable-based policy in managing foreign investment inflows to enhance economic growth as well as maintain environmental issues. The existence of FDI shall not hinder the political will of the House state to protect the environment. However, it is essential to enhance the role of the president's state government to have a good policy of FDI in order to protect the environment (Wartini, 2016). According to Doytch (2020), high-income countries tend to experience a consumption-related ecological impact of FDI. In contrast, Low and Middle-Income countries tend to experience the production-related ecological impact of FDI. Since developing countries dominate the countries in Southeast Asia, this issue has become very important.

Previous studies also found interesting empirical results regarding factors that enhance the deforestation rate. Deforestation occurs due to some politics and development processes. It is creating some assumption that institutional and political aspects possibly became one-factor affecting deforestation. There is a hypothesis about the link between corruption and deforestation, as the empirical finding from previous research. Based on the results of this study, corruption, and uncontrolled decentralization are one of the causes of deforestation in various countries, including Indonesia (Pachmann, 2013). Corruption, collusion, and nepotism are an indication of poor governance in a government agency. Poor quality of governance within the

forestry service can lead to illegal land clearing permits, corruption in tree replanting funds, and other forestry policy malfunctions. (Cuneyt and Rasim, 2008).

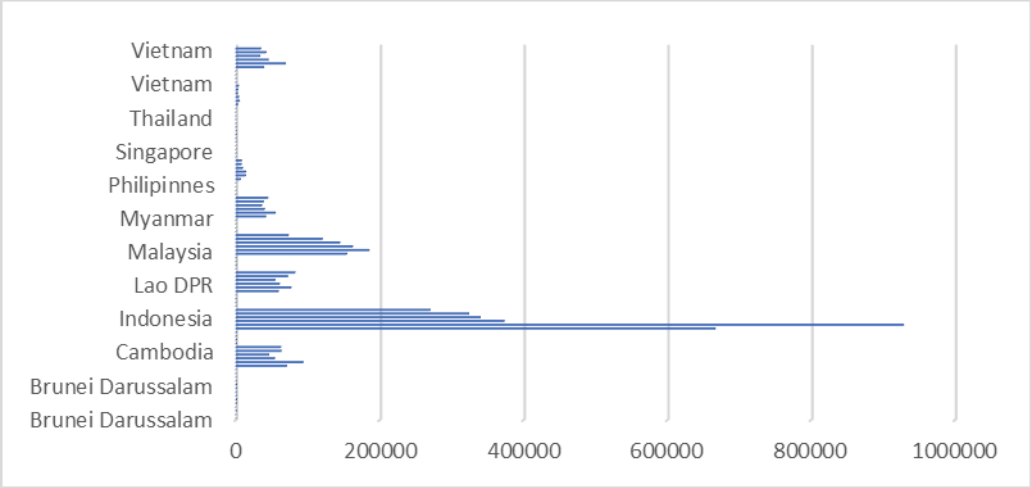

Figure 1. Southeast Asia Forest Lost 2011-2020 (In Hectares)
Source: Rainforest Mongabay (2022).

Based on Figure 1 above shows the forest lost data of Southeast Asian Countries from 2011 until 2020. The data reflected that some countries, such as Myanmar, Vietnam, Cambodia, Malaysia, Indonesia, Lao DPR had massive forest lost that represent the deforestation rate during the period. Interestingly, the data further explained that deforestation massively occurs in developing countries. Indonesia became the country with the most forest lost in Southeast Asia. It is recorded that in 2016, forest lost in Indonesia peaked within 928,66 hectares forest lost, and gradually decreased to 270,05 hectares in 2020. It is followed by Malaysia and LAO DPR, with 200 hectares of average forest lost yearly. This condition reflected that the development process in Southeast Asian countries is still far from sustainability principles that will enhance the climate change issues.

From the various empirical facts above, it can be concluded that the reduction in forest area due to deforestation and degradation in various countries is a complex and multidimensional problem because it is related to various aspects. The rapid economic, physical development and world population growth have contributed to the decreasing area of forest, decreasing the quality of the forest environment, and increasing carbon emissions which have led to the decline in environmental quality. Deforestation is an issue that needs to be considered as an environmental indicator in the development process. This study aims to determine the determinants that affect the occurrence of deforestation in Southeast Asian countries.

This research became crucial due to the finding from Lai (2022). It is stated that Southeast Asia, including Indonesia, Malaysia, Vietnam, and Thailand, is home to almost 15% of the world's tropical forests, which makes it even more attractive as a center of deforestation. Furthermore, Deforestation in Indonesia is very rampant compared to its neighbors in Southeast Asia. Figures for 2019 show that Indonesia alone is responsible for nearly 14% of global tropical deforestation, behind Brazil, North and South America, and all of Africa combined. This is the background to the urgency of research on the factors that trigger deforestation in Southeast Asia as one

of the centres of tropical forests in the world, but ironically has a very high rate of deforestation.

2. LITERATURE REVIEW

2.1. Impact of Economic Growth on Forest Areas and the Environment

Indonesia's growing economy and increasing population have pushed the high demand for land use for economic activities, which poses a threat to forest sustainability. Negative externalities arise from various activities such as land conversion, encroachment, illegal logging, and illegal trade in plants and animals. Inappropriate procedures and policies in changing land functions lead to damage or negative externalities to forests and land. Economic activities carried out without paying attention to sustainability will cause forest and land damage (Isnaini and Agustina, 2020).

According to Cuaresma et al. (2017), economic growth provides an increase in environmental pollution until it reaches a certain income threshold and then decreases when income increases beyond this threshold. The Kuznets Environmental Curve Hypothesis for deforestation says that the initial rate of the economic growth process will be accompanied by an increase in the rate of deforestation until the economy reaches a certain income threshold. Beyond that further expansion in economic growth corrects deforestation. Based on the studies that have been conducted by Cuaresma et al. (2017), found an empirical finding providing strong evidence that economic growth will harm environmental qualities, especially in low-income developing countries.

2.2. Impact of Population on Deforestation

According to Bologna and Aquino (2020), excessive human population growth leads to an increase in human population pressure. Human population pressure is a state where the human population is more than the available land. This is the main reason for humans to exploit forest resources and transform forest land for residential and agricultural purposes. One of the efforts to exploit forest resources is deforestation. Deforestation is the process of removing natural forests by logging for timber or converting forest land allocation to non-forests.

Chakravarty et al. (2012) suggest deforestation caused by agricultural expansion or timber production creates a scarcity of forest products and reduces the ability of forests to produce ecosystem goods and services. Population growth and economic growth lead to increased demand for forest products and forestry services, which can reinforce this scarcity. Forest product prices increase and become increasingly profitable by planting trees in forests and gardens.

Proximate and environmental degradation problems are interconnected. Barros (2021) found that forest border land clearing is not only a demographic process in terms of fertility, and migration is the main factor behind forest clearing at the border because border areas tend to have very high soil fertility, further encouraging forest conversion for agriculture.

2.3. Impact of Corruption on Deforestation

Corruption, in the broadest sense, includes all public behavior that deviates from a formally defined obligation to achieve private financial or material gain. The concepts of corruption thus include bribery and nepotism, and clientelism (relative support or acquaintance) (Meehan and Tacconi, 2017). Corruption not only harms the country's economy, but corruption also causes various social and environmental problems. According to (Pachmann, 2013), uncontrolled corruption is one of the causes of deforestation in various countries, including Indonesia.

Environmental damage occurs due to large-scale exploitation. Excessive resource exploitation has been prohibited in the law, but the political aspect makes this practice still exist, ignoring the existing law (Koyuncu and Yilmaz, 2009). Indonesia is the country with the largest tropical forest area but also became the country with high deforestation in the world due to massive illegal land clearing by companies for industrial purposes. According to Pachmann (2013), various mining, forest, coastal and marine exploitation permits flow without the correct procedures and processes, and many permits are granted without previously carrying out AMDAL and other standard requirements. This incoherent practice is a form of corruption that became one factor that increased Indonesia's deforestation rate.

2.4. Impact of Foreign Direct Investment on Deforestation

Previous research found an adverse effect of FDI on the environment is supported by the race-to-the-bottom hypothesis, which argues that increased gains from globalization are achieved at the expense of the environment because more open economies adopt looser environmental standards. The pressure on firms to remain competitive forces them to adopt cost-saving production techniques that can be environmentally harmful. In terms of deforestation, several studies have provided empirical evidence regarding the effect of foreign direct investment on deforestation. For example, Tarascina (2018) found that foreign-owned firms that signify the presence of FDI contributed significantly to an increase in the emissions of petroleum pollutants, waste gas, and SO_2 in China that harm the forest area in the country that arise from the land expansion to fulfill the infrastructure development demands.

Conversely, FDI effects on the environment could also be positive. In this proximate, it is referred to as the pollution that foreign-owned companies are more energy-efficient and use cleaner production processes compared to domestic firms. According to Demena and Afesorgbor (2020), the FDI also can affect the environment through land expansion from the foreign firm that invests in a country. But the relation is positive. Through technology spillovers, it means that foreign firms will transfer their sustainable knowledge and technologies that local firms can adopt to reduce emissions and industrial waste that create environmental issues. Furthermore, through FDI, there is a possibility that environmentally-friendly technologies and practices would be transferred to developing countries (Dermawan et al., 2011).

3. METHODOLOGY

This research aims to conduct a study and analysis of deforestation of countries in the Southeast Asian region, as well as find its main determinants. This study aims to analyze the determinants of deforestation in Southeast Asian Countries. This research used forest area loss to represent deforestation to become a dependent variable. This research uses four independent variables, including economic growth, represented by gross domestic product output, total population, foreign direct investment, represented by foreign direct investment inflows, and the corruption index of each country.

The data used in the study is secondary data obtained from Rainforest Mongabay, Worldbank, and the Federal Reserve Bank. This research uses panel data from 10 Southeast Asian countries, including Brunei Darussalam, Cambodia, Indonesia, Filipina, Malaysia, Myanmar, Laos, Singapore, Thailand, and Vietnam, from 2011 until 2020.

The method used in this study is panel data regression. The panel data regression analysis method conducts best model selection testing using the common pool, fixed effect, and random effect methods. In estimating the best model, this research uses Chow Test and Hausman Test. Furthermore, Widarjono (2007) states that panel data regression only uses normality, multicollinearity, and heteroscedasticity as classical assumption tests and makes the autocorrelation test became unnecessary because the type of data is time series. The econometrics model in this study is compiled as follows:

$$Y_{it} = \alpha + \beta_1 X_{1it} + \beta_2 X_{2it} + \beta_3 X_{3it} + \beta_4 X_{4it} + \varepsilon \quad (2)$$

Where Y_1 is forest loss (deforestation) in Southeast Asian countries as a dependent variable; α is intercept; β_1, β_2, ... is the coefficient of regression; X_1 is economic growth; X_2 is total population; X_3 is corruption index; X_4 is Foreign Direct Investment, and ε is the error term.

4. RESULT AND DISCUSSION

4.1. Result of Analysis

The first step in conducting the panel data analysis is the best model selection test. This research uses Chow Test and Hausman Test to obtain the best panel regression model for this study. The Chow and Hausman Test are represented in the tables below:

Table 1. Chow Test

Effect Test	Statistics	Prob
Cross-section F	21.870614	0.000
Cross Section Chi-square	119.051826	0.000

Source: Data Processed (2022).

Table 2. Hausman Test

Effect Test	Chi-Sq Stat.	Prob
Cross-section random	128.751582	0.000

Source: Data Processed (2022).

Based on Chow and Hausman test result in the table above, it is known that the probability value is below the α value. Both test result implies that fixed effect model is the best model for this research.

Table 3. The Fixed Effect Model (Result Estimation)

Variable	Coefficient	Std.Error	t-Statistics	Prob.
Constant	-117.8632	135.8455	-8.676270	0.0000
Economic Growth	0.139777	0.045674	3.060316	0.0029
Population	6.894623	7.957917	8.663854	0.0000
Corruption Index	4.085452	1.051120	3.886760	0.0002
Foreign Direct Investment	-0.191058	0.065417	-2.920613	0.0045
R-Square	0.751605		F-Statistic	20.01713
Adjusted R-Square	0.714057		Prob F-statistic	0.000000

Source: Data Processed (2022).

Based on the estimation result above, it can be concluded that all variables, including economic growth, population, corruption index, and foreign direct investment, significantly affect deforestation in Southeast Asian countries. From the estimation result above, can be obtained panel regression equation as follows:

Deforestation = -1178.632 + 0.139777*EconomicGrowth+ 68.94623*Population + 4.085452*CorruptionIndex -0.191058*ForeignDirectInvestment + ε
…… (3)

The equation above implies some empirical results. The estimation could be explained below: the constant value is - 1178.632, meaning all independent variables are equal to 0, and the forest lost (deforestation) in Southeast Asian Countries is about - 117.8632 hectares. Furthermore, the economic growth value is 0.139777, which means that every 1 percent increase in economic growth will increase deforestation by 0.13 percent with ceteris paribus assumption. The value of the population is 6.894623, which means that every 1 percent population increase will increase deforestation by 6,8 percent with ceteris paribus assumption. The value of the Corruption index is 4.085452, which means that every index increase in the corruption index will increase deforestation by 4,08 percent with ceteris paribus assumption. Last, foreign direct investment has a value of -0.191058, which means that every 1 percent increase in foreign direct investment inflows will decrease deforestation by 0,19 percent with ceteris paribus assumption.

The t-test is used to determine the influence of the variable partially. From the estimation result above, all variables have probability value under α value (<0,05), which means that all the variables, including economic growth, population, corruption index, and foreign direct investment have significant effect on deforestation.

Furthermore, the F-stat value is 20.01713 with a probability value of 0.0000, which means that all the variables simultaneously affect deforestation in Southeast Asian Countries. The R-square value from this estimation model is 0,993013, which means that all variables (economic growth, population, corruption index, and foreign direct investment) are able to explain 99.3% variation effect of deforestation, and the other 0,7% are explained by other variable exclude from the research model.

4.2. Result of Analysis

For developing countries, the development process has a vital role in creating the community's welfare. This research, in line with the research conducted by Isnaini (2019), has proven a positive influence between economic growth and deforestation in Kalimantan. In the study, it was found that variable economic growth has a significant positive influence on deforestation. This is because the increasing expansion of economic activity will encourage the process of infrastructure development and expansion of the economic sector, which leads to land clearing in general. Jayachandran (2022) states that rising incomes mean more households can afford cars, and the rapid expansion of the network of roads and highways makes travel by road a cheap and convenient option for many people, but the impact will harms environmental quality. Agusti et al. (2020) suggest that country policymakers can minimize the deforestation rate through proper land-use policies.

This research implies that population positively significance affects deforestation. This research is in line with Kustanto (2022), who found that high populations are the main cause of forest land clearing for settlement. According to Po et al. (2020), a higher number of residents will be a big challenge for the environment, especially in forest areas, settlement patterns that tend to be centered in one area (urban area). This research explained how important rural migration is in minimizing deforestation. Furthermore, Debel et al. (2014) highlight that population growth has a significant impact on forest cover area due to land expansion and massive wood exploitation.

According to Jha and Bawa (2006), understanding the impact of population growth and human development, particularly on deforestation in developing countries, requires a temporal perspective. Bologna and Aquino (2020) suggested that conservation knowledge education is a good policy aberration to reduce population growth impact on deforestation.

This research implies that corruption index has a significant positive effect on deforestation. The link between deforestation and corruption is theoretically defined as "the abuse of entrusted power for private gain" that has been almost universally recognized (Korwin, 2016). In line with this result, Research conducted by Koyuncu and Yilmaz (2009) using cross-country data has shown that good governance is one of the factors causing the occurrence of deforestation. It is empirically proven that the Corruption Perception Index has a positive and significant influence on deforestation.

Furthermore, Pachmann (2013) proved that corruption is one of the causes of deforestation in Indonesia. He claims that while the level of corruption in Indonesia is not the main issue, the nature of corruption is. In terms of the effort to minimize the effect of corruption on deforestation, Scarrow (2017) recommends developing a more integrated policy to reduce the effect of corruption on deforestation in order to help

reduce illegal forest activities such as illegal logging. Dermawan et al. (2011) also propose incorporating anti-corruption safeguards as core elements in Indonesia's Reducing Emissions from Deforestation and Forest Degradation (REDD+) design.

This research found that foreign direct investment has a negative and significant effect on deforestation, which means that the foreign direct investment increase will reduce deforestation. According to Demena and Afesorgbor (2020), the relationship between FDI and deforestation can be positive and negative. Borregaard (2008) discovered foreign direct investment can reduce deforestation, which is consistent with this finding. Foreign direct investment can provide capital inflows to host countries; the more capital inflows a host country receives, the more resources it can devote to development activities such as technological advancement, increased funding for forest and environmental care, and more sustainable development.

However, there is significant variation in the quality of foreign direct investment and the impact of such inflows on host countries. Similarly, some host country environments are less conducive to positive FDI impacts, regardless of the foreign firm's or investor's strategy or operational behavior. For example, a country's insufficient domestic capabilities limit its ability to reap the benefits of inward FDI and limit knowledge spillovers (Wartini, 2016).

4.3. Policy Implications

Considering the result of this research, a policy brief should be designed for Southeast Asia Countries, especially for developing countries. Regarding the policy brief suggestion for Indonesia from Dermawan et al. (2019), Government should integrate Anti-corruption safeguards as core elements in REDD+ design. Other Southeast Asian Countries, especially Myanmar, Vietnam, Cambodia, Malaysia, and Lao DPR, as countries with high deforestation, also highly recommended to implement this REDD+ safeguards design. Petty corruption abounds in the forestry sector, including bribing local officials to ignore violations of forest regulations, harvesting timber without legal permits, and extracting outside concession boundaries. Decentralizing forest governance is not an easy way to reduce deforestation and forest degradation. Some decentralization reforms have reduced deforestation, whereas others have had the opposite effect. Decentralization could aid in addressing the negative local externalities of deforestation and degradation and encourage more forest conservation. Decentralization could help other REDD+ policies be implemented more effectively, efficiently, and equitably.

Policymakers intend to implement some reforms to limit forest conversion. Land demarcation, transparency data, and closing regulatory loopholes are three likely targets for anti-corruption efforts, as they will influence future land use and may serve as a foundation for more profound reforms. The licensing rules legitimized the numerous projects already underway and are thus urgent. The risk of corruption in the distribution of REDD+ funds and the reconciliation of project reports will increase as REDD+ evolves.

According to Kustanto (2022), recent Developments in border governance, law enforcement, and mechanisms to penalize deforestation by restricting access to markets and finance have slowed deforestation but haven't fulfilled the region's demand for private investment, innovation, and businesses. Land titles, which serve

as the foundation for landowners' access to credit, have progressed slowly. Greenpeace has increased the reputational risk of companies doing business, frightening potential investors and market participants alike with their sustainable campaign. As a result, the success of this campaign may sideline responsible agricultural and livestock companies and individuals who are needed to consolidate the progress made in reducing deforestation.

5. CONCLUSION

Deforestation is one of the development dilemmas for developing countries, especially in Southeast Asia. This research found that economic growth, population, and corruption index have a positive effect on deforestation in Southeast Asia. This research also found that foreign direct investment has a negative effect on deforestation, which means that the increase in foreign direct investment inflows will reduce deforestation in Southeast Asia. This research found that foreign direct investment is able to reduce deforestation through increasing budget allocations for forest and environmental conservation. Therefore, a policy brief by the government is needed to minimize its impact on the environment also to deforestation.

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