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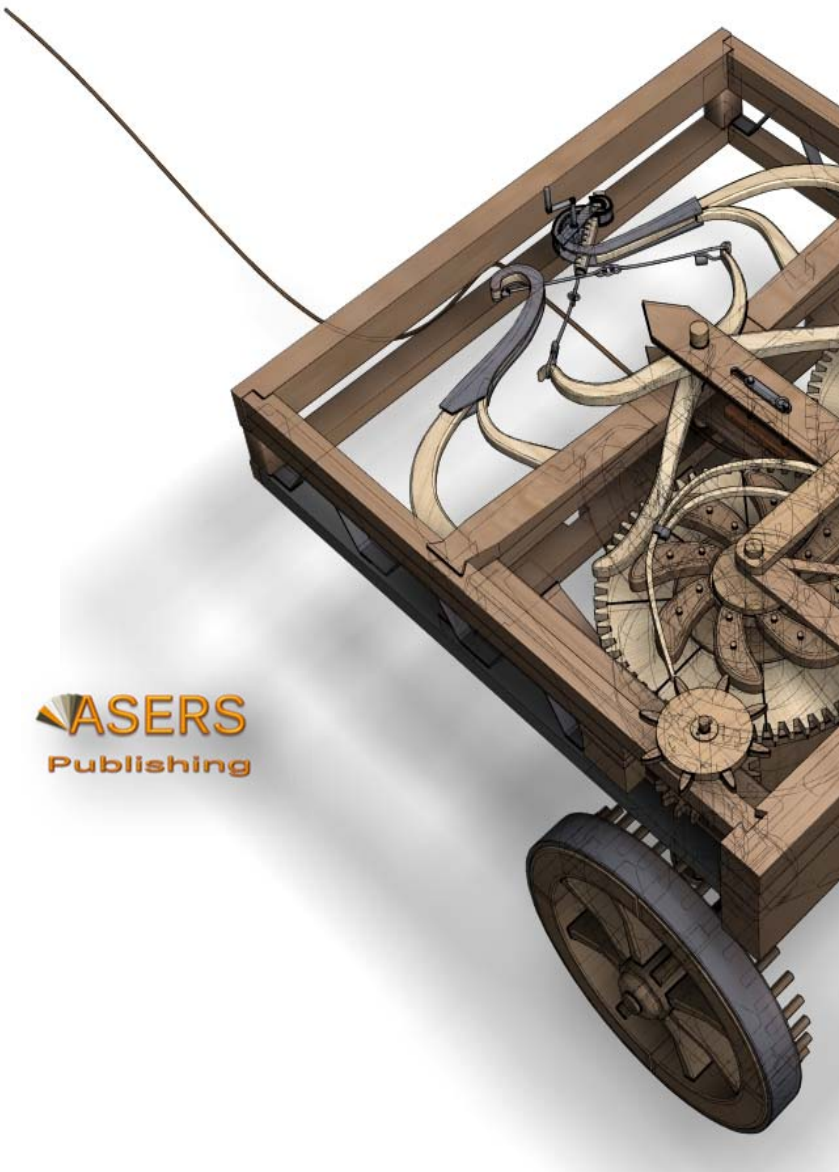

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Tourism-Energy-Environment-Growth Nexus: Evidence from India

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Abstract:

This paper examined the dynamic linkages between tourism development, energy consumption, environmental degradation and economic growth in the context of the Indian economy. The short-run findings establish a chain-link between tourism development, economic growth, energy consumption and environmental degradation. Foreign tourist arrivals positively contribute to economic growth which in turn increases per capita energy use thereby raising CO_2 emissions – a major cause of environmental degradation and consequential adverse effects on tourism development. The long-run findings, although inconclusive, are only indicative of short-run observations. Therefore, the policy focus should be on devising promotional strategies for encouraging the extensive use of clean energy for environmental protection. Such a policy base can be instrumental in fostering the development of India tourism and also, be pivotal for achieving sustainable economic growth.

Keywords: Tourism; Energy Consumption; Environmental Quality; Economic Growth; India.

JEL Classification: L83; O13; O40; P28; Q50; Z32.

Introduction

In this 21st Century, the primary focus of policy circle is promoting the economic activities that are inclusive and sustainable (Tang and Abosedra 2014). In theory, it is claimed that tourism, energy, and environment play a vital role in influencing the economic growth of a country (Banday *et al*. 2014; Mishra and Verma 2018; Sharma and Rao 2018; Nepal *et al*. 2018). In India, tourism represents a key socio-economic activity with its wide-ranging impacts on the growth of output, employment, trade, investment, revenue generation, and social and human development (Mishra *et al*. 2011; Rout *et al*. 2016; Mishra and Verma 2017; Rout *et al*. 2018). In the country, tourism is one of the largest and fastest growing service sector activities in terms of its total contribution to gross domestic product (9.4 per cent), total employment (8.0 per cent), total exports (5.8 per cent), and total investment (6.3 per cent) in the year 2017 (WTTC 2018). This implies a significant potential of tourism in generating growth stimulating spirals in the Indian economy. According to the estimates by Mishra *et al*. (2018), foreign tourist arrivals in India will continue to increase in the coming years. The growth of tourist traffic and the increase in the number of tourists will not only contribute to the economic growth, but also add to its energy consumption and enunciate the associated environmental problems thereby denting the ultimate goal of achieving inclusive and sustainable development in the country.

Although tourism has long been considered as a smokeless industry, Higham *et al*. (2016) described it as an environmentally damaging industry on account of the Green House Gases (GHGs) that it emits due to the increased tourist mobility. Gossling and Peeters (2015) estimated that the global tourism system has caused 1.12Gt carbon emissions over 1900-2010. While pointing out the reasons for such environment degrading emissions, Cadarso *et al*. (2016) fixed the responsibility with the intensive use of energy in different tourism-related activities. An estimate by UNWTO (2008) already made it clear that 75 per cent of tourism sector CO_2 emissions are being caused by transportation (40 per cent by air transport, 30 per cent by car transport & 30 per cent by other means of transport) while 21 per cent and 4 per cent of emissions are caused by accommodation and tourist activities respectively. As per the estimates of Gossling and Peeters (2015), the global environmental impact of the tourism sector due to a one-night stay in accommodation is the emission of CO_2 ranges between 0.1 and 260kg.

Such environmental degradation has consequences both for the tourism sector and the overall economic growth of a country. It has been globally observed that tourist hesitates to return to polluted, dirty and unattractive destinations when alternative destinations are available at comparable prices (Butler 2000). In a most recent study, Tugcu and Topcu (2018) noted that the carbon emissions had a negative impact on tourism receipts in 10 most visited countries viz., France, US, Spain, China, Italy, Turkey, UK, Germany, Russia, and Malaysia during 1995-2010. Thus, tourism sector development gets affected by environmental issues like pollution, global warming, waste increases etc. (Stefanica and Butnaru 2015). Similarly, increased levels of environmental degradation due to tourism sector negatively affect the job environment, manpower productivity, farm productivity, revenue generation, national income and human well-being in a developing country like India (Ginevicius *et al*. 2017; Vijayalaxmi and Saravanakumar 2017; Sinha and Bhatt 2017).

Therefore, tourism in India needs to be considered from the viewpoint of energy consumption and the emission of GHGs. This has also been the argument of researchers around the world (see Dubois and Ceron 2006; Kelly and Williams 2007; Kuo *et al*. 2012; Tiwari *et al*. 2013; Nizic *et al*. 2016; Nizic *et al*. 2017; Sghaier *et al*. 2018). Therefore, the broad objective of this paper is to investigate the nexus between tourism development, energy consumption, environmental pollution and economic growth in India.

1. Literature Review

In the era of globalization, tourism represents one of the largest and fastest growing industries primarily due to the substantial decrease in travel costs and easy availability of information on destinations almost all over the world (Isik and Radulescu 2017). As such researchers tend to describe tourism as an engine of economic growth (Mishra *et al*. 2016; Isik *et al*. 2017; Rout *et al*. 2018). India, because of its rich social traditions, cultural heritage, spiritual footprints, colourful fairs & festivals and natural beauties (Chaiboonsri and Chaitip 2012; Mishra and Verma 2019) offer a wide range of tourism products including heritage tourism, spiritual tourism, eco-tourism, adventure tourism, science tourism, rural tourism, agri-tourism and medical tourism (Dhariwal 2005; Mishra and Verma 2019) which attract a large number of visitors from different parts of the Globe. As a consequence, India depicts a continuous increase in both domestic and foreign tourist visits to all its States/UTs. The domestic as well as foreign tourist visits during 1991 and 2016 witnessed a compound annual growth rate of 13.03% and 8.25% respectively in the country (MoT 2017). If at least this trend will continue, then the Indian tourism industry would require huge amounts of energy for the production of its products, services and visitor experiences.

In the literature, it has been argued that recreational tourism contributes considerably to the energy and environmental costs of a nation (Becken *et al*. 2003). Particularly, energy is needed to facilitate transportation of visitors, and to provide them with amenities and other supporting facilities such as catering, accommodation, and management of tourist attractions at the destinations (Becken *et al*. 2003; Kelly and Williams 2007; Liu *et al*. 2011; Tiwari *et al*. 2013; Tang and Abosedra 2014; Perles-Ribes *et al*. 2017; Sghaier *et al*. 2018). The resulting energy consumption is considered as the significant cause of increased emissions, reduced environmental quality, and compromised visitor experiences at tourism destinations (Gossling 2002; Kelly and Williams 2007; Katircioglu *et al*. 2014; Gamage *et al*. 2017). This environmental degradation is potential enough to adversely influence the subsequent tourism demand and development opportunities at destinations thereby fettering the march of the nation towards sustainable development.

Such a consequence was well recognized at the World Summit on Sustainable Development in Johannesburg in 2002 and international tourism was considered to be one of the world's major energy consumers and a source of environmental pollution (Nepal 2008; Nepal *et al*. 2018). Researchers including Tang *et al*. (2011), Geng *et al*. (2011) and Kuo *et al*. (2012) have suggested for low-carbon tourism as the best policy option to ensure sustainable development of a country. The low-carbon tourism strategies can be used to obtain a

higher quality of tourism experience as well as to achieve greater socio-economic and environmental benefits with energy conservation and emission reduction (Sghaier *et al*. 2018). In the same line of argument, Alam & Paramati (2017) concludes that tourism investments play a considerable role in tourism development and to improve environmental quality by reducing CO_2 emissions. Paramati *et al*. (2017) stated that the impact of tourism on carbon emissions has been showing a faster decreasing trend in developed nations than in less developed ones thereby lending support to the environmental Kuznets curve hypothesis. The environmental Kuznets curve hypothesis implies that the impact of tourism on carbon emissions declines with an increase in real per capita income of a country (Nepal *et al*. 2018). However, such evidence for less developed countries is very limited (Chen *et al*. 2018).

Therefore, it is inferred from the review of extant literature that increases in tourist visits and activities lead to tourism development which in turn leads to a significant increase in energy consumption thereby creating a pressure on the environment and ultimately hindering the macroeconomic growth of the destination country. This type of argument is very crucial for an emerging market economy like India where the tourism industry has been witnessing a fast growth in terms of tourist visits and contributions. Although some studies addressing these issues are there in the context of various countries, India specific studies are almost non-existent. Therefore, this study has been designed to address the said issues in the Indian context.

2. Methodology

The objective of this study is to investigate the nexus between tourism development, energy consumption, environmental pollution and economic growth in the context of the Indian economy. In line with this objective, following are the hypotheses of this study: First, the existing studies support the positive relationship between the development of tourism sector and the real economic growth in India (see Mishra *et al*. 2011; Mallick *et al*. 2016; Sharma and Rao 2018; Rout *et al*. 2018). In line with this argument and in view of the growing contribution of the tourism industry in the Indian economy, it is hypothesized that *there can be a positive relationship between tourism and economic growth in India*. Second, the extant studies divulge a positive effect of tourism sector development on energy consumption (Gossling 2013). Although studies are only a few in the Indian context, the inferences from related studies such as Gossling (2000) for small Island States, Nepal (2008) for Nepal, Katircioglu (2014a) for Turkey, Katircioglu *et al*. (2014) for Cyprus, Solarin (2014) for Malaysia, and Tang *et al*. (2016) for India lend us to conclude a positive effect of tourist arrivals on energy consumption. In this context, it is hypothesized that *there can be a positive relationship between tourism and energy use in India*. Third, the related past studies reveal a positive impact of tourism on the emission of GHGs. Although studies are almost non-existent in the context of Indian economy, the experiences of China (Kuo *et al*. 2012; Tang *et al*. 2014), Malaysia (Solarin 2014; Azam *et al*. 2018), Cyprus (Katircioglu *et al*. 2014), Turkey (Katircioglu 2014a), Singapore (Katircioglu 2014b), Nepal (Nepal *et al*. 2018), Caspian Sea nations (Rasekhi and Mohammadi 2015), Asia-Pacific countries (Shakouri *et al*. 2017), South-East Asian region (Sherafatian-Jahromi *et al*. 2017) infer that the increase in the number of tourist arrivals has larger positive impacts on carbon emissions. In this context, it is hypothesized that *there can be a positive relationship between tourism and environmental degradation in India*. Fourth, past studies also indicate the growth-retarding impact of environmental degradation in terms of increased CO_2 emissions. Environmental degradation adversely affects available scarce resources and makes inefficient human capital thereby generating negative spirals for the growth of aggregate output. On the contrary, CO_2 emissions also increase along with the increase in per capita income (see Mardani *et al*. 2019 for an extensive review of the nexus between CO_2 emissions and economic growth). Omri (2013) noted the strong linkage between environmental quality and economic growth in the sense that growth may be limited when damages are made to the ecosystem. Particularly, Tiwari (2011), Azam *et al*. (2015) and Nain *et al*. (2017) provide the empirical evidence for the negative impact of CO_2 emissions on economic growth in case of India. In this context, it is hypothesized that *there can be a negative relationship between environmental degradation and economic growth in India*.

This paper investigates the above-mentioned nexus over the period spanning from 1971 to 2014. The selection of this study period is especially due to the non-availability of energy consumption data for the following years of 2014, increase in tourist arrivals, and intensified environmental degradation prompted by energy consumption. The variables included in the study are the number of foreign tourist arrivals in millions (*fta*), per capita energy use in kg of oil equivalent (*enc*), per capita CO_2 emission in metric tons (eco_2), and gross domestic product per capita at constant 2010 US$ (*gdp*). All these variables are taken in their natural logarithms to induce stationarity. The required annual data on these variables were compiled from the World Development Indicators of the World Bank, and India Tourism Statistics of Ministry of Tourism, Government of India.

In line with the theoretical and empirical arguments deduced from the past studies, and in accordance with the hypotheses of the study, the following macro-level models have been formulated:

$$gdp = f\left(fta, enc, eco_2\right) \quad (1)$$

$$fta = f\left(gdp, enc, eco_2\right) \quad (2)$$

$$enc = f\left(gdp, fta, eco_2\right) \quad (3)$$

$$eco_2 = f\left(gdp, fta, enc\right) \quad (4)$$

In addition to these models, the following model has also been stated to investigate the validity of the Environmental Kuznets Curve (EKC) while controlling for tourism and energy consumption:

$$eco_2 = f\left(gdp, gdp^2, enc, fta\right) \quad (5)$$

The model (1) assumes that the real economic growth of India is determined by tourism, energy consumption, and CO_2 emissions. The model (2) presupposes that the tourism sector mobility is influenced by economic growth, energy consumption and CO_2 emissions. The model (3) accepts that energy consumption is linked to economic growth, tourism activities and CO_2 emissions. The model (4) believes that CO_2 emission is determined by economic growth, tourism activities, and energy consumption. Similarly, the model (5) presumes that the CO_2 emission is due to tourism activities, energy consumption and/or economic growth in India.

These models have been developed for their estimation in a time-series framework. But the time series estimation requires the examination of the unit roots for understanding the stationary properties of the variables. For this purpose, Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests have been used in this study. It will be clear from these tests that the variables under the study are all integrated of order one and no one is I(2). This justifies the estimation of models (1) to (4) by employing Autoregressive Distributed Lag (ARDL) model based bounds test approach for long-run relationships and subsequent use of VAR based Granger causality approach for short-run relationships. In addition, the Ridge Regression estimation technique has been used to estimate the model (5) in the presence of very high degrees of correlation and multicollinearity.

3. Results and Discussion

At the outset, the trends in GDP per capita, per capita energy use, per capita CO_2 emissions, and foreign tourist arrivals in India during the period from 1971 to 2014 are shown in the table-1. These variables clearly depict a rising trend over the years. The growth indicator GDP per capita shows a positive trend over the years from 1971 to 2014. It has increased from the lowest (US$ 351.71) in 1974 to its peak (US$ 1645.33) in 2014. We can say that the real per capita GDP of India has almost increased 4.6 times during the period 1974-2014 with the mean per capita GDP of US$ 705.31. Foreign tourist arrival is the key indicator of tourism sector development in the Indian economy and thus, enhancing the number of such arrivals is one of the key objectives of national tourism policy. This indicator also depicts an increasing trend over the years from 1971 to 2014. The number of arrivals increased from the lowest (0.30 million) in 1971 to its peak (7.68 million) in 2014. However, the trend has been disrupted in 2001 and 2002 may be due to dot.com bust and in 2009 may be due to the effects of the global financial recession of 2007-08. Since 2010, foreign tourist arrivals have increased at a rapid pace. It infers not only the development of tourism in the country but also the growth of Indian economy in real terms. Aligned with such rising trend patterns, per capita energy use and per capita CO_2 emissions are also depicting increasing trends in the country. The per capita energy consumption has increased from the lowest (268.08 kgoe) in 1972 to its peak (637.43 kgoe) in 2014 with the mean energy consumption of 386.13 kgoe per head during the period. As a consequence, the emission of CO_2 has continuously increased from the lowest (0.36 kgoe) in 1971 to its highest (1.73 kgoe) in 2014 with the average emission of 0.82 kgoe during the period.

It is revealed from the above discussion that the considered indicators of economic growth, tourism, energy consumption and CO_2 emission represent a rising trend over 1971 and 2014. This co-movement clearly

signals the existence of certain relationships between these variables which can be helpful in examining the hypotheses of the study. However, to explore the nexus between tourism, energy consumption, CO_2 emission and economic growth, it is essential to understand the stationary properties of the time series variables. The table 2 reveals the desired stationary properties on the basis of ADF and PP unit root tests. In both these tests, the null hypothesis of unit roots for all the variables could not be rejected at level but rejected at the first differences. It means all the variables are non-stationary in their levels, but stationary in their first differences.

Table 1. Trend Patterns in GDP Per Capita, Per Capita Energy Use, Per Capita CO_2 Emissions & Foreign Tourist Arrivals in India, 1971-2014

Year	GDP Per Capita (Constant 2010 USD)	Per Capita Energy Use (kgoe)	Per Capita CO_2 Emission (metric tons)	Foreign Tourist Arrivals (millions)
1971	362.77	268.12	0.36	0.30
1981	403.88	294.68	0.48	1.28
1991	530.89	358.66	0.74	1.68
2001	785.34	417.38	0.97	2.54
2005	971.23	451.14	1.07	3.92
2010	1345.77	563.16	1.40	5.78
2014	1645.33	637.43	1.73	7.68
#Mean	705.31	386.13	0.82	2.50
#S.D.	369.37	103.94	0.38	1.98

Note: # Mean and S.D. are for the full period (1971 to 2014)
Source: Compiled from WDI, World Bank & India Tourism Statistics, MoT, Govt. of India

Therefore, no variable is integrated of order two indicating thereby that the ARDL model-based bounds test approach can be used to study the long-run relationship between economic growth, tourism, energy use, and environmental quality (Sghaier *et al*. 2018; Nepal *et al*. 2018). The results are presented in Table 3. It is inferred that the F-statistic for economic growth, tourism and energy consumption models are greater than the critical upper bound value at 1 per cent thereby rejecting the null hypothesis of no cointegration (no long-run relationship) between the variables. However, for the environmental quality model, F-statistic lies between the critical lower and upper bound values at 5 per cent thereby leaving the decision on cointegration inconclusive. Therefore, we estimated the long-run relationship of the first three models and the results are summarized in Table 4. It is observed that only energy consumption has a significant influence on economic growth and the other way around in the long-run. The results of standard diagnostic tests – serial correlation, heteroskedasticity and stability tests – are presented in Table 5 which implies that the estimations are unbiased and robust.

Table 2. Stationary Properties of GDP Per Capita, Per Capita Energy Use, Per Capita CO_2 Emissions & Foreign Tourist Arrivals Series, 1971-2014

Estimation	GDP Per Capita (Ln*gdp*)	Per Capita Energy Use (Ln*enc*)	Per Capita CO_2 Emission (Lneco_2)	Foreign Tourist Arrivals (Ln*fta*)
Augmented Dickey-Fuller (ADF) Unit Root Test (with intercept & linear trend) **H_0: Series has a Unit root**				
At Level	-1.365 (0.857)	-0.206 (0.991)	-1.814 (0.680)	-2.493 (0.329)
At 1st Diff.	-7.950 (0.000)*	-6.148 (0.000)*	-6.301 (0.000)*	-5.978 (0.000)*
Phillips-Perron (PP) Unit Root Test (with intercept & linear trend) **H_0: Series has a Unit root**				
At Level	-1.329 (0.867)	-0.384 (0.985)	-2.007 (0.581)	-2.522 (0.316)
At 1st Diff.	-10.195 (0.000)*	-6.207 (0.000)*	-6.329 (0.000)*	-5.969 (0.000)*

Note: Values outside the parentheses are test statistics & within the parentheses are p-values
*significant at 1% level
Source: Authors' Own Estimation

Table 3. Results of ARDL Model Based Bounds Test for Cointegration

ARDL Models	Lag Structure	F-Stat	Critical Value Bounds		
			1%	5%	10%
F_1(gdp | fta, enc, eco_2)	ARDL(1,1,0,0)	6.95*	4.29 to 5.61	3.23 to 4.35	2.72 to 3.77
F_2(fta | gdp, enc, eco_2)	ARDL(1,1,0,0)#	5.43*	3.42 to 4.84	2.45 to 3.63	2.01 to 3.10
F_3(enc | gdp, fta, eco_2)	ARDL(1,0,1,1)#	6.40*	3.42 to 4.84	2.45 to 3.63	2.01 to 3.10
F_4(eco_2 | gdp, fta, enc)	ARDL(3,3,3,1)	3.37	4.29 to 5.61	3.23 to 4.35	2.72 to 3.77

Note: #No constant and no trend in the model; In other models, only constants and no trends; *sig. at 0.01
Source: Authors' Own Estimation

On the basis of the results of the bounds test, the short-run dynamics between the variables have been estimated in a VAR framework, and the results are summarized in Table 6. These results show the Granger Causality between the variables. In the short-run, foreign tourist arrival Granger causes economic growth, and economic growth in turn Granger causes foreign tourist arrivals. In fact, economic growth and foreign tourist arrivals have feedback relationship in the short-run. Furthermore, energy consumption Granger causes foreign tourist arrivals in the short-run and this influence is significantly negative. Moreover, energy consumption Granger causes CO_2 emission and vice-versa in the short-run, and this influence is significantly positive. In addition, the lagged error correction terms (ECT), the long-run components, are negative and significant as expected in the first three models. This indicates that the deviations in the long-run relationship in the models for economic growth, tourism and energy consumption are corrected at the speed of 15.3 per cent, 12.4 per cent, and 5.7 per cent respectively per year.

Table 4. Results of Long-run Relationship in the Models

Variables	Growth (gdp)		Tourism (fta)		Energy (enc)	
	Coeff.	t-stat (p-val.)	Coeff.	t-stat (p-val.)	Coeff.	t-stat (p-val.)
gdp	-	-	3.171	1.263 (0.214)	0.924*	32.76 (0.000)
fta	0.139	0.939 (0.354)			0.095	0.609 (0.546)
enc	1.738**	2.375 (0.023)	-3.323	-1.202 (0.237)	-	-
eco$_2$	0.048	0.104 (0.917)	-0.261	-0.203 (0.839)	-0.329	-1.333 (0.191)
Constant	-3.787	-0.845 (0.403)	-	-	-	-

** and ** indicate sig. at 1% and 5% respectively*
Source: Authors' Own Estimation

Table 5 - Results of Diagnostic Tests of ARDL Models

ARDL Model Specification	BG SC LM test (p-value)	BPG Heteroskedasticity test (p-value)	Ramsey RESET Test (p-value)
ARDL(1,1,0,0)	0.075 (0.927)	1.048 (0.405)	0.414 (0.524)
ARDL(1,1,0,0)	0.666 (0.520)	0.655 (0.659)	0.651 (0.429)
ARDL(1,0,1,1)	1.963 (0.155)	1.586 (0.179)	1.613 (0.212)
ARDL(3,3,3,1)	0.042 (0.673)	0.442 (0.938)	2.388 (0.112)

Source: Authors' Own Estimation

Table 6. Results of Short-Run Relationship in the Models

VAR Models	Short-Run Results				Error Correction
	Δgdp	Δfta	Δenc	Δeco$_2$	ECT
Δgdp	-	0.125* (3.047) [0.004]	0.266 (1.194) [0.240]	0.007 (0.007) [0.916]	-0.153*** (-1.781) [0.083]
Δfta	1.598* (3.123) [0.003]		-0.411*** (-1.758) [0.086]	-0.032 (-0.222) [0.825]	-0.124** (-1.981) (0.054)
Δenc	0.053*** (1.896) [0.065]	-0.023 (-1.136) [0.263]	-	0.267* (3.951) [0.000]	-0.057*** (-1.848) [0.072]
Δeco$_2$	0.108 (0.747) [0.102]	0.013 (0.286) [0.777]	1.373* (5.061) [0.000]	-	-

Note: *, ** and *** indicate sig. at 1%, 5% and 10% respectively
Source: Authors' Own Estimation

It is noticed that energy consumption positively influences the environmental quality in terms of carbon emissions. However, the past studies as well as the theoretical argument support the validity of this relationship in the long-run also (see Sghaier *et al*. 2018). In order to verify this theoretical claim, it is essential to estimate the Environmental Kuznets Curve which envisages that environmental degradation increases with economic development when income levels are low, but decreases with economic development when income levels are higher in the long-run (Grossman and Krueger 1991; Dinda 2004; Fodha *et al*. 2010; Alam *et al*. 2016; Zaman and Moemen 2017; Sghaier *et al*. 2018).

Here, the argument is that the tourism development, on the one hand, contributes to increased income level, and on the other hand, induces energy consumption thereby causing deteriorations to environmental quality via intensified CO_2 emissions. Therefore, we have estimated the model (5) using the following regression equation:

$$Lneco_{2t} = \beta_0 + \beta_1 Lngdp_t + \beta_2 Lngdp_t^2 + \beta_3 Lnfta_t + \beta_4 Lnenc_t + \varepsilon_t \quad (6)$$

The Ridge Regression estimation technique has been employed because some of the regressors depict multicollinearity (see Table-7 and Table-8). It is revealed that Ln*gdp* and Ln*gdp*^{2} are highly correlated and having very large Variance Inflation Factor (VIF) with zero tolerance. The results of ridge regression are presented in Table-9 which infers that the coefficient in the Ln*gdp*^{2} term is negative but not statistically significant. It means although the Environmental Kuznets curve is indicative in the case of India, it is not statistically significant. However, it is confirmed that energy consumption has a statistically significant positive impact on CO_2 emissions in the country. About 1 per cent increase in energy consumption is associated with 0.62 per cent increase in CO_2 emissions, and it is statistically significant at 1 per cent level.

Table 7. Correlation Matrix (Ln*gdp*, *Lngdp*^{2}, *Lnfta*, Ln*enc*, Ln*eco*$_2$)

Variables	Ln*eco*$_2$	Ln*gdp*	*Lngdp*^{2}	Ln*enc*
Ln*gdp*	0.16234 (0.359)	-	-	-
Lngdp^2	0.16234 (0.359)	0.99999 (0.000)*	-	-
Ln*enc*	0.60049 (0.000)*	0.47928 (0.004)*	0.47928 (0.004)*	-
Lnfta	0.23573 (0.180)	0.56708 (0.000)*	0.56708 (0.000)*	0.23092 (0.189)

Note: p-values in parentheses; *denotes significance of Pearson's correlation coefficient at 0.01 level
Source: Authors' Own Estimation

Table 8. Least Squares Multicollinearity (Ln*eco*$_2$, Ln*gdp*, *Lngdp*^{2}, Ln*enc*, *Lnfta*)

Regressors	Variance Inflation Factor (VIF)	Tolerance
Ln*gdp*	4206772843986860.0000	0.0000
Lngdp^2	4206772878093800.0000	0.0000
Lnfta	1.7189	0.5818
Ln*enc*	1.3034	0.7672

Since some VIF's are greater than 10, multicollinearity is a problem.
Source: Authors' Own Estimation

Table 9. Results of Ridge Regression (Ln*eco*$_2$ is the dependent variable)

Regressors	Regular Coefficients	Standardized Coefficients	Std. Error (standardized)	t-value (standardized)	Pr(>|t|)	V.I.F
Constant	0.0249	NA	NA	NA	NA	NA
Ln*gdp*	0.0280	0.003577	0.008897	0.402	0.688	0.1261
Lngdp^2	-0.0140	-0.003577	0.008897	0.402	0.688	0.1261
Lnfta	0.0434	0.017531	0.013715	1.277	0.201	0.3001
Ln*enc*	0.6238*	0.057669*	0.013925	4.141	0.0000345	0.3088

R-squared: 0.3167; Ridge Regression (Ridge Parameter = 0.7653212 Chosen automatically and computed using 1PCs)
**sig. at 0.01*
Source: Authors' Own Estimation

Now, putting together, the results of the short-run empirical exercise infer that the tourism sector development has a positive impact on the real economic growth of India which in turn raises the energy consumption. The short-run increase in energy consumption, on the one hand, increases the emission of CO_2 and on the other hand, reduces foreign tourist arrivals to the country. The implication is that environmental degradation leaves the footprints in the country which probably discourages repeat tourist visits to India. Is this

implication valid in the long-run? Probably yes! The long-run empirical findings reveal that higher levels of economic growth lead to an increase in energy consumption which in turn raises the emission of CO_2 causing degradations to the quality of the environment in the country. It is quite likely to negatively affect tourist arrivals. However, the long-run prediction of the negative impact of environmental degradation on tourism development is inconclusive due to the absence of the cointegrating relationship between them. This warrants a further empirical investigation by which this paper is delimited.

Conclusion

This study empirically examined the relationship between tourism sector development, energy consumption, environmental degradation and economic growth in an emerging market economy of India. It hypothesized a positive relationship between tourism sector development and economic growth in the country. And, this hypothesis found to hold only in the short-run. It also hypothesized a positive relationship between tourism sector development and energy consumption in India. But the findings lend to support the negative influence of energy consumption on tourism in the country. In addition, the study hypothesized a positive relationship between tourism sector development and environmental degradation in the country. Although this relationship is indicative, it is not statistically significant in this research work. Furthermore, it hypothesized a negative relationship between environmental degradation and economic growth in India. And, it was found not valid in this research work. In the short-run, tourism sector development in terms of increase in foreign tourist visits positively affects economic growth which in turn increases per capita energy use and CO_2 emissions rise. It has adverse effects on the environment and tourism sector development. Therefore, the short-term policy focus should be on devising strategies encouraging the extensive use of clean energy for environmental protection and sustainable development. Additionally, emphasis should be given on promoting sustainable tourism products and services. This is expected to enhance foreign tourist arrivals in the country thereby generating spirals of opportunities for revenue generation, employment creation, poverty reduction and overall growth of the country.

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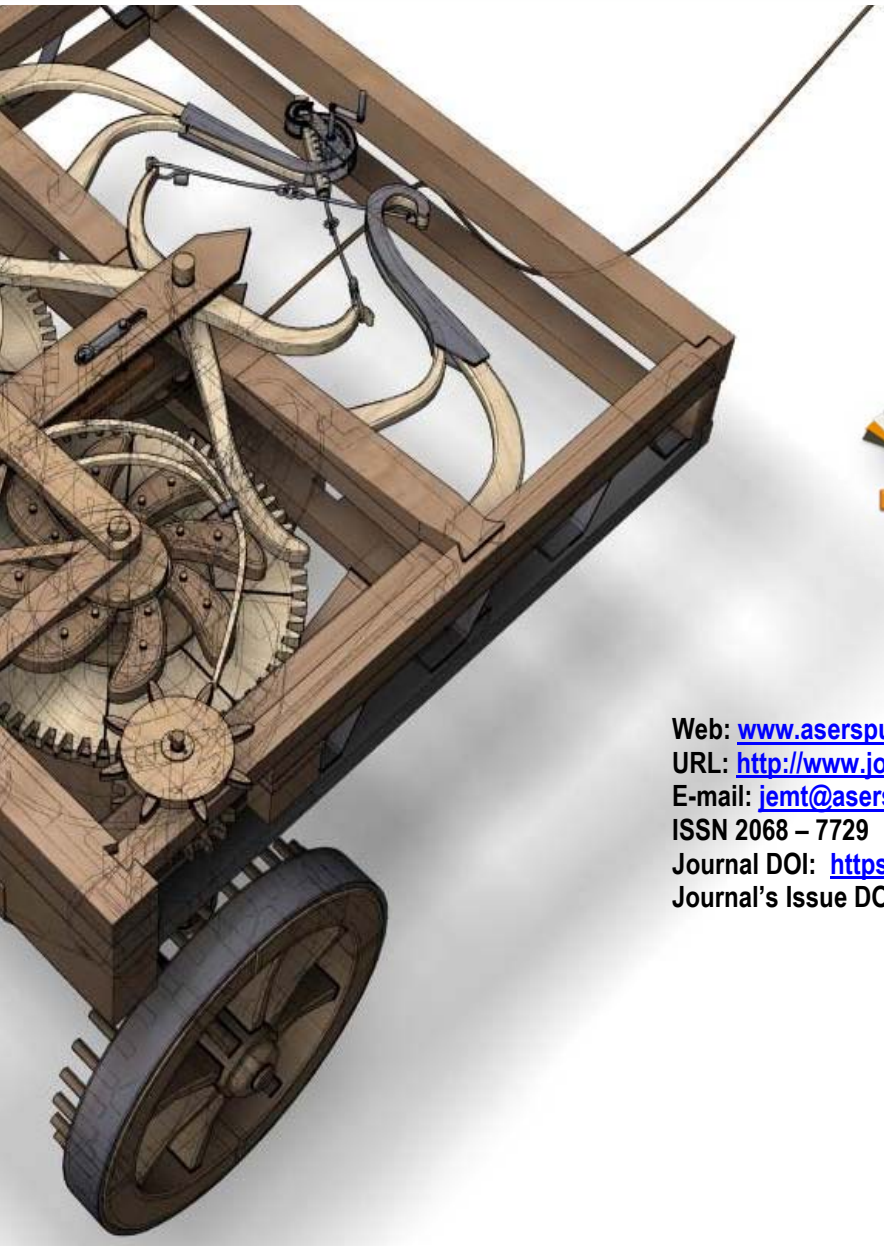

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