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Tourism Density Effect on Environmental Performance Index: Evidence in ASEAN Countries

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Abstract

The purpose of this current study is to assess the effect of tourism density on the environmental performance index on 10 ASEAN countries from 2002 to 2017. This study adopted panel data regressions with the Driscoll and Kraay standard. This method accounts for cross-sectional dependence, heteroskedasticity, autocorrelation, and the possible correlation between countries when observing the environmental performance index and tourism density. Empirical results found a statistically significant and negative relationship between the tourism density index and the environmental performance index in 10 ASEAN countries. This result implied that an increase in the tourism density index will deteriorate the environmental performance index. The results of this study underline the need for sustainable tourism policies and practices in tourism destinations to be executed by the local stakeholders and policymaker to accelerating the Sustainable Development Goals (SDGs) in ASEAN countries. In addition, this study offers justification for the policymaker to give careful attention to the carrying capacity of a tourist destination.

Keywords: Tourism density index; Environmental performance index; ASEAN; Sustainable Development Goals (SDGs)

Introduction

Tourism is globally recognized by most countries as a major source of growth of national income, investment, employment, and a positive balance of payments. Tourism has a great potential to contribute towards the Sustainable Development Goals (SDGs) specifically in promoting sustainable economic growth, sustainable production and consumption patterns, and the sustainable use of oceans and marine resources [1]. However, the carrying capacity of a tourist destination such as roads, public transportation, and other services that were primarily created for local use may suffer under

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an increasing number of tourists [1]. This phenomenon is closely linked to the concept of "over-tourism" and has emerged as one of the most discussed issues in popular media and, increasingly, in academia [2].

Due to the economic benefit of tourism, people may take for granted the negative impacts; nevertheless, according to Mola et al. [3], the negative effects of excessive tourism on the ecosystems and human health have been recognized by many scholars and have become issues of concern. The main concern by society at large is the environmental stress due to the degradation of the ecosystem and natural resources. The method of quantifying the performance of one country in reducing environmental stress is through the Environmental Performances Index (EPI).

Since 1990, the influx of significant tourism density occurred in ASEAN countries [4]. The growth of the tourism industry is in line with an increase in tourist arrival. The rapid increase in the number of tourist arrivals contributes greatly to the growths of gross domestic production (GDP), investments, and levels of employment among ASEAN countries [5]. As ASEAN countries have rich and diverse tangible and intangible cultural tourism resources as well as diverse endemic ethnic cultures, the ASEAN region has escalated its share of global and Asia Pacific regional arrivals and receipts [6]. As presented in Figure 1, in 2018, the ASEAN countries earned US$ 158.81 billion in international tourism receipts. Thailand is the higher earner of all ASEAN countries with US$ 65.24 billion in receipts or accounting 41.08% of the ASEAN's total international tourism receipts. This was followed by Malaysia with US$ 21.77 billion (13.7%), Singapore (12.9%), Indonesia (9.8%), and Vietnam (6.35%). Further down is Philippines (6.1%), Laos (4.8%), Cambodia (3.0%), Brunei (1.1%), and Myanmar (1.0%).

Looking at the total number of visitor arrivals to ASEAN countries, ASEAN statistics indicate an increase of more than double for 2018 compared with 2010, see Figure 2. Among the ASEAN countries, Thailand exceeds Malaysia as the largest tourist destination in 2018. It is expected that the growth of international arrivals to ASEAN in 2020 will exceed other regions [8]. Nonetheless, the tourism development in ASEAN countries draws attention to the negative effect of over-tourism, as shown by the bold decision of the Philippines' government to close the resort island of Boracay, and the Thailand government to shut down the operation of Maya Bay. Both decisions were made due to environmental violations from mass tourism.

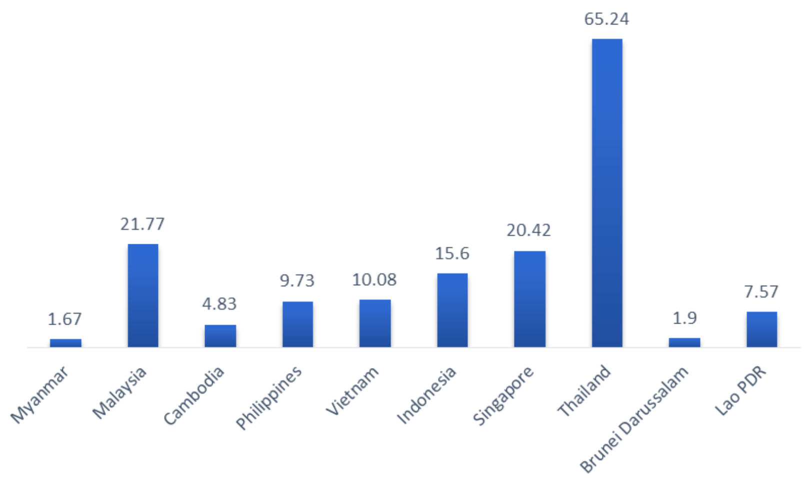

Figure 1 International tourism receipts in ASEAN countries, 2018 (in billion USD).
Source: World Bank [7]

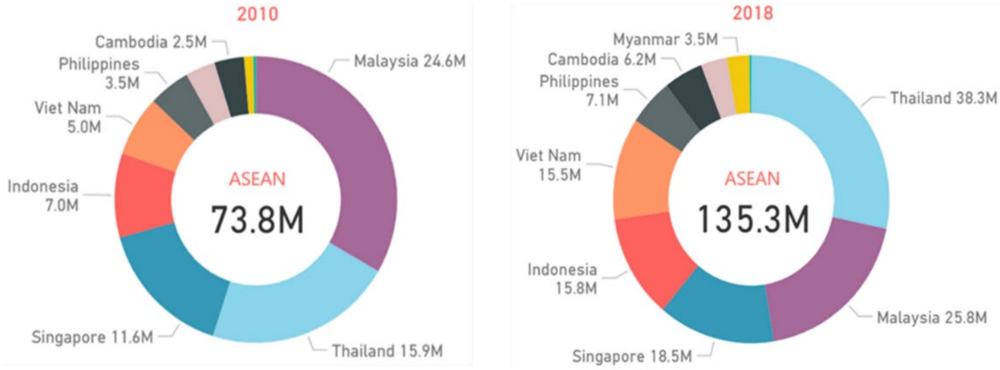

Figure 2 Total visitor arrivals to ASEAN in 2010 and 2018.
Source: ASEAN Secretariat [6]

Tourism has been included in SDGs as one of the target industries for Goals 8, 12, and 14 namely, inclusive and sustainable economic growth, sustainable consumption and production (SCP), and the sustainable use of oceans and marine resources, respectively [4]. Globally, sustainable tourism is considered one of the best solutions to generates economic growth while protecting the environment [9].

The tourism activities affected economic growth and indirectly influence the environment quality. Theoretically, the association between tourism and economic growth is explained by the tourism-led-growth hypothesis which is derived from the export-led growth hypothesis [10]. Since tourism is considered a type of trade, the effect of tourism can be divided into three effects, namely the scale effect, technique effect, and composition effects [11]. Figure 3 presented the shows the conceptual framework for tourism and environment quality nexus.

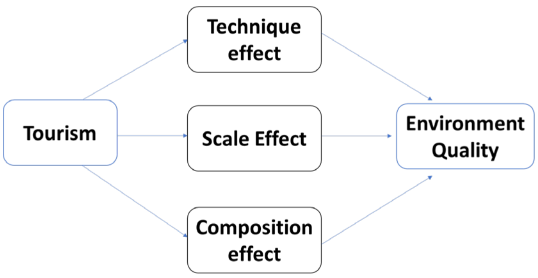

Figure 3 Interaction between tourism and environmental quality.
Source: Authors' construction.

Scale effect refers to the change in environmental quality as a result of a change in the size of economic activities including tourism activities. Following the idea of Cole et al. [12], when more input and natural sources are required to meets an increase in the production of goods and services due to tourism activities, it places more stress on the environment in terms of wastages and emissions. Meanwhile, the effect of technique derived from the demand for the application of clear technologies and products in the tourism sector due to strict environmental law and regulation [13]. Thus, the technique effect is obtained when the environmental quality improves or pollution reduces. Next, the composition effect refers to changes in the economic structure. According to Olivier et al. [14], the declining trend due to rapid sectoral composition change from carbon-intensive activities and high value-added manufacturing industry to less carbon-intensive activities such as the service sector. Since tourism is considered as a services industry, the shifting to the services sector expanding the share of the less polluting sector and may reduce the pollution level.

In support of the theoretical assertions, tourism is said to influence the environment in a mutual relationship through various viewpoints. A large body of literature believes that have proven that tourism causes deterioration in the environment [15–16] and related both in the shot and long term [17].

However, some scholars found the opposite results. In the case of Singapore for the period 1970–2010, and found that tourism improved environmental quality [18]. This finding is also in line with the case of Ubud tourist destination, Bali, Indonesia, nevertheless the environmental pressure from tourism activities needs additional attention in the long run [19]. On the other hand, few studies provided evidence of the environmental Kuznets curve (EKC) hypothesis and claimed that the impact of tourism on environmental degradation to reduced more so for developed countries compared to developing countries [20].

Although the relationship between tourism and the environment has been given special attention by many researchers, strong evidence from research using panel data and tourism density index as an indicator are limited. Among the few, Paramati et al. [21] found that tourism development reduces the environmental performance index. Nevertheless, study did by [22] found that tourism development reduces the environmental performance index in developing countries while improving the environmental performance index in developed countries.

Given this information gap in the literature, the current study attempts to examine the relationship between tourism density and environmental performance in ASEAN countries using panel data analysis, specifically with the Driscoll and Kraay standard errors, from 2002 to 2017.

A study on the effect of tourism density on environmental performance for ASEAN countries merits an investigation for two reasons. First, ASEAN's emergence as the engine of the global economy that is consequently affected by various environmental issues such as pollutions and scarcity of clean water. Second, to date, very limited studies have been undertaken to observe the relationships between tourism densities and environmental performances in ASEAN countries. Thus, this begs the following question; does the environment performance will turn from good to bad due to excessive tourism concentrations, or is it the other way around? In this context, this paper aims to explore the nexus between tourism density and environmental performance index in ASEAN countries using the panel data analysis with the Driscoll and Kraay standard errors for the period from 2002 to 2017.

The current study put forward three contributions. First, the study fills in a research gap that will provide a better understanding of how the effects of tourism density influence the environmental performance of Southeast Asian countries, specifically in 10 ASEAN countries. Currently, empirical studies on this issue are limited. Secondly, on the empirical side, this study uses the tourism density index variable as an indicator for over-tourism to represent the environmental performance index. The study utilized the panel data regression with the Driscoll and Kraay standard errors, a method that has not been used in previous empirical studies. This method accounts for cross-sectional dependence, heteroskedasticity, autocorrelation, and the possible correlation between countries when observing the environmental performance index and tourism density. Third, the findings of this study may provide policymakers, industry players, and other stakeholders with insights needed to minimize the impact of ever-increasing tourist arrivals.

Materials and method

1) Estimating model

As the objective of this paper is to assess the effect of tourism density on environmental performance for ASEAN, we develop the relationship function as follows:

$$EPI = f(TDI, GDPPC, FDI, U) \qquad \text{(Eq. 1)}$$

Eq. 1 indicates an environmental performance as measured by the Environmental Performance Index (EPI) as a function of Tourism Density Index (TDI) and other control variables such as GDP per capita (GDPPC), Foreign Direct Investment (FDI), and Urbanization (U). Accordingly, the empirical model as a linear specification of a panel model is designated as Eq. 2.

The current study's first control variable is GDP per capita. Several studies claimed that GDP per capita would negatively influence the EPI [23], however, this result is contradicted by a few studies [24]. The second control variable, FDI, is since it claimed to have a positive impact on the EPI [25]. The third control variable is urbanization. The process of urbanization may worsen environmental quality although empirical studies that explain the association between urbanization EPI remain scarce [26].

Subsequently, based on the resource-based viewpoint and past research such as He et al. [16], Uzar and Eyuboglu [17] and Solarin [27]. the following hypothesis have been developed in assessing the effects of tourism on environmental performance:

H1: The tourism density Index has an inverse relationship with environmental performance

2) Data

The data used in this research is a panel of 10 ASEAN countries for the period 2002–2017. The chosen group of countries is selected due to the availability of data on the EPI which is the dependent variable. The data on EPI is published by the Yale University's Environment School. EPI is based on two key policies. First, the environmental health that measures the environmental stresses on human health, and secondly, the vitality of ecosystem that measures ecosystem health and natural resource management [28]. The current study uses TDI indicator to represent the number of tourist arrivals per head of the population. GDP per capita income, defined as GDPPC which is widely used to measure the economy's performance. Other control variables are FDI and U. Data on the independent variables are extracted from the World Development Indicator (2019) dataset for the years 1990 to 2016. The description for each variable used is given in Table 1.

3) Panel regression

This study employs the Discoll-Krayy standard errors for pooled ordinary least squares (OLS) and fixed effects (FE) estimations based on a linear model expressed as Eq. 2.

Table 1 Description and nit of the data

Variable	Data description	Unit of measurement
EPI	Quantify and numerically mark the environmental performance of a state's policies.	The composite index developed by Yale University's Environment School
TDI	Compared the number of locals to the number of tourists.	Tourist arrivals per head of population.
GDPPC	Total gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products.	Data in constant 2010 U.S. dollars
FDI	Direct investment equity flows in the reporting economy.	Data in current U.S. dollars.
U	People living in urban areas as defined by national statistical offices.	Ratios of urban to the total population

$$y_{it} = \alpha_i + \beta_i x'_{it} + u_{it}, \text{i=1, …., N, t=1,…, T} \quad \text{(Eq. 2)}$$

Where y_{it} is the dependent variable proxied by the EPI at the country I and at time t, while x'_{it} denotes the matrix of independent variables. The β_i denotes the coefficients with $(K+1)\ x\ 1$ vector. By stacking all observation, the formulation is expressed as:

$$y = \left[y_{1,t_{1,1}}, \dots, y_{1,T_{1,1}} y_{2t_{2,1}}, \dots, y_{N,T_N}\right]'$$

and $$x = \left[x_{1,t_{1,1}}, \dots, x_{1,T_{1,1}} x_{2t_{2,1}}, \dots, x_{N,T_{1,N}}\right]' \quad \text{(Eq. 3)}$$

It is assumed that the independent variable (x_{it}) are uncorrelated with the scalar of the error term (u_{is}) for all $s, t,$ that is, there is strong endogeneity. The error terms are allowed to be autocorrelated, heteroscedastic, and cross-sectionally dependent. Under these assumptions, β_i can be consistently estimated using ordinary least square (OLS) regressions which yield:

$$\hat{\beta} = (X'X)^{-1}X'y \quad \text{(Eq. 4)}$$

Then, the coefficient estimates of Driscoll-Kraay standard errors are derived as "square roots $(\hat{S}_T)$ of the asymptotic covariance matrix" expressed as:

$$\text{V}\,(\hat{\beta}) = (X'X)^{-1}\hat{S}_T(X'X\,)^{-1} \quad \text{(Eq. 5)}$$

Meanwhile, the fixed-effects estimator is implemented in two steps. In the first step, all model variables $z_{it} \in \{y_{it}, x_{it}\}$ are as follows:

$$\tilde{z}_{it} = z_{it} - \bar{z}_i + \bar{\bar{z}} \quad \text{(Eq. 6)}$$

Where, $\bar{z}_i = T_i^{-1} \sum_{t=t_{i1}}^{T_i} z_{it}$

and $\bar{\bar{z}}_i = (\sum T_i)^{-1} \sum_i \sum_t z_{it}$ (Eq. 7)

Recognizing that the within-estimator corresponds to the OLS estimator of:

$$\tilde{y}_{it} = \widetilde{x'}_{it}\theta - \tilde{\varepsilon}_{it}, \quad \text{(Eq. 8)}$$

The second step then estimates the transformed regression model in (Eq. 3) by pooled OLS estimation with the Driscoll and Kraay standard errors.

Results and findings

1) Panel unit root and cross-sectional dependence test

The empirical estimation starts with conducting the panel unit root test of the IPS test [29] for stationary with- and without- trend and intercept at the level and first difference as presented in Table 2. The IPS test assumes cross-section independence [30], thus the hypothesis is restrictive and leads to size distortion and low power for macro series. Thus, this study also adopts the second generation panel unit root of Pesaran (2007) CIPS tests due to the presence of cross-sectional dependence which generates results as presented in Table 3. The IPS and Pesaran CIPS tests are adopted to provide more robust findings. Under both the assumptions of cross-sectional independence and dependence across the panel, all tests suggest that the null hypothesis of non-stationary for all variables can be rejected in the first difference, and implied that all variables become stationary in the first differentiation. This result implied that any shock that affects the variables is likely to have a temporary effect on the ASEAN countries.

The presence of the cross-section independency tests using the Pesaran (2004) [31] and Pesaran (2015) [32] CD statistics are as presented in Table 4. The results reveal that the CD test rejects the assumption of cross-sections independent as well as the assumption of weakly cross-sectional dependence. This implies that the variables are correlated across panel groups and Asian countries might share geographical proximities and socioeconomic similarities. If the cross-sectional dependence or unobserved common factors is neglected, it can lead to imprecise estimates.

Table 2 Panel unit root test with IPS (2003) test

Variables	(IPS) without trend		IPS with trend	
	At level	1st difference	At level	1st difference
EPI	-1.5469	-3.4038***	-0.3680	-3.2876 ***
TDI	0.2533	-3.6782***	-1.4599	-4.6825***
FDI	-4.9326***	-5.1209***	-6.5799***	-6.4213***
GDPPC	-4.1919***	-4.7763***	-4.9284 ***	-6.7788 ***
URB	-4.0211**	-4.6747***	-4.8210	-5.4421***

Remark: IPS represents the Im, Pesaran, and Shin (2003) test for stationary with and without trend and intercept at a level and first difference. *, **, *** indicate statistical significance at 10%, 5% and 1% level respectively. The null hypothesis is that the variable is non-stationary.

Table 3 Panel unit roots test based on Pesaran (2007)

Variable	CIPS			
	Without trend		With trend	
	At level	1st difference	At level	1st difference
EPI	-1.955	-2.446**	-1.892	-2.981**
TDI	-2.012	-3.210**	-2.111	-4.02***
FDI	-2.916***	-4.341***	-2.818	-4.217***
GDPPC	-2.375**	-4.980***	3.312**	-5.045***
URB	-2.077**	-4.180***	3.202**	-5.104***

Remark: CIPS test developed with the command of xtcips of stata 14 with 3 maximum lags; the critical value for CIPS statistics at (***) 1%, (**) 5%, and (*) 10% level. The null hypothesis is that the variable is homogeneous non-stationary.

Table 4 Pesaran panel cross-sectional dependence test

Variable	Pesaran (2004) CD statistics	Pesaran (2015) CD statistics
EPI	16.88***	26.57***
TDI	22.20***	25.58***
FDI	6.85***	15.21***
GDPPC	16.41***	26.54***
URB	12.30***	26.82***

Remark: Null hypothesis of cross-section independence (Pesaran, 2004) and null hypothesis of weakly cross-sectional dependence (Pesaran, 2004). (*) significant at the 10% level, (**) significant at the 5% level, and (***) significant at the 1% level.

4) Driscoll-Kraay panel regression

Before proceeding to the estimation of the panel data regression with Driscoll- Kraay standard errors for coefficients, this study performed two regressions, namely, the POLS and fixed effect estimations with Driscoll-Kraay standard errors.

The results obtained for the estimated coefficients using POLS are presented in Table 5. The tourism density index for ASEAN countries is found to be positively related to environmental performance. Quantitatively, an increase of 1% of tourism density improves the environmental performance index by 0.0375%. Next, FDI is found to improve the environmental performance Index, and the empirical relationship shows that a 1% increase in foreign direct investment improves the environmental performance index by 0.0065%. Meanwhile, the economic development as proxied by GDP per capita found to have a positive effect on the environmental performance of ASEAN countries, specifically, a 1% increase in GDP per capita improves the environmental performance index by 0.1524%. The variable urbanization is found to have a negative relationship with the environmental performance index. The results show that a 1% increase in the urban population worsens the environmental performance index by 0.0416% at a 10% level of significance.

The model is tested using the Hausman test to determine whether fixed effects or random effects estimation is better. If we obtain a probability of less than 0.05, it follows that the better model for the data would be the fixed effects model, otherwise the random-effects model would be more suitable. The result is presented in Table 4, where the probability of 0.001 is indicated, thus it is concluded that the fixed-effects model is more appropriate. The estimation results obtained for the coefficients under the fixed-effects model are presented in Table 4.

The fixed-effects model estimation shows that there is a statistically significant and negative relationship between the tourism density index and the environmental performance index. Specifically, a 1% increase in tourism density leads to a worsening of the environmental performance index by 0.1529%. Briefly, the results show an increase in tourist ratio with the country's population disturbed the environmental performance in ASEAN countries.

The finding for the FDI coefficient shows a negative relationship to the environmental performance index but statistically not significant. According to Li et al. [33], the insignificant influence of FDI on EPI indicate there exists heterogeneity regarding the impact of FDI between developed and developing ASEAN countries. For instance, a developed country such as Singapore has better environmental standards and technology to cushioning the negative impact of FDI on EPI compare to developing countries.

Next, the estimated coefficient for GDP per capita is found to be positively and statistically significantly related to the environmental performance index where a 1% increase in GDP per capita leads to an increase in EPI between by 0.593%. This finding consistent with Fakher and Abedi [34] and implied that economic growth played a vital role in improving the environmental performance index. The result further revealed that the coefficient of the variable urbanization is statistically significant at only a 10% level of significance and shows a negative association with the environmental performance index. This finding shows that urbanization deteriorates the environment in ASEAN countries. Notable, Tan et al. [35] suggested that urbanization increase deforestation while Fakher, and Abedi [36] claimed that increasing urbanization population propelled the coal consumption.

For both estimations under POLS and fixed-effect models, the value of goodness-of-fit measures (R-square) is found to be at 50 to 72 %.

Table 5 Regression with Driscoll-Kraay standard errors: POLS and Fixed Effect (FE)

Variable	POLS	FE
TDI	0.0375**	-0.1529***
	(0.0208)	(0.0508)
FDI	0.0065**	-0.0048
	(0.0031)	(0.0018)
GDPPC	0.1524***	0.5930***
	(0.0341)	(0.1102)
URB	-0.0416*	-0.0210*
	(0.0694)	(0.1731)
Constant	2.3922***	-0.9379***
	(0.0656)	(1.2906)
Hausman Test	-	Chi2(4) =44.78 Prob>chi2 = 0.001
R-squared	0.7218	0.5060
Obs.	160	160

Remark: The dependent variable is EPI. All variables are expressed in natural logarithm (ln). (*) indicates a level of significance at the 10% level, (**) indicates a level of significance at the 5% level, and (***) indicates a level of significance at the 1% level. The analysis uses Discoll-Krayy standard errors for pooled OLS and FE estimation as reported in the parentheses.

Conclusions

This study provides empirical evidence on the effect of tourism density on environmental performance in 10 ASEAN countries. Panel data analysis with Driscoll- Kraay standard errors were applied. The results show that the tourism density index appears to harm the environmental performance index for the ASEAN Countries. This is the first study that uses TDI as a factor to explain the Environmental Performance Index. The findings of the current study are consistent with Uzar and Eyuboglu [17], Rasekhi and Mohammadi [22], and Sharif et al. [29]. The results imply that as tourism density increases, the ability of ASEAN countries to reduce environmental stress decreases. The results likely reflected a negative scale and composition effect. Although tourism increases the size of economic activities, nevertheless as a destination becomes crowded due to the growing number of tourists, this will lead to an increase in water consumption, heavy traffic, air pollution, litter, and waste in tourism destinations [22]. Moreover, an increase in the construction of tourism and recreational facilities such as accommodation can lead to environmental damages such as sand and soil erosions and extensive paving [37]. This in turn may affect the beaches and islands that are major tourism attractions. Besides, the overbuilding of tourist and recreational facilities may cause damage that can lead to the loss of biodiversity, which in turn means a loss of tourism potential.

The findings in the current study may have several policy implications. First, countries should set strategic long-term plans for sustainable tourism which include the consideration of the carrying capacity for specific areas and attractions by determining the acceptable levels of the tourism density. Second, tour operators should be allocated resources to specifically engage in the conservation of sensitive areas and habitat. For example, green building or the use of energy-efficient and renewable construction materials are increasingly important ways for the tourism industry to decrease its impact on the environment. Third, policymakers may pay attention to tourist concentration in large cities by properly designing and planning for sustainable lifestyles for the urban population which is needed in Asian countries to encourage the development of activities that not only contribute to economic growth but also to reduce carbon footprints; such plans would include ecotourism and renewable energy consumption in long-run. Fourth, to undertake a continuous effort to discourage energy-extensive activities and shift to eco-friendly ones by imposing a price on carbon emissions either through taxes through caps. Fifth, programs should be adopted to increase environmental awareness among tourists and raise consciousness on environmental sustainability. Such programs may incorporate the principles and practices of sustainable tourism consumption and long-run environmental sustainability.

The limitation of this study lies in the scope of the sample size of 10 ASEAN countries. Besides, the effects of over-tourism also may consider indicators other than or in addition to tourist arrivals per head of population. On the other hand, this research can be further expanded by comparing ASEAN countries with other regions or divided countries into developed and developing countries. Further study also can extend the model in the non-linear model to observe the existence of the Environmental Kuznets Curve in the tourism density index-environmental performance index nexus.

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