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Natural resources, tourism development, and energy-growth-CO_2 emission nexus: A simultaneity modeling analysis of BRI countries

Anwar Khan [a,*], Yang Chenggang [a], Jamal Hussain [a], Sadia Bano [b], AAmir Nawaz [b]

[a] West Centre for Economics Research, Southwestern University of Finance and Economics, 55 Guanghuacun Street, Chengdu, 611130, China
[b] School of Economics, Southwestern University of Finance and Economics, 55 Guanghuacun Street, Chengdu, 611130, China

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ABSTRACT

The empirical investigation of tourism and natural resources in energy-growth-CO_2 emission nexus is carried out in simultaneous equations framework for 51 "Belt & Road Initiative (BRI) countries" over 1990–2016. The dependent variables in four systems of equations are income, CO_2 emission, energy use, and tourism development index. Empirics from difference and system GMM diagnosed the feedback effect between energy use and income; also validated energy push CO_2 emission in conjunction with EKC for BRI countries. The results supported bidirectional causality between tourism and income; moreover, tourism push emission hypothesis validated for BRI countries. On the other hand, natural resources are contributing to tourism development, energy use, and CO_2 emission in BRI countries. Additionally, natural resources are contributing negatively and significantly to income, thus obeying the natural resource curse phenomenon. So, the allocation of funds on green infrastructure are required to improve the environmental quality and benefit through green tourism. Moreover, the implementation of conservation policies on "natural resources" can help the GDP growth, environmental quality, and tourism sector on a single platform.

1. Introduction

From the previous decade, tourism is considered to be among one of the most growing industries in the world, as the international tourist arrivals will reach 1.8 billion by 2030 as predicted by UNWTO (2011). The energy consumption associated with the tourism industry is also growing geometrically (Dogan and Aslan, 2017; Katircioglu et al., 2019). As a result of the accelerated depletion of natural resources, energy use is increasing with the increasing trend (Hussain et al., 2020a). The continuous consumption of energy in exploiting natural resources and tourism industry may boost economic growth, however, by generating waste, which can readily influence the quality of environment negatively (Kongbuamai et al., 2020). Theoretically, tourism development has a significant role in natural resources, economic growth processes, energy use patterns, and environmental degradation. The consumption of dirty energy for transportation and hoteling has stimulated the CO_2 emission into the environment, thus degrading natural resources (Alkhathlan and Javid, 2013; Solarin, 2014). Being its speedy growth, it is acknowledged as one of the major sectors that consume energy (Isik et al., 2018). Indeed, elements of travelling and hoteling are absorbing high frequencies of energy, thus having detrimental impacts on CO_2 emissions. Tourism development is ignored in literature as a determinant of energy consumption and its role in stimulating energy consumption patterns (Gokmenoglu and Eren, 2019). Similarly, it is identified as one of the primary determinants of energy consumption (Dogan et al., 2017; Katircioglu et al., 2014). Resultantly, it is apparent that tourism development has multifaceted impacts on economic growth, natural resources, energy consumption, and CO_2 emission through various channels. Hence, it cannot be overlooked in the empirical framework.

Natural resources considered to be the elements of economic growth and social development (Hussain et al., 2020b). At the early stages of economic growth, economies rely on natural resources, however, at later stages; people demand good air, thus the increase in environment starts (Khan et al., 2019). Therefore, both economic growth and natural resources considered to the significant elements in maintaining the environmental quality (Zafar et al., 2019). Since the natural resources provide services to human and tourism activities, it helps in absorbing

* Corresponding author.
E-mail addresses: anwar.aerc@gmail.com (A. Khan), cd6369@163.com (Y. Chenggang), hussain.jamal@smail.swufe.edu.cn (J. Hussain), saadiya.qau@outlook.com (S. Bano), aamir.nawaz@live.com (A. Nawaz).

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the emissions, and waste generated from economic, social, and tourism activities, as well as deliver material for development in facilities including, transportation, hoteling, restaurants, and tourism destinations (Kongbuamai et al., 2020). The overexploitation of natural resources may create environmental troubles in terms of environmental degradation through overconsumption and extraction (Khan et al., 2020). The role of tourism and natural resources in the simultaneous equation modelling (SEM) framework is new, and existing literature used a single equation framework, which is insufficient to define the role of both indicators into energy use, CO_2 emission, and economic growth. The relationship between economic growth and natural resources is ambiguous, like Sachs and Warner (1995) explored that countries with an abundance of natural resources reduce the economic pace of growth. However, natural resource curse is possible in the countries which have weak institutions, and the countries with sufficient good quality institutions' natural resources can be used to accelerate the sustainable pace of development (Mehlum et al., 2006). To earn economic progress, countries rely on natural resources and extracts up to thresh hold level results in natural environmental degradation. All the economic activities increase the rate of natural resource exploitation, thus increase in waste generated (Danish et al., 2019). In another way, the extensive use of natural resources in agricultural production, mining and deforestation negatively influence the environment (Hassan et al., 2019b). The issue of natural resources and environment pulls governments towards unrequired subsidies that cause ecological deprivation (Danish et al., 2019). Similarly, the requirement of energy to extract "natural resources" is a dilemma towards environmental sustainability.

The selection of Belt & Road Initiative countries (BRI) is based on two principles, and the first is that this initiative integrates almost all the continents of the globe, and the countries in this initiative experience enormous growth rates, which are no exception to environmental stress. The share of BRI countries in natural resource reserves globally is, 74.69% in coal production, 53.82% of natural gas, 58.54% of crude oil, and 55.17% of the oil supply of the world (Hussain et al., 2020a). Secondly, this initiative captures more than 62.3% of the whole population of the world, occupies 8.5% of the land area, has acquired more than 30% of the world GDP alone, with the emission level of 33.7% excluding china (Khan et al., 2019). On these grounds, the study of this initiative will have a strong basis for policies to gauge the economic growth, and give strategies to reduce environmental burden, thus able to provide sufficient pleasant environment, attract more tourism by ensuring green investment, and green tourism industry. Hence enable to maintain the natural resources potential of these countries. Therefore, the study is unique in many ways and can provide guidelines to policymakers in these countries on earliest basis.

The study is unique, and contributes to the literature in many ways, most significantly, (1) the introduction of the new regressors, which has never been put up in energy-growth-environment nexus. These variables are tourism development, and natural resources; tourism development is measured as the relative weight index of the three drivers of tourism (tourism receipts, tourism expenditures, and tourist arrivals) while natural resource rent is taken to indicates the natural resources. (2) In addition to energy-growth-environment, a separate equation of tourism is introduced into the nexus. In essence, each equation presents an independent branch of literature. The first equation is income equation commonly used to diagnose the energy-economic growth relationship under the Cobb Douglas production function, the second equation is environmental pollution equation, which explains the EKC structure, third is the energy equation, which is less often considered, and finally, we built tourism equation which is new and uses income-energy and natural resources nexus. (3) The study adopts a comprehensive perspective through a less often-used methodology simultaneous equation modelling which best fits the data in case of endogeneity, and provides efficient estimates. Finally, the contribution of this research in the literature section must not be ignored, based on the new variables, a comprehensive set of new and updated literature included in the energy-growth-environment relationship. Similarly, the current study provides a new path in the direction of methods used, which could be an asset in the broad policy conclusions.

Including the introduction, the study is categorized into six sections. The second section offers a conceptual background of the study; section three explains the energy-growth-environmental nexus in simultaneous equation framework; section four describes the data, and econometric methodology, part five consists of empirical outcomes and discussion and section six concludes the study.

2. Review of the empirical literature

The significance of simultaneous equation modelling (SEM) in empirical work is getting attention due to its adequate causal dimensions. Previously, the causal relationship across the variables was tested with Granger (1969) causality approach when the SEM was less known. However, the causality approach provides the causal relationship being unable to show the sign and magnitude of variables. SEM solves this problem and adds additional benefits of including more controlled variables in the structural model to control the omitted variable biasness (Arminen, 2018; Omri, 2013).

First, the economic growth and environmental nexus relied heavily on the hypothesis of the "environmental Kuznets curve (EKC)". The relationship establishes the inverted U-hypothesis between per capita GDP and indicators of environmental degradation (Grossman and Krueger, 1995). Past literature (Sapkota and Bastola, 2017; Al-Mulali et al., 2016; Danish et al., 2019; Hafeez et al., 2018; Yasmeen et al., 2018) have extensively used single equation models based on CO_2 emission due to availability of data, discussion and role of CO_2 in climate change. Secondly, the energy growth nexus sparked after the pioneering work of Kraft and Kraft (1978), and for more detail (see Sofien and Omri, 2016) that developed four hypotheses based on economic growth and energy consumption. Firstly, the unidirectional causality links form the consumption of energy to GDP growth. Secondly, the conservation hypothesis explores the one-way causal relationship from GDP growth to energy use. Thirdly, the feedback hypothesis, which indicates that the causal linkages between energy and GDP growth are two-way. Finally, the neutrality hypothesis says that there is no causality between energy use and economic growth at all.

This study distributes the review of literature into four subsections; the first section of research explains the past relationship of "natural resources and economic growth", the second section is focused on the relationship between "natural resources and environment", third is based on tourism and economic growth. The fourth section explores the past studies on the relationship between tourism and the environment. We discussed them each in detail below.

2.1. Natural resources and GDP growth

Existing studies have not accounted for "natural resources in the energy-growth and environment nexus"; however, the relationship between natural resources and economic growth is discussed in some detail. The interrelationship of economic growth and natural resources evolved after the phenomenon of the natural resource curse.[1] Due to this

[1] Growth in resource scarce countries is higher as compared to resource abundant countries. This phenomenon is named as "resource curse theory or paradox of plenty" after the seminal work of Sachs & Warner (1995) see (Havranek et al., 2016). The paradox of plenty occurs because of the countries utilizing more of its energy on single sector by neglecting other sectors of the economy. Thus, the countries become more dependent to prices of goods and GDP becomes more volatile. Further, corruption in government organizations escalates when proper resource rights and income distribution not establishes in society, hence unfair regulation of industrial sector rises. For detail, see (Sachs and Warner, 1995).

resource curse issue, the countries spoil their natural resources like oil, minerals, metals and energy resources, this phenomenon was revealed in many studies (Havranek et al., 2016; Mehlum et al., 2006). There is another way around, economists like David Ricardo and Rostow have observed that natural resources endowment has explored the opportunities of investment in developing countries. Brunnschweiler (2008) explained that natural resources stimulate economic growth through institutional quality. Hassan et al., (2019a) have revealed that the rapid rise in industrialization and urbanization have increased the demand for natural resources; however, their study negated the resource curse phenomenon. The extraction of natural resources is progressing worldwide, especially in poor countries of the world, where the primary focus is economic growth by neglecting the importance of natural resources in the environment (Hailu and Kipgen, 2017). Hassan et al. (2019a,b) explored that the economic progress of countries are affected as natural resources are consumed over time; thus, they shifted from conservation to natural resource depletion. The poor management of natural stocks and efficient technologies can degrade natural resources. The causal relationship of natural resources, financial development and economic growth in Pakistan is tested by Nawaz et al. (2019); the results indicated that "natural resources" tends to increase the economic pace of development; likewise, their results also supported the bidirectional causality. A recent study conducted by Armey and McNab (2018) has discovered that natural resource and national expenditures have a negative relationship. There are a limited number of reviews (Danish et al., 2019; Hassan et al., 2019a; Havranek et al., 2016) conducted on the relationship between natural resources and economic growth; however, they failed to include this variable in the simultaneous equation form in energy-growth-environment and tourism nexus.

2.2. Natural resources and environment

The liability of climate change and environmental degradation is concerned with economic activities. Economic growth drives industrialization and urbanization, which escalates the extraction of natural resources and expands agricultural productivity (Hassan et al., 2019a). All these economic activities deplete natural resources through waste generation beyond the assimilative capacities of the natural environment (Danish et al., 2019). Additionally, "natural resources" play a critical role in the production, thus balanced supply of natural resources leads to reduce the price rise and slow down the oil consumption (Balsalobre-Lorente et al., 2018). The understandings on the association between GDP, natural resources, and environmental pollution are not only relevant for policy analysis but also to make improvements in renewable energy production industries. It is worth mentioning that various past researches have ascertained the association of natural resources to GDP growth and but not to CO_2 emission. In empirical testing, the inclusion of natural resources in "energy growth and environmental nexus" as an explanatory variable is new, and there is no vast literature available, which has tested the relationship of "natural resources and energy-growth-environment" link. The latest studies, for example, Balsalobre-Lorente et al. (2018); Danish et al. (2019); and Hassan et al. (2019b) have been conducted; however, their results based on contrasting opinions and having single equation models suggesting further attention towards the empirical analysis of the topic.

2.3. Tourism sector and GDP growth

A wast number of the studies have explored the causal linkages and long-run magnitude between GDP growth and tourism by using a variety of tourism development indicators for many countries and panels (Dogan and Aslan, 2017). The rapid expansion in this relationship is observed in the past decades. Tourism push growth is started from the seminal work of McKinnon (1964), who said that foreign exchange had brought tourism to the country, that can be utilized to produce more goods and services, thus enhancing economic growth. On the other hand, the work on growth push tourism is limited, reasoning that, if a country applies more economic policies with quality investment in physical and human infrastructures will reach economic development, and this development transmits into the tourism industry (Škrinjarić, 2019). Studying the data of non-OECD and OECD countries, Lee and Chang (2008) have diagnosed that improvement in the tourism industry has less influence on the growth of OECD compared to non-OECD countries. Their results established a feedback relationship between economic growth and tourism for OECD countries; on the other hand, unidirectional causality has noticed in non-OECD countries. Likewise, Katircioglu (2009) explored one-way causal communication from economic growth to tourism in Cyprus. Payne and Mervar (2010), using Toda and Yama moto granger causality revealed that tourism led growth hypothesis is existed in Croatia. In addition, Tang (2011) discovered the growth led tourism hypothesis for Malaysia. In similar lines, Bilen et al. (2017) revealed that Dumitrescu-Hurlin causality supported the unidirectional causality from tourism to economic growth where bidirectional causality resulted using Croux-Roesens causality test. Additionally, Cortes-Jimenez and Pulina (2010) diagnosed two-way causal nexus in Spain, in developed and developing countries by Seetanah (2011), in European countries by Çaglayan et al. (2012), and in the non-OECD countries Lee and Chang (2008). The past studies on the topic indicate the tourism index as the relevant determinant of economic growth; thereby, we have incorporated this variable by considering the omitted variable biasness in the data.

2.4. Tourism and environment

Various recent studies have tested the relationship between tourism and CO_2 emission. Lee and Brahmasrene (2013) investigated the association of tourism and economic growth on CO_2 emission using the Johansen cointegration test from 1988 to 2009 for European countries. The empirical findings proposed that tourism enhances both economic growth and CO_2 emission for the study area. Solarin (2014), in the case of Malaysia, narrated the visibility of the long-run relationship between CO_2 emissions; further, the results discovered a unilateral causal linkage from tourism to CO_2 discharge. In similar lines, Zaman et al., 2016b for east Asian countries have indicated that the causality from tourism to CO_2 and GDP to tourism is unidirectional. They were using GMM for the data of Asia Pacific countries over 1995–2013. Similarly, Shakouri et al. (2017) found a significant contribution of tourism on CO_2 emission.

Further, Shakouri et al. (2017) revealed that a one-way causal relationship was from CO_2 emission to tourism for the study area. Testing the data for Malaysia Solarin (2014) using the ARDL model from 1972 to 2010 exposed that there is a long-run positive relationship between tourist arrivals and CO_2 emission. In a similar study, Ben Jebli, M., Ben Youssef, S. & Apergis (2015), using panel data for 1995–2010 discovered that tourist arrivals and energy use have adverse effects on the environment in Tunisia. They show that tourist arrivals, in the long run, reduce the CO_2 emission. Zhang and Liu (2019) testing the data of ten Northeast and South East Asian countries have found that improvement in tourism development may help regenerate the environmental amenities in the long run however the tourism is witnessed to be degrading element of the environment in this region.

The discussion of literature has confirmed that the studies conducted in the past have mixed results for the relationship of considered variables. Therefore, more attention is required to empirically test the link to suggest reliable policies for a sustainable development process. Thus, SEM is a secure way to reach this objective.

3. Theoretical settings

Since, the connexion between energy-growth-environment and tourism index is interested in the association of energy consumption, economic development, environmental pollution, and tourism development. The estimators used in this scenario allow the energy-growth-

CO_2 emission and tourism to be determined simultaneously by enabling them for reverse causality. Thus, an effective alternative, which a few studies in the past have undertaken, is simultaneous equation modelling. Therefore, simultaneous equation modelling based on the energy-growth-environment and tourism relationship uses four equations: separate equation for each energy, growth, environment, and tourism.

3.1. Income function

To examine tourism development and natural resources in the energy-growth-CO_2 framework for BRI countries, we employed the Cobb-Douglas production function in our study. In this function, GDP is the function of capital and labour. Similarly, GDP is also the function of energy that has a direct relationship with economic growth (Abdouli and Hammami, 2018). Thus, we use the following general form of Cobb-Douglas production function;

$$Y = AK^{\propto}E^{\gamma}L^{\phi}\varepsilon^{u} \tag{i}$$

Where Y denotes real income, E is used for energy consumption; K&L is used for capital and labour as production factors. The term A is technology and ε^{u} is used for error terms. α, γ *and* ϕ are production elasticities of capital, energy use, and labour force. When the elasticities in the Cobb-Douglas function are restricted to $(\propto = \gamma = \phi = 1)$, the function shows constant returns to scale. The use of energy and CO_2 emission appears to be directly related to the given technology level and at any point in time (Abdouli and Hammami, 2016). Thus, energy is the function of CO_2 emission and is expressed as; E = bCO2.

$$Y = b^{\gamma}AK^{\alpha}CO2^{\gamma}L^{\phi}\varepsilon^{u} \tag{ii}$$

In our model, technology is endogenously determined by the use of natural resource extraction, gross fixed capital formation, and tourism development index (Abdouli and Hammami, 2018; Zaman et al., 2016b). The development in the tourism industry provides funds to accelerate capital formation in the country, which in turn promotes economic growth through investment in capital stock, thus increasing the production level and investment in environmental projects. That is why we have;

$$A_t = \vartheta CF(t)^{\alpha}NR(t)^{\beta}TRI(t)^{\gamma} \tag{iii}$$

Where ϑ is time constant, CF, NR, and TRI denote capital formation, "natural resources", and tourism index "respectively in the augmented form of the Cobb Douglas production model. Combing the above equations (ii) and (iii) will give the following equation;

$$Y_t = \vartheta^{*}CO(t)_2^{\varnothing}EU(t)^{\alpha}NR(t)^{\beta}TRI(t)^{\gamma}CF(t)^{\gamma}L(t)^{1-\gamma} \tag{iv}$$

To get the values in per capita form, we assumed the constant scale of production and divided the above equation with labour in the model. Finally, by taking the log, the linear structure of the production function can of the following econometric form;

$$y_t = \alpha_{0t} + \alpha_{1t}tri_t + \alpha_{2t}nr_t + \alpha_{3t}eu_t + \alpha_{4t}cf_t + \in_t \tag{v}$$

Since our study is based on the panel data, the equation above is rewritten in the panel data structure as;

$$y_{it} = \alpha_{0it} + \alpha_{1it}tri_{it} + \alpha_{2it}nr_{it} + \alpha_{3it}eu_{it} + \alpha_{4it}cf_{it} + \in_{it} \tag{vi}$$

The lower case variables are the logarithm of income (y), tourism development index (tri), natural resources rents (nr), energy use (eu), and gross fixed capital formation (cf) and $\in$ are the error term of the regression equation(vi).

From the literature cited in Shaheen et al. (2019) and ((Khoshnevis Yazdi, Homa Salehi and Soheilzad 2017); we have seen that the relationship of tourism and income have positively related, thus providing the evidence that tourist inflows to the countries are beneficial in terms of economic progress. Therefore, the relationship between tourism index and income is expected to be a positive sign of α_1. Noticeably, the consensus on how natural resources effect economic growth is yet not built. Since the available literature on the relationship between natural resource extraction and income is mixed due to the natural resource curse (Havranek et al., 2016). Therefore, the sign of α_2 is expected to be positive/negative in the income equation. One of the primary sources of income increase in the recent energy-growth-environment nexus is pointed to be energy use; therefore, the relationship between them must be positive. Hence the sign of α_3 is positive for income equation. It is found from the extant literature that in the process of capital formation, physical and human capital is employed to improve the growth of the economy. Therefore, the relationship between gross fixed capital formation and income is positive. Finally, $\in$ is taken as error term of the regression equation.

3.2. Environmental pollution (CO_2) function

There are past studies; newest among them are; Acheampong et al., 2019; Azam et al. (2019); Dogan et al. (2019); they have accounted for a variety of determinants of environmental emission, which might serve to avoid omitted variable biasness. Therefore, we have included the tourism development index and natural resource rents to determine the different possibilities of EKC. The current study further tailored the above equation into the EKC structure by adding a quadratic form of income i-e,

$$co_2 = \gamma_0 + \gamma_{1it}y_{it} + \gamma_{2it}ys_{it} + \gamma_{3it}tri_{it} + \gamma_{4it}eu_{it} + \gamma_{5it}nr_{it} + \gamma_{6it}cf_{it} + \gamma_{7it}re_{it} + \varepsilon_{it} \tag{vii}$$

The lower case letters in the equation are the logarithm of income, income square, tourism index, energy use, natural resources, capital formation, and renewable energy. As, to the expected relationship of the variables, the signs of γ_1 *and* γ_2 are "expected to be positive and negative", respectively, which captures the standard form of "EKC hypothesis" (Apergis and Ozturk, 2015). Since the past literature (Lazăr et al., 2019; Bélaïd and Youssef, 2017; Zhang and Liu, 2019) on energy consumption and environmental emission has suggested that the coefficient of energy use(γ_4) be positive. Furthermore, tourism development increases environmental emission (Zaman et al., 2016b; Zhang and Liu, 2019), thereby γ_3 is also expected to be positive. Like the studies conducted by Danish et al. (2019) and ((Balsalobre-Lorente et al. 2018b), the natural resources have seen both positive and negative relation to environmental emission. Thus the sign of γ_5 is dependent on the nature of energy use in the extraction of natural resources, which may turn the coefficient positive or negative. The sign. of γ_6 is also calculated as positive in previous studies (Zaman et al., 2016b). Finally, the impact of renewable energy is expected to be negative, as most of the researchers for instance; Ben Jebli et al., (2019); Chen et al., (2019b) and Dong et al. (2018) have concluded that the "renewable energy" has a substantial role in improving the environment in many countries and regions across the globe.

3.3. Energy use function

To update the energy-growth-environment relationship, two new variables, tourism development index and natural resources, have been included in the energy equation. Thus, the augmented feature of this relationship can be written as;

$$eu_{it} = a_{0it} + \beta_{1it}y_{it} + \beta_{2it}tri_{it} + \beta_{3it}nr_{it} + \beta_{4it}co_{2,it} + \beta_{5it}cf_{it} + \varepsilon_{it} \tag{viii}$$

Where, the variables in the lower case indicates the logarithmically transformed variables including energy consumption (eu), per capita real GDP(y), tourism development index (tri), natural resources (nr), carbon dioxide emission (co_2) and gross fixed capital formation (cf). Where $\mathcal{E}_{it}$ is the corresponding error term.

Previous researches have concluded that energy consumption increases with economic growth (Arminen, 2018; Omri and Anis, 2013); thus, the expected sign of β1 is positive. The existing literature (Gokmenoglu and Eren, 2019) observed causal linkages from tourism to energy use, which proves the significant impact of tourism on energy. The studies by Dogan et al. (2017), and Katircioglu et al., (2014) have identified tourism as the essential factor of energy use in terms of transportation, hoteling, etc. therefore the sign of β2 has an expectedly positive sign. Moreover, the relationship between natural resources extraction and energy use found to be positive, like the more extraction of natural resources uses more sources of energy consumption (Kwakwa et al., 2020). Thus, the value of β3 is also positive. Finally, the relationship between gross fixed capital formation and energy use also seems positive. For example, more capital formation requires more use of energy resources, hence increases the production and growth level in the economy (Anthony and Shaikh Mostak, 2015).

3.4. Tourism development index function

Finally, besides the energy-growth-environment equations, this study investigates the dynamic relationship between economic growth, energy use, natural resources, and gross fixed capital formation on tourism development index in BRI countries.

$$tri_{it} = \varnothing_{0it} = \varnothing_{1it}y_{it} + \varnothing_{2it}eu_{it} + \varnothing_{3it}nr_{it} + \varnothing_{4it}cf_{it} + \in_{it} \quad \text{(ix)}$$

To determine the connexion between the chosen variables, this study has thoroughly evaluated the literature (Shaheen et al., 2019; Zhang and Liu, 2019) and found mixed results for per capita income and tourism across the countries and regions depending upon their state of economic development. Thereby, we are expecting a positive or negative sign of $\varnothing_1$in the current study. The causal linkages from energy use to tourism highlights the one-way positive relationship between energy and tourism (Zhang and Liu, 2019); however (Zaman et al., 2016b), and (Nepal et al., 2019) have seen a negative relationship between energy use to tourism. Therefore, it is expected to have both positive/negative correlations between energy use and tourism development index based on the nature of the energy mix. The relationship between natural resources and tourism is not diagnosed previously; however, we assume its signs would be positive. Finally, the effect of capital formation is expected to be positive in the current study (Nepal et al., 2019).

In summary, the four-dimensional structural equations for energy-growth-environment and tourism development index are empirically examined with the following set of equations;

$$y_{it} = \alpha_{0it} + \alpha_{1it}tri_{it} + \alpha_{2it}nr_{it} + \alpha_{3it}eu_{it} + \alpha_{4it}cf_{it} + \in_{it} \quad \text{(x)}$$

$$co_2 = \gamma_0 + \gamma_{1it}y_{it} + \gamma_{2it}ys_{it} + \gamma_{3it}tri_{it} + \gamma_{4it}eu_{it} + \gamma_{5it}nr_{it} + \gamma_{6it}cf_{it} + \gamma_{7it}re_{it} + \varepsilon_{it} \quad \text{(xi)}$$

$$eu_{it} = \beta_{0it} + \beta_{1it}y_{it} + \beta_{2it}tri_{it} + \beta_{3it}nr_{it} + \beta_{4it}co_{2,it} + \beta_{5it}cf_{it} + \varepsilon_{it} \quad \text{(xii)}$$

$$tri_{it} = \varnothing_{0it} = \varnothing_{1it}y_{it} + \varnothing_{2it}eu_{it} + \varnothing_{3it}nr_{it} + \varnothing_{4it}cf_{it} + \in_{it} \quad \text{(xiii)}$$

Besides, to the income, energy use, and environmental emission, some other variables are taken as endogenous in the system of equation in the study. If these variables were taken endogenous in 3SLS/2SLS estimators, there would be other instruments needed. The advantage of using GMM in panel data analysis is to use internal instruments as an alternative to external instruments.

4. Data accumulation and estimation

4.1. Data collection

We employed panel data in the current study that shortens the issues related to the short time series available for the energy-growth-environment nexus. In the panel data analysis, it is also possible to control for country-country specific and heterogeneous effects. Our sample is restricted to 51 BRI countries based on the availability of the data, which are presented in Appendix A1. To shrink the measurement errors and fluctuations in business cycles, the data taken is averaged based on three years following Roodman (2007). After averaging the data in three years, the final sample consisted of nine periods started from 1990 to 1992 and ended with 2014–2016.

Appendix Table A2 gives a brief introduction to the variables. Of the endogenous variables, the income level of the BRI countries is measured with per capita GDP, energy use, environmental pollution as per capita CO_2 emission. Regarding the exogenous variables, renewable energy consumption is taken as a percentage share of total energy consumption, gross fixed capital formation in the percentage of GDP, and natural resource extraction is used as total natural resource rent percentage of GDP. The World Bank (2018) data is used for estimation of the equations. To see the nature of data, Fig. 1 explains the data distribution, and we have presented the table of descriptives in appendix Table A3.

The current study further developed an index of tourism that is composed of three distinct tourism variables, including tourist receipts in US$; Tourism expenditures in US$, and the number of tourist arrivals annually based on their weights. Data on all the selected variables are drawn from world development indicators (WDI), an online database of World Bank (2018). The principal component analysis (PCA) is applied for the tourism variables to construct a single weighted index that is termed to be a tourism development index in the current study (see, Zaman et al., 2016b). PCA is a statistical approach commonly used to examine and diagnose that have an internal correlation. To reduce the amount of data needed, the present study used this method and the new variables calculated are called principal components. Table 1 show the PCA to develop an index of tourism development. First segment of Table 1 indicates the maximum Eigenvalue of 2.404 for the first component, 0.4748 for the second component, and 0.1207 for the last component. The first component shows the highest proportion of variation, which is 80.14%, followed by the second component, with 15.83%, and the third factor shows the lowest change of 0.403%. On the other hand, second segment of Table 1 signals the eigenvalue loading in three-components, including PC1, PC2, and PC3. PC2 and PC3 indicate negative and lowest values of loadings; thus, the current study uses PC1 to construct the index of tourism development. Fig. 2 on the results from the scree plot test confirms the selection of PC1, which is appropriate for the tourism development index. Finally, the last segment of Table 1 explains the existence of correlation between different variables of tourism development. As indicated from the results that the tourism expenditures and tourism receipts are positively correlated with tourist arrivals, and similarly, tourism expenditures and tourism receipts are also correlated for BRI countries.

To control and preserve for the sample size, we have interpolated some of the variables by following (Naz et al., 2019; Zaman et al., 2016a). All the variables are transformed into a log for the final estimation. Finally, since the time taken was the average of three years that is very short to test for unit roots reliably, all the considered variables were differenced. Estimation in differenced form avoids the problems with trends, and in most of the cases, the variables in first difference are more likely to be stationary (Arminen and Menegaki, 2019).

4.2. Econometric methodology

There are two options in the simultaneous system of equations, the first is a single equation system, and another is simultaneous equation modelling. Wooldridge (2010, p252) has explained the advantages and disadvantages of using both methods, and Arminen (2018) has explored the nexus of energy-growth-environment simultaneous modelling framework. The base thing in econometric estimation is the model selection process. If specified correctly, the system of the equations is reliable and gives efficient results compared to single equation modelling. Nevertheless, if one of the equations in order is miss-specified, then the parameters in the whole system are inefficient (Arminen and

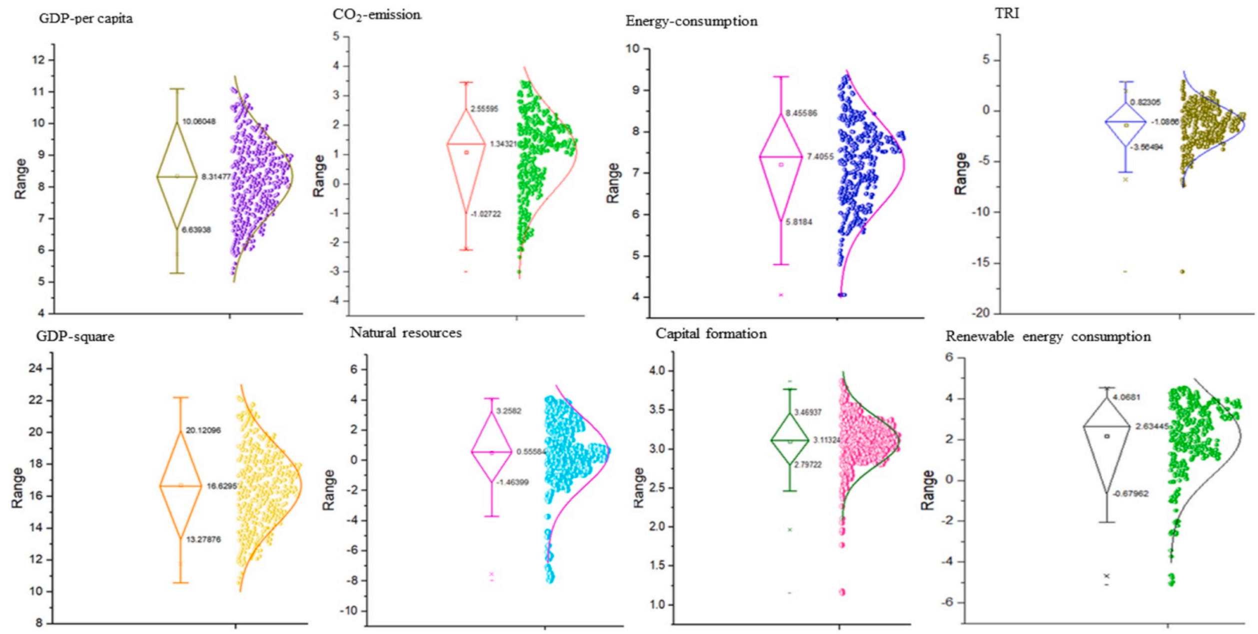

Fig. 1. Box plots of the variables.

Table 1
Tourism development index.

Eigenvalue calculation				
Number	Value	Difference	Proportion	Cumulative proportion
Component- One	2.4043	1.9294	0.8014	0.8014
Component- Two	0.4748	0.3541	0.1583	0.9597
Component- Three	0.1207		0.0403	1.0000
Coefficient estimation for PCA of Tourism index				
Variable	PC1	PC2	PC3	
TX	0.5219	0.8524	0.0326	
TA	0.6056	−0.3433	−0.7179	
TR	0.6008	−0.3944	0.6954	
Observed correlation matrix				
Indicators	TX	TA	TR	
TX	1.000			
TA	0.6181	1.000		
TR	0.5969	0.8787	1.000	

Menegaki, 2019). To avoid such impurities in results, there are studies which have used dynamic system generalized method of moments (D-SGMM) developed by Blundell and Bond (1998) and dynamic differenced generalized method of moments (D-DGMM) by Arellano and Bond (1991) and Arellano and Bover (1995) see Roodman (2009) for more detail. Arminen and Menegaki (2019) highlighted that the estimators in the SEM framework are categorized as single equation estimators due to their particular concentration on single regress and at a time. Amri (2017); Omri and Kahouli (2014) and Saidi and Hammami (2016) used differenced GMM in their SEM studies and Adewuyi and Awodumi (2017) have involved system GMM in the interrelationship of energy-growth- and environment. The essential advantage of these methods compared to others is that they rely on internal instruments for estimation. However, the external instrument advocates best in case of reverse causation, however finding external instruments is a complicated task, which varies across the units and periods. Nevertheless, Farhadi et al. (2015) have concluded that internal instruments used in differenced and system GMM acts as the best alternative to control for endogeneity in explanatory variables.

Following the studies of Amri (2017); Chaabouni and Saidi (2017); Tiba et al. (2016) and Omri and Kahouli (2014), the generalized form of SEM can be written as;

$$y_{it} = X_{it}\beta + \vartheta y_{i,t-1} + c_i + \mu_{it} \tag{xiv}$$

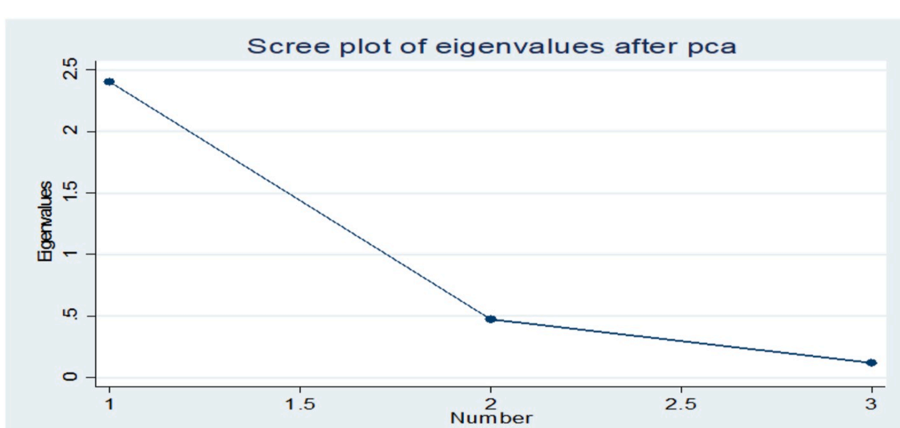

Fig. 2. Scree plot of Eigenvalues for Tourism index.

Where t is used for time dimension, and i indicates the crossection units (countries). Error terms are comprised of country-specific effects (c_i) and usual error terms(μ_{it}). The properties of country-specific fixed effects and idiosyncratic errors are attributed as $E(c_i) = E(\mu_{it})=E(c_i\mu_{it}) = 0$.

By taking the difference to eliminate the country-specific fixed effect from the above equation resulting in;

$$\Delta y_{it} = (\Delta X)_{it}\beta + \vartheta(\Delta y_{i,t-1}) + \Delta\mu_{it} \quad \text{(xv)}$$

Where Δ indicates the operator of the first difference.

After taking the first differences, the predetermined variables turn endogenous; however, the lags of regressors are still valid instruments in GMM framework. The D-DGMM approach uses predetermined and endogenous variables lags as their instruments in the first difference where the D-SGMM incorporates the system of equations in level into the first difference system of equations. Further, the D-SGMM also uses the lags of predetermined and endogenous variables in its first difference form as instruments; additionally, the lagged first differences of predetermined and endogenous variables are also capable of using as instruments in the level models. Thus, it is assumed that there is no correlation between individual effects and the disturbance terms. Finally, to the validity of instruments, the Hansen test of over-identification of instruments is employed to determine the validity of instruments chosen.

Since Roodman (2009) expressed that both D-DGMM and D-SGMM are formulated to address the large groups and few periods, most of the energy-growth-environment nexus studies have not followed this criterion. When the groups are smaller than periods, the Arellano bond test for correlation and robust standard errors does not remain accurate, which results in the issue that the number of the instrument turns quadratic to several groups in the study. If some periods is greater, the number of instruments will be more resulting in the overfitting of the model. Therefore, Roodman (2009) underlined a rule of thumb to address this issue. That is, the number of groups must be greater than the instruments. Consequently, it is required to collapse the instrument matrix to reach this goal.

5. Empirical results and discussion

To attain the objectives, we have employed two-step D-SGMM and two-step D-DGMM in the current study. To estimate the empirical results, we used XTABOND2 module developed by Roodman (2009). Arminen (2018) has highlighted that system, and differenced GMM are designed for greater N (cross-sections) and small T (periods). However, energy-growth-environment nexus has not always considered this. Ignoring these profits is that, the Arellano second-order autocorrelation and cluster robust standard errors remain unreliable if the number of units is minimal. Secondly, if the periods are large, the dynamic panel becomes insignificant. On the other hand, the number of instruments is quadratic to a number of cross-sections, which over fits the model by adding more instruments compared to sample size. Therefore, Roodman (2009) introduced a thumb rule that a number of groups must be higher than instruments used in the model; this objective is achieved by using the collapse option to limit the lags of instruments used in the model (Arminen, 2018). Finally, time dummies have added in the models to hold the idiosyncratic error term properties on the assumption of no autocorrelation across the countries.

5.1. Income model

The empirical outcomes for difference and system GMM for four models are exhibited in Tables 2–5. Model (1) & (3) are estimated with D. DGMM and model (2) & (4) are estimated with S. DGMM estimator. Table 2 summarizes the results of the income equation, which indicates that the lagged term of income in all the four models estimated with difference and system GMM are found to be significant, which implies the existence of long-run relationships. The significant positive value of energy use appears to be robust, thus confirming that the energy use as a factor of production. This result is consistent with many past studies, for example, Arminen and Menegaki (2019), Shaheen et al. (2019), and (Esen and Bayrak, 2017). Energy is the most important determinant of economic development; therefore, its role in determining the production structure of an economy is crucial (Shaheen et al., 2019). On the other hand, the coefficient of tourism index is positively significant in all the models, which provides evidence that in the case of BRI countries; tourism responds to income positively that increases the development pace, referring to the past studies (Al-mulali et al., 2014; Paramati et al., 2017; Shaheen et al., 2019). CF in all the models is significant with a positive sign, which contributes to the economic growth of the countries. Finally, when the natural resources are included in the model, it exhibits negative with significant explanatory power, this may be the reason due to the resource curse (Havranek et al., 2016). Sachs and Warner (1995) explained that; due to institutional quality, resource-rich countries grow relatively slower than resource-scarce countries. The results are aligned with past studies of (Cotet and Tsui, 2013; Gylfason and Zoega, 2006). To tackle any econometric issues, we tested the data for second-order autocorrelation by Arellano and Bond. The results reported are favourable (no autocorrelation); hence, the models given are free of autocorrelation problem. On the other hand, Hansen's test of over-identification also clarifies that the instruments used in the study are valid; following the thumb rule of Roodman (2009); a number of instruments taken are lower than that of cross-section units. Thus, the model here is correctly specified.

Table 2
Income equation.

Dependent variable: Y	(1)	(2)	(3)	(4)
lagged Y	1.303***	1.321***	1.006***	1.015***
	(0.207)	(0.214)	(0.007)	(0.008)
TRI	0.012***	0.015**	0.041***	0.037***
	(0.001)	(0.006)	(0.003)	(0.008)
EU	0.2826***	0.3068**	0.0367***	0.0458***
	(0.032)	(0.030)	(0.007)	(0.008)
CF	0.121***	0.161***	0.1688***	0.1712***
	(0.020)	(0.029)	(0.036)	(0.036)
NR	–	−0.025***	–	−0.006***
	–	(0.003)	–	(0.002)
Constant	–	–	0.226**	0.251**
	–	–	(0.113)	(0.118)
Observations	357	357	408	408
Groups	51	51	51	51
Instruments	19	20	13	14
AR(II)	0.091	0.47	0.613	0.198
Hansen Test	0.21	0.10	0.23	0.61

Note: *, **, *** indicates level of significance at 10%, 5% and 1% respectively; model (1) and (3) are estimated with diff. dynamic GMM and model (2) and (4) are calculated with system dynamic GMM; time dummies are excluded from the table. Standard errors are given in parenthesis. The null hypothesis of Arellano and bond second-order autocorrelation [AR (II)] is H_0: No autocorrelation and the null hypothesis of the Hansen test is H_0: Instruments are valid.

5.2. Environmental pollution model

From the results given in Table 3 for the environmental pollution equation, it is clear that income, energy use, natural resources, and gross fixed capital formation are active contributors to CO_2 emission with expectedly increasing effects. The first order coefficient of income is positive, and second-order is negative, which states that income at first considerably upsurges the CO_2 emission. Then it mitigates CO_2 emission after reaching a certain level of income. This relationship postulates

Table 3
Pollution equation.

Dependent variable: CO_2	(1)	(2)	(3)	(4)
L.CO2	0.378**	0.392**	0.649***	0.635***
	(0.158)	(0.161)	(0.141)	(0.129)
Y	0.712*	0.636	2.035**	1.887***
	(0.391)	(0.398)	(0.904)	(0.893)
Ysq	−0.581**	−0.894***	−0.036**	−0.050***
	(0.121)	(0.199)	(0.015)	(0.016)
TRI	0.101**	0.009**	0.017*	0.017**
	(0.003)	(0.004)	(0.010)	(0.008)
EU	0.633***	0.612**	0.277**	0.273**
	(0.172)	(0.168)	(0.158)	(0.134)
CF	0.104***	0.113**	0.135**	0.145***
	(0.034)	(0.037)	(0.052)	(0.048)
RE	−0.133***	−0.136***	−0.048**	−0.051***
	(0.047)	(0.045)	(0.024)	(0.013)
NR	–	0.023	–	0.015*
		(0.021)		(0.008)
Observations	357	357	408	408
Groups	51	51	51	51
Instruments	13	14	22	23
AR(II)	0.506	0.429	0.19	0.158
Hansen Test	0.116	0.106	0.110	0.41

Note: *, **, *** indicates level of significance at 10%, 5% and 1% respectively; model (1) and (3) are estimated with diff. dynamic GMM and model (2) and (4) are calculated with system dynamic GMM; time dummies are excluded from the table. Standard errors are given in parenthesis. The null hypothesis of Arellano and bond second-order autocorrelation [AR (II)] is H_0: No autocorrelation and the null hypothesis of the Hansen test is H_0: Instruments are valid.

Table 4
Energy equation.

Dependent variable: Energy Use	(1)	(2)	(3)	(4)
L.EU	0.854***	0.909***	0.873***	0.932***
	(0.202)	(0.207)	(0.201)	(0.206)
Y	0.252**	0.301***	0.277	0.444***
	(0.11)	(0.108)	(0.098)	(0.165)
TRI	0.012	0.014	0.015	0.017*
	(0.009)	(0.009)	(0.009)	(0.009)
CO_2	0.098	0.057	0.079	0.036
	(0.137)	(0.144)	(0.140)	(0.146)
CF	0.078**	0.091**	0.079*	0.096**
	(0.036)	(0.037)	(0.042)	(0.041)
NR	–	0.008*	–	0.009*
		(0.004)		(0.005)
Observations	408	408	408	408
Groups	51	51	51	51
Instruments	20	21	20	21
AR(II) (p-values)	0.633	0.601	0.623	0.588
Hansen Test (p-values)	0.233	0.271	0.11	0.18

Note:: *, **, *** indicates level of significance at 10%, 5% and 1% respectively; model (1) and (3) are estimated with diff. dynamic GMM and model (2) and (4) are calculated with system dynamic GMM; time dummies are excluded from the table. Standard errors are given in parenthesis. "The null hypothesis of Arellano and bond second-order autocorrelation [AR (II)] is H_0: No autocorrelation and the null hypothesis of the Hansen test is H_0: Instruments are valid".

inverted U-shape of EKC[2] for BRI countries. Our results support the previous work of Saboori and Sulaiman (2013), Caron and Fally (2018), and Sapkota and Bastola (2017). The connection between energy use and CO_2 emission supports the energy lead emission hypothesis. These results are aligned with Omri (2013), and Arouri et al. (2012) for ME&NA and Wang et al. (2018) for countries with different incomes, who found that increase in energy consumption increases CO_2 emission.

Table 5
Tourism development equation.

Dependent variable: TRI	(1)	(2)	(3)	(4)
lagged TRI	0.476***	0.474***	0.739***	0.720***
	(0.043)	(0.042)	(0.042)	(0.044)
Y	0.473***	0.465***	0.159*	0.199**
	0.179	0.173	0.086	−0.089
EU	−0.022***	−0.054***	−0.020***	−0.037**
	(0.005)	(0.002)	(0.001)	(0.018)
CF	0.544***	0.553***	0.768***	0.853***
	(0.171)	(0.168)	(0.193)	(0.204)
NR	–	0.069**	–	0.076***
	–	(0.037)	–	(0.022)
Constant	–	–	−3.7082***	−4.211***
	–	–	(1.001)	(1.085)
Observations	357	357	408	408
Groups	51	51	51	51
Instruments	18	19	12	13
AR(II)	0.575	0.617	0.315	0.32
Hansen Test	0.260	0.150	0.221	0.310

Note: *, **, *** indicates level of significance at 10%, 5% and 1% respectively; model (1) and (3) are estimated with diff. dynamic GMM and model (2) and (4) are calculated with system dynamic GMM; time dummies are excluded from the table. Standard errors are given in parenthesis. The null hypothesis of Arellano and Bond's second-order autocorrelation [AR (II)] is H_0: No autocorrelation and the null hypothesis of the Hansen test is H_0: Instruments are valid.

Besides, the relationship between tourism development index and CO_2 emission is positive; this implies that tourism development considerably affected the environmental quality in selected BRI states. Referring to Azam et al. (2018), who highlighted the importance of sustainable tourism policies, thus to combat tourism induced CO_2 to reach "shared prosperity". Shaheen et al. (2019) suggested introducing ecotourism policies to mitigate tourism lead emission, Ali et al. (2018) underlined to the importance of tourism standards and sanitation that helps to improve the country's ecological stock thus to combat tourism lead emission. Surprisingly, the coefficient of natural resource in CO_2 emission model remains insignificant for difference GMM; on the other hand, it turns partially significant (10%) in D-SGMM. These results support the phenomenon of natural resource lead emission hypothesis for BRI countries. This result implies that more pressure on natural resources to achieve high economic growth may be a threat to the quality of the environment in long-run. The empirical results state that CF has a positive relation with CO_2 emission, which indicates the private investment lead emission (Zaman et al., 2016b). Moreover, renewable energy is mitigating the CO_2 emission in BRI countries. The results are aligned with Apergis et al. (2018) and Chen et al. (2019a,b), who get similar results that renewable energy decreases CO_2 emission. They emphasized the economies to encourage the renewable energy use that have considerable beneficial impacts on the climate change. The diagnostic results in the bottom of Table 3 explains about the instrumental validity, validates the no autocorrelation assumption, and the number of cross-sections in the models is higher than instruments.

5.3. Energy consumption model

The estimates for energy consumption model are given in Table 4 explains that income (y) in all the four models found to be significant and positive; this demonstrates that increase in revenue tends to increases energy use (Shahbaz et al., 2012). Based on the results, the causal communication between energy use and economic growth is bidirectional. They are referring to the outcomes of Islam et al., (2013) for Malaysia, Odhiambo (2009) for Tanzania and Omri (2013) for MENA countries. The relationship between tourism index and the energy consumption is positive but insignificant with little explanatory power. However, CF has substantial positive magnitude with energy consumption, which explains that with the process of capital formation, the requirement of energy use is increasing, referring to (Omri, 2013). The

[2] Standard form of EKC hypothesis explains that at initial level of development, environment degrades; however, with further increase in economic growth, the investment in environment increases thus improves environmental condition, which depicts inverted U-shaped EKC (Panayotou, 1993).

addition of natural resources in the model found to be a positive contributor to energy use in BRI countries. This suggests that energy consumption by extraction technologies in mining, oil extraction, etc. Of the correlation between CO_2 emission and energy use, the coefficient of CO_2 emission in energy equation is insignificant for all models, thus suggesting unidirectional causality flowing from energy use to CO_2 for BRI states. Again, there is no autocorrelation, instruments are valid, and the countries are greater than used instruments; thus, the outcomes are free from any econometric issues.

5.4. Tourism development model

Finally, Table 5 derives the empirical results of the tourism development index; the lagged TRI reveals the long-run relationship. The estimates explored that income, CF and natural resources are the significant contributors to tourism development index. This implies that increase in income increases the tourism; referring to Lean et al. (2014) and Shaheen et al. (2019); when an economy expands, it generates productive opportunities in all sectors including tourism, competition rises and costs in the tourism sector declines that enhances the tourism revenues. This phenomenon reveals the two-way causality links between "tourism and income" in BRI countries. The results explored the negative relationship between energy use and the tourism sector in selected BRI countries. Our findings are identical with Zaman et al., 2016b, who also received similar results in the case of developing and developed countries. However, CF and natural resources are found to be escalating determinants of tourism development in BRI countries. The abundance of natural resource stock attracts more tourists; hence, domestic/private investment in the tourism industry is appropriate to enhance the revenue from tourism in the long-run. To assess the model specification, we tested them for second-order autocorrelation and instrumental validity. The results given at the end of the table reveal that the models here are free from second-order correlation, provides the evidence of valid instruments, and the number of instruments is lower than that of several groups taken in the study.

6. Conclusions and implications

The study is attempted to explore the influence of "tourism, and natural resources in energy-growth, and CO_2 emission nexus" using simultaneous equation modelling for 51 BRI countries over 1990–2016. To this end, we have built four equations; each equation has separate literature in energy-growth-environment nexus. The first equation is based on the income function, second explained the CO_2 emission function in light of the EKC hypothesis, the third equation is centred on energy use, and final equation describes the Tourism demand function. The current research enables the simultaneity modelling of this quartet with two remarkable results.

Firstly, empirical estimations derived from dynamic and system GMM documented the feedback hypothesis between energy consumption and income. Additionally, there is unidirectional causality detected from energy use to CO_2 emission in conjunction with the EKC hypothesis. This indicates that in BRI countries, economic growth is mainly fuelled with energy consumption; thereby, the energy lead emission hypothesis deems true. The explanatory power of energy use is reliable, thus given reason that these countries have low penetration of clean technologies and renewable energy in production. The gross fixed capital formation showed the inflexion point that the BRI countries must care about the CO_2 emission and environmental degradation. Secondly, Tourism development and natural resources are equally important in economic growth and CO_2 emission. In income and CO_2 equation models, "tourism substantially contributes both to economic growth and CO_2 emission". Feedback relationship is also observed between economic growth and tourism development. The empirical results substantiate the tourism lead growth and vice versa; tourism lead emission and investment lead emission hypothesis for BRI countries is also supported in the study. Natural resources deem negatively related to economic growth; thus suggesting natural resource curse in BRI states. The empirics explained that natural resources are contributing to CO_2 emission, and tourism development, based on colossal energy use.

The policies emerging from our research are reliable and have considerable importance for selected BRI countries. From the "two-way causal association between energy use and income and unidirectional causality between energy and CO_2 emission", the efforts are required to encourage to adopt new and clean technologies to achieve sustained economic growth by decreasing CO_2 emission. In addition, regulations must be introduced in in-efficient use of energy and share of renewable sources in total energy. This can be achieved if tariffs are applied to the imports of old and dirty technologies by giving incentives/subsidies on the new and green technology imports to these countries; thereby domestic investors are encouraged to invest in clean technologies. The climate mitigation strategies should be introduced to get economic incentives from the tourism sector. The orientation of budgets in green infrastructure development is significantly essential to safeguard environmental quality, thus benefit through green tourism. Moreover, the conservation of natural resources will also help attain sustainable economic growth by implementing sustainable tourism development policies across the BRI countries. Finally, the resource curse relationship in BRI countries cannot be neglected, therefore needs attention to improve the quality of institutions to cater to the inefficiencies in natural resource exploitation to achieve sustained growth. Despite all the efforts we have made, there are still some directions for future research. Firstly, though we have established the nexus of "tourism-growth-energy and environment", our chosen variable may not be able to represent all the indicators of growth, energy, and environment. Secondly, our study did not involve the new countries included in BRI. Future research should consider the fresh list and re-estimate the dynamic system of models to obtain robust results for policy insights. Finally, there is room for future research in the unchartered domain of Tourism-FDI-environment nexus in the SEM framework to develop sustainable tourism development plan.

CRediT authorship contribution statement

Anwar Khan: Conceptualization, Methodology, Formal analysis, Software, Writing - original draft, Investigation, Writing - review & editing. **Yang Chenggang:** Supervision, Validation, Resources. **Jamal Hussain:** Data curation, Investigation, Writing - review & editing. **Sadia Bano:** Data curation, Investigation. **AAmir Nawaz:** Data curation, Investigation.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.resourpol.2020.101751.

Table A1
Selected BRI countries

Albania	Estonia	Lithuania	Serbia
Armenia	Georgia	Malaysia	Singapore
Azerbaijan	Hungary	Moldova	Slovak Republic
Bangladesh	India	Mongolia	Slovenia
Belarus	Indonesia	Montenegro	Sri Lanka
Bosnia and Herzegovina	Iraq	Myanmar	Tajikistan
Brunei Darussalam	Israel	Nepal	Thailand
Bulgaria	Jordan	Pakistan	Timor-Leste
Cambodia	Kazakhstan	Philippines	Turkey
China	Kuwait	Poland	Ukraine
Croatia	Kyrgyz Republic	Romania	United Arab Emirates
Czech Republic	Latvia	Russian Federation	Vietnam
Egypt, Arab Rep.	Lebanon	Saudi Arabia	

Table A2
Description of variables

Variable	Acronyms	Unit of measurement
Tourism development index	TRI	Tourist receipts in US$; Tourism Expenditures in US$; Number of tourist arrivals annually
Energy use	EU	KGs of oil equivalent/capita
Carbon dioxide emission	CO_2	Metric ton/capita
real GDP	Y	2011 US$/capita
Capital stock	CF	Gross fixed capital formation as a percentage of GDP.
Natural resources	NR	Total natural resource rent percentage of GDP
Renewable energy	RE	Renewable energy consumption percentage of total energy consumption

Table A3
Descriptive statistics based on three-year averages

Variable(s)		Mean	S.D	Minimum	Maximum	Observation(s)
CO_2	Overall	5.6688	6.1089	0.0499	31.9764	N = 459
	Between		6.011	0.1364	28.4452	n = 51
	Within		1.3459	−2.3994	12.0918	T = 9
EU	Overall	2216.303	2209.59	58.3959	11431.47	N = 459
	Between		2173.638	58.5894	9705.892	n = 51
	Within		490.012	−2283.273	3941.878	T = 9
Y	Overall	8759.171	11700.43	196.567	66037.73	N = 459
	Between		11459.8	505.596	53099.28	n = 51
	Within		2804.825	−8663.273	24655.09	T = 9
NR	Overall	7.5858	12.6716	0.000345	60.8177	N = 459
	Between		12.0407	0.0005668	50.9454	n = 51
	Within		4.257	−14.4326	33.7969	T = 9
TRI	Overall	−1.54E-08	1.5442	−0.8415	17.0136	N = 459
	Between		1.2812	−0.835	6.7035	n = 51
	Within		0.8786311	−4.343789	10.31005	T = 9
RE	Overall	22.94719	23.80487	0.0061057	94.48977	N = 459
	Between		23.41203	0.0124966	89.60861	n = 51
	Within		5.303128	0.6654913	46.56749	T = 9
CF	Overall	23.23383	6.46202	3.177027	48.22357	N = 459
	Between		4.541883	12.71402	37.82133	n = 51
	Within		4.635657	5.06922	44.27634	T = 9

References

Abdouli, Mohamed, Hammami, Sami, 2016. Economic growth, FDI inflows and their impact on the environment: an empirical study for the MENA countries. Qual. Quantity 51, 121–146. https://doi.org/10.1007/s11135-015-0298-6.

Abdouli, M., Hammami, S., 2018. Economic growth, environment, FDI inflows, and financial development in Middle East countries: fresh evidence from simultaneous equation models. J. Knowl. Econ. 1–33. https://doi.org/10.1007/s13132-018-0546-9.

Acheampong, A.O., Adams, S., Boateng, E., 2019. Do globalization and renewable energy contribute to carbon emissions mitigation in Sub-Saharan Africa? Sci. Total Environ. 677, 436–446. https://doi.org/10.1016/J.SCITOTENV.2019.04.353.

Adewuyi, A.O., Awodumi, O.B., 2017. Biomass energy consumption, economic growth and carbon emissions: fresh evidence from West Africa using a simultaneous equation model. Energy 119, 453–471. https://doi.org/10.1016/J.ENERGY.2016.12.059.

Al-mulali, U., Fereidouni, H.G., Lee, J.Y.M., Mohammed, A.H., 2014. Estimating the tourism-led growth hypothesis: a case study of the Middle East countries. Anatolia 25, 290–298. https://doi.org/10.1080/13032917.2013.843467.

Al-Mulali, U., Ozturk, I., Solarin, S.A., 2016. Investigating the environmental Kuznets curve hypothesis in seven regions: the role of renewable energy. Ecol. Indicat. 67, 267–282.

Ali, Q., Khan, M.T.I., Khan, M.N.I., 2018. Dynamics between financial development, tourism, sanitation, renewable energy, trade and total reserves in 19 Asia Cooperation Dialogue members. J. Clean. Prod. 179, 114–131. https://doi.org/10.1016/j.jclepro.2018.01.066.

Alkhathlan, K., Javid, M., 2013. Energy consumption, carbon emissions and economic growth in Saudi Arabia: an aggregate and disaggregate analysis. Energy Pol. 62, 1525–1532. https://doi.org/10.1016/j.enpol.2013.07.068.

Amri, F., 2017. Intercourse across economic growth, trade and renewable energy consumption in developing and developed countries. Renew. Sustain. Energy Rev. 69, 527–534. https://doi.org/10.1016/j.rser.2016.11.230.

Anthony, N. Rezitisand, Shaikh Mostak, Ahammad, 2015. The relationship between energy consumption and economic growth in South and southeast asian countries: a panel vector autoregression approach and causality analysis. Int. J. Energy Econ. Pol. 5, 704–715.

Apergis, N., Ozturk, I., 2015. Testing environmental Kuznets curve hypothesis in asian countries. Ecol. Indicat. 52, 16–22. https://doi.org/10.1016/j.ecolind.2014.11.026.

Apergis, N., Ben Jebli, M., Ben Youssef, S., 2018. Does renewable energy consumption and health expenditures decrease carbon dioxide emissions? Evidence for sub-

Saharan Africa countries. Renew. Energy 127, 1011–1016. https://doi.org/10.1016/j.renene.2018.05.043.

Arellano, M., Bond, S., 1991. Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. Rev. Econ. Stud. 58, 277. https://doi.org/10.2307/2297968.

Arellano, M., Bover, O., 1995. Another look at the instrumental variable estimation of error-components models. J. Econom. 68, 29–51. https://doi.org/10.1016/0304-4076(94)01642-D.

Armey, L.E., McNab, R.M., 2018. Expenditure decentralization and natural resources. Q. Rev. Econ. Finance 70, 52–61. https://doi.org/10.1016/j.qref.2018.05.015.

Arminen, H., 2018. Simultaneous equations modeling in the energy-growth nexus. Econ. Econ. Energy-Growth Nexus 307–345. https://doi.org/10.1016/B978-0-12-812746-9.00010-9.

Arminen, H., Menegaki, A.N., 2019. Corruption, climate and the energy-environment-growth nexus. Energy Econ. 80, 621–634. https://doi.org/10.1016/J.ENECO.2019.02.009.

Arouri, M., Ben Yousef, A., M'henni, H., Rault, C., Arouri, M., Ben Youssef, A., M'Henni, H., Rault, C., 2012. Energy consumption, economic growth and CO2 emissions in Middle East and north african countries. Energy Pol. 45, 342–349.

Azam, M., Mahmudul Alam, M., Haroon Hafeez, M., 2018. Effect of tourism on environmental pollution: further evidence from Malaysia, Singapore and Thailand. J. Clean. Prod. 190, 330–338. https://doi.org/10.1016/j.jclepro.2018.04.168.

Azam, M., Khan, A.Q., Ozturk, I., 2019. The effects of energy on investment, human health, environment and economic growth: empirical evidence from China. Environ. Sci. Pollut. Res. https://doi.org/10.1007/s11356-019-04497-4.

Balsalobre-Lorente, D., Shahbaz, M., Roubaud, D., Farhani, S., 2018. How economic growth, renewable electricity and natural resources contribute to CO2 emissions? Energy Pol. 113, 356–367. https://doi.org/10.1016/j.enpol.2017.10.050.

Bélaïd, F., Youssef, M., 2017. Environmental degradation, renewable and non-renewable electricity consumption, and economic growth: assessing the evidence from Algeria. Energy Pol. 102, 277–287. https://doi.org/10.1016/J.ENPOL.2016.12.012.

Ben Jebli, M., Ben Youssef, S., Apergis, N., 2015. The dynamic interaction between combustible renewables and waste consumption and international tourism: the case of Tunisia. Environ. Sci. Pollut. Res. 66, 12050–12061. https://doi.org/10.1007/s11356-015-4483-x.

Ben Jebli, M., Ben Youssef, S., Apergis, N., 2019. The dynamic linkage between renewable energy, tourism, CO2 emissions, economic growth, foreign direct investment, and trade. Lat. Am. Econ. Rev. 28, 2. https://doi.org/10.1186/s40503-019-0063-7.

Bilen, M., Yilanci, V., Eryüzlü, H., 2017. Tourism development and economic growth: a panel Granger causality analysis in the frequency domain. Curr. Issues Tourism 20, 27–32. https://doi.org/10.1080/13683500.2015.1073231.

Blundell, Bond, S., 1998. Initial conditions and moment restrictions in dynamic panel data models. J. Econom. 87, 115–143.

Brunnschweiler, C.N., 2008. Cursing the blessings? Natural resource abundance, institutions, and economic growth. World Dev. 36, 399–419. https://doi.org/10.1016/j.worlddev.2007.03.004.

Çaglayan, E., Sak, N., Karymshakov, K., 2012. Relationship between tourism and economic growth: a panel granger causality approach. Asian Econ. Financ. Rev. 2, 591–602.

Caron, J., Fally, T., 2018. Per Capita Income, Consumption Patterns, and CO2 Emissions (No. 24923), JEL No. F18,O10,Q47,Q56. https://doi.org/10.3386/w24923. Cambridge, MA.

Chaabouni, S., Saidi, K., 2017. The dynamic links between carbon dioxide (CO2) emissions, health spending and GDP growth: a case study for 51 countries. Environ. Res. 158, 137–144. https://doi.org/10.1016/j.envres.2017.05.041.

Chen, Y., Wang, Z., Zhong, Z., 2019a. CO2 emissions, economic growth, renewable and non-renewable energy production and foreign trade in China. Renew. Energy 131, 208–216. https://doi.org/10.1016/j.renene.2018.07.047.

Chen, Y., Zhao, J., Lai, Z., Wang, Z., Xia, H., 2019b. Exploring the effects of economic growth, and renewable and non-renewable energy consumption on China's CO2 emissions: evidence from a regional panel analysis. Renew. Energy 140, 341–353. https://doi.org/10.1016/J.RENENE.2019.03.058.

Cortes-Jimenez, I., Pulina, M., 2010. Inbound tourism and long-run economic growth. Curr. Issues Tourism 13, 61–74. https://doi.org/10.1080/13683500802684411.

Cotet, A.M., Tsui, K.K., 2013. Oil, growth, and health: what does the cross-country evidence really show? Scand. J. Econ. 115, 1107–1137. https://doi.org/10.1111/sjoe.12027.

Danish, Baloch, M.A., Mahmood, N., Zhang, J.W., 2019. Effect of natural resources, renewable energy and economic development on CO2 emissions in BRICS countries. Sci. Total Environ. 678, 632–638. https://doi.org/10.1016/J.SCITOTENV.2019.05.028.

Dogan, E., Aslan, A., 2017. Exploring the relationship among CO2 emissions, real GDP, energy consumption and tourism in the EU and candidate countries: evidence from panel models robust to heterogeneity and cross-sectional dependence. Renew. Sustain. Energy Rev. 77, 239–245. https://doi.org/10.1016/J.RSER.2017.03.111.

Dogan, Buhari, Saboori, Behnaz, Can, Muhlis, 2019. Does economic complexity matter for environmental degradation? An empirical analysis for different stages of development. Environ. Sci. Pollut. Res. (26), 31900–31912. https://doi.org/10.1007/s11356-019-06333-1.

Dogan, E., Seker, F., Bulbul, S., 2017. Investigating the impacts of energy consumption, real GDP, tourism and trade on CO2 emissions by accounting for cross-sectional dependence: a panel study of OECD countries. Curr. Issues Tourism 20, 1701–1719. https://doi.org/10.1080/13683500.2015.1119103.

Dong, K., Hochman, G., Zhang, Y., Sun, R., Li, H., Liao, H., 2018. CO2 emissions, economic and population growth, and renewable energy: empirical evidence across regions. Energy Econ. 75, 180–192. https://doi.org/10.1016/J.ENECO.2018.08.017.

Esen, Ö., Bayrak, M., 2017. Does more energy consumption support economic growth in net energy-importing countries? J. Econ. Financ. Adm. Sci. 22, 75–98.

Farhadi, M., Islam, M.R., Moslehi, S., 2015. Economic freedom and productivity growth in resource-rich economies. World Dev. 72, 109–126. https://doi.org/10.1016/j.worlddev.2015.02.014.

Gokmenoglu, K.K., Eren, B.M., 2019. The role of international tourism on energy consumption: empirical evidence from Turkey. Curr. Issues Tourism 1–7. https://doi.org/10.1080/13683500.2019.1574723.

Granger, C.W.J., 1969. Investigating causal relations by econometric models and cross-spectral methods. Econometrica 37, 424. https://doi.org/10.2307/19127912.

Grossman, G.M., Krueger, A.B., 1995. Economic growth and the environment. Q. J. Econ. 110, 353–377. https://doi.org/10.2307/21184433.

Gylfason, T., Zoega, G., 2006. Natural resources and economic growth: the role of investment. World Econ. 29, 1091–1115. https://doi.org/10.1111/j.1467-9701.2006.00807.x.

Hafeez, M., Chunhui, Y., Strohmaier, D., Ahmed, M., Jie, L., 2018. Does finance affect environmental degradation: evidence from One Belt and One Road Initiative region? Environ. Sci. Pollut. Res. 25, 9579–9592. https://doi.org/10.1007/s11356-018-1317-7.

Hailu, D., Kipgen, C., 2017. The extractives dependence index (EDI). Resour. Pol. 51, 251–264. https://doi.org/10.1016/J.RESOURPOL.2017.01.004.

Hassan, S.T., Xia, E., Huang, J., Khan, N.H., Iqbal, K., 2019a. Natural resources, globalization, and economic growth: evidence from Pakistan. Environ. Sci. Pollut. Res. 26, 15527–15534. https://doi.org/10.1007/s11356-019-04890-z.

Hassan, S.T., Xia, E., Khan, N.H., Shah, S.M.A., 2019b. Economic growth, natural resources, and ecological footprints: evidence from Pakistan. Environ. Sci. Pollut. Res. 26, 2929–2938. https://doi.org/10.1007/s11356-018-3803-3.

Havranek, T., Horvath, R., Zeynalov, A., 2016. Natural resources and economic growth: a meta-analysis. World Dev. 88, 134–151. https://doi.org/10.1016/j.worlddev.2016.07.016.

Hussain, J., Khan, A., Zhou, K., 2020a. The impact of natural resource depletion on energy use and CO2 emission in Belt & Road Initiative countries: a cross-country analysis. Energy 199, 117409. https://doi.org/10.1016/j.energy.2020.117409.

Hussain, J., Zhou, K., Guo, S., Khan, A., 2020b. Investment risk and natural resource potential in "Belt & Road Initiative" countries: a multi-criteria decision-making approach. Sci. Total Environ. 137981. https://doi.org/10.1016/j.scitotenv.2020.137981.

Isik, C., Dogru, T., Turk, E.S., 2018. A nexus of linear and non-linear relationships between tourism demand, renewable energy consumption, and economic growth: theory and evidence. Int. J. Tourism Res. 20, 38–49. https://doi.org/10.1002/jtr.2151.

Islam, F., Shahbaz, M., Ahmed, A.U., Alam, M.M., 2013. Financial development and energy consumption nexus in Malaysia: a multivariate time series analysis. Econ. Modell. 30, 435–441. https://doi.org/10.1016/J.ECONMOD.2012.09.033.

Katircioglu, S., 2009. Tourism, trade and growth: the case of Cyprus. Appl. Econ. 41, 2741–2750. https://doi.org/10.1080/00036840701335512.

Katircioglu, S.T., Feridun, M., Kilinc, C., 2014. Estimating tourism-induced energy consumption and CO2 emissions: the case of Cyprus. Renew. Sustain. Energy Rev. https://doi.org/10.1016/j.rser.2013.09.004.

Katircioglu, Setareh, Cizreliogullari, M.N., Katircioglu, Salih, 2019. Estimating the role of climate changes on international tourist flows: evidence from Mediterranean Island States. Environ. Sci. Pollut. Res. 26, 14393–14399. https://doi.org/10.1007/s11356-019-04750-w.

Khan, A., Hussain, J., Bano, S., Chenggang, Y., 2019. The repercussions of foreign direct investment, renewable energy and health expenditure on environmental decay? An econometric analysis of B&RI countries. J. Environ. Plann. Manag. 1–22. https://doi.org/10.1080/09640568.2019.1692796.

Khan, A., Muhammad, F., Chenggang, Y., Hussain, J., Bano, S., Khan, M.A., 2020. The impression of technological innovations and natural resources in energy-growth-environment nexus: a new look into BRICS economies. Sci. Total Environ. 727, 138265. https://doi.org/10.1016/j.scitotenv.2020.138265.

Khoshnevis Yazdi, S., Homa Salehi, K., Soheilzad, M., 2017. The relationship between tourism, foreign direct investment and economic growth: evidence from Iran. Curr. Issues Tourism 20, 15–26. https://doi.org/10.1080/13683500.2015.1046820.

Kongbuamai, N., Bui, Q., Yousaf, H.M.A.U., Liu, Y., 2020. The impact of tourism and natural resources on the ecological footprint: a case study of ASEAN countries. Environ. Sci. Pollut. Res. https://doi.org/10.1007/s11356-020-08582-x.

Kraft, J., Kraft, A., 1978. Relationship between energy and GNP. J. Energy Dev. 3.

Kwakwa, Paul Adjei, Alhassan, Hamdiyah, Adu, George, et al., 2020. Effect of natural resources extraction on energy consumption and carbon dioxide emission in Ghana. Int. J. Energy Sect. Manag. 14 (1), 20–39. https://doi.org/10.1108/IJESM-09-2018-0003.

Lazăr, D., Minea, A., Purcel, A.-A., 2019. Pollution and economic growth: evidence from central and eastern European countries. Energy Econ. 81, 1121–1131. https://doi.org/10.1016/J.ENECO.2019.05.011.

Lean, Hooi Hooi, Chong, Sio Hing, Hooy, C.-W., 2014. Tourism and economic growth: comparing Malaysia and Singapore. Int. J. Econ. Manag. 8, 139–157.

Lee, J.W., Brahmasrene, T., 2013. Investigating the influence of tourism on economic growth and carbon emissions: evidence from panel analysis of the European Union. Tourism Manag. 38, 69–76. https://doi.org/10.1016/j.tourman.2013.02.016.

Lee, C.-C., Chang, C.-P., 2008. Tourism development and economic growth: a closer look at panels. Tourism Manag. 29, 180–192. https://doi.org/10.1016/j.tourman.2007.02.013.

McKinnon, R.I., 1964. Foreign exchange constraints in economic development and efficient aid allocation. Econ. J. 74, 388. https://doi.org/10.2307/2228486.

Mehlum, H., Moene, K., Torvik, R., 2006. Cursed by resources or institutions? World Econ. 29, 1117–1131. https://doi.org/10.1111/j.1467-9701.2006.00808.x.

Nawaz, K., Lahiani, A., Roubaud, D., 2019. Natural resources as blessings and finance-growth nexus: a bootstrap ARDL approach in an emerging economy. Resour. Pol. 60, 277–287. https://doi.org/10.1016/j.resourpol.2019.01.007.

Naz, S., Sultan, R., Zaman, K., Aldakhil, A.M., Nassani, A.A., Abro, M.M.Q., 2019. Moderating and mediating role of renewable energy consumption, FDI inflows, and economic growth on carbon dioxide emissions: evidence from robust least square estimator. Environ. Sci. Pollut. Res. 26, 2806–2819. https://doi.org/10.1007/s11356-018-3837-6.

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 Manag. 72, 145–154. https://doi.org/10.1016/j.tourman.2018.08.025.

Odhiambo, N., 2009. Energy consumption and economic growth nexus in Tanzania: an ARDL bounds testing approach. Energy Pol. 37, 617–622.

Omri, A., 2013. CO2 emissions, energy consumption and economic growth nexus in MENA countries: evidence from simultaneous equations models. Energy Econ. 40, 657–664. https://doi.org/10.1016/J.ENECO.2013.09.003.

Omri, A., Kahouli, B., 2014. Causal relationships between energy consumption, foreign direct investment and economic growth: fresh evidence from dynamic simultaneous-equations models. Energy Pol. 67, 913–922.

Panayotou, T., 1993. Empirical tests and policy analysis of environmental degradation at different stages of economic development. ILO Work. Pap. 1–42.

Paramati, S.R., Alam, M.S., Chen, C.-F., 2017. The effects of tourism on economic growth and CO_2 emissions: a comparison between developed and developing economies. J. Trav. Res. 56, 712–724. https://doi.org/10.1177/0047287516667848.

Payne, J.E., Mervar, A., 2010. The tourism–growth nexus in Croatia. Tourism Econ. 16, 1089–1094. https://doi.org/10.5367/te.2010.0014.

Roodman, D., 2007. The anarchy of numbers: aid, development, and cross-country empirics. World bank econ. Rev. 21, 255–277. https://doi.org/10.1093/wber/lhm004.

Roodman, D., 2009. How to do xtabond2: an introduction to difference and system GMM in Stata. STATA J. 9, 86–136.

Saboori, B., Sulaiman, J., 2013. Environmental degradation, economic growth and energy consumption: evidence of the environmental Kuznets curve in Malaysia. Energy Pol. 60, 892–905. https://doi.org/10.1016/j.enpol.2013.05.099.

Sachs, J., Warner, A., 1995. Natural Resource Abundance and Economic Growth (No. 5398). https://doi.org/10.3386/w5398. Cambridge, MA.

Saidi, K., Hammami, S., 2016. Economic growth, energy consumption and carbone dioxide emissions: recent evidence from panel data analysis for 58 countries. Qual. Quantity 50, 361–383. https://doi.org/10.1007/s11135-014-0153-1.

Sapkota, P., Bastola, U., 2017. Foreign direct investment, income, and environmental pollution in developing countries: panel data analysis of Latin America. Energy Econ. 64, 206–212. https://doi.org/10.1016/j.eneco.2017.04.001.

Seetanah, B., 2011. Assessing the dynamic economic impact of tourism for island economies. Ann. Tourism Res. 38, 291–308. https://doi.org/10.1016/J.ANNALS.2010.08.009.

Shahbaz, M., Zeshan, M., Afza, T., 2012. Is energy consumption effective to spur economic growth in Pakistan? New evidence from bounds test to level relationships and Granger causality tests. Econ. Modell. 29, 2310–2319. https://doi.org/10.1016/J.ECONMOD.2012.06.027.

Shaheen, K., Zaman, K., Batool, R., Khurshid, M.A., Aamir, A., Shoukry, A.M., Sharkawy, M.A., Aldeek, F., Khader, J., Gani, S., 2019. Dynamic linkages between tourism, energy, environment, and economic growth: evidence from top 10 tourism-induced countries. Environ. Sci. Pollut. Res. 1–11. https://doi.org/10.1007/s11356-019-06252-1.

Shakouri, B., Khoshnevis Yazdi, S., Ghorchebigi, E., 2017. Does tourism development promote CO_2 emissions? Anatolia 28, 444–452. https://doi.org/10.1080/13032917.2017.1335648.

Škrinjarić, T., 2019. Examining the causal relationship between tourism and economic growth: spillover index approach for selected CEE and sEE countries. Economies 7, 1–19. https://doi.org/10.3390/economies7010019.

Sofien, T., Omri, A., 2016. Literature Survey on the Relationships between Energy Variables, Environment and Economic Growth. MPRA Paper. University Library of Munich, Germany.

Solarin, S.A., 2014. Tourist arrivals and macroeconomic determinants of CO_2 emissions in Malaysia. Anatolia 25, 228–241. https://doi.org/10.1080/13032917.2013.868364.

Tang, C.F., 2011. Is the tourism-led growth hypothesis valid for Malaysia? a view from disaggregated tourism markets. Int. J. Tourism Res. 13, 97–101. https://doi.org/10.1002/jtr.807.

Tiba, S., Omri, A., Frikha, M., 2016. The four-way linkages between renewable energy, environmental quality, trade and economic growth: a comparative analysis between high and middle-income countries. Energy Syst. 7, 103–144. https://doi.org/10.1007/s12667-015-0171-7.

UNWTO, 2011. Tourism towards 2030 Global Overview.

Wang, S., Li, G., Fang, C., 2018. Urbanization, economic growth, energy consumption, and CO2 emissions: empirical evidence from countries with different income levels. Renew. Sustain. Energy Rev. 81, 2144–2159. https://doi.org/10.1016/j.rser.2017.06.025.

Wooldridge, J.M., 2010. Econometric Analysis of Cross Section and Panel Data. MIT Press.

World Bank, 2018. World Development Indicators (WDI) | Data Catalog [WWW document]. World bank. https://datacatalog.worldbank.org/dataset/world-development-indicators. accessed 1.31.19.

Yasmeen, R., Li, Y., Hafeez, M., Ahmad, H., 2018. The trade-environment nexus in light of governance: a global potential. Environ. Sci. Pollut. Res. 25, 34360–34379. https://doi.org/10.1007/s11356-018-3390-3.

Zafar, M.W., Zaidi, S.A.H., Khan, N.R., Mirza, F.M., Hou, F., Kirmani, S.A.A., 2019. The impact of natural resources, human capital, and foreign direct investment on the ecological footprint: the case of the United States. Resour. Pol. 63, 101428. https://doi.org/10.1016/j.resourpol.2019.101428.

Zaman, K., Abdullah, A. bin, Khan, A., Nasir, M.R., bin, M., Hamzah, T.A.A.T., Hussain, S., 2016a. Dynamic linkages among energy consumption, environment, health and wealth in BRICS countries: green growth key to sustainable development. Renew. Sustain. Energy Rev. 56, 1263–1271. https://doi.org/10.1016/J.RSER.2015.12.010.

Zaman, K., Shahbaz, M., Loganathan, N., Raza, S.A., 2016b. Tourism development, energy consumption and Environmental Kuznets Curve: trivariate analysis in the panel of developed and developing countries. Tourism Manag. 54, 275–283. https://doi.org/10.1016/J.TOURMAN.2015.12.001.

Zhang, S., Liu, X., 2019. The roles of international tourism and renewable energy in environment: new evidence from Asian countries. Renew. Energy. https://doi.org/10.1016/J.RENENE.2019.02.046.