



Behavior of Tourism Industry under the Situation of Environmental Threats and Carbon Emission: Time Series Analysis from Thailand

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ABSTRACT

The purpose of this study is to examine the environmental trend of tourism industry in the region of Thailand. For this objective, six dimensions for tourism and five for carbon emission as environmental factor is observed. Time duration of the study consists of 2000-2014 with annual observations. Data is collected from official webpage of world development indicator for the regression analysis. Findings of the study indicate that carbon emission through manufacturing and construction industries and carbon emission from other sector has their significant impact on tourism industry in Thailand. These findings are providing reasonable evidence for their regional and managerial implication as significant attention is required to control the harmful effect of environmental indicators on tourism industry. In addition, practical implication of the study can be expanded to other economies in ASEAN region like Malaysia and Indonesia as well. However, limitations of the study can be considered through considering of only one dimension of environmental factor (carbon emission), while ignoring others. Meanwhile, study is limited to the contemporary time duration and application of advance econometric techniques. Future studies can be reconsidered while overcoming these limitations.

Keywords: Environmental Factors, Carbon Emission, Tourism Industry, World Bank, Thailand

JEL Classifications: Q55, Z31

1. INTRODUCTION

From the context of tourism industry, both developed and developing economies in the world have their significance. Tourism sector in ASEAN region has got significant attention from the tourists because of its natural beauty and environment friendly outcomes. Since last couple of years, these economies have experienced dramatic increase of tourism from the world (Britton, 1982; D'Amore, 1988; Ioannides and Debbage, 1998). It is found that various places are attracting the tourists which give them an opportunity to explore and enjoy through location

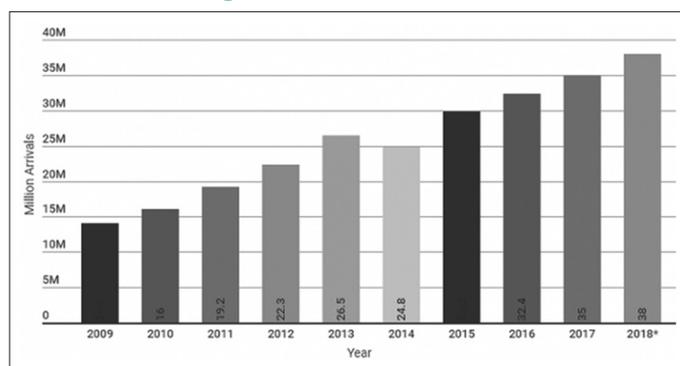
of these states. It is believed that many destinations in the world has got fast growing concept for their tourism, but with increasing concerned as well (Lee et al., 2015; Zaitseva et al., 2016). Another notion in the field of tourism industry is that mass tourism is a bad thing (Sharpley, 2015; Smith, 2015; Malimi, 2017). In addition, tourism and environmental issues are associated to each other (López-Sánchez and Pulido-Fernández, 2016; Kojo and Paschal, 2018). Reserachers are conducted their best efforts to analyze the relationship between various factors of environment and their effect on tourism industry by all means. In this regard, recommendations for the future decision is very much important

due to its social, cultural and economical implications. In addition, developing and understanding the association between natural environment and tourism provides various benefits in both fields.

From the context of Thailand, it has emerged itself in the field of international tourism with the steady growth since 1960 (Elliott, 1987; Kontogeorgopoulos, 2017; Liu and Dejphanomporn 2018). Since that time, it has developed cooperation with USA for the foreign investment in its region, improvement of infrastructure and providing a different exposure to international individuals. Meanwhile, economy of Thailand has experienced with the rapid economic transformation, and its tourism industry has been turned to “touristic transaction” (Kontogeorgopoulos, 2017). The government of Thailand has explored new areas for the attraction of international tourists in the country. Since 1980s, these efforts are continued in the economy and two major trends of tourism in Thailand has been identified (Kontogeorgopoulos, 2017). The first one is under the title of diversification of source market and second is response to western tourism market with steady growth rate. Various natural and environmental issues in the country have attained the attention by the reserachers, policy makers and related officials (Chon et al., 1993; Kontogeorgopoulos, 2017). This study has targeted the economy of Thailand to explore the idea of tourism industry under environmental threats like carbon emission, which has its adverse effect on overall climate.

The rest of the paper is as follows. Section two indicates the literature context of the study. Section three and four provides discussion about variables and methods. Section four and five explains findings of the and overall conclusion. Graph below provides an outlook of tourism industry in Thailand, covering 2009-2018 with annual observations (Figure 1). It provides million arrivals per year in Thailand from world economy for the sake of tourism. With the provision of some services to the tourists, dramatic increase in tourism revenue and international tourists is experienced in the country. However, some issues are emerging in nature, causing their adverse impact on tourism industry of Thailand. These are under the title of air pollution, environmental pollution, safety of tourists through local transportation and delivery of good health related services to the tourists. Another emerging discussion in Thailand is related to the hotel industry and its services for the tourists.

Figure 1: Tourism in Thailand



Source: (Thailand-business-supplement 2018). <https://thailand-business-supplement.com/2018/11/06/thailand-jumps-by-the-largest-amount-in-efficiency-index>

2. LITERATURE REVIEW

Various studies have examined the concept of tourism in different economies of the world. For instance, (Kamran and Omran, 2018) have examined the impact of environmental indicators, natural climate on the tourism industry of Pakistan. Data is observed over last three decades with annual observation. Multiple regression approach is applied to examine the effect of selected regressors on tourism industry. It is found that tourism industry in Pakistan is directly influenced by set of variables from natural environment, but most significant are the natural and climate indicators. Research work conducted by (Lerner and Haber, 2001; Luong et al., 2017) have explored the concept of performance for small tourism ventures with the presence of environment and development. While applying four integral model, key focus was on environmental milieu, support from the institution, entrepreneurial human capital with the services provided by business venture (Umrani et al., 2016). The results indicate that dual nature of the impact of support from institution exists on tourism sector. In addition, idea of tourism is also explored from the context of social capital as well. Akrivos et al. (2014) aims to explore the concept of entrepreneurial tourism with the adoption of sustainable resources (Haseeb et al., 2019). Research approach is based on the data collected from 75 entrepreneurial respondents. Findings of the study indicates that sustainable sources are playing significant role in determining the tourism industry. Tang et al. (2017) examine those factors which have their influence on the carbon emission of tourism industry. For this purpose, carbon decomposition model is used, extracted from a case study in China. Authors have explained that carbon emissions are significantly associated to the tourism scale and intensity of energy as well. Meanwhile, their study has contributed through focusing on theoretical framework with the development of low carbon tourism. Meng et al. (2016) have examined the quantifying direct and indirect carbon emission in tourism industry of China. It is observed that during the time of 2010, overall 2.447 carbon emission is examined from tourism industry (Jermisittiparsert et al., 2019). Practical suggestions of the study indicate that there is strong need of attention for the tourism industry and carbon emission in targeted economies.

Peeters (2010) considers the tourism transport, carbon dioxide emission and technology factors. His findings indicates the fact that final impact of consumption of energy significantly depends upon the both types of negative and positive feedback from the system of technology in tourism transport. It is also suggested that for the better future outcomes in tourism industry, focus is required towards the technological advancement in transport of tourism and related issues. Thongdejsri and Nitivattananon (2019) aims to examine the procedure for low carbon tourism program as implemented in world city of heritage towards sustainability. Design of the study is based on the sustainable tourism with set of dimensions being observed. It is observed that application of low carbon tourism program in world heritage city has provides significant feedback for the future application. Additionally, carbon emission due to increasing tourism has its managerial discussion. Chenoweth (2009) has provided his

empirical contribution for the purpose of investigating range of tourism related travel operations with the measuring the carbon dioxide emission as resulted with international vocation patterns. Research design is based on the data for the vocations in world economy with the relative values of carbon emission and their climate impact. It is found that international flights among the contents and cruise ships are causing an impact of increasing carbon emission. Meanwhile, they have suggested some approaches to lower the carbon emission in the world economy. Scott et al. (2006) examines the factor of climate change with sustainability under ski-based tourism in the north and eastern region of America. Their study has developed a model to assess the impact of climate change with the possible level of risk too. It is suggested that until the time of 2020, climate change will significantly occur in the six areas being examined with the increasing trend in up coming time as well (Haseeb et al., 2019). Some authors have expressed their opinion that climate change and weather have their significant influence on the tourism industry along with recreational activities as well (Butler, 2001; Koetse and Rietveld, 2009; Lise and Tol, 2002; Scott et al., 2005; Wall and Badke, 1994). While series of studies are conducted to explore the potential impact of climate change on different industries including tourism (Amelung et al., 2007; Becken and Hay, 2007; Gössling et al., 2002; Hall and Higham, 2005; Hamilton et al., 2005; Moreno and Becken, 2009; Perry, 2006; Scott, 2011; Scott et al., 2008; Weaver, 2011; Liu, 2018). Yet, the exploration of tourism industry from the context of climate change, environmental factors are their present and future consequences will be known as an ongoing discussion.

To the best of author's findings, this study is among the initial contribution in the field of tourism industry and carbon emission in the region of Thailand over last 15 years. Although, some studies have provided their theoretical and empirical contribution, but with limited consideration of both tourism and carbon emission factors. Significance of the study can be viewed in a way that it has investigated five dimensions for

tourism industry and six dimensions of carbon emission for separate regression findings. Meanwhile theoretical contribution of the study in existing body of literature can be viewed in a context that it is providing a comprehensive outlook in the field of tourism industry.

3. VARIABLES OF THE STUDY

For both proxies of tourism and environmental factors, below is the detailed for the variable names, abbreviations, operational definition, measurement and online data source. All data is free from any type of biasness, hence no ethical issues for the empirical investigation under regression findings.

4. RESEARCH METHODOLOGY

Present section covers the discussion for research design and methodology being adopted. This study is based on the time series data from the economy of Thailand during the time of 2000 to 2014 with annual observation. Data is collected from official web source of world development indicator WDI for all the variables of the study. After the data collection both descriptive and regression analysis approach is applied. Descriptive approach is widely used method to explore the data set and related trends over the years. While regression approach reflects the causal association between variables of the study. For present study five proxies for dependent variable under the title of tourism industry in Thailand and six dimensions for carbon emissions as major explanatory variables of environmental issues in Thailand are selected. For each of the dependent variables, separate findings are presented under results and discussion of the study.

5. RESULTS AND DISCUSSION

Table 1 explains descriptive findings of the study. Overall observation for each of the variable, selected in this study are 15

Name of variable	Abbreviation	Definition	Measurement	Data source
International tourism, expenditures (% of total imports)	ITExp	Indicates overall expense incurred by the Government in the economy	% of total imports	World bank group
International tourism, expenditures (current US\$)	ITEUSD	Indicates overall expense in terms of US dollars	Current US\$	World bank group
International tourism, receipts for travel items (current US\$)	ITR4TIUSD	Overall receipt in the economy through tourism	Current US\$	World bank group
International tourism, expenditures for passenger transport items (current US\$)	ITE4PTI	Measures the expenditure for passenger transport items	Current US\$	World bank group
International tourism, receipts for passenger transport items (current US\$)	ITR4PTIUSD	Measures the receipts for passenger transport items	Current US\$	World bank group
Carbon dioxide emission	CO ₂ EM	CO ₂ intensity	Per kg of oil equivalent energy use	World bank group
CO ₂ emissions from transport	CO ₂ EMT	Total emission from transport	% of total fuel combustion)	World bank group
CO ₂ emissions from other sectors, excluding residential buildings and commercial and public services	CO ₂ EOS	Total of emission from all other sectors in the economy	% of total fuel combustion)	World bank group
CO ₂ emissions from manufacturing industries and construction	CO ₂ EMINDC	Emission from manufacturing industries and construction	(% of total fuel combustion)	World bank group
CO ₂ emissions from electricity and heat production	CO ₂ EEHP	Emission from electricity and heat	% of total fuel combustion	World bank group

considering a time from 2000 to 2014 with annual observation. For international tourism measured through expense measured through percentage of total import is 3.913 with the deviation of 0.754. Minimum observation for ITEXP is 2.951 and maximum is 5.273. For international tourism expense measured in US dollars is 5.97E+0.09. With the deviation of 1.88E+0.09. For international tourism expense for travel items or ITE4TIUSD is 4.70E+0.09. For environmental factors, five variables for carbon emission are added in the model. It is observed for carbon dioxide emission in Thailand is 3.821 with deviation of 0.496. For carbon emission through transport measured as % of total fuel combustion, mean value is 26.875. While mean value for carbon emission through other sector is 5.216. Rest of descriptive findings for the variables are presented as follows:

Table 2 considers the effect of environmental factors like carbon emission in Thailand on international tourism expense, measured through percentage of total import. It is found that through CO₂EM effect on ITEXP is -0.509, indicating its negative influence with standard error of 0.041 and t-value of -12.41. This effect is significant at 1% level of significance as P < 0.01. Through carbon dioxide emission from transport, coefficient is 0.500 with standard error of 0.450. This impact is found to be insignificant under full sample period of interest. While carbon emission through other sector indicates an effect of 1.209 with the t-value of 1.99, explaining a direct influence on tourism industry in Thailand. While carbon emission through manufacturing and construction industries, effect on international tourism expense is 0.585, significant at 1% chance of error. While CO₂EEHP has reflected an insignificant impact on tourism expense. Overall value of explained variation as defined under Table 2 by all explanatory variables of environmental effect is 0.794, reflecting a good change. F-test has a score of 6.934 which is above threshold point of 3.50, significant at 1% chance of error. It means that all the coefficients are significantly different from zero.

Table 3 shows the effect of environmental factors like carbon emission and its influence on international tourism expense measured through US dollars. It is observed that through COEM coefficient is 2.525 with standard error of 1.195. This effect is significantly positive at 1% chance of error. Through COMET, significantly negative influence on ITEUSD is observed with the coefficient of -6.72 and standard error of 2.621. Through COEOS, effect on ITEUSD is 7.34, insignificant at all level of significance. Through COEEMINDC effect is -4.687 significant at 1% with t score of 2.257. While carbon emission through heat and production (CO₂EEHP) IS 6.364 with t-value of 2.014, significant at 1% chance of error. Overall explanatory power under model 2 as presented in Table 3 is 96.7, reflecting a higher variation by all environmental factors in international tourism expense in Thailand.

Table 4 considers the effect of environmental factors like carbon emission in Thailand on international tourism expense for travel items, measured through US dollars. It is found that through CO₂EM effect on ITE4TIUSD is 2.024, indicating its positive influence with standard error of 0.293 and t-value of 6.90. This effect is significant at 1% level of significance as P < 0.01. Through carbon dioxide emission from transport, coefficient is 2.365 with standard error

Table 1: Descriptive statistics

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
ITEXP	15	3.913	754	2.951	5.273
ITEUSD	15	5.97E+09	1.88E+09	3.22E+09	8.82E+09
ITE4TIUSD	15	4.70E+09	1.37E+09	2.77E+09	7.07E+09
ITR4TIUSD	15	1.84E+10	1.17E+10	7.08E+09	4.18E+10
ITE4PTI	15	1.27E+09	5.48E+08	4.10E+08	1.85E+09
ITR4PTIUSD	15	3.31E+09	6.83E+08	2.30E+09	4.34E+09
COEM	15	3.821	0.496	2.88	4.62
COEMT	15	26.875	1.513	24.655	29.017
CO ₂ EOS	15	5.216	0.333	4.776	5.799
CO ₂ EMINDC	15	21.375	1.207	19.662	24
CO ₂ EEHP	15	43.545	1.964	41.104	46.6

Table 2: Linear regression

ITEXP	Coef.	Std. Err.	t-value	P-value	Sig.
COEM	-0.509	0.041	-12.41	0.000	***
COEMT	0.500	0.450	1.11	0.295	
CO ₂ EOS	1.209	0.067	1.99	0.045	**
CO ₂ EMINDC	0.585	0.325	1.80	0.105	*
CO ₂ EEHP	0.475	0.367	1.29	0.228	
_CONS	-7.067	4.666	-1.73	0.208	
Mean dependent var.	3.913	SD dependent var.		0.754	
R-squared	0.794	Number of obs.		15.000	
F-test	6.934***	Prob. > F		0.006	
Akaike crit. (AIC)	21.372	Bayesian crit. (BIC)		25.620	

***P<0.01, **P<0.05, *P<0.1. SD: Standard deviation

Table 3: Linear regression

ITEUSD	Coef.	Std. Err.	t-value	P-value	Sig.
COME	2.525	1.195	2.10	0.000	***
COMET	-6.72	2.621	-2.55	0.000	***
CO ₂ EOS	7.341	4.421	1.660	0.922	
CO ₂ EMINDC	-4.687	2.257	2.07	0.000	***
CO ₂ EEHP	6.364	2.014	3.159	0.000	***
_CONS	9.654	7.684	1.287	0.359	
Mean dependent var.	5.333	SD dependent var.		1.827	
R-squared	0.967	Number of obs.		15.000	
F-test	52.615	Prob. > F		0.000	
Akaike crit. (AIC)	3.013	Bayesian crit. (BIC)		7.261	

***P<0.01, **P<0.05, *P<0.1. SD: Standard deviation

of 1.028. This impact is found to be significant under full sample period of interest. While carbon emission through other sector indicates an effect of 6.014 with the t-value of 1.91, explaining a direct influence on tourism industry in Thailand. While carbon emission through manufacturing and construction industries, effect on international tourism expense is 3.945, significant at 10% chance of error. While CO₂EEHP has reflected an insignificant impact on tourism expense. Overall value of explained variation as defined by all explanatory variables of environmental factors is 0.954, reflecting a good change. F-test has a score of 32.263 which is above threshold point of 3.50, significant at 1% chance of error. It means that all the coefficients are significantly different from zero.

Table 5 considers international tourism, receipt for travel items, measured through US dollars as main dependent variable of the study. While carbon dioxide emission considered through five items is main independent variable. Effect of CO₂ME is 1.640 on ITR4TIUSD, indicating a significant and positive effect at 1%

Table 4: Linear regression

ITE4TIUSD	Coef.	Std. Err.	t-value	P-value	Sig.
COME	2.024	0.293	6.90	0.000	***
COMET	2.365	1.028	2.31	0.000	***
CO ₂ EOS	6.014	5.102	1.178	0.425	
CO ₂ EMINDC	3.945	2.061	1.915	0.067	*
CO ₂ EEHP	-7.0125	5.740	1.221	0.807	
_CONS	1.971	3.014	0.654	0.621	
Mean dependent var.	4.333	SD dependent var.		1.3654	
R-squared	0.956	Number of obs.		15.000	
F-test	39.263	Prob. > F		0.000	
Akaike crit. (AIC)	7.772	Bayesian crit. (BIC)		2.021	

***P<0.01, **P<0.05, *P<0.1. SD: Standard deviation

Table 5: Linear regression

ITR4TIUSD	Coef.	Std. Err.	t-value	P-value	Sig.
COME	1.640	0.097	16.90	0.000	***
COMET	-4.680	2.102	-2.22	0.000	***
CO ₂ EOS	6.698	8.145	0.823	0.416	
CO ₂ EMINDC	-5.024	2.241	-2.241	0.000	***
CO ₂ EEHP	2.184	1.652	1.323	0.656	
_CONS	2.652	6.054	0.44	0.564	
Mean dependent var.	1.644	SD dependent var.		0.6354	
R-squared	0.893	Number of obs.		15.000	
F-test	14.964	Prob. > F		0.000	
Akaike crit. (AIC)	7.521	Bayesian crit. (BIC)		3.201	

***P<0.01, **P<0.05, *P<0.1. SD: Standard deviation

chance of error. Through CO₂MET effect is -4.680, significant at 1%, reflecting its negative influence on international tourism. Through carbon dioxide emission from transport, coefficient is -4.680 with standard error of 2.102. This impact is found to be significant. While carbon emission through other sector indicates an effect of 6.698 with the t-value of 8.145, explaining a direct influence on tourism industry in Thailand. While carbon emission through manufacturing and construction industries, effect on international tourism receipt is -2.024, significant at 1% chance of error. While CO₂EEHP has reflected an insignificant impact on tourism receipt. Overall value of explained variation as defined by all explanatory variables of environmental factors under Table 5 is 0.893, reflecting a good change. F-test has a score of 14.964 which is above threshold point of 3.50, significant at 1% chance of error. It means that all the coefficients are significantly different from zero, reflecting a good change.

Table 6 considers the effect of environmental factors on international tourism expense for passenger items or ITE4PTI, measured through US dollars. It is found that through CO₂EM effect on ITE4PTI is 4.0241, indicating its positive influence with standard error of 1.625 and t-value of 2.475. This effect is significant at 1% level of significance as P < 0.01. Through carbon dioxide emission from transport, coefficient is -2.697 with standard error of 1.014. This impact is found to be significant under full sample period of interest. While carbon emission through other sector indicates an effect of 6.364 with the t-value of 5.634, explaining a direct but insignificant influence on tourism industry

Table 6: Linear regression

ITE4PTI	Coef.	Std. Err.	t-value	P-value	Sig.
COME	4.0241	1.625	2.475	0.000	***
COMET	-2.697	1.014	-2.65	0.000	***
CO ₂ EOS	6.364	5.634	1.129	0.266	
CO ₂ EMINDC	-3.645	1.098	-3.319	0.000	***
CO ₂ EEHP	-6.852	7.684	-0.891	0.520	
_CONS	16.64	12.641	1.23	0.317	
Mean dependent var.	6.364	SD dependent var.		4.254	
R-squared	0.900	Number of obs.		15.000	
F-test	16.246	Prob>F		0.000	
Akaike crit. (AIC)	2.608	Bayesian crit. (BIC)		5.856	

***P<0.01, **P<0.05, *P<0.1. SD: Standard deviation

Table 7: Linear regression

ITR4PTIUSD	Coef.	Std. Err.	t-value	P-value	Sig.
COEM	2.25	1.020	2.20	0.000	***
COEMT	-6.15	3.084	-1.99	0.069	**
CO ₂ EOS	-1.92	0.542	-3.55	0.000	***
CO ₂ EMINDC	-4.97	2.01	-2.47	0.000	***
CO ₂ EEHP	-3.67	2.01	-1.82	0.0687	*
_CONS	4.87	2.087	2.33	0.000	***
Mean dependent var.	3.124	SD dependent var.		2.147	
R-squared	0.824	Number of obs.		15.000	
F-test	8.417	Prob. > F		0.003	
Akaike crit. (AIC)	6.66	Bayesian crit. (BIC)		4.917	

***P<0.01, **P<0.05, *P<0.1. SD: Standard deviation

in Thailand. While carbon emission through manufacturing and construction industries, effect on international tourism expense is -3.645, significant at 10% chance of error. While CO₂EEHP has reflected an insignificant impact on tourism expense. Overall value of explained variation as defined by all explanatory variables of environmental factors is 0.90, reflecting a good change. F-test has a score of 32.263 which is above threshold point of 3.50, significant at 1% chance of error. It means that all the coefficients are significantly different from zero.

Table 7 reflects the effect of environmental factors on tourism industry on Thailand, as measured through ITR4PTIUSD. It is observed that all items of environment under the title of carbon dioxide emission have their significant influence on tourism proxy. While the effect of CO₂EM is significantly positive, except from other proxies which have their negative and significant impact. Value of F-test is 8.417, significant at 5% level of significance.

6. CONCLUSION AND FUTURE DIRECTION

This study has empirically investigated the effect of carbon emission and its various proxies on international tourism in the region of Thailand. For this purpose, data over last 15 years have been collected from official website of world bank for both environmental factors and tourism industry. Findings through regression analysis explains that for ITEXP, significant determinants are carbon emission through overall sector, manufacturing industries and constructions, and carbon emission through other sector has their significant influence. For international tourism expense as measured through Us

dollars, effect of carbon emission overall, carbon emission through transport, carbon emission through manufacturing industries and construction, and carbon emission through heat and production is significant. For international tourism expense as measured through tourism items have a significant influence from carbon emission overall, carbon emission through transport, and carbon emission through manufacturing and construction industries. While significant determinant for international tourism receipt are carbon emission overall, carbon emission through transport, and carbon emission manufacturing and construction industries. In addition, for international tourism expenditure for passenger transport item, significant determinants are overall carbon emission, carbon emission through transport, and emission from manufacturing and construction industries. Besides, last proxy of international tourism receipt for passenger transport items has a significant influence from all proxies of carbon emission.

Based on these findings, it is concluded that for overall tourism industry, environmental factors are playing their significant role in general. While in depth analysis indicates that factors like carbon emission from manufacturing and construction industries and carbon emission through other sectors have their significant impact on all dimensions of tourism industry in the region of Thailand. These findings are providing reasonable evidence for their regional and managerial implication as significant attention is required to control the harmful effect of environmental indicators on tourism industry. In addition, practical implication of the study can be expanded to other economies in ASEAN region like Malaysia and Indonesia as well. However, limitations of the study can be considered through considering of only one dimension of environmental factor (carbon emission), while ignoring others. Meanwhile, study is limited to the contemporary time duration and application of advance econometric techniques. Future studies can be reconsidered while overcoming these limitations.

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