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Tourism-Induced Environmental Degradation ASEAN Countries: Causes and Consequences

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ABSTRACT

The existence of digitalization and technological advancements causes information to spread quickly. In fact, information about the tourism sector among countries like ASEAN is very easily accessible, which leads to an increase in people's mobility for tourism activities. ASEAN is one of the regions in the Asia Pacific with the highest CO_2 emissions. Tourism is considered to be an important indicator in explaining a country's environmental pollution. This is based on the Tourism-Led Growth hypothesis, which states that the expansion of tourism activities impacts economic growth, while on the other hand, the Environmental Kuznets Curve hypothesis explains that economic development triggers environmental degradation. This study aims to analyze the influence of GDP per capita, the number of international tourists, and the volume of international flight passenger traffic on CO_2 emissions and the relevance of the EKC hypothesis in 5 ASEAN countries (Indonesia, Malaysia, the Philippines, Thailand, and Vietnam). The data processing method uses panel data regression analysis. The selected model in this study is the fixed effect model with cross-section weight estimation. The results of the study indicate that GDP per capita and the volume of international flight passenger traffic have positive coefficients with probabilities of 0.0000 and 0.0171, respectively. Meanwhile, the number of foreign tourist visits has a negative coefficient with a probability of 0.0216. This study also shows that the EKC hypothesis is relevant to the case of the 5 ASEAN countries with a turning point at an income level of USD 9,937 per capita.

Keywords: Environmental Degradation, Tourism, Environmental Kuznets Curve, ASEAN Countries
JEL Classifications: Q56, Q57, L83, R11

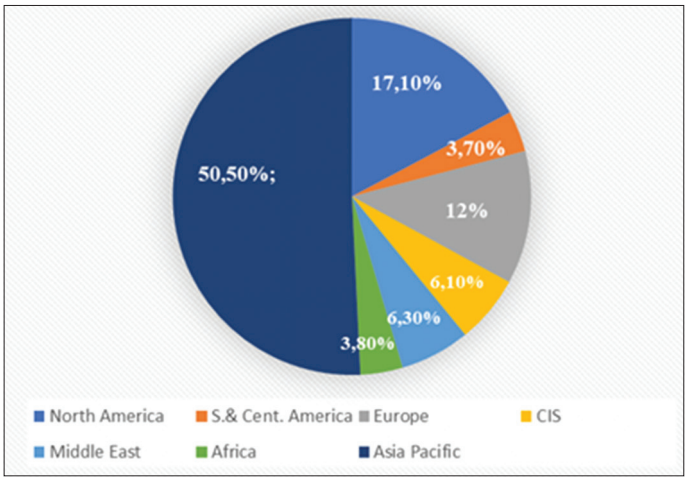
1. INTRODUCTION

Environmental degradation has become an important issue in various parts of the world. The emergence of public concern over environmental issues has triggered efforts to understand more clearly and begin to take steps and real reasons for the problems and causes of environmental degradation. One indicator of environmental degradation is climate change. Climate change caused by CO_2 emissions is becoming a significant concern for the international community because the earth's temperature increases.

In 2019, the Asia-Pacific region was the largest CO_2-emitting region in the world. Asia Pacific is an area that includes the coastal areas of East Asia, Southeast Asia, and Australia near the Pacific Ocean, and it includes countries in the Pacific Ocean (Oceania). The following is data on the contribution of CO_2 emissions in the world region:

Based on Figure 1 the Asia-Pacific region is the largest CO_2 emitting region in the world with a CO_2 emission contribution of 50.50%, followed by the North American region with 17.10%, the European region with 12%, and with the lowest order of CO_2 emission contribution occupied by the African region, which is equal to 3.80% of the world's total CO_2 emissions. The high CO_2 emissions in the Asia-Pacific region indicate that this region has the worst environmental quality compared to other regions. This creates an urgency in the Asia-Pacific region related to the environment, so extra attention is needed to create good environmental quality.

Figure 1: Contribution of regional CO_2 emissions to the World in 2019 (percent)



Source: (British Petroleum Statistical Review of World Energy, 2019)

Economic growth that can improve people's welfare in general is a development target pursued by almost all countries in the world. However, economic growth can sometimes create trade-offs in the form of negative externalities that can reduce people's welfare. In the case of massive negative externalities such as climate change due to carbon emissions, Tol (2012) projects a decrease in total well-being when temperature increases reach a certain point. Similar to these findings, the study by Hitz and Smith (2004) indicates an exponential negative impact on several sectors if the temperature rise reaches a certain level. In addition, carbon emissions can also have a negative impact on human health, as mentioned in the study by Gunawan and Budi (2017).

The trade-off between economic growth and environmental damage is further explained in the Kuznets Environmental Curve hypothesis. According to the Environmental Kuznets Curve (EKC) hypothesis, economic development represented by Gross domestic product (GDP) per capita in the early stages of industrialisation will be accompanied by increased environmental damage. ASEAN is one of the regional regions in the Asia-Pacific region, and Noor and Saputra (2020) in his research explained that the majority of ASEAN countries are often identified as developing countries that are in the early stages of development according to the Environmental Kuznets Curve (EKC) hypothesis. Therefore, reducing environmental damage is difficult to implement because of the need for economic development and society's lack of environmental awareness. Research conducted by Caraka et al. (2018) also shows that the data on carbon emissions and gross domestic product within ASEAN is proven to correlate.

One sector that contributes to CO_2 emissions and Gross domestic product (GDP) in the world is the tourism industry. The World Tourism Organization (WTTC) (World Travel and Tourism Council) also said that tourism is one of the largest industrial sectors in the world. The travel and tourism sector supports one in 10 jobs worldwide and contributes 10.3% of the global GDP. The high number of tourists travelling has increased the use of transportation, one of which is air flight, thereby increasing the burning of fossil fuels. Research conducted by Lenzen et al. (2018) shows that tourism's global carbon footprint has increased by 3.9-4.5 $GtCO_2e$, 4 times more than previous estimates or contributes 8% of global greenhouse gas emissions.

ASEAN is known for some exciting tourism. The following is the number of tourist attractions in ASEAN member countries:

Based on the Figure 2, if you look at the total based on the four categories above, Indonesia, Malaysia, the Philippines, Thailand, and Vietnam are the countries that have the most tourist attractions. The many tourist attractions in these countries will increase the interest in visiting foreign tourists, ultimately impacting the country's economic growth. The following is data on the number of foreign tourist arrivals in the five ASEAN countries with the most tourist attractions:

From 2010-2020 in Figure 3, foreign tourist arrivals from the five countries experienced a positive trend. A positive trend in visits by foreign tourists encourages economic activity in the tourism sector, which has good potential. With the year-to-year increase in the tourism sector, the tourism support sector also has the potential to grow rapidly. The development of the tourism sector and its supporting sectors have a role in a country's economic growth.

The high number of foreign tourists in these countries will undoubtedly increase transportation traffic, for example, from the aviation sector. Peeters and Dubois (2010) revealed that tourism and travel industry activities, such as transportation and accommodation, contributed 4.4% of total CO_2 emissions. According to research by Higham et al. (2016), about 90% of energy consumption in the tourism and travel sector is caused by aviation (43%), road (42%), sea and rail (15%) transportation. Data on international flight passenger traffic in five countries (Indonesia, Malaysia, the Philippines, Thailand, and Vietnam) also experienced an increase in 2010-2020. This increase may have an impact on increasing CO_2 emissions in these countries.

In the recent development of the Environmental Kuznets Curve theory, tourism is an important variable that can help explain changes in a country's environmental pollution. A study (De Vita et al., 2015) explains the two reasons for including tourists. First is the significant contribution of tourism to the gross domestic product. The second reason is the nature of the tourism sector as a service sector. Tourism development will increase the effect of scale as companies need to use more energy to produce additional services and products. The nature of tourism as a service sector or service-oriented contributes to the transition of goals from an agrarian and manufacturing society to a service-based economy (composition effect). Tourism capacity, therefore, presents a paradoxical position for its effect on environmental performance and has been considered a key factor for inclusion in the Environmental Kuznets Curve model (Dogru et al., 2020). This supports the adoption of EKC theory when validating whether tourism can further promote economic growth but contribute to environmental degradation.

The relationship between tourism and CO_2 emissions has been investigated in several studies focusing on country groups with

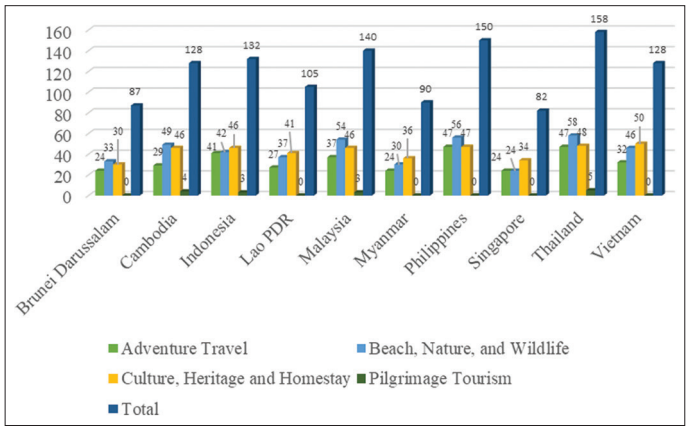
panel data; for example, research conducted by Danish and Wang (2018) and Shakouri et al. (2017) that the arrival of foreign tourists increases CO_2 emissions. Unlike the research conducted by Paramati et al. (2017), Azam et al. (2018) and Ekonomi et al. (2021) found that the number of foreign tourist visits can reduce CO_2 emissions in the cases of Eastern Europe, Thailand, Singapore, and Indonesia.

The problems above show that an important problem in economic development is dealing with trade-offs between development and efforts to preserve the environment. Development that does not pay attention to these two aspects will result in problems in the future. In summary, economic development, which solely refers to profit without considering the sustainability of nature and the environment, will negatively impact nature and humans. So, this study aims to see the effect of GDP per capita, the number of foreign tourists, and the number of international flight passengers on CO_2 emissions and the relevance of the EKC hypothesis in five ASEAN countries.

2. RESEARCH METHODS

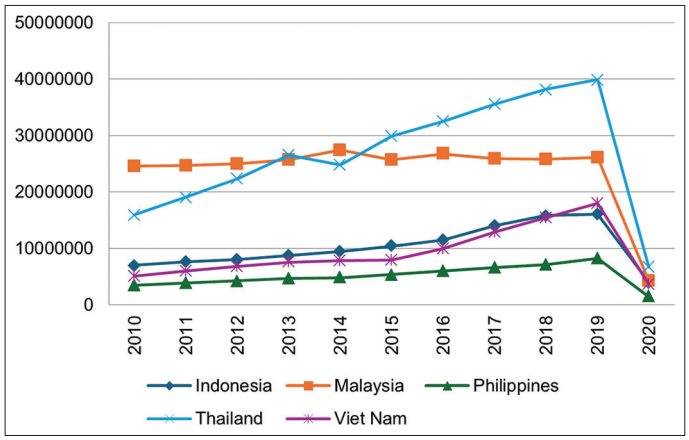
This study uses secondary data, specifically panel data that combines time series and cross-section data from 2010 to 2020. Indonesia, Malaysia, the Philippines, Thailand, and Vietnam are the five ASEAN countries in this region. The study of tourism-induced environmental degradation in ASEAN countries from 2010 to 2020 is important because this period saw a significant increase in tourist numbers, which had a considerable impact on the environment. Rapid growth in tourism infrastructure was often not accompanied by adequate environmental management, leading to ecosystem degradation. Additionally, global awareness of climate change pushed ASEAN countries to adopt sustainable tourism policies. This period is crucial for evaluating the effectiveness of those policies and finding solutions to the environmental challenges faced.

Figure 2: Number of tourist attractions in ASEAN member countries



Source: (Aseantourism. travel, 2023)

Figure 3: Arrivals of international tourists in 2010-2020



Source: (ASEANStats, 2022)

The variables used are CO_2 emissions, GDP per capita, GDP per capita squared, the number of foreign tourists, and the number of international flight passenger traffic obtained from ASEANStats and the World Bank. The data collection method used is documentation and library research obtained from the official website. The analytical method used is descriptive analysis and panel data regression analysis. The equation model in this study is:

$$ECO_2it = \beta 0 + \beta 1GDPit + \beta 2GDP2it + \beta 3Touit + \beta 4Airpit + \mu it$$

Where ECO_2 is CO_2 emissions (metric tons per capita); a is a constant; β is the regression coefficient on each independent variable; GDP is GDP per capita (current USD); GDP2 is GDP per capita squared (current USD); Tou is the number of visits by foreign tourists (thousand people); Airp is the number of international flight passenger traffic (thousand people); μit is the error component at time t of individual cross sections; i is cross-sectional data from 5 ASEAN countries and; t is time series data from 2010 to 2020.

Several tests are needed to determine the best model for this panel data research. The first is the Chow test, which determines the difference between the expected and fixed effects. The two Hausman tests are used to choose between the Fixed Effect and Random Effect models. The third test is the Lagrange test, which is used to choose between the Random Effect and Common Effect models. After getting the best model, the next step is to test the classical assumptions.

3. RESULTS AND DISCUSSION

The influence of tourism in five ASEAN countries (Indonesia, Malaysia, the Philippines, Thailand, and Vietnam) on CO_2 emissions in 2010-2020 was analyzed using the panel data regression analysis method. The following are the results of the selection of models in this study.

From the results of Table 1. The probability value of the Chow test and Hausman test is 0.0000 <5% significance level, so the

Table 1: Best model selection

Chow test	CEM versus FEM	Hausman test	FEM versus REM
Prob.	0.0000	Prob.	0.0000
Selected models	FEM	Selected models	FEM

Source: (Data processed, 2023)

Table 2: Fixed effect estimation results

Variable	Coefficient	Std. error	t-statistics	Prob.
C	0.895745	0.315882	2.835696	0.0068
GDP	0.726057	0.111848	6.491484	0.0000
GDP2	−0.036530	0.009215	−3.963998	0.0003
Touch	−0.029663	0.012473	−2.378132	0.0216
Airp	0.012377	0.005001	2.474660	0.0171

Source: Eviews output 9

selected model is the fixed effect model. In the fixed effect model, it can be estimated without using weighting (LSDV), weighting (cross-section weight), or generalized least square (GLS). Next, the structure of variance-covariance and non-spherical distribution will be examined to determine whether the estimates used require transformation by using weights due to the assumption of homoscedasticity and non-cross-sectional correlation. This examination was carried out using the Lagrange Multiplier and Lambda-LM tests.

From the results of these calculations, the LM value is 24.53662, and the critical point is 9.487729, so the decision from the LM test results is to reject H_0 and accept H_1, which means heteroscedastic residual covariance variance. Meanwhile, the Lambda LM test results show that Breusch-Pagan LM's probability value is 0.277, which is more than the 5% significance level, so it fails to reject H_0, which means there is no correlation between individual residuals.

The results of the LM lambda test concluded that there was no correlation between individual residuals, so the appropriate estimation method in this study was FEM with weight least square (WLS) with cross-section as the weight. The purpose of weighting is to reduce the level of heterogeneity between data cross-sections. The following is the estimated result of panel data using the weighting method:

From these results in Table 2, the model formed is

$ECO_2 = 0.895745 + 0.726057GDP-0.036530GDP2-0.029663Tou + 0.012377Airp + eit$

The estimation results show that the constant value is 0.895745, which means that if the independent variable is considered constant or zero, CO_2 emissions in Indonesia, Malaysia, the Philippines, Thailand, and Vietnam increase by 0.895745 per year.

Based on the study's results, per capita GDP in 5 ASEAN countries, namely Indonesia, Malaysia, the Philippines, Thailand, and Vietnam, has a positive and significant effect on CO_2 emissions. This means that an increase will also follow an increase in GDP per capita in CO_2 emissions. If GDP per capita increases by 1% in 5 ASEAN countries, it will cause an increase in emissions of 0.72605, and vice versa. These results are in line with the results of research conducted by Mikayilov et al. (2018), Eyuboglu and Uzar (2019); and Paramati et al. (2017), which states that there is a positive relationship between the increase in GDP per capita and the level of CO_2 emissions. These results are based on the EKC hypothesis, where the Environmental Kuznets Curve (EKC) is in the first stage, also called the pre-industrial stage, where economic growth goes through the transition from agriculture to the industrial sector. Economic development, represented by gross domestic product (GDP) per capita, will be accompanied by increased environmental damage in the early stages of industrialisation. This is because the state will focus on increasing production without paying attention to environmental aspects, which will cause environmental degradation.

Then, a negative and significant GDP2 result with a significant positive GDP indicates that the Environmental Kuznet Curve hypothesis from 2010 to 2020 is relevant in 5 ASEAN countries (Indonesia, Malaysia, Philippines, Thailand, and Vietnam). This result is consistent with the EKC hypothesis, which is in the form of an inverted U-curve, where initially, an increase in GDP per capita will be followed by environmental degradation until it reaches its peak (turning point), then after reaching this turning point an increase in GDP per capita will be followed by a decrease in degradation. Environment. The turning point calculation from the environmental Kuznet curve can use the formula = (−β1)/2β2 (Dinda, 2004). Based on this formula, the results obtained a turning point that occurred at the per capita income level of USD 9.937 thousand. These results are supported by research conducted by Munir et al. (2020), Mohd and Othman (2016), and Wei and Lihua (2022).

Based on these calculations, the EKC hypothesis has not yet occurred, but the EKC hypothesis may occur in the long term. Assuming a cateris paribus, an increase in GDP of 1,000 in 5 ASEAN countries will increase CO_2 emissions by 0.726057 metric tons per capita. This increase will continue until these countries reach a GDP per capita level of US 9,937 thousand. After the GDP per capita value has been passed, CO_2 emissions begin to decrease by 0.036530 metric tons for every USD 1,000 GDP per capita because currently, only Malaysia has ever achieved a GDP per capita of more than USD 9.937 thousand, while Indonesia, the Philippines, Thailand, and Vietnam are still below it, so the EKC hypothesis has not occurred in these countries. Still, the EKC hypothesis can be reached in the future because the value of GDP per capita is positive while the value of GDP2 is negative.

Based on the results of this study, it was found that the number of foreign tourists significantly negatively affected CO_2 emissions. The variable coefficient value of the number of foreign tourist visits is −0.029663. If the number of foreign tourist visits increases by 1%, the CO_2 emission level will decrease by −0.029663. These results are supported by research conducted by Paramati et al. (2017), Ben Jebli et al. (2019); Mohd and Othman (2016); and Ekonomi et al. (2021). The negative coefficient of tourism on CO_2 emissions is due to an increase in foreign exchange, which can be used to import advanced technologies, including environmentally friendly technologies, thereby reducing CO_2 emissions and preserving the environment. In addition, tourism, as one of the main sub-sectors of the service sector, is cleaner than the agricultural and manufacturing sectors; consequently, it will help reduce CO_2 emissions (Koçak et al., 2020). Tourism that negatively impacts environmental degradation is also proven in Thailand, which received an award from the pacific Asia travel association (PATA) for a green tourism campaign. Green tourism was also considered in the East coast economic region (ECER) master plan for Malaysia in 2008. In addition, the "1 Malaysia

Green, 1 Malaysia Clean" and "Malaysia Business Tourism Green Program" campaigns were launched in 2010 by the Ministry of Tourism to preserve the environment.

The last variable, namely the number of international flight passengers, has a significant positive effect on environmental degradation in the five selected ASEAN countries, which in this study are Indonesia, Malaysia, the Philippines, Thailand, and Vietnam. This can be seen from the probability value of 0.0171 (<5%). Meanwhile, the variable coefficient value of the number of foreign tourist visits has a coefficient of 0.012377. This means a 1% increase in international flight passengers will also increase CO_2 emissions by 0.012377 in the five ASEAN countries. The results of this study are supported by research conducted by Balsalobre-Lorente et al. (2021), which shows that international air transportation positively impacts environmental degradation.

Transportation is a derived demand that arises from the demand for other commodities or services, for example, tourism. The high number of foreign tourist arrivals will increase the high number of international flight passenger traffic because air transportation is more efficient for mobility than sea transportation. On the other hand, the aviation sector utilizes a lot of energy. Higham et al. (2016) also stated that around 90% of energy consumption in the tourism and travel sector is caused by aviation (43%), road (42%), sea, and rail (15%) transportation.

4. CONCLUSION

Based on the description of the results of research and discussions related to the effect of tourism on environmental degradation in five ASEAN countries for the 2020-2020 period, the conclusion in this study is that GDP per capita and the amount of international flight passenger traffic have a positive and significant effect on CO_2 emissions. Then, the GDP2 variable and the number of foreign tourists negatively and significantly affect CO_2 emissions. This study's EKC hypothesis is relevant in five (5) ASEAN member countries: Indonesia, Malaysia, the Philippines, Thailand, and Vietnam.

The government, as the party that has the authority to carry out state policies, has an important role in interventions related to tackling climate change, one of which is through reducing CO_2 emission levels. Government intervention is needed to reduce the level of CO_2 emissions by implementing policies that encourage the reduction of CO_2 emissions. Based on this research, the government should encourage the adoption of clean technology using renewable energy for production purposes to increase the level of environmental quality. Then, the impact of tourism that reduces CO_2 emissions, in this case, a policy that supports the development of the tourism sector, seems to be an excellent policy to combat global warming in this region by emphasising green development. Tourism is very attractive for this region and builds its supporting sectors (transportation, accommodation, food, and beverages).

Furthermore, according to the EKC theory, the government is advised to increase its country's per capita income by encouraging development in relatively environmentally friendly sectors. One program that has been implemented and needs to be developed further is the green investment program, which encourages investors to invest in sectors that promote mitigation or adaptation to climate change.

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