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The Relationship between Tourism Receipt, Economic Growth, Inflation, Energy Consumption, and Carbon Dioxide Emissions: Evidence in Southeast Asia

The article aims to investigate the causal relationship between tourism receipt, economic growth, inflation, energy consumption, and CO_2 emissions in five developing countries, including Indonesia, Malaysia, the Philippines, Thailand, and Viet Nam in Southeast Asia between 1995 and 2014 based on time-series data using the vector autoregressive model. We found that tourism receipts and CO_2 emissions were positive drivers of inflation, while GDP and energy consumption negatively impacted inflation. It has been empirically found that GDP has a negative effect on CO_2 emissions. In the short run, there is a directional causality running from inflation to tourism receipt, energy consumption, and CO_2 emissions, but there is no relationship among variables in the long run. Empirical findings of the study suggest that the development of the tourism sector, especially in international tourism arrivals, should be encouraged along with carefully controlling inflation. In addition, economic growth has been identified as a significant determinant contributing to reducing inflation and CO_2 emissions in Southeast Asia. Finally, policies were recommended to achieve sustainable tourism in Southeast Asia.

Keywords: Tourism Receipt, Economic Growth, Inflation, Energy Consumption, Carbon Dioxide Emission

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Introduction

Tourism has been one of the world's fastest-growing economic sectors for the last two decades (Jayathilake, 2013; Bhuiyan, 2015). In Southeast Asia, international tourist arrivals increased from 21.2 million in 1990 to 96.7 million in 2014 (UNWTO, 2015a). Tourism not only contributes to

income generation, employment creation, and socio-cultural phenomenon but also benefits development (Scheyvens, 2002). The direct contribution of tourism to gross domestic product (GDP) accounted for USD135.8 billion (or 4.9 percent of GDP) and was projected to rise by 5.9 percent to USD143.9 billion in 2018. In 2017, tourism created 14.4 million jobs in Southeast Asia and was forecasted to increase by 3 percent annually to 20 million jobs in 2028. The revenue from visitors traveling to the region was predicted to rise 5.4 percent per annum over the period of 2018–2028 and reach US$243.2 billion in 2028 (World Travel & Tourism Council, 2018).

Southeast Asian countries highly depend on their tourism sector, and the annual growth of tourist arrivals to this region is increasing. According to an estimation by the World Tourist Organisation, in 2010, the number of arrivals in the region was four times higher than that in 1990. Tourist arrival growth in Southeast Asia was predicted to rise by 5 percent until 2030 (Sherafatian-Jahromi, 2016). Although tourism can improve transportation infrastructure, employment might be seasonal, negatively affecting the economy. Consequently, the increase in the demand for goods and commodities may influence their price and generate inflation (Xue-Pin and Jun-Yang, 2012). Further, political instability (Alesina and Perotti, 1996), corruption (Jong-Sung and Khagram, 2005), and inefficiency in resource allocation (Ostry and Berg, 2011) have been seen as the result of income inequality. In Southeast Asia, carbon dioxide (CO_2) emissions have increased since 1970, and the temperature has risen 1 to 3 degree Celsius between 1950 to 2000. By 2010, five countries, including Indonesia, Malaysia, the Philippines, Thailand, and Viet Nam accounted for about 90 percent of greenhouse gas emissions in Southeast Asia (ADB, 2015). Energy-related CO2 emissions in the Association of Southeast Asian Nations (ASEAN) region were predicted to increase from 1.26 billion tonnes in 2014 to 3.14 billion tonnes in 2040 (Lu et al., 2017).

The Asia-Pacific region has been hardly affected by the Covid-19 pandemic, leading to a sudden drop in tourist arrivals (Trupp and Dolezal, 2020). For instance, by March 2020, tourist arrivals in the region rapidly declined by 64 percent, impacting the livelihood of millions who rely on the tourist dollar (UNWTO, 2020). During the years before the crisis due to the Covid-19 pandemic, Southeast Asia has been known as a fascinating region with 128.7 million international tourist arrivals in 2018, generating EUR 121 billion in tourism receipts (UNWTO, 2019), contributing 12.6 percent to the region's economy, and creating employment for 38.1 million people (12.2 percent of total employment) (WTTC, 2019). Unequal distribution of economic benefits, overexploitation of resources, and uncontrolled tourism development can be seen as the results of different forms of (mass) tourism development (Dolezal et al., 2020).

Liu et al. (2019) found that tourism receipts have no impact on the environment, but energy consumption has been identified as a key driver leading to environmental degradation in Pakistan, while a study by Paramiti et al. (2017) concluded that the reduction of effects of tourism on CO_2 emissions in developed countries is faster than that in developing countries. Lee and Brahmasrene (2013) argued that tourism, CO_2 emissions, and foreign direct investment (FDI) are significantly positive impacts on economic growth and economic growth has a positive relationship with CO_2 emissions, while tourism and FDI negatively affect CO_2 emissions. What is the relationship between tourism receipt, economic growth, inflation, energy consumption, and CO_2 emissions in Southeast Asia? How do these variables correlate in the short and long run? The article investigates the causal relationship between tourism receipt, economic growth, inflation, energy consumption, and CO_2 emissions of five developing countries in Southeast Asia, namely Indonesia, Malaysia, the Philippines, Thailand, and Viet Nam, between 1995 and 2014. With a database gathered from the World Development Indicators, the vector autoregressive (VAR) model was employed to

estimate the relationship between these variables. More importantly, policies were recommended to achieve sustainable tourism in the region.

Literature Review

The theme of the relationship between tourism, economic growth, inflation, energy consumption, and CO_2 emissions has been strongly debated in recent years all over the world. Lenzen et al. (2018) examined the effects of tourism on global carbon emissions in 160 countries between 2009 and 2013. Results demonstrated that global greenhouse gas emissions increased by about 8 percent due to tourism's carbon footprint, and transport, shopping, and food are significant contributors. Akadiri et al. (2020) investigated the relationship between tourism, economic growth, and carbon emissions in 16 small island developing countries between 1995 and 2014. They found that the internal factor, especially the tourism island territories, is the key driver generating environmental pollution.

Liu et al. (2022) investigated the influence of tourism development on environmental pollution in 70 countries between 2000 and 2017, and they found that financial development and carbon emissions have an inverted U-shaped and U-shaped relationship in direct and indirect impacts, while population density, trade openness, and economic growth significantly affect environmental pollution, and education expenditure and infrastructure have important relationships with tourism development and environmental pollution. Fahimi et al. (2018) argued that the tourism sector did not significantly contribute to export earnings and economic growth of 11 countries between 1995 and 2015.

Some studies found a long-run relationship between tourism and economic growth (Pulido-Fernandez et al., 2015; Seghir et al., 2015; Danish and Wang, 2018), but tourism negatively affects the environmental quality (Danish and Wang, 2018). In Europe, Chou (2013) concluded that the

causality between economic growth and tourism spending is found in the Czech Republic and Poland. However, tourism spending may have little or no effect on economic growth in Bulgaria, Romania, and Slovenia. At the same time, Bella (2018) claimed that there is a long-run decreasing relationship between environmental degradation and economic growth driven by tourism in France. Siano and Canale (2022) evaluated the relationship between tourism and economic growth in Italian provinces for the period 2005-2018, and they concluded that tourism has contributed to the economic growth of locals, but it should not be exploited over the needs of the resident population.

In Asia, it has been empirically found that tourism has been identified as the positive driver leading to CO_2 emissions in China (Luo et al., 2020; Chen et al., 2018). Further, Ohlan (2017) concluded that India's tourism, financial development, and economic growth are co-integrated, and there is a directional causality from tourism to economic growth. The relationship between tourism, economic growth, inflation, energy consumption, and CO_2 emissions are also interesting in Southeast Asia. Research by Mazumder et al. (2013) found that, in Southeast Asia, tourism can be developed through the formation of the pertaining environment and mobilization of endowed strategic resources. Bhuiyan et al. (2012) proposed policies to reduce CO_2 emissions for eco-tourism in Malaysia, while Chulaphan and Barahona (2018) found that tourists from South Asia contribute to economic growth in Thailand. Lastly, Tang and Tan (2016) concluded that there is a long-run relationship between GDP, energy consumption, and CO_2 emissions in Cambodia.

Tu and Zhang (2020) examined the effect of tourism on economic growth in 75 Chinese ethnic autonomous counties between 2007 and 2016, and they found that tourism plays an essential role in fostering economic growth in Chinese ethnic minority areas, but tourism's contribution to economic growth tends to decline due to tourism specialization. Likewise, Liu et al. (2021)

assessed the nexus between tourism and economic growth in Hong Kong in both crisis and non-crisis periods, and they claimed that the growth of Hong Kong's tourism presents a rapid recovery following major crisis events. Liu et al. (2022) explored the relationship between tourism and environmental pollution in Pakistan between 1980 and 2017. It has been empirically found that there is a long-term relationship between tourism development, economic growth, energy consumption, trade openness, foreign direct investments, and ecological footprint. Therefore, sustainable tourism, fuel mix variation, and services sector-oriented foreign direct investment should be considered by policymakers.

According to the definition of the UNWTO, sustainable tourism development refers to the environmental, economic, and socio-cultural aspects of tourism development, and a suitable balance must be established between these three dimensions to guarantee its long-term sustainability. Existing studies examine the relationship between tourism and economic growth, while others assess the impacts of tourism on the environment in various regions and countries in the world. However, research on sustainable tourism development in Southeast Asia is still limited. Tourism has played an essential role in Southeast Asia's employment creation and economic growth. However, the region is facing serious obstacles related to environmental degradation due to energy consumption, CO_2 emissions, and unstainable tourism. Therefore, the study aims to emphasize the importance of sustainable tourism development in Southeast Asia based on social, economic, and environmental dimensions. Association between tourism receipt, economic growth, inflation, energy consumption, and CO_2 emissions in five Southeast Asian countries will be investigated to propose appropriate and feasible solutions for sustainable tourism development in the region.

Methodology

Data Collection

The author gathered a panel dataset for the causality between international tourism receipt, GDP, inflation rate, per capita energy consumption, and CO_2 emissions in Southeast Asia from the database World Development Indicators released by the World Bank between 1995 and 2014. Specifically, five developing countries in Southeast Asia, including Indonesia, Malaysia, the Philippines, Thailand, and Viet Nam, were chosen for the study. A panel dataset was collected for the last two decades (1995–2014). Thus, a total of 100 observations were entered for data analysis. The panel data was used for this research because of the following advantages: (1) it benefits in terms of obtaining a large sample, giving more degree of freedom, more information, and less multicollinearity among variables; and (2) it may overcome constraints related to control individual or time heterogeneity faced by the cross-sectional data (Hsiao, 2014).

Five Southeast Asian countries, namely Indonesia, Malaysia, the Philippines, Thailand, and Viet Nam have been selected for the study for the following reasons. First, Thailand and Malaysia developed international tourism from the 1960s onward, receiving more than half of all regional international tourist arrivals. The tourism sector of Indonesia had a steady growth in recent years due to its ecological and cultural resource abundance in addition to the development of low-cost carriers in the region (Hampton and Clifton, 2017). Tourism in the Philippines has improved, although this country was isolated from airline connections for many years (Trupp et al., 2020). Cambodia, Laos, and Viet Nam opened their gates for international tourism only in the 1990s (Trupp and Dolezal, 2020). Second, according to the World Travel and Tourism Council (WTTC) estimation, Indonesia was ranked 23rd worldwide for absolute growth in travel and tourism (T&T) and secure[d the seventh] position for long-term growth. The tourism sector currently contributes 5.8 percent to GDP and is predicted to rise to 6.6 percent in the next decade, accounting for 10 percent

of total employment (WTTC, 2018a). Contribution to GDP of the Philippines' tourism accounted for 21.1 percent, ranked 18th globally, and was forecasted to reach 22.4 percent in the next decade. Contribution to the employment of the tourism sector in this country stands in sixth place (WTTC, 2018b). In Viet Nam, T&T contributed about 10 percent to GDP and was expected to grow at a similar percentage during the next decade, and the contribution of T&T to total employment was estimated to rise from 7.6 percent to 8 percent in the same period. The contribution of T&T to Vietnam's economy was ranked 47th in the world (WTTC, 2018c). The contribution of T&T to the economy in Malaysia and Thailand accounted for 20.8 percent and 10 percent, respectively (Azam et al., 2018).

To conclude, although starting points for the tourism development of Indonesia, Malaysia, the Philippines, Thailand, and Viet Nam are different, it is a fact that T&T has a significant contribution to the economy and employment in these countries. In addition, five of these countries have been known as potential tourist destinations in the region for the next decades. Therefore, these five countries have been selected for the study.

Data Analysis

The Vector Autoregressive (VAR) model was widely applied by scholars worldwide to investigate the relationship between economic growth and tourism development and forecast tourism demand (Alaminos et al., 2020; Assaf et al., 2018; Chaitip and Chaiboonsri, 2014; Georgantopoulos, 2013; and Mello and Nell, 2005). In this study, the VAR model was used to examine the causality between international tourism receipt, GDP, inflation rate, per capita energy consumption, and CO2 emissions of five countries in Southeast Asia between 1995 and 2014. The VAR model was chosen for this study because it explains the endogenous variables solely by their own history, apart from deterministic regressors, and therefore this method incorporates non-statistical a priori

information (Pfaff, 2008). Moreover, the VAR model is a popular method in economics and other sciences since it is a simple and flexible model for multivariate time series data (Suharsono et al., 2017).

The specification of a VAR model can be defined as follows (Pfaff, 2008):$Y_t =$

$$A_1 Y_{t-1} + \cdots + A_p Y_{t-p} + \varepsilon_t \quad (1)$$

Where: Y_t denotes a set of K endogenous variables (international tourism receipt, GDP, inflation rate, per capita energy consumption, and CO_2 emissions); Ai represents (K x K) coefficient matrices for i = 1,…, p; and ε_t is a K-dimensional process with $E(\varepsilon_t) = 0$.

An important characteristic of the AVR model is stability, and therefore it generates stationary time series with time-invariant means, variances, and covariance structure, given sufficient starting values. The stability of an empirical VAR model can be analyzed by considering the companion form and computing the eigenvalues of the coefficient matrix. A VAR model may be specified as follows (Pfaff, 2008):

$$\varepsilon_t = A\varepsilon_{t-1} + V_t \quad (2)$$

Where: ε_t denotes the dimension of the stacked vector; A is the dimension of the matrix (K_p x K_p); and V_t represents (KP x 1).

The VAR process is stable if the eigenvalue of A is greater than 1.

Table 1: Description of Covariates in the VAR Model

Variable definitions	Unit	Source

International tourism receipt: expenditure of international inbound visitors	US$	World Development Indicators
GDP: the final value of the goods and services produced by a country during a year	US$	World Development Indicators
Inflation rate: the percentage increase or decrease in prices during a year	%	World Development Indicators
Per capita energy consumption: average volume of energy used per capita in a country	kg of oil	World Development Indicators
CO_2 emissions: total amount of CO_2 in a country for a year	kilo tonne (kt)	World Development Indicators

Note: US$ means United States Dollar

In this study, the procedure of a VAR model includes six steps, consisting of (1) performing the unit root test; (2) determining lag length; (3) estimating the VAR model; (4) testing the Granger causality; (5) checking the stability of eigenvalues; and (6) implementing the Johansen test for co-integration. The VAR model was estimated by the Stata MP 14.2 software.

Step 1: Performance of the unit root test:

The objective of this step is to examine the stationarity of international tourism receipt, GDP, inflation rate, per capita energy consumption, and CO2 emissions with the hypothesis as follows:

Null hypothesis (H0): The variables contain a unit root

Alternative hypothesis (Ha): The variables do not contain a unit root

If a variable contains a unit root, then this implies that the time series of this variable is not stationarity.

Step 2: Determination of the lag length:

This step aims to specify the optimal lag for the VAR model.

Step 3: Estimation of the VAR model:

In this step, the VAR model will be estimated to identify the relationship among international tourism receipt, GDP, inflation rate, per capita energy consumption, and CO2 emissions.

Step 4: Testing the Granger causality:

The purpose of this step is to evaluate the predictive capacity of a single variable on other variables.

Step 5: Examination of the stability of eigenvalues:

The purpose of this step is to examine the stability of the eigenvalues in the VAR model. If all the eigenvalues lie inside the unit circle, then we can conclude that the VAR model satisfies the stability condition.

Step 6: Implementation of the Johansen test for co-integration:

In this step, the Johansen co-integration test was carried out to assess the long-run relationship among variables with the hypothesis as follows:

Null hypothesis (H0): There is no co-integration among variables

Alternative hypothesis (Ha): There is co-integration among variables

Study Results

International Tourism Receipt, GDP, Inflation, Per Capita Energy Consumption, and CO_2 Emissions: An Overview

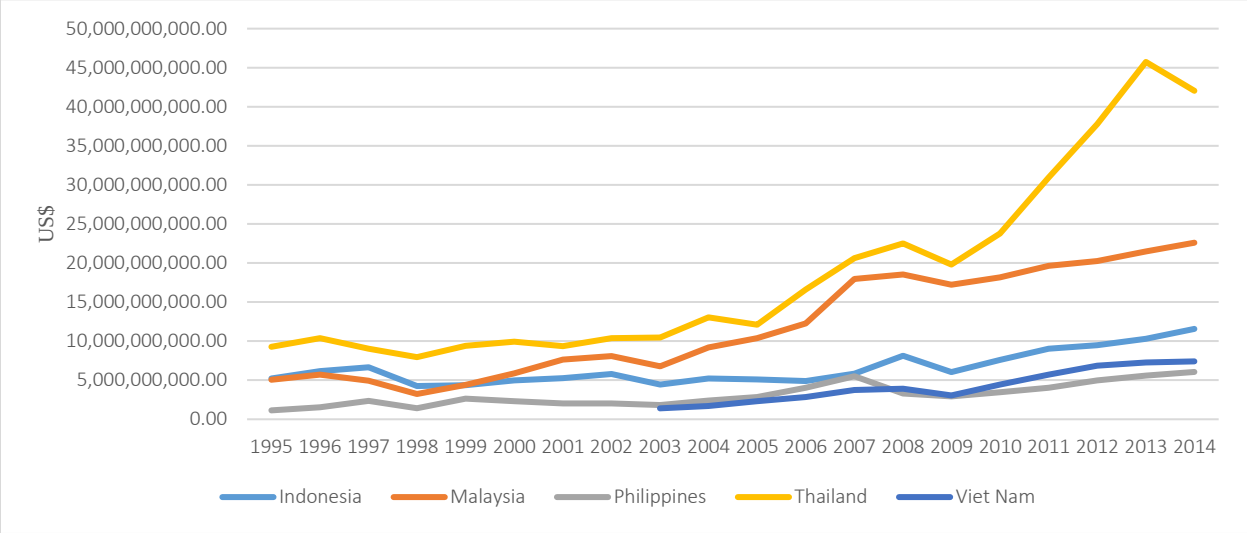

Figure 1: International Tourism Receipt of Selected Countries in Southeast Asia

Source: World Bank, 2020

Indonesia was the biggest economy in Southeast Asia, followed by Thailand, Malaysia, the Philippines, and Viet Nam. For example, by 2014, the GDP of Indonesia reached more than US$890 billion, which is higher than that of the second largest country (Thailand) by more than doubled, while the GDP of Malaysia accounted for more than US$338 billion, followed by the Philippines (more than US$284 billion), and Viet Nam (about US$186 billion) (Figure 2).

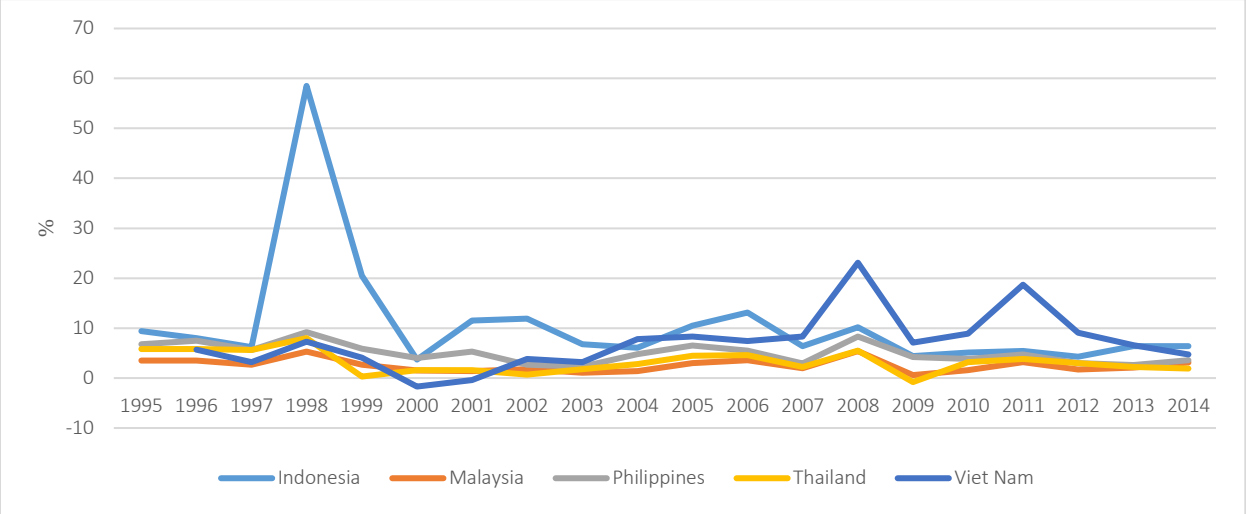

Figure 3: Inflation Rate of Selected Countries in Southeast Asia

Source: World Bank, 2020

Between 1995 and 2006, Indonesia had the highest inflation rate, while the inflation rate of Malaysia was the lowest. However, from 2007 onward, Viet Nam has replaced Indonesia to become the highest inflation rate country. For Indonesia, by 1998, the inflation rate reached a peak of more than 58 percent, while by 2008, the inflation rate of Viet Nam reached a peak of more than 23 percent. Superhigh inflation rates in these countries may be explained by the negative effects of the economic crises in Asia and the Pacific that occurred in 1997–1998 and 2007–2008 (Figure 3).

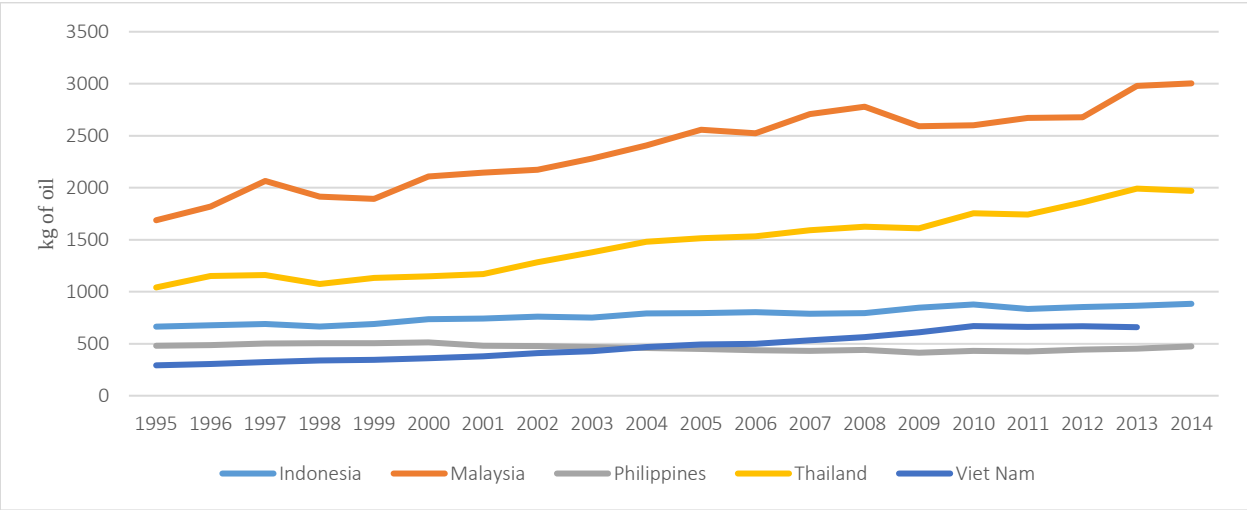

Figure 4: Per Capita Energy Consumption of Selected Countries in Southeast Asia

Source: World Bank, 2020

Malaysia, Thailand, and Indonesia are three leading countries in terms of energy consumption in Southeast Asia. From 2006 onward, Viet Nam has overcome the Philippines to become the fourth largest country in energy consumption. For instance, by 2014, per capita, Malaysia consumed more than 3,000 kg of oil, followed by Thailand (1,969 kg of oil), Indonesia (more than 883 kg of oil), and Viet Nam (more than 474 kg of oil) (Figure 4).

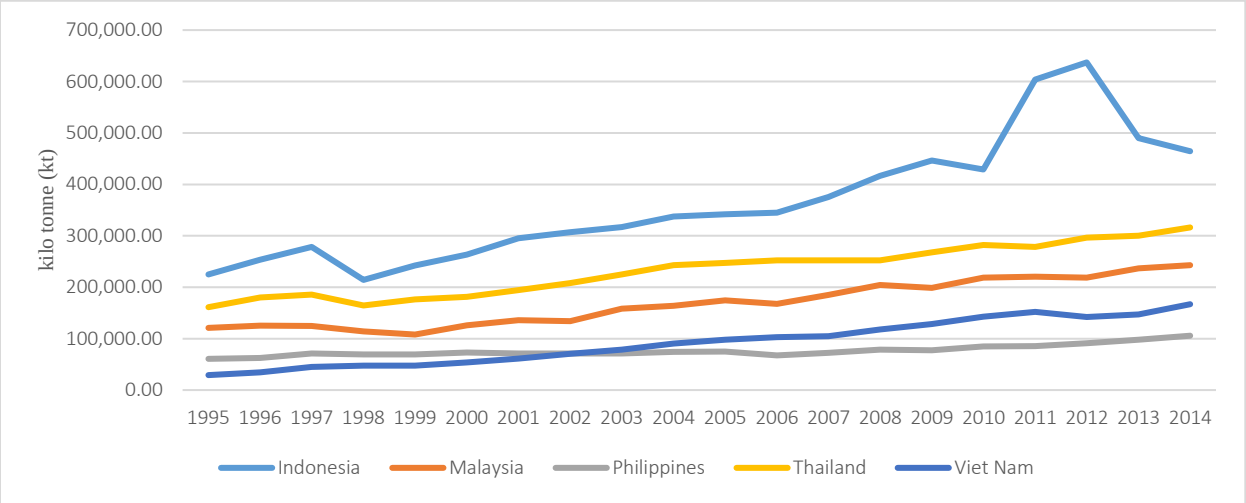

Figure 5: CO_2 emissions of selected countries in Southeast Asia

Source: World Bank, 2020

Due to the effects of industrialization and urbanization, in addition to a population boom over the last decades, the CO_2 emissions of five countries significantly increased, especially in Indonesia. For example, by 2014, CO_2 emissions of Indonesia reached more than 464 thousand kt, followed by Thailand (more than 316 thousand kt), Malaysia (more than 242 thousand kt), Viet Nam (more than 147 thousand kt), and the Philippines (more than 98 thousand kt) (Figure 5).

Table 2: Characteristics of International Tourism Receipt, GDP, Inflation, Energy Consumption, and CO_2 Emissions in Selected Countries in Southeast Asia

Variable	Mean	SD	Min	Max
International tourism receipt	8.54e+09	8.66e+09	0	4.57e+10
GDP	2.07e+11	1.90e+11	2.07e+10	9.18e+11
Inflation rate	5.64	6.66	-1.7	58.5
Per capita energy consumption	1105.91	773.68	0	3003.5
CO_2 emissions	187172	122614	29090.3	637078.9

Source: Author's calculation, 2020

Note: SD denotes standard deviation

The average international tourism receipt, GDP, and an inflation rate of five countries accounted for US$8.5 billion, US$207 billion, and 5.6 percent, respectively. Per capita, energy consumption and CO_2 emissions of five countries reached more than 1105 kg of oil and 187,000 kt on average (Table 2).

The Relationship between International Tourism Receipt, GDP, Inflation, Per Capita Energy Consumption, and CO_2 Emissions in Southeast Asia

Implementation of the Unit Root Test

The unit root test was carried out to check the stationarity or non-stationarity of the time series variables (Shadab, 2018). In this study, the Augmented Dickey-Fuller (ADF) test and the Phillips-Peron (PP) test were used to examine the stationarity of international tourism receipt, GDP, inflation rate, per capita energy consumption, and CO_2 emissions with the hypothesis as follows:

Null hypothesis (H_0): The variables contain a unit root

Alternative hypothesis (H_a): The variables do not contain a unit root

If a variable contains a unit root, then this implies that the time series of this variable is not stationarity.

Table 3: Results of the Unit Root Test

Variables		ADF Test		PP Test		Conclusion
		Level	1st difference	Level	1st difference	
LnInternational tourism receipt	Constant	-2.77*	-6.83***	-2.88**	-9.75***	I(1)
	Constant & trend	-2.89	-6.80***	-3.02	-9.70***	I(1)
LnGDP	Constant	-2.77*	-6.90***	-2.95**	-9.99***	I(1)
	Constant & trend	-2.95	-6.87***	-3.19*	-9.95***	I(1)
LnInflation rate	Constant	-4.01***	-11.36***	-5.63***	-16.75***	I(0)
	Constant & trend	-3.99***	-11.31***	-5.66***	-16.72***	I(0)
LnPer capita energy consumption	Constant	-0.47	-2.86**	-0.49	-3.79***	I(1)
	Constant & trend	-1.01	-2.97	-1.00	-3.84**	I(1)
$LnCO_2$ emissions	Constant	-2.51	-7.30***	-2.57*	-10.11***	I(1)
	Constant	-2.66	-7.28***	-2.80	-10.06***	I(1)

Source: Author's calculation, 2020

*Note: ***, ** and * denote statistical significance at 1%, 5% and 10%, respectively*

The results in Table 3 show that the time series of the inflation rate is stationary at the level [I(0)] because the absolute value of the test statistic is greater than critical values at 1% and 5%, respectively. However, the time series of international tourism receipts, GDP, per capita energy

consumption, and CO2 emissions are not stationary at this level. Thus, the first difference was carried out to examine the stationary of these variables. Results indicate that the absolute values of test statistics are greater than critical values at 1% and 5%, respectively, and therefore we can conclude that the time series of these variables do not contain unit roots, and this suggests that the time series are stationary at the first difference [I(1)]. The results of the unit root test are consistent to employ the VAR model.

Determination of the Lag Length

The objective of this step is to specify the optimal lag for the VAR model. If the lag used is too little, then the residual of the regression will not show the white noise process, and as a result, the actual error could not be accurately estimated by the model (Suharsono et al., 2017).

Table 4: Selection of the Lag Length

Lag	LL	LR	Df	p	FPE	AIC	HQIC	SBIC
0	-662.05				0.74	13.89	13.95	14.03
1	-397.63	528.84*	25	0.000	0.00*	8.90*	9.23*	9.71*
2	-393.20	8.84	25	0.999	0.00	9.33	9.93	10.80
3	-383.76	18.88	25	0.802	0.01	9.66	10.52	11.79
4	-370.11	27.29	25	0.341	0.01	9.89	11.03	12.70

Endogenous: LnReceipt LnGDP LnInflation LnEnergy consumption $LnCO_2$

Exogenous: Constant

Number of observations = 96

Source: Author's calculation, 2020

Notes: * denotes lag order selected by the criterion; LL means log-likelihood values; LR represents sequential modified LR test statistics; FPE denotes final prediction error; AIC means Akaike information criterion; HQIC represents Hannan-Quinn information criterion; and SBIC means Schwarz's Bayesian information criterion.

As seen in Table 4, results suggest that the optimal lag length, in this case, is the lag 1 because this value was recommended by AIC, HQIC, and SBIC indicators. Thus, lag 1 (the number of lag is equal to 1) was chosen to run the VAR model in the next step.

Estimation of the VAR Model

Table 5. Estimation of the VAR Model

Variables	**Coefficient**	**Standard Error**	**t**	**P-value**
LnTourism receipt				
LnTourism receipt (L1)	0.891***	0.07	11.40	0.000
LnGDP (L1)	-0.677	0.87	-0.77	0.442
LnInflation rate (L1)	0.323	0.49	0.65	0.518
LnEnergy consumption (L1)	-0.174	0.78	-0.22	0.825
LnCO_2 emissions (L1)	0.545	1.11	0.49	0.627
Constant	13.919	14.67	0.95	0.345
LnGDP				
LnTourism receipt (L1)	0.014	0.01	1.39	0.167
LnGDP (L1)	0.711***	0.11	6.08	0.000
LnInflation rate (L1)	0.003	0.06	0.06	0.954
LnEnergy consumption (L1)	-0.101	0.10	-0.97	0.336
LnCO_2 emissions (L1)	0.155	0.14	1.04	0.300

Constant	5.938***	1.95	3.03	0.003
LnInflation rate				
LnTourism receipt (L1)	0.032**	0.01	2.01	0.047
LnGDP (L1)	-0.302*	0.17	-1.69	0.094
LnInflation rate (L1)	0.255**	0.10	2.52	0.013
LnEnergy consumption (L1)	-0.678***	0.16	-4.24	0.000
LnCO_2 emissions (L1)	0.562**	0.22	2.47	0.015
Constant	6.062**	2.98	2.03	0.045
LnEnergy consumption				
LnTourism receipt (L1)	-0.000	0.01	-0.03	0.978
LnGDP (L1)	-0.095	0.19	-0.48	0.632
LnInflation rate (L1)	-0.051	0.11	-0.46	0.646
LnEnergy consumption (L1)	0.913***	0.17	5.13	0.000
LnCO_2 emissions (L1)	0.118	0.25	0.47	0.641
Constant	1.648	3.32	0.50	0.621
LnCO_2 emissions				
LnTourism receipt (L1)	0.007	0.00	0.95	0.343
LnGDP (L1)	-0.150*	0.08	-1.74	0.085
LnInflation rate (L1)	-0.014	0.04	-0.29	0.770
LnEnergy consumption (L1)	-0.100	0.07	-1.30	0.197
LnCO_2 emissions (L1)	1.058***	0.11	9.60	0.000
Constant	3.732**	1.44	2.58	0.012

Source: Author's calculation, 2020

Notes: L1 means lag 1

***, **, and * denote statistical significance at 1%, 5%, and 10%, respectively

As seen in Table 5, international tourism receipt has a positive relationship with the inflation rate, implying that the devaluation of domestic currencies may increase international tourism receipt in Southeast Asia. Further, GDP negatively affects the inflation rate and CO_2 emissions and these reflect that GDP should be encouraged because it is a significant driver contributing to reducing the inflation rate and CO_2 emissions in the region. Per capita, energy consumption negatively affects the inflation rate, suggesting that an increase in energy consumption can decrease the inflation rate. This also presents an important role of energy in production and livelihood in the region since energy is a crucial input for sectors like agriculture, industry, services, and resident livelihood, which can be seen as an essential determinant to stabilize prices in the economy. Results show that an increase in CO_2 emissions leads to a rise in the inflation rate, so CO_2 emissions in the region should be reduced to decrease the inflation rate.

Testing the Granger Causality

The purpose of this step is to assess the predictive capacity of a single variable on other variables (Musunuru, 2017). In this study, hypotheses need to be tested as follows:

Testing the relationship between international tourism receipt and other variables:

Null hypothesis (H0): International tourism receipt does not cause GDP, inflation, per capita energy consumption, and CO_2 emissions

Alternative hypothesis (Ha): International tourism receipt causes GDP, inflation, per capita energy consumption, and CO_2 emissions

Testing the relationship between GDP and other variables:

Null hypothesis (H_0): GDP does not cause international tourism receipt, inflation, per capita energy consumption, and CO_2 emissions

Alternative hypothesis (H_a): GDP causes international tourism receipt, inflation, per capita energy consumption, and CO_2 emissions

Testing the relationship between inflation and other variables:

Null hypothesis (H_0): Inflation does not cause international tourism receipt, GDP, per capita energy consumption, and CO_2 emissions

Alternative hypothesis (H_a): Inflation causes international tourism receipt, GDP, per capita energy consumption, and CO_2 emissions

Testing the relationship between per capita energy consumption and other variables:

Null hypothesis (H_0): Per capita energy consumption does not cause international tourism receipt, GDP, inflation, and CO_2 emissions

Alternative hypothesis (H_a): Per capita energy consumption causes international tourism receipt, GDP, inflation, and CO_2 emissions

Testing the relationship between CO_2 emissions and other variables:

Null hypothesis (H_0): CO_2 emissions do not cause international tourism receipt, GDP, inflation, and per capita energy consumption

Alternative hypothesis (H_a): CO_2 emissions causes international tourism receipt, GDP, inflation, and per capita energy consumption

Table 6: Results of the Granger Causality Wald Test

Directional relationship	**Probability**	**Conclusion**
International tourism receipt ⟶ GDP	0.44 > 0.05	Accept H_0
International tourism receipt ⟶ Inflation	0.51 > 0.05	Accept H_0

International tourism receipt → Per capita energy consumption	0.82 > 0.05	Accept H_0
International tourism receipt → CO_2 emissions	0.62 > 0.05	Accept H_0
GDP → International tourism receipt	0.16 > 0.05	Accept H_0
GDP → Inflation	0.95 > 0.05	Accept H_0
GDP → Per capita energy consumption	0.33 > 0.05	Accept H_0
GDP → CO_2 emissions	0.30 > 0.05	Accept H_0
Inflation → International tourism receipt	0.04 < 0.05	Reject H_0
Inflation → GDP	0.09 > 0.05	Accept H_0
Inflation → Per capita energy consumption	0.00 < 0.05	Reject H_0
Inflation → CO_2 emissions	0.01 < 0.05	Reject H_0
Per capita energy consumption → International tourism receipt	0.97 > 0.05	Accept H_0
Per capita energy consumption → GDP	0.63 > 0.05	Accept H_0
Per capita energy consumption → Inflation	0.64 > 0.05	Accept H_0
Per capita energy consumption → CO_2 emissions	0.64 > 0.05	Accept H_0
CO_2 emissions → International tourism receipt	0.34 > 0.05	Accept H_0
CO_2 emissions → GDP	0.08 > 0.05	Accept H_0
CO_2 emissions → Inflation	0.76 > 0.05	Accept H_0
CO_2 emissions → Per capita energy consumption	0.19 > 0.05	Accept H_0

Source: Author's calculation, 2020

There are directional causalities running from inflation rate to international tourism receipt, per capita energy consumption, and CO_2 emissions (Table 6).

Examination of Eigenvalue Stability

The objective of this step is to examine the stability of the eigenvalues in the VAR model. All the eigenvalues lie inside the unit circle, and we can conclude that the VAR model satisfies the stability condition (Figure 6).

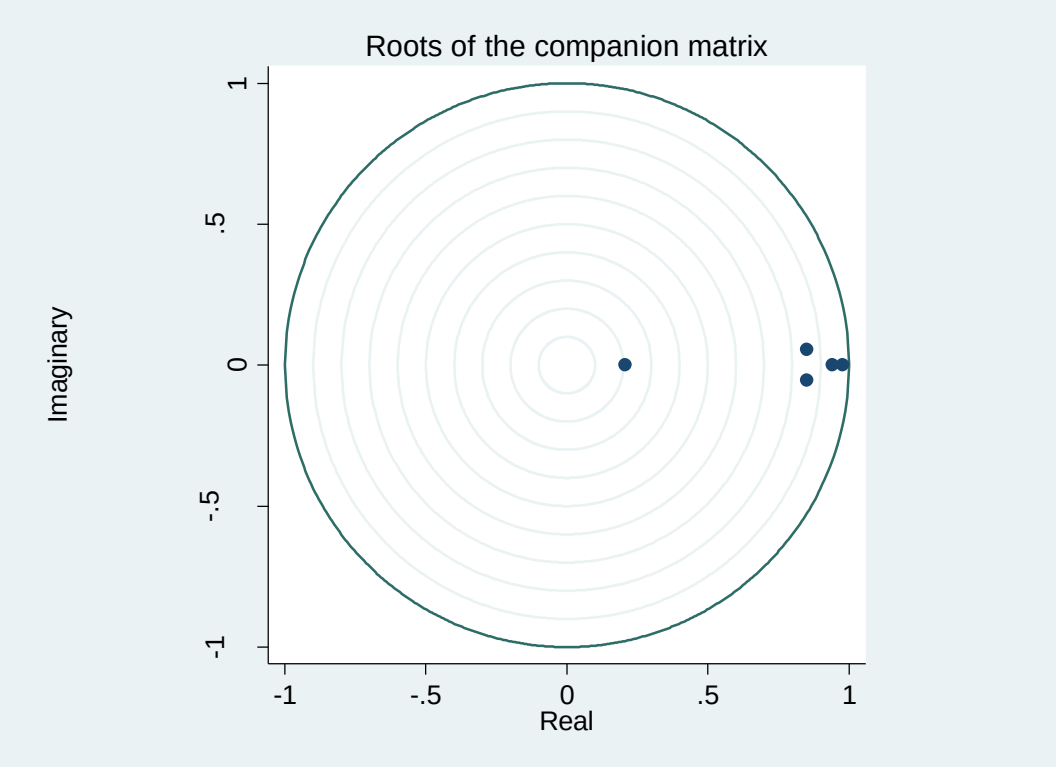

Figure 6: Checking the Stability of Eigenvalues in the VAR Model

Source: Author's calculation, 2020

Performance of the Johansen Co-integration Test

The Johansen co-integration test was performed to determine the long-run relationship among variables. The hypothesis to be tested can be identified as follows:

Null hypothesis (H0): There is no co-integration among variables

Alternative hypothesis (Ha): There is co-integration among variables

In this research, the Johansen co-integration test was carried out by trace statistic test. Trace test is a likelihood-ratio-type test that operates under different assumptions in the deterministic part of the data generation process (Lutkepohl et al., 2001).

Table 7: Results of Trace Statistic in the Johansen Co-integration Test

Maximum rank	LL	Eigenvalue	Trace statistic	5% critical value	1% critical value
0	-437.34		56.82*1*5	68.52	76.07
1	-422.97	0.254	28.08	47.21	54.46
2	-416.43	0.124	15.00	29.68	35.65
3	-411.06	0.103	4.26	15.41	20.04
4	-408.93	0.042	0.02	3.76	6.65
5	-408.92	0.000			

Source: Author's calculation, 2020

Notes: *[1] and *[5] denote the number of co-integrations (ranks) chosen to accept the null hypothesis at 1% and 5% critical values, respectively.

As seen in Table 7, we cannot reject the null hypothesis in the rank zero (no co-integration) because the trace statistic is less than the 5% and 1% critical values (56.82 < 68.52 and 56.82 < 76.07), and this suggests that there is no co-integration among variables in the long run.

Discussion

In summary, we found that international tourism receipt positively correlates with the inflation rate. Moreover, GDP negatively affects the inflation rate and CO_2 emissions. It has been empirically found that per capita energy consumption negatively influences the inflation rate. Results state that an increase in CO_2 emissions leads to a rise in the inflation rate. There are

directional causalities running from inflation rate to international tourism receipt, per capita energy consumption, and CO_2 emissions. However, there is no relationship among variables in the long run.

Our findings contradict to conclusions of Kadir and Karim (2012) and Shih and Do (2016) because these studies argued that there is a causal relationship between tourism and economic growth in the long run, while we found that there is no long-run relationship among variables. Different results can be interpreted by differences in the research scope and methods. Specifically, our study focuses on examining the relationship between international tourism receipt, GDP, inflation rate, per capita energy consumption, and CO_2 emissions of five Southeast Asian countries, while Kadir and Karim (2012) investigated the relationship between tourism and economic growth in Malaysia, and Shih and Do (2016) evaluated the influence of tourism on the economic growth of Viet Nam. Alaminos et al. (2020) concluded that the increase in economic productivity generates growth in the tourist demand in France, Germany, and Japan, and Georgantopoulos (2013) argued that tourism has a positive effect on real output in India, while our results found no relationship between economic growth and tourism.

Siano and Canale (2022) found that tourism has important contributions to the economic growth of Italian provinces, but it should not be exploited over the needs of the resident population. Tu and Zhang (2020) argued that tourism plays a significant role in facilitating economic growth in Chinese ethnic minority areas, but tourism's contribution to economic growth tends to decline due to tourism specialization. Liu et al. (2022) concluded that there is a long-term relationship between tourism development, economic growth, energy consumption, trade openness, foreign direct investment, and ecological footprint in Pakistan. Inchausti-Sintes (2021) concluded that tourism is not a source of ecological depletion when the environment is integrated into the

economic system. Ehigiamusoe (2020) argued that tourism is a significant determinant of environmental degradation in 31 African countries. Therefore, sustainable tourism development should be implemented along with the needs of local inhabitants and environmental protection to balance the benefits of residents, enterprises, communities, and society and avoid overwhelming exploit natural resources and ecological depletion.

Before the COVID-19 pandemic, 128.7 million international tourist arrivals in 2018 generated EUR121 billion in tourism receipts for Southeast Asia (UNWTO, 2019), contributing 12.6 percent to the economy and 12.2 percent to total employment in the region (WTTC, 2019). However, the increase in international tourism receipts may lead to the rise of inflation which spin-overs to adversely affect stable macroeconomics and livelihood of inhabitants in Southeast Asian countries. Further, policies fostering economic growth should be encouraged in the region since these assist in controlling inflation and reducing CO2 emissions. The differences in international tourist arrivals between countries in Southeast Asia reflect the significance of implementing sustainable tourism in the region. For instance, Thailand and Malaysia attract more than half of international tourist arrivals to the region because these countries have developed international tourism since the 1960s, while Indonesia's tourism growth in recent years was due to ecological and cultural resource abundance, and the Philippines improved its tourism in recent years from isolated airlines connections. Cambodia, Laos, and Viet Nam opened their gates for international tourism in the 1990s, while Myanmar tourism still faces bottlenecks because of ethical concerns. The tourism sector in Southeast Asia was strongly hurt by the COVID-19 pandemic. The number of international visitor arrivals in the region fell by 82 percent in 2020 compared to the previous year, while domestic tourism was constrained because of travel restrictions and reduced economic activity. As a result, travel and tourism's contribution to regional GDP rapidly dropped by 53

percent in 2020, endangering millions of tourism workers and small and medium-sized enterprises (ADB, 2021).

Conclusions and Policy Implications

The tourism sector plays a crucial role in Southeast Asia's economic development and employment creation. The aim of this article was to examine the causal relationship between tourism receipt, economic growth, inflation, energy consumption, and CO_2 emissions of five developing countries such as Indonesia, Malaysia, the Philippines, Thailand, and Viet Nam in Southeast Asia between 1995 and 2014. In the VAR model, we find that tourism receipt and CO_2 emissions have positive relationships with inflation, while GDP and energy consumption negatively affect inflation. Further, results show that GDP has a negative effect on CO_2 emissions. The Granger causality Wald test demonstrates a directional causality from inflation to tourism receipt, energy consumption, and CO_2 emissions. However, the result of the Johansen test indicates that there is no long-run relationship among variables.

This study provides strategic contributions to theory, practice, and methodology in the sustainable tourism area. First, it enriches the theory of sustainable development by enhancing the development of sustainable tourism in Southeast Asian countries, controlling tourism receipts to stabilize inflation, and fostering economic growth to reduce inflation and CO_2 emissions. Second, there is causality from inflation to tourism receipts, energy consumption, and CO_2 emissions, which reflects that inflation should be considered by Southeast Asian countries because of its relationship with tourism receipts, energy consumption, and CO_2 emissions. Lastly, unlike cross-sectional data, time-series data is employed in the study, which allows for the evaluation of the causal relationship between tourism receipt, economic growth, inflation, energy consumption, and CO_2 emissions in five Southeast Asian countries, namely Indonesia, Malaysia, the Philippines, Thailand, and Viet Nam for the last two decades.

Tourism has been indicated as an important sector contributing to the socio-economic development of Southeast Asian countries based on income generation, employment creation, socio-cultural phenomenon, and benefits development. Consequently, it is necessary to develop a sustainable tourism sector because it assists countries in the region to obtain the economic benefit, protect the environment, preserve natural resources, and improve the livelihood of local inhabitants. Therefore, policies should be recommended to achieve sustainable tourism in Southeast Asia. First, GDP should be encouraged because it contributes to reducing inflation and CO_2 emissions in the region. Second, low CO_2 policies should be carried out since it not only decreases inflation but also ensures sustainable tourism in Southeast Asian countries. For instance, these countries may implement low CO_2 policies, consisting of low-carbon technologies, sustainable tourism, low-carbon tourism consumption, paid carbon taxes, government and tour operator initiatives, institutional facilities development, and tourism friendly traffic system. Third, tourist objectives must be transparent and emerge these goals into national plans with the participation of governments, local communities, and tourism entrepreneurs (Mazumder et al., 2013). Fourth, implementing actions in the ASEAN Tourism Strategic Plan, consisting of positioning and branding ASEAN in its markets, networks with multi and bilateral international partners, and developing and marketing ASEAN sub-regional destinations (ASEAN, 2017). Finally, implementation of the Comprehensive Recovery Framework Implementation Plan includes (i) developing climate resilient quality infrastructure and improving service delivery; (ii) developing human capital needed to sustainably manage tourism; (iii) accelerating the use of digital technologies for tourism skills training, marketing, congestion management, and implementing health and safety protocols; (iv) promoting tourism enterprise development; and (v) policy and regulatory reforms to encourage higher-yield tourism (ADB, 2021).

It is very difficult for the study to avoid limitations. First, due to a shortage of the latest available data, the period for the research was only between 1995 and 2014. Second, the study has been carried out prior to the occurrence of the COVID-19 pandemic, and consequently, the current and potential effects of the COVID-19 pandemic on tourism in Southeast Asian countries seem to be ignored. Therefore, it suggests a new direction for future research to investigate the relationship between tourism receipt, economic growth, inflation, energy consumption, and CO2 emissions in Southeast Asia under the influence of the COVID-19 pandemic.

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