Article Type: Research Paper

How Important is Environmentally Sustainable Tourism? Evidence in Indonesia from 1974-2018 Using NARDL Cointegration

Nadya Setiawati and Eksa Pamungkas

AFFILIATION:
Department of Economics, Faculty of Economics and Business, Universitas Padjajaran, West Java, Indonesia

***CORRESPONDENCE:**
nadyasetiawati14@gmail.com

THIS ARTICLE IS AVALILABLE IN:
http://journal.umy.ac.id/index.php/esp

DOI: 10.18196/jesp.v23i2.15238

CITATION:
Setiawati, N., & Pamungkas, E. (2022). How Important is Environmentally Sustainable Tourism? Evidence in Indonesia from 1974-2018 Using NARDL Cointegration. *Jurnal Ekonomi & Studi Pembangunan, 23*(2), 201-219.

ARTICLE HISTORY
Received:
27 Jun 2022
Revised:
21 Sep 2022
Accepted:
11 Oct 2022

Abstract: Tourism is one of the most important sectors of the Indonesian economy because it is one of the mainstay sectors in obtaining foreign exchange, which is expected to increase economic growth. However, along with its positive impact on economic growth, the expansion of the tourism industry is also a significant contribution to rising CO2 emissions and energy consumption. This study focuses on assessing the impact of the tourism sector as proxied by the number of international tourist visits on GDP per capita and the environment as seen from CO2 emissions and total energy consumption. This study uses data covering 44 years (1974 - 2018). The Nonlinear Autoregressive Distributed Lag (NARDL) method was used in this study. The results indicate that an increase in total foreign tourist arrivals has a positive impact on real GDP per capita and total energy consumption in the short term, whereas a decrease has a beneficial effect on reducing real GDP per capita, CO2 emissions, and total energy consumption. In the long term, an increase in total international tourist arrivals is known to have a positive effect on increasing real GDP per capita, CO2 emissions, and total energy consumption; then, the decrease has a positive effect on reducing real GDP per capita and CO2 emissions. The result of this study demonstrates that an increase in total international tourist arrivals has a positive effect on short- and long-term impact on real GDP per capita and total energy consumption. There are several policy implications as a consideration of the results of this study, such as the use of carbon-neutral transportation and hybrid energy as well as tax breaks or low-cost financing opportunities to purchase and install green technology.
Keywords: Emission; Energy Consumption; GDP; Tourism; NARDL
JEL Classification: C22; Q56; Z32

Introduction

Tourism is one of Indonesia's most important economic industries (Saptutyningsih & Duanta, 2021; Sujai, 2016). Over the last few years, tourism has substantially contributed to the Gross Domestic Product (GDP). Therefore, tourism is also one of the economy's mainstays and is vital in accomplishing sustainable development goals. (Davidson & Sahli, 2014; Kapera, 2018; Lee & Jan, 2019). This is because industries that rely on non-renewable natural resources, such as oil and gas, cannot be relied upon in the long term. Furthermore, despite growing social disparities and environmental costs, the tourism sector is the driver of wealth and job creation. The United Nations (UN) declared 2017 as the International Year of Sustainable Tourism for Development, providing a chance to assess tourism's impact and advocate for legislation that would make tourism a major contributor to the Sustainable Development Goals (SDGs) (Nepal et al., 2019).

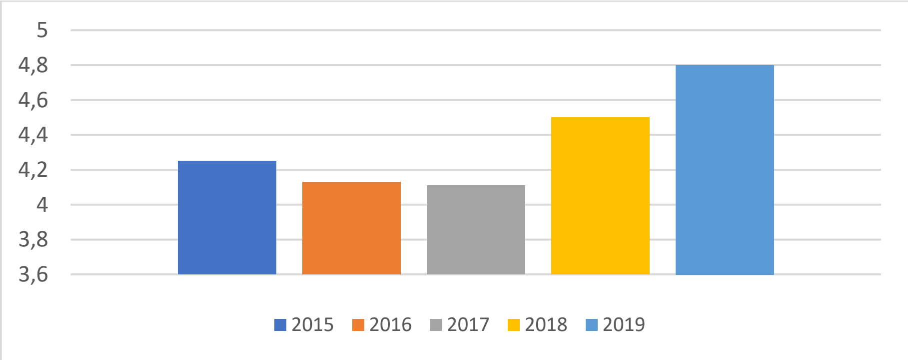

Figure 1 Contribution of the Tourism Sector to Indonesia's GDP (in percent)
Sources: Ministry of Tourism (2020)

Tourism is recognized as one of the leading sectors in Indonesia, making it one of the country's primary sources of foreign currency, which is anticipated to stimulate economic growth (Azizurrohman et al., 2021). Based on the Ministry of Tourism Performance Report (2019) , it is known that the tourism sector may create substantial quantities of foreign exchange and that this amount increases significantly every year, from Rp. 175.71 trillion in 2015 to Rp. 229.50 trillion in 2018. The tourist industry also contributes to the absorption of the labor force, as evidenced by the annual growth of its entire workforce. In 2015, there were 10.36 million workers, which then expanded in 2018 to 12.70 million people. The tourism sector also contributes significantly to GDP. It can be seen in figure 1 that from 2015 through 2019, the tourism sector contributed an average of 4.3% of GDP, with the highest contribution being in 2019. This contribution was driven by the increasing number of local, and foreign tourists, and investment (Ministry of Tourism, 2020). Likewise, the number of foreign tourist visits to Indonesia has increased over the last five years. Based on Figure 2, it can be seen that the number of foreign tourist visits in 2019 reached 16.11 million and showed the highest number compared to previous years.

Figure 2 The Number of International Tourist Visits to Indonesia
Sources: Ministry of Tourism (2020)

The relationship between tourism and economic growth has been studied for the past two decades (Pigliaru & Lanza, 2000). It is known that the causal relationship between tourism and growth includes four scenarios: tourism-led growth, economy-driven tourism, bidirectional causality, and no-causality (Antonakakis et al., 2016). Several studies explained the truth of the Tourism-Led Economic Growth (TLEG) hypothesis, (Tang & Tan, 2017) for example, assess whether the TLEG hypothesis is internationally valid by considering the degree of state wealth and institutional quality using panel data from 167 nations. Their findings suggest that tourism helps to economic growth, although the effect differs depending on income levels and institutional quality. Antonakakis et al. (2016), using the spillover index technique to investigate the dynamic relationship between tourism growth and economic growth, found a relationship between tourists and economic growth but is not constant over time. Then, the results of his research also show that the TLEG and Economic-Driven Tourism Growth (EDTG) hypotheses are correct.

However, along with its positive effect on economic growth, the development of the tourism sector is also one of the contributors to increasing greenhouse gas (GHG) emissions significantly (Gössling, 2013; Gössling & Buckley, 2016). The success of the development in the tourism sector can be measured from the increase in the reception and number of tourists. According to research by (Kuo et al., 2012), an increase in tourism revenue will only result in an increase in CO_2 emissions and lower than the increase in the total of tourist visits in China. (Solarin, 2014), in his research on the presence or absence of long-term causality between tourist arrivals and pollution in multivariate analysis covering Gross Domestic Product (GDP), total energy consumption, financial development, and urbanization in Malaysia. His research also shows that an increase in the number of tourist arrivals positively encourages an increase in pollution. In Indonesia, (Lee & Syah, 2018) examined the economic and environmental consequences of mass tourism on regional tourism destinations, particularly the establishment of the "Ten New Bali's" from 1980 to 2015. Based on this research, it was found that there is a balance relationship long-term relationship between tourism receipts, environmental degradation, and economic growth.

By 2035, this sector is expected to account for around 7.5% of global CO_2 emissions (UNWTO et al., 2008). One aspect of tourism that will contribute to emissions is foreign tourists, based on research by, which became a catalyst for increasing CO_2 emissions in Cyprus. In addition, (Katircioglu, 2014), in another study, found similar evidence for Turkey, where international tourists also contributed significantly to increasing greenhouse gas emissions. However, some studies have found that tourist arrivals have a significant negative effect on CO_2 emission levels in both the short and long term in Singapore (Katircioğlu, 2014).

The majority of the extant literature discusses the impact of tourism on CO_2 emissions through various channels of energy consumption (Koçak et al., 2020), where the aspect of tourism that has the greatest effect on energy use in international travel (Gössling et al., 2015). Tourism uses fossil energy sources predominantly, such as coal, natural gas, and oil, especially for transportation activities, activities in tourist destinations, and accommodation (Gössling & Peeters, 2015). Therefore, understanding how much energy consumption in tourist destinations can encourage the conservation of greenhouse gas energy by formulating policies and guidelines (Zhang & Zhang, 2019).

There are several previous studies that discuss the relationship between CO2 emissions, energy consumption, and tourism. Among them are, (Zaman et al., 2016), examined the relationship between carbon dioxide emissions and economic growth and tourism development in East Asia and Pacific countries, the European Union, and other high-income OECD and non-OECD countries from 2005 to 2013 using the Environmental Kuznets Curve (EKC) hypothesis. The study's findings confirm that there is an inverse U-shaped link between the region's carbon emissions and per capita income, and that tourist expansion causes higher emissions. (Wu et al., 2016) assess energy consumption and carbon dioxide emissions in China's tourist sector and compare overall emissions across key regions in their study.

Energy usage, sustainable tourism, and destination management have a complex relationship. Therefore, a successful tourism destination cannot exist without sustained tourism growth. Tourism and destination sustainability hinges on energy usage (Ritchie & Crouch, 2003). Further research on energy consumption should be encouraged, since understanding tourist energy consumption is becoming an essential approach for destinations to avoid environmental deterioration and foster ecologically responsible tourism growth (Zhang & Zhang, 2019).

In addition, many earlier research has utilized a linear technique to analyze the link betw een tourism and the outcome variable, such as economic growth. Meanwhile, the analysis of non-linear and time-varying relationships is rarely conducted (Wu et al., 2016). According to Ridderstaat et al. (2013), the tourism-growth relationship cannot be fully analyzed linearly because the tourism effect diminishes returns. Tang & Tan (2017) also explained that the causal relationship between tourism growth shows a fluctuating influence from time to time, so it is necessary to consider non-linear and time-varying problems in the analysis.

Therefore, this study addresses a gap in the literature about the impact of foreign tourist visits on economic growth and the environmental impact of CO2 emissions and overall energy consumption. This study examines the asymmetric link between international tourist visits, which is uncommon in Indonesian research on related themes. This study focuses on the time period between 1974 and 2018, when sustainable tourism was not yet a major topic of public debate and was not generally adopted by policymakers. This study utilized the non-linear ARDL model to capture the asymmetric influence of international tourist visits. This research contributes to the literature in various ways. First, this study uses the NARDL model, which is able to capture the short-term and long-term impacts as well as the effects of asymmetry or changes resulting from the increase and decrease in the number of international tourists. Second, the research not only analyzes the impact of international tourist arrivals on economic growth, but also on emissions and total energy consumption. Third, this study considers the existence of time deterministic in the form of trends, structural breaks, and error correction terms (ECT). The results of this study are expected to be a reference and recommendation in identifying strategies for developing the tourism sector that seeks to balance economic growth while reducing pollutant emissions and encouraging energy efficiency.

Research Method

Data

The data used include real GDP per capita and foreign tourist arrivals (total from the Central Statistics Agency (BPS) as well as data on total carbon dioxide emissions and total energy consumption from the World Bank. The data used is time series with a range from 1974 - 2018, which means there are 44 yearly observations in this study.

Method

The Nonlinear Autoregressive Distributed Lag (NARDL) model was used in this study. This model can explicitly capture the short-run and long-run effect and test for the asymmetric effect of tourist arrivals which is an advantage over other methods such as linear VAR and several non-linear methods, including quantile regression and Markov-switching which have recently gained popularity in the literature (Liang et al., 2020).

This model has several advantages. First, this method provides long-term and short-term estimates in one step. Second, this method can overcome the problem of bias in small samples and endogeneity bias which depends on the presence or absence of autocorrelation residuals. In addition, this method allows hidden Cointegration tests and includes an asymmetric dynamic multiplier that monitors the asymmetric intertemporal response of the dependent variable due to positive-negative changes in the independent variables (Nusair, 2016).

Model Specification

First, we determine the symmetric linear equation model as follows:

$$\ln Y_t = \alpha + \theta T + \vartheta \ln tourist_t + \beta D + \mu_t \quad (1)$$

Where Y_t is the expected outcome consisting of real GDP value, carbon emissions, and total energy consumption, $tourist_t$ is the number of tourists who come, T shows the trend, D is another independent variable, α is the constant value, θT is coefficient of the time trend, μ_t is the assumption of the error term. This study uses an asymmetric long-run model based on partial sum decomposition based on (Shin et al., 2014), as follows:

$$\ln Y_t = \alpha + \theta T + \vartheta^{+} tourist_t^{+} + \vartheta^{-} tourist_t^{-} + \delta D + \mu_t \quad (2)$$

Where $\vartheta^{+} = \vartheta^{-}$ indicates a symmetrical effect of tourist arrival on outcomes. If $\vartheta^{+} > 0$ and $\vartheta^{-} > 0$ implies that increasing tourism will improve outcomes, vice versa. (Shin et al., 2014) modified the symmetric Autoregressive Distributed Lag (ARDL) model developed by

(Pesaran et al., 2001) to analyze the problem of non-linear and asymmetric effects using partial number decomposition determined in the following equation:

$$\mathrm{lntourist_t = lntourist_0 + lntourist_t^+ + lntourist_t^-} \qquad (3)$$

$\mathrm{lntourist_0}$ is a variable value, $\mathrm{lntourist_t^+}$ and $\mathrm{lntourist_t^-}$ explain the process of partial addition that accumulates positive and negative changes in the tourist arrivals variable, which is then described again in the following equation:

$$lntourist_t^+ = \sum_{j=1}^{t} \Delta lntourist_j^+ = \sum_{j=1}^{t} max\,(\Delta lntourist_j, 0) \qquad (4)$$

$$lntourist_t^- = \sum_{j=1}^{t} \Delta lntourist_j^- = \sum_{j=1}^{t} max\,(\Delta lntourist_j, 0) \qquad (5)$$

The two equations are an asymmetric cointegration model with partial sum decomposition. Then to estimate the asymmetric long-run and short-run elasticity, the specification model used is as follows:

$$\mathrm{\Delta lnYt = \theta_0 T + \theta_1 lnY_{t-1} + \theta_2^+ lntourist_{t-1}^+ + \theta_3^- lntourist_{t-1}^- + \sum_{j=1}^{q-1} \alpha_j\, \Delta lnY_{t-j} + \sum_{j=0}^{q-1} \beta_j^+\, \Delta lntourist_{t-j}^+ + \sum_{j=0}^{q-1} \beta_j^-\, \Delta lntourist_{t-j}^- + \delta D + \mu_t} \qquad (6)$$

In this study, three deterministic were used: structural breaks, trend, and Error-Correction Term (ECT). Thus, the specifications of the model (6) used in this study it is further elaborated as follows:

$$\mathrm{\Delta lnYt = \theta_0 T + \theta_1 lnY_{t-1} + \theta_2^+ lntourist_{t-1}^+ + \theta_3^- lntourist_{t-1}^- + \sum_{j=1}^{q-1} \alpha_1\, \Delta lnY_{t-j} + \sum_{j=0}^{q-1} \beta_1^+\, \Delta lntourist_{t-j}^+ + \sum_{j=0}^{q-1} \beta_2^-\, \Delta lntourist_{t-j}^- + \beta_3(lnY_{t-1} - lntourist_{t-1}) + \delta_1 SB_t + \mu_t} \qquad (7)$$

ECT is indicated by $\mathrm{lnY_{t-1} - lntourist_{t-1}}$ which is a correction for short-term disequilibrium conditions. Then $\mathrm{SB_t}$ is a dummy variable that indicates the existence of Structural Breaks.

Then, to test the long-term asymmetry in the equation, a long-term null symmetry hypothesis test was carried out from $\mathrm{lntourist_t}$ using the Wald Test where $\mathrm{H_0}: \theta_2^+ = \theta_2^-$ and $\mathrm{H_a}: \theta_2^+ \neq \theta_2^-$. In the same way, a short-term asymmetry test of $\mathrm{\Delta lntourist_t}$ is also carried out, where $\mathrm{H_0} : \sum_{j=0}^{q} \beta_j^+ = \sum_{j=0}^{q} \beta_j^-$ and $\mathrm{H_a} : \sum_{j=0}^{q} \beta_j^+ \neq \sum_{j=0}^{q} \beta_j^-$. The null hypothesis of the symmetric effect test will be rejected if the $\mathrm{p - value} \leq \alpha$, where α is the level of significance. Cointegration test is also performed on the equation, where $\mathrm{H_0}$: $\theta_1 = \theta_2^+ = \theta_2^- = 0$ and $\mathrm{H_a}: \theta_1 \neq 0;\ \theta_2^+ \neq 0;\ \theta_2^- \neq 0$. The null hypothesis indicates the condition when there is no cointegration and the alternative hypothesis is the opposite. The cointegration test criterion is if the F-statistics are above the upper critical bound $\mathrm{F - stat > I(1)_{critical}}$), it can be said that there is cointegration or the null hypothesis is rejected. Meanwhile, if the F-statistics are below the lower critical bound $\mathrm{(F - stat < I(0)_{critical})}$, it can be said that there is no cointegration or the null hypothesis cannot be rejected. Then if the F-statistics are between the upper and lower critical bounds, then the cointegration becomes uncertain. To estimate the asymmetric cumulative dynamic multiplier effects of $\ln Y_t$ for each unit change of $\ln tourist_t^+$ and $\ln tourist_t^-$, the following equation is used:

$$m_h^+ = \sum_{j=0}^{h} \frac{\partial \ln Y_{t+j}}{\partial \ln tourist_t^+};\ m_h^- = \sum_{j=0}^{h} \frac{\partial \ln Y_{t+j}}{\partial \ln tourist_t^-}\ , h = 0,1,2, \dots, \dots$$

Where according to (Shahzad et al., 2017) if the value of $h \to \infty$, then the value of m_h^+ and m_h^- will approach the long-term coefficient. By analyzing the adjustment pathway and the duration of the imbalance of certain positive and negative shocks, it will provide an overview of the short-term and long-term asymmetric adjustment patterns (Fousekis et al., 2016; Shahzad et al., 2017).

Result and Discussion

Summary Statistics dan Unit Root Test

Statistical information of the variables used can be seen in Table 1.

Table 1 Summary Statistics

Sum. Statistics	Real GDP	Tourist Arrival	CO^2 Emissions	Energy Consumption
Mean	925503.3	4350012	1.189858	98.64756
Maximum	5651456	1.58e+07	2.178462	158.83
Minimum	7269	313452	0.4022925	35.59
Std. Dev	1463498	3777920	0.516021	40.85881

The unit root test was performed using the Augmented Dickey-Fuller (ADF) test developed by (Dickey & Fuller, 1979) and the Phillips-Perron test developed by (Phillips & Perron, 1988). The unit root test can be seen in Table 2.

Table 2 Unit Root Test

	ADF Test		Pperron Test	
Variables	**Level**	**First-Difference**	**Level**	**First-Difference**
lny	-0.745	-7.008***	-0.691	-7.103***
lcoemis	-1.807	-5.347***	-1.812	-5.302***
lenergycons	-3.114***	-	-3.155***	-
lntourist	-1.232	-4.164***	-1.039	-4.236***

Note. ***p<0.01, **p<0.05, and *p<0.1

Based on the tests that have been carried out with a significance level of 5%, it can be seen that the GDP per capita and CO2 emissions variables are not stationary at the level but are stationary at the first differences, both based on the ADF and Perron tests. In comparison, the total energy consumption variable is stationary at the level.

Then the unit root test was also carried out on the structural breaks that had been made using the xtbreak test method by (Ditzen et al., 2021), which can be used to estimate and test many known and unknown structural breaks in time series and panel data. The vce(hac) command is used to control autocorrelation and heteroscedasticity problems in the observed structural breaks. A structural break can be said to be significant if the value of t-stat > bai-perron critical value at a certain level, 1%, 5%, or 10%. Various results on the stationarity of the existing variables are known, with the majority indicating that structural breaks tend to be more significant over the long period and only a few being significant over the short term. The unit root test on the structural break is shown in Table 3.

Table 3 Structural Breaks Unit Root Test

Variable	Level		First-Difference	
	NP-Stat	Break	NP-Stat	Break
lny	22.08***	1983; 1993	0.50	1983; 1993
lntourist	27.45***	1988	3.02	1984; 1993
lncoemiss	59.71***	1979; 2002	1.75	1980; 1989
lntourist	3.14	1979; 1988	14.74***	1987; 1994
lnenergycons	18.06***	1996; 2002	13.38***	2002
lntourist	13.81***	1986; 1992	17.66***	1986; 1992

Note. ***p<0.01, **p<0.05, and *p<0.1

Optimal Lag Length Test

On each dependent variable, a test was done to determine the best lag time for the non-linear ARDL model. Table 4 displays the lag length test. Based on the results of the optimum lag test, it can be determined that the optimum lag for each of the variables that influence the outcome is 1.

Table 4 Lag Length Test

Variabel: lny						
Lag	**LL**	**LR**	**FPE**	**AIC**	**HQIC**	**SIC**
0	61.1561	NA	0.000012	-2.83688	-2.79122	-2.7115
1	135.108	14.945*	5.0e-07*	-6.00526*	-5.82263*	-5.50372*
2	138.109	6.0027	6.7e-07	-5.71264	-5.39304	-4.83496
3	142.564	8.9095	8.5e-07	-5.49092	-5.03434	-4.23709
4	146.836	8.5447	1.1e-06	-5.2603	-4.66675	-3.63032
Variabel: lncoemiss						
Lag	**LL**	**LR**	**FPE**	**AIC**	**HQIC**	**SIC**
0	207.775	NA	7.2e-09	-10.2387	-10.1929*	-10.1121*
1	217.897	20.244	6.8e-09*	-10.2948*	-10.1117	-9.78818
2	222.219	8.6439	8.7e-09	-10.0609	-9.74035	-9.17248
3	233.789	23.141*	7.8e-09	-10.1895	-9.73148	-8.9228
4	237.517	7.4556	1.1e-08	-9.92585	-9.33047	-8.27919

Table 4 Lag Length Test (con't)

Variabel: lnenergycons						
Lag	**LL**	**LR**	**FPE**	**AIC**	**HQIC**	**SIC**
0	123.046	NA	5.7e-07	-5.85589	-5.81023	-5.73051
1	237.854	29.622*	5.3e-09*	-11.0173*	-10.8346*	-10.5157*
2	239.836	3.9645	4.7e-09	-10.6749	-10.3553	-9.79726
3	245.435	11.197	5.6e-09	-10.509	-10.0524	-9.25519
4	249.874	8.8782	7.3e-09	-10.2865	-9.69299	-8.65656

Note. LL: log likelihood; LR: adjusted sequential LR test statistic; FPE: final prediction error; AIC: Akaike information criterion; SIC: Schwartz information criterion; HQIC: Hannan–Quinn information criteria.

Cointegration Test (Bounds Test)

Then, a limits test is conducted to assess whether the model's variables are cointegrated or have a long-term link. The results of the cointegration test (bounds test) are shown in Table 5. It can be seen that there is cointegration in the three models discussed in this study.

Table 5 NARDL Bounds Test

Model	Specification	F-Stat	α	PSS-Bounds	
				I(0)	I(I)
$\ln y_t \mid \ln tourism_t^{+} \ln tourism_t^{-}$	NARDL(1,1)	F(2,42) = 5.95***	10%	2.788	3.540
			5%	3.368	4.203
			1%	4.800	5.725
$\ln coemiss_t \mid \ln tourism_t^{+} \ln tourism_t^{-}$	NARDL(1,1)	F(2,42) = 6.61***	10%	2.788	3.540
			5%	3.368	4.203
			1%	4.800	5.725
$\ln energycons_t \mid \ln tourism_t^{+} \ln tourism_t^{-}$	NARDL(1,1)	F(5,36) = 5.68***	10%	2.788	3.540
			5%	3.368	4.203
			1%	4.800	5.725

Note. ***p<0.01, **p<0.05, and *p<0.1

Then, Table 6 illustrates the explanation for the asymmetric effect of NARDL based on the three outcomes. Based on the estimation results, it can be seen that the asymmetric effect of international tourist arrivals on GDP per capita, CO2 emissions, and the total energy consumption is significant in both the short and long term.

Table 6 Asymmetric Effects Test

Null Hypothesis	Long-Run	Short-Run
Symmetric effect of tourism on Real GDP per capita	$\chi^2(I)$ = 7.37*** [0.000]	$\chi^2(I)$ = 3.71* [0.060]
Symmetric effect of tourism on CO2 emissions	$\chi^2(I)$ = 10.27*** [0.000]	$\chi^2(I)$ = 6.51*** [0.003]
Symmetric effect of tourism on total energy consumption	$\chi^2(I)$ = 44.43*** [0.000]	$\chi^2(I)$ = 6.91*** [0.002]

Note. ***p<0.01, **p<0.05, and *p<0.1

NARDL Estimation

Regression was performed using NARDL to estimate the short-term and long-term asymmetric effects of international tourist visits on the dependent variables used, namely real GDP per capita, CO2 emissions, and total energy consumption.

Table 7 Short-Run and Long-Run NARDL for Real GDP Per Capita

Outcome Variable(1): lny				
Variable	**Coefficient**	**Standard Error**	**t-statistic**	**p-value**
Short Run				
$\Delta \mathbf{lntourism}_j^+$	3.38156***	1.402168	2.41	0.024
$\Delta \mathbf{lntourism}_j^-$	0.73158***	1.501854	2.67	0.013
Long Run				
$\mathbf{lntourism}_j^+$	3.31228***	0.493975	2.22	0.036
$\mathbf{lntourism}_j^-$	1.2918*	0.870353	1.85	0.076
Deterministic				
Trend	-0.058030	0.043812	1.32	0.197
SB	-0.254651	0.296311	0.86	0.398
ECT	0.706023***	0.123435	5.72	0.000
Constanta	6.580389***	1.181342	5.57	0.000
R^2	0.8600			
$F_{FF}(17,25)$	9.03***			0.000

Note. ***p<0.01, **p<0.05, and *p<0.1

Table 7 shows the regression results for outcome variable 1, namely real GDP per capita. Based on the results, it is known that asymmetric international tourist visits (positive and negative) have a significant effect on real GDP per capita both in the short and long term. In the short term, a 1 percent rise in international tourist arrivals will result in a 3.38 percentage point increase in real GDP, while a 1 percent decline in international tourist arrivals would result in a 0.73 percentage point decrease in real GDP, which is statistically significant at the 1% level. Meanwhile, in the long term, a 1 percent increase in the number of international visitor arrivals increases real GDP per capita by 3.28 percentage points, and a 1 percent decline in tourist visits decreases real GDP per capita by 1.29 percentage points, which is significant at the 10% significance level. Then, based on the table, it reveals that the trend and structural break have no significant effect. However, the error correction term has a significant effect of 74.52 percent at a significance level of 1 percent. It demonstrates a 74.52 percent correction of the imbalance that occurred in the current year, indicating a reasonably swift adjustment to the long-term equilibrium.

This study's results align with the research by Kumar et al. (2019), which examines the effect of international tourist arrivals on real GDP in Cook Island. Based on the results of the paper, it is known that an increase in international tourist arrivals has a significant effect on increasing real GDP both in the short and long term. Furthermore, based on the estimation results, it can be seen that the increase in international tourist arrivals has a greater positive impact when compared to the negative effects caused by the decrease. This result shows that there is strong evidence that shows the justification of the TLEG hypothesis in Indonesia, where international tourist arrivals are a significant factor in economic growth during the period used in the study.

Table 8 Short-Run and Long-Run NARDL for CO2 Emissions

Outcome Variable(2): lncoemiss				
Variable	**Coefficient**	**Standard Error**	**t-statistic**	**p-value**
Short Run				
$\Delta\mathbf{lntourism}_j^+$	0.393980	0.367033	1.07	0.294
$\Delta\mathbf{lntourism}_j^-$	0.27387***	0.316249	2.09	0.047
Long Run				
$\mathbf{lntourism}_j^+$	0.983983***	0.420041	2.34	0.028
$\mathbf{lntourism}_j^-$	0.52598*	0.299143	-1.76	0.091
Deterministic				
Trend	-0.042087***	0.043812	1.32	0.197
SB	-0.012334	0.296311	0.86	0.398
ECT	0.003807	0.123435	5.72	0.000
Constanta	0.136654***	1.181342	5.57	0.000
R^2	0.8600			
$F_{FF}(17,25)$	2.88***			0.008

Note. ***p<0.01, **p<0.05, and *p<0.1

Then the results for the dependent variable CO2 emissions are shown in Table 8. Based on the data, it can be seen that international tourist visits have an asymmetrically significant effect on CO2 emissions over the long term, while only the negative partial sums are significant over the short term. In the short term, a 1 percent decrease in the number of international tourist arrivals affects reducing CO2 emissions by 0,27 percentage points. Meanwhile, in the long term, an increase in the number of tourist visits by 1 percent has an effect of 0.98 percentage points in increasing CO2 emissions, and a decrease of 1 percent has a smaller effect in reducing CO2 emissions, which is 0,56 percentage points. The coefficient of a significant trend at the 1 percent level is negative, which means it captures weakness in macroeconomic policies, lower investment, and skilled worker emigration (Kumar & Stauvermann, 2016).

The results of this study are in line with the research by Lawal et al. (2018), which states that there is a positive long-term relationship between international tourist arrivals and CO2 emissions in Malaysia from 1972 – 2010. Furthermore, based on UNWTO & International Transport Forum (2019), the tourism sector is responsible for 5% of the world's carbon emissions, of which 75% are generated by tourist mobility and 25% by on-site consumption, including as much as 21% by accommodation and as much as 4% by tourist activities.

One of the factors of high mobility is the use of transportation due to the increased arrivals of international tourists (Gühnemann et al., 2021). Therefore, transportation is one of the largest contributors to CO2 emissions in Indonesia. In 2019, based on a report from the Ministry of Energy and Mineral Resources (2020), it is known that transportation is the second largest contributor to emissions in Indonesia. In that year, transportation accounted for 24.64 percent of total carbon dioxide emissions, with an average annual growth of 7.17 percent (Ministry of Energy and Mineral Resources, 2020). However, there are no data available to explain the precise distribution of transport-related tourism emissions in Indonesia.

Based on the International Visitor Arrivals Statistics (2018), it is known that in 2018 international tourist arrivals based on the main air entrances were 73.18 percent of the total international tourist arrivals to Indonesia. Gössling et al. (2015), in their research, explain that airplanes are vehicles that produce the highest emissions among other means of transportation in the tourism sector. In addition, based on Indonesia's geographical conditions, where tourism destinations spread across islands, causing planes to become one of the most frequently used transportation modes. Other vehicles used in tourism transportation are also able to increase emissions significantly due to the use of fossil fuels which are still dominantly used (Jamnongchob et al., 2017; Zhang et al., 2019).

Table 9 Short-Run and Long-Run NARDL for Total Energy Consumption

Outcome Variable(3): lnenergycons				
Variable	**Coefficient**	**Standard Error**	**t-statistic**	**p-value**
Short Run				
$\Delta\mathbf{lntourism}_j^+$	0.337568*	0.200690	1.74	0.094
$\Delta\mathbf{lntourism}_j^-$	0.024918*	0.172057	1.85	0.076
Long Run				
$\mathbf{lntourism}_j^+$	0.5147297***	0.219658	2.34	0.028
$\mathbf{lntourism}_j^-$	-0.0244621	0.158727	-0.15	0.879
Deterministic				
Trend	-0.014554*	0.007925	-1.84	0.079
SB	-0.039115	0.036837	-1.06	0.299
ECT	-0.000163	0.015388	-0.01	0.992
Constanta	0.085736***	0.026213	3.27	0.000
R^2	0.7305			
$F_{FF}(17,25)$	3.83***			0.001

Note. ***p<0.01, **p<0.05, and *p<0.1

Then, based on Table 9, it can be seen that asymmetrically (both positive and negative) international tourist visits have a significant effect in the short term, and in the long term, only the increase has a significant effect. In the short term, it is known that an increase in international tourist arrivals by 1 percent has an effect on increasing total energy consumption by 0,33 percentage points, while a decrease of 1 percent only reduces total energy consumption by 0,02 percentage points. The results of this study are in line with research by (Katircioglu, 2014) and (Katircioğlu, 2014), which state that in the long term, international tourist visits have a positive and significant effect on the amount of energy used.

This study's findings are consistent with (Khanal et al., 2021) conclusion that tourism's numerous activities, including transportation and hotel lodging, contribute to a rise in energy consumption. Hotels are tourist lodgings that are energy-intensive due to the behavior of their tenants, where numerous services and requests for amenities and operations are valid 24 hours a day, 365 days a year (Smitt et al., 2021). Therefore, hotels are among the top 5 regarding the largest energy consumption in the tertiary building sector (Hotel Energy Solutions, 2011).

Based on the Hotel and Other Accommodation Statistics 2019, it is known that hotels are one of the dominant accommodations in the tourism sector in Indonesia, where until 2019, there were 3,516-star hotel businesses out of 29,243 tourism accommodation businesses or around 12.02 percent. Meanwhile, for non-star accommodation businesses, there are 12,246, or about 47.60 percent (Statistics Indonesia, 2019). In Indonesia, buildings, including hotels, use 50 percent of energy in general or 70 percent of electricity from total consumption, exceeding industry and transportation. Hospitality specifically contributes to national energy use by 3 percent, with a growth rate of 8.6 percent per year (USAID, 2015). With a large number of hotels in Indonesia and average growth of 8 percent per year, an energy-saving strategy or the use of environmentally friendly energy is needed (Statistics Indonesia, 2019).

Causality and Stability Test

A causality test was conducted using the Vector Autoregressive (VAR) model to see how the relationship between the independent variable (x) and the dependent variable (y) was related. By setting the optimum lag of 1, linear and non-linear causality tests were carried out.

Table 10 Symmetric Causality

Symmetric Causality		
Panel A: Causality Test (Dependent Variable: Real PDB Per Capita)		
x → y	lny_t	$lntourism_t$
lny_t	-	$\chi^2(I)$ = 3.9859**[0.046]
$lntourism_t$	$\chi^2(I)$ = 4.8541*[0.088]	-
Panel B: Causality Test (Dependent Variable: CO2 Emissions)		
x → y	$\mathrm{lncoemiss_t}$	$\mathrm{lntourism_t}$
$\mathrm{lncoemiss_t}$	-	$\chi^2(\mathrm{I})$ = 9.7846***[0.002]
$\mathrm{lntourism_t}$	$\chi^2(\mathrm{I})$ = 4.5376*[0.091]	-
Panel C: Causality Test (Dependent Variable: Total Energy Consumption)		
x → y	$\mathrm{lncoemiss_t}$	$\mathrm{lntourism_t}$
$\mathrm{lnenergycons_t}$	-	$\chi^2(\mathrm{I})$ = 1.9385 [0.164]
$\mathrm{lntourism_t}$	$\chi^2(\mathrm{I})$ = 6.7794 ***[0.004]	-

Note. ***p<0.01, **p<0.05, and *p<0.1

The symmetrical causality test shows that there is a two-way relationship between real GDP per capita and the number of international tourist arrivals, as well as CO2 emissions and the number of international tourist visits. Then, it is also known that there is a one-way relationship between international tourist visits and total energy consumption. The results of this study are in line with research by (Kumar et al., 2019) which states that there is a two-way causality between the number of international tourist visits and the real value of GDP.

Table 11 Asymmetric Causality

Asymmetric Causality			
Panel A: Causality Test (Dependent Variable: Real PDB Per Capita)			
x → y	$\ln y_t$	$\ln tourism_t^+$	$\ln tourism_t^-$
$\ln y_t$	-	$\chi^2(I)$ = 4.5316**[0.033]	$\chi^2(I)$ = 4.8141*[0.090]
$\ln tourism_t^+$	$\chi^2(I)$ = 4.9089**[0.027]	-	$\chi^2(I)$ = 0.5254 [0.469]
$\ln tourism_t^-$	$\chi^2(I)$ =4.6991*[0.095]	$\chi^2(I)$ = 0.61849[0.432]	-
Panel B: Causality Test (Dependent Variable: CO2 Emissions)			
x → y	$\ln coemiss_t$	$\ln tourism_t^+$	$\ln tourism_t^-$
$\ln coemiss_t$	-	$\chi^2(I)$ = 17.475***[0.000]	$\chi^2(I)$ = 2.8871*[0.089]
$\ln tourism_t^+$	$\chi^2(I)$ = 6.1338**[0.013]	-	$\chi^2(I)$ = 1.0723[0.300]
$\ln tourism_t^-$	$\chi^2(I)$ = 6.6611**[0.036]	$\chi^2(I)$ = 0.41658[0.519]	-
Panel C: Causality Test (Dependent Variable: Total Energy Consumption)			
x → y	$\ln energycons_t$	$\ln tourism_t^+$	$\ln tourism_t^-$
$\ln energycons_t$	-	$\chi^2(I)$ = 2.5436 [0.111]	$\chi^2(I)$ = 1.384 [0.240]
$\ln tourism_t^+$	$\chi^2(I)$ = 7.4913 **[0.024]	-	$\chi^2(I)$ = 26503 [0.104]
$\ln tourism_t^-$	$\chi^2(I)$ = 3.1768* [0.075]	$\chi^2(I)$ = 1.3761 [0.241]	-

Note. ***p<0.01, **p<0.05, and *p<0.1.

Based on the asymmetric causality test that has been carried out, the results obtained are not much different from the symmetric causality test. Where it is known that there is a two-way relationship between an increase in international tourist arrivals ($\ln tourism_t^+$) and real GDP per capita, as well as a decrease in international tourist arrivals ($\ln tourism_t^-$) with real GDP per capita. Then there is also a two-way relationship between an increase in international tourist arrivals ($\ln tourism_t^+$) and CO2 emissions and a decrease in international tourist arrivals ($\ln tourism_t^-$) and CO2 emissions. Finally, there is a one-way relationship between the increase in international tourist arrivals ($\ln tourism_t^+$) to total energy consumption and a decrease in international tourist arrivals ($\ln tourism_t^-$) to total energy consumption.

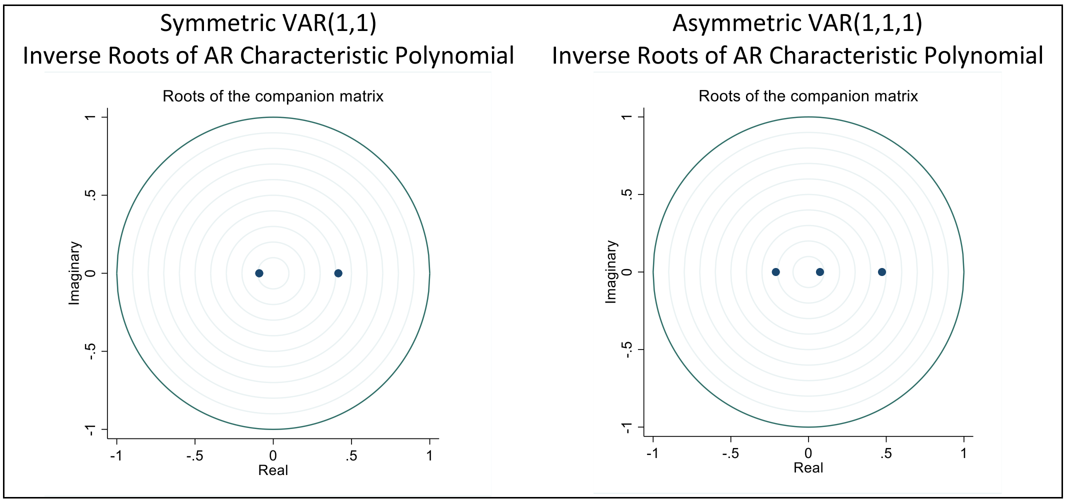

Figure 3 VAR Model Stability Test for Dependent Variable Real GDP Per Capita

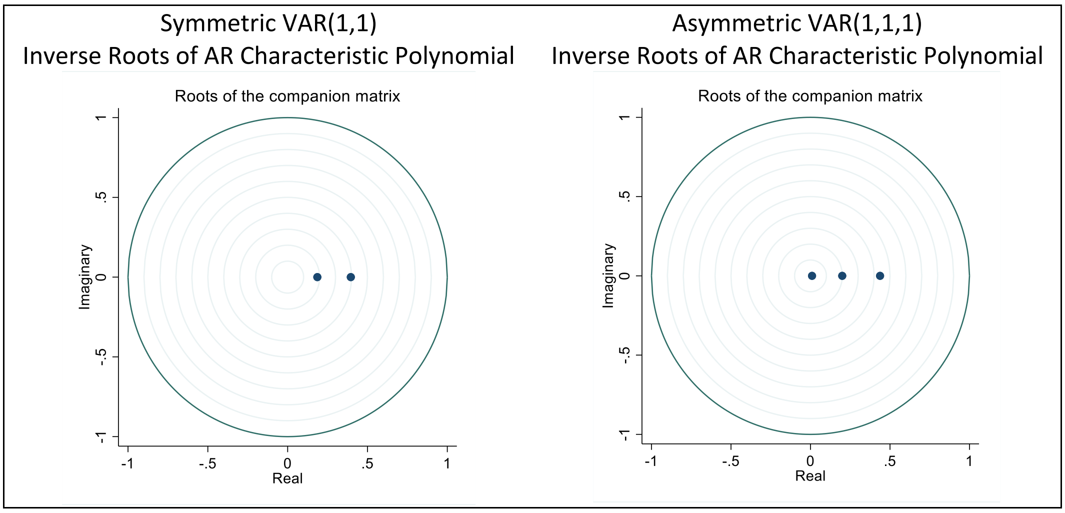

Figure 4 VAR Model Stability Test for Dependent Variable CO2 Emission

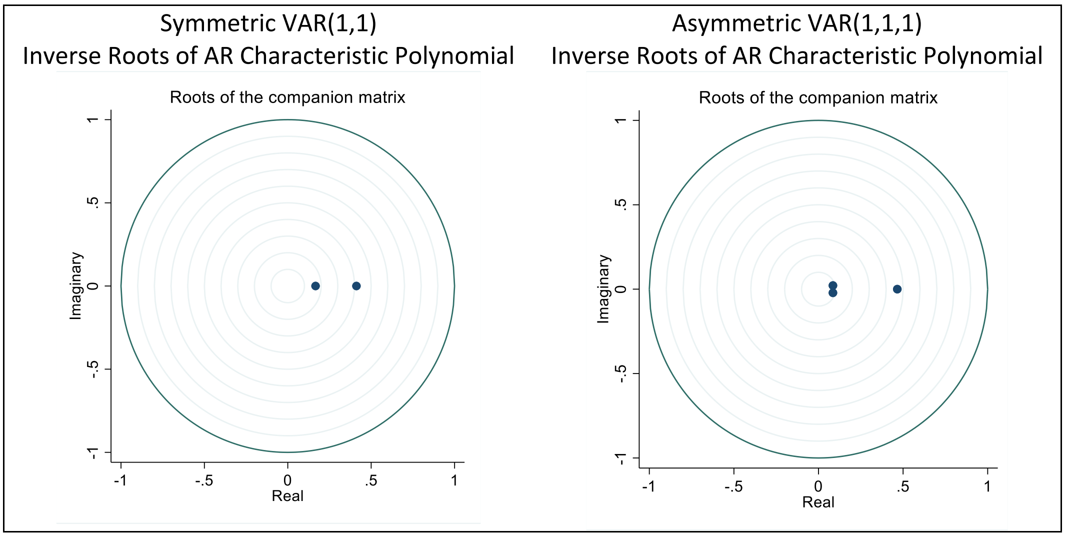

Figure 5 VAR Model Stability Test for Dependent Variable Total Energy Consumption

The stability of the VAR model was carried out using the inverse root of the autoregressive characteristic polynomial graph. Figures 3, 4, and 5 illustrate the stability of the VAR model for each dependent variable. Based on the figure, it can be seen that all VAR models are stable.

Conclusion

This study aims to examine the impact of the tourism sector as proxied by the number of tourist visits to Indonesia on the environment in terms of CO2 emission conditions and total energy consumption, and its effect on economic growth. Based on the estimation results, it can be seen that in the short term, an increase in total international tourist arrivals has a positive effect on increasing real GDP per capita and total energy consumption, while a decrease has a positive effect on reducing real GDP per capita, CO2 emissions, and total energy consumption. In the long term, an increase in total international tourist arrivals is known to have a positive effect on increasing real GDP per capita, CO2 emissions, and total energy consumption, then the decrease has a positive effect on reducing real GDP per capita and CO2 emissions. Where the increase in the number of international tourist visits has a greater effect on real GDP per capita compared to CO2 emissions and total energy consumption in the short and long term.

Based on this study's results, the importance of environmentally sustainable tourism in Indonesia can be seen. This is because if it is not handled properly, then along with the increase in the number of international tourists, which has an impact on increasing national income, there will also be an increase in CO2 emissions and total energy consumption. While along with the increase in emissions, a portion of the national income will be spent on environmental restoration. Therefore, sustainable tourism is very important to be developed optimally in Indonesia. Because sustainable tourism takes not only full account of the economic benefits, but also the current and future social and environmental impacts, addressing the needs of visitors, industry (tourism), the environment, and host communities (UNWTO, 2013).

There are several policy implications as a consideration of the results of this study. Given that an increase in the number of international tourist arrivals has a significant effect on CO2 emissions and total energy consumption, the use of carbon-neutral transportation and hybrid energy, as well as the use of cleaner energy, is deemed important. Hotels and other accommodation facilities can be encouraged to generate electricity from renewable sources. Governments can provide tax breaks or low-cost financing opportunities to purchase and install green technology for businesses in the tourism sector.

References

Antonakakis, N., Dragouni, M., Eeckels, B., & Filis, G. (2016). Tourism and economic growth: Does democracy matter? *Annals of Tourism Research, 61*, 258–264. https://doi.org/10.1016/j.annals.2016.09.018

Azizurrohman, M., Hartarto, R. B., Lin, Y.-M., & Nahar, F. H. (2021). The Role of Foreign Tourists in Economic Growth: Evidence from Indonesia. *Jurnal Ekonomi & Studi Pembangunan, 22*(2), 313–322. https://doi.org/10.18196/jesp.v22i2.11591

Davidson, L., & Sahli, M. (2014). Foreign direct investment in tourism, poverty alleviation, and sustainable development: a review of the Gambian hotel sector. *Journal of Sustainable Tourism, 23*(2), 167–187. https://doi.org/10.1080/09669582.2014.957210

Dickey, D. A., & Fuller, W. A. (1979). Distribution of the Estimators for Autoregressive Time Series With a Unit Root. *Journal of the American Statistical Association, 74*(366), 427–431. https://doi.org/10.2307/2286348

Ditzen, J., Karavias, Y., & Westerlund, J. (2021). *Testing and Estimating Structural Breaks in Time Series and Panel Data in Stata*. Department of Economics, University of Birmingham.

Fousekis, P., Katrakilidis, C., & Trachanas, E. (2016). Vertical price transmission in the US beef sector: Evidence from the nonlinear ARDL model. *Economic Modelling, 52*, 499–506. https://doi.org/10.1016/j.econmod.2015.09.030

Gössling, S. (2013). National emissions from tourism: An overlooked policy challenge? *Energy Policy, 59*, 433–442. https://doi.org/10.1016/j.enpol.2013.03.058

Gössling, S., & Buckley, R. (2016). Carbon labels in tourism: persuasive communication? *Journal of Cleaner Production, 111*, 358–369. https://doi.org/10.1016/j.jclepro.2014.08.067

Gössling, S., & Peeters, P. (2015). Assessing tourism's global environmental impact 1900–2050. *Journal of Sustainable Tourism, 23*(5), 639–659. https://doi.org/10.1080/09669582.2015.1008500

Gössling, S., Scott, D., & Hall, C. M. (2015). Inter-market variability in CO2 emission-intensities in tourism: Implications for destination marketing and carbon management. *Tourism Management, 46*, 203–212. https://doi.org/10.1016/j.tourman.2014.06.021

Gühnemann, A., Kurzweil, A., & Mailer, M. (2021). Tourism mobility and climate change - A review of the situation in Austria. *Journal of Outdoor Recreation and Tourism, 34*, 100382. https://doi.org/10.1016/j.jort.2021.100382

Hotel Energy Solutions. (2011). *Analysis on Energy Use by European Hotels – Online Survey and Desk Research.* https://doi.org/10.18111/9789284414970

Jamnongchob, A., Duangphakdee, O., & Hanpattanakit, P. (2017). CO 2 emission of tourist transportation in Suan Phueng Mountain, Thailand. *Energy Procedia, 136*, 438–443. https://doi.org/10.1016/j.egypro.2017.10.300

Kapera, I. (2018). Sustainable tourism development efforts by local governments in Poland. *Sustainable Cities and Society, 40*, 581–588. https://doi.org/10.1016/j.scs.2018.05.001

Katircioglu, S. T. (2014). International tourism, energy consumption, and environmental pollution: The case of Turkey. *Renewable and Sustainable Energy Reviews, 36*, 180–187. https://doi.org/10.1016/j.rser.2014.04.058

Katircioğlu, S. T. (2014). Testing the tourism-induced EKC hypothesis: The case of Singapore. *Economic Modelling, 41*, 383–391. https://doi.org/10.1016/j.econmod.2014.05.028

Khanal, A., Rahman, M. M., Khanam, R., & Velayutham, E. (2021). Are Tourism and Energy Consumption Linked? Evidence from Australia. *Sustainability, 13*(19), 10800. https://doi.org/10.3390/su131910800

Koçak, E., Ulucak, R., & Ulucak, Z. Ş. (2020). The impact of tourism developments on CO2 emissions: An advanced panel data estimation. *Tourism Management Perspectives, 33*, 100611. https://doi.org/10.1016/j.tmp.2019.100611

Kumar, N., Kumar, R. R., Kumar, R., & Stauvermann, P. J. (2019). Is the tourism–growth relationship asymmetric in the Cook Islands? Evidence from NARDL cointegration and causality tests. *Tourism Economics, 26*(4), 658–681. https://doi.org/10.1177/1354816619859712

Kumar, R. R., & Stauvermann, P. J. (2016). The linear and non-linear relationship between of tourism demand and output per worker: A study of Sri Lanka. *Tourism Management Perspectives, 19*, 109–120. https://doi.org/10.1016/j.tmp.2016.05.005

Kuo, K. C., Liu, M., & Lai, S. L. (2012). Effect of Tourism Development on Energy Consumption, CO₂ and Economic Growth in China. *Advanced Materials Research, 524–527*, 3380–3383. https://doi.org/10.4028/www.scientific.net/amr.524-527.3380

Lawal, A. I., Asaleye, A. J., Iseolorunkanmi, J., & Popoola, O. R. (2018). Economic Growth, Agricultural Output and Tourism Development in Nigeria: An Application of the ARDL Bound Testing Approach. Journal of Environmental Management and Tourism, 9(4), 786-794. https://doi.org/10.14505//jemt.v9.4(28).12

Lee, J. W., & Syah, A. M. (2018). Economic and Environmental Impacts of Mass Tourism on Regional Tourism Destinations in Indonesia. *The Journal of Asian Finance, Economics and Business, 5*(3), 31–41. https://doi.org/10.13106/jafeb.2018.vol5.no3.31

Lee, T. H., & Jan, F.-H. (2019). Can community-based tourism contribute to sustainable development? Evidence from residents' perceptions of the sustainability. *Tourism Management, 70*, 368–380. https://doi.org/10.1016/j.tourman.2018.09.003

Liang, C. C., Troy, C., & Rouyer, E. (2020). U.S. uncertainty and Asian stock prices: Evidence from the asymmetric NARDL model. *The North American Journal of Economics and Finance, 51*, 101046. https://doi.org/10.1016/j.najef.2019.101046

Ministry of Energy and Mineral Resources. (2020). *Energy Sector GHG Emissions Inventory.*

Ministry of Tourism. (2019). *Ministry of Tourism Perfomance Report 2019*.

Ministry of Tourism. (2020). *Ministry of Tourism Perfomance Report 2020*.

Nepal, R., Indra al Irsyad, M., & Nepal, S. K. (2019). Tourist arrivals, energy consumption and pollutant emissions in a developing economy–implications for sustainable tourism. *Tourism Management, 72*, 145–154. https://doi.org/10.1016/j.tourman.2018.08.025

Nusair, S. A. (2016). The effects of oil price shocks on the economies of the Gulf Co-operation Council countries: Nonlinear analysis. *Energy Policy, 91*, 256–267. https://doi.org/10.1016/j.enpol.2016.01.013

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics, 16*(3), 289–326. https://doi.org/10.1002/jae.616

Phillips, P. C. B., & Perron, P. (1988). Testing for a unit root in time series regression. *Biometrika, 75*(2), 335–346. https://doi.org/10.1093/biomet/75.2.335

Pigliaru, F., & Lanza, A. (2000). Tourism and economic growth: does country's size matter?. *Rivista Internazionale di Scienze Economiche e Commerciali, 47*(2000), 77-85. Retrieved from https://iris.unica.it/handle/11584/1227

Ridderstaat, J., Croes, R., & Nijkamp, P. (2013). Tourism and Long-run Economic Growth in Aruba. *International Journal of Tourism Research, 16*(5), 472–487. https://doi.org/10.1002/jtr.1941

Ritchie, J. R. B., & Crouch, G. I. (2003). *The competitive destination : a sustainable tourism perspective*. CABI Pub.

Saptutyningsih, E., & Duanta, A. (2021). Tourists' Preferences for Sustainable Tourism: The Case of Pok Tunggal Beach, Yogyakarta Indonesia. *Jurnal Ekonomi & Studi Pembangunan, 22*(1), 128–143. https://doi.org/10.18196/jesp.v22i1.10130

Shahzad, S. J. H., Nor, S. M., Ferrer, R., & Hammoudeh, S. (2017). Asymmetric determinants of CDS spreads: U.S. industry-level evidence through the NARDL approach. *Economic Modelling, 60*, 211–230. https://doi.org/10.1016/j.econmod.2016.09.003

Shahzad, S. J. H., Shahbaz, M., Ferrer, R., & Kumar, R. R. (2017). Tourism-led growth hypothesis in the top ten tourist destinations: New evidence using the quantile-on-quantile approach. *Tourism Management, 60*, 223–232. https://doi.org/10.1016/j.tourman.2016.12.006

Shin, Y., Yu, B., & Greenwood-Nimmo, M. (2014). Modelling Asymmetric Cointegration and Dynamic Multipliers in a Nonlinear ARDL Framework. *Festschrift in Honor of Peter Schmidt*, 281–314. https://doi.org/10.1007/978-1-4899-8008-3_9

Smitt, S., Tolstorebrov, I., Gullo, P., Pardiñas, A., & Hafner, A. (2021). Energy use and retrofitting potential of heat pumps in cold climate hotels. *Journal of Cleaner Production, 298*, 126799. https://doi.org/10.1016/j.jclepro.2021.126799

Statistics Indonesia. (2019). *Hotel and Other Accomodations Statistics in Indonesia*. Retrieved from https://www.bps.go.id/publication/2020/07/03/4206448bd185bf883b73d414/statistik-hotel-dan-akomodasi-lainnya-di-indonesia-2019.html

Sujai, M. (2016). Strategi Pemerintah Indonesia Dalam Menarik Kunjungan Turis Mancanegara. *Kajian Ekonomi dan Keuangan, 20*(1), 61–76. https://doi.org/10.31685/kek.v20i1.181

Tang, C. F., & Tan, E. C. (2017). Tourism-Led Growth Hypothesis: A New Global Evidence. *Cornell Hospitality Quarterly, 59*(3), 304–311. https://doi.org/10.1177/1938965517735743

UNWTO and International Transport Forum. (2019). Transport-related CO2 Emissions of the Tourism Sector – Modelling Results, UNWTO. https://doi.org/10.18111/9789284416660

UNWTO, UNEP, & WMO. (2008). Climate Change and Tourism – Responding to Global Challenges. https://doi.org/10.18111/9789284412341

UNWTO. (2013). *Sustainable Tourism for Development Guidebook - Enhancing capacities for Sustainable Tourism for development in developing countries*. Retrieved from https://www.e-unwto.org/doi/book/10.18111/9789284415496

USAID. (2015). Practical Guide to Energy Saving in Hotels.

Wu, P.-C., Liu, S.-Y., Hsiao, J.-M., & Huang, T.-Y. (2016). Nonlinear and time-varying growth-tourism causality. *Annals of Tourism Research, 59*, 45–59. https://doi.org/10.1016/j.annals.2016.04.005

Zaman, K., Shahbaz, M., Loganathan, N., & Raza, S. A. (2016). Tourism development, energy consumption and Environmental Kuznets Curve: Trivariate analysis in the panel of developed and developing countries. *Tourism Management, 54*, 275–283. https://doi.org/10.1016/j.tourman.2015.12.001

Zhang, L., & Zhang, J. (2020). A systematic review on tourism energy consumption, sustainable tourism, and destination development: a behavioral perspective. *Transport and Energy Research,* 295–313. https://doi.org/10.1016/b978-0-12-815965-1.00013-2

Zhang, Y., Khan, S. A. R., Kumar, A., Golpîra, H., & Sharif, A. (2019). Is tourism really affected by logistical operations and environmental degradation? An empirical study from the perspective of Thailand. *Journal of Cleaner Production, 227*, 158–166. https://doi.org/10.1016/j.jclepro.2019.04.164