



Re-investigating the nexuses of renewable energy, natural resources and transport services: a roadmap towards sustainable development

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Abstract

We investigate the impact of renewable energy and green practices (RE), transportation services and infrastructure (T.S.), GDP growth (GDP), and forestry and natural resources (AFF) on the sustainable tourism development in the Eastern European Countries (EECs). The study employed cross-sectional dependence and CIPS unit root test to check stationarity along with the dynamic common correlated effect (DCCE) model proposed by Chudik and Pesaran (2015) to test parameters for ensuring robustness. The outcome of DCCE method suggests that renewable energy (RE), Transport Services (T.S.), Agriculture, Forestry and Fishing (AFF), and economic growth (GDP) have a significantly positive impact on international tourism in the sampled countries of Europe. Our findings could be insightful for policymakers and understanding the impact of renewable energy and transportation services on tourism development, and thereby help in taking appropriate policy measures in the sampled countries.

Key words Carbon emissions · Renewable energy · Sustainable tourism · Dynamic common correlated effect · Transport services

Introduction

The tourism industry (T.I.) has emerged as among the fastest growing industries over the globe, creating millions of jobs, increasing the world income, curbing inflation, and causing infrastructure development all-around, as it is considered a prerequisite for the development of tourism opportunities. According to Meo et al. (2020), the revenue receipts through

T.I. are equivalent to exports and are expected to contribute towards the GDPs of travel destination states substantially by 2050, as reported by the World Tourism Organization of United Nations (UNWTO 2012). Consequently, the states and policymakers have been focusing much on the development of T.I. not only to earn much needed foreign exchange but also to create jobs, to invigorates the growth of T.I., and thereby to accelerate their overall economic growth (Roudi

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et al. 2019; Khoshnevis et al. 2017; Brida et al. 2016, 2015; Tang and Abosedra 2014). Although travel and tourism significantly contribute to economic development in the modern era, this contribution also has its costs, particularly related to the environment and ecosystem. Since tourism is invariably linked to, and thus also affected by, several sectors, it can be considered an outcome of various dimensions acting simultaneously in influencing, to greater or lesser extent, the attractiveness of an area, and thus tourism sustainability (Tanizawa et al. 2011).

While the popularity of any tourists' destination very much depends upon varied resources in addition to the eco-environmental beauties of any target territory such as the provision of logistic and accommodation services, cultural heritage, strategic geographical position, etc., the environmental degradation, energy usage, and excess water consumption remain the key barriers to sustainable tourism (Ciacci et al. 2021).

The academicians have started thinking about how these barriers can be removed and eventually turned their interest towards green energy, green transportation, green infrastructure, and green technologies because these are the ways to overcome the issues related to energy, water, environmental dynamics, and thereby attain the sustainable development (see e.g., Eluwole et al. 2019; Nguyen and Su 2021; Saint Akadiri et al. 2019; Udemba 2019; Chien et al. 2021; Razzaq et al. 2020). All in all, this growing interest is due to the fact that unsustainable tourism is considered to be a significant source of carbon emissions. As such, reduction of environmental impact becomes inevitable through mitigating the effects of burning the fossil fuels and unsustainable tourism practices. In the Sustainable Development Goals (SDGs) adopted by the United Nations (UN 2015), the goal at No. 13 addresses reducing the environmental impact of the use of fossil fuels and global tourism.

Sustainable tourism development is very much dependent upon economic activity, that has natural effects on environmental issues (Lasisi et al. 2020). Economic growth creates funding opportunities for the country to bear expenditure on environmental sustainability and increases the ability to introduce environmental-friendly practices (Nguyen and Su 2021).

There has been increase in the research thrust on the socio-economic effects of the tourism activities (e.g., see Croes et al. 2021), and the environmental effects of the tourism activities have also been the subject of attention among the environmentalists in the context of development of a sustainable tourism regime (ITO) (Usman et al. 2020).

Energy (especially the renewable energy) is among the major determinants of environmental concerns and sustainability, that eventually affects the economic well-being and

since the tourism sector is a significant consumer of energy, to design a sustainable tourism regime, the most important thing is to understand the interrelationships between the fundamental factors related to the economy, environment, energy, and tourism (Shakouri et al. 2017; Lasisi et al. 2020). Sustainable tourism development refers to an integrated approach aiming virtually at future-friendly planning with coverage of all of its social, economic, and environmental dimensions by creating and ensuring a desirable balance between the needs of human beings and maximum possible sustainability of natural resources, including the tourism destinations (Lasisi et al. 2020).

Sustainable tourism development and management pose several challenges for policymakers and as such analyzing the nexus of environmental quality and tourism development has become a crucial issue for policymakers to design most appropriate policies for a sustainable life (Okumus and Erdogan 2021). The T.I.-related pressing challenges include mainly the ecological degradation, waste management, food wastages, and the mass-energy consumption, whereby the overall incremental global warming estimates are between 5.2 and 12.5% (UNEP and UNWTO 2012).

In order to achieve reductions in greenhouse gas (GHG) emissions as per the global climate policies, a radical shift to the usage of renewable energy sources is being advocated all around the globe (Pulido-Fernández et al. 2019; Saint Akadiri et al. 2019; An et al. 2021). The currently available alternative sources are geothermal and ocean energy, bioenergy, hydro, wind, and solar power. The renewable energy implementation should be critically assessed as they may also have some negative impacts, as reported in the study by Gasparatos et al. (2017). The empirics of Isaeva et al. (2020), Li et al. (2021), and Ohlan (2017) estimate the relationship between GDP growth and tourism. ITO in the form of inbound tourism attracts the tourists to visit the host country based on a variety of motives, including business tours, religious tours, leisure and pleasure tours and etc. As such the tourists and traders, especially the foreigners, invest, spend, and contribute their share to the economic growth.

Furthermore, higher GDP growth also plays an active role in promoting outbound tourism. The business community visits other countries to search for new markets and investment opportunities. In another study, Sarpong et al. (2020) analyzed the impact of renewable energy and tourism receipts on the living standards taking twenty years' data of eight South African countries. They find that openness of trade and renewable energy usage has a significantly negative relationship with living standards. Tourism arrival and receipts are the important factors that help improve the living standards of people in the South African region.

Many researchers like Gössling et al. (2012) and Nguyen and Su (2021) suggest that academicians and practitioners agree on the concept that tourism must be sustainable. For

sustainable tourism, all the stakeholders should play their part. The sustainable tourism is one of the important considerations for the tourists, where they are willing to pay a premium for sustainable destinations. There are a number of ways to develop sustainable tourism and one of these is the use of renewable energy at the tourists' destinations. Though this will add additional costs for the tourists, they will be willing to pay the premium as their ethical consideration (Nguyen et al. 2020).

Sustainable tourism has much to do with the four significant aspects of development — economic, cultural, social, and ecosystem/environmental. The tourism business intensively exploits the natural resources and eventually affects the previously mentioned four aspects of the economy (Buckley 2011). Due to the abrupt climate changes taking place all around the globe, a holistic policy is required to guarantee sustainable tourism in the short and long run. This will result in ecologically sustainable, economically, and environmentally viable tourism. Thus, sustainable tourism can be defined as the development of tourism and travel regime ensuring an appropriate balance between all of above mentioned four aspects as now tourists consider these four aspects necessary for their choice of destination and ultimate satisfaction (Sharpley 2000). Another definition of green tourism proposed by the Green Tourism Association of Taiwan reads as “tourism activities that minimize the environmental impacts and reduce non-green energy usage and thereby the carbon emission while enjoying ecology-humanity-culture integrity.” Another related term is ecotourism which is also called nature-based tourism. In ecotourism, the primary focus is on the environment and ecological protection.

The primary area of concern for sustainable tourism is to check the level of carbon emissions by the tourism sector to protect the environment and ecosystem (Nguyen and Su 2021). Increasing carbon emissions is one of the challenges to future tourism, where a radical shift is required in order to have a significant reduction in CO₂ emission to avoid climate degradation. Such transformation is not only required in the modes of transportation but also in the choice of tourists' destinations (Peeters and Dubois 2010). As such, the researchers have started linking tourism with sustainable development (Hall 2010; Nguyen and Su (2021). The United Nations (U.N.) adopted the action plan of “Sustainable Development Agenda 21”, and afterward, the UNWTO, Earth Council (E.C.), and the World Travel and Tourism Council (WTTC) have also separately put forward their agendas for sustainable development. Despite all the developments mentioned above, limited literature on sustainable tourism is available (Buckley 2012), and this study attempts to fill the specific gaps identified in the extant literature on the subject of ITO and development thereof.

Statement of research objectives

The availability of energy resources and their consumption are the primary drivers of economic development (Adedoyin et al. 2020a, b; Kirikkaleli et al. 2020; Nathaniel et al. 2020a; Udi et al. 2020) and as such specific economic challenges confront the nations deficient in the energy resources. The negative side of energy consumption is that the exploitation of these resources increases environmental challenges, like environmental degradation, global warming, etc. (Nathaniel and Khan 2020; Nguyen and Su 2021). The use of non-renewable energy sources has caused environmental as well as health issues in the societies (Guarnieri and Balmes 2014), giving birth to EKC hypothesis about the relationship between economic growth and environmental pollution (Işık et al. 2019; Bölük and Mert 2015). Many countries are facing the issue of environmental degradation due to overdependence on fossil fuels which results in increased greenhouse emissions (Pandey et al. 2020; Isik et al. 2017). The tourism sector is a significant contributor of carbon emission, so it has a significant role in climate change (Dogru et al. 2019). In recent times, tourism has been recognized as a driver of environmental degradation (World Travel and Tourism Council 2019; Gokmenoglu and Eren 2020; Isik et al. 2017; Işık et al. 2019).

As compared to the studies on the tourism-growth nexus, those related to the transport-tourism-energy nexus are sparse. However, it is concluded that one of the major contributors to GHG effect in the tourism industry (Gössling, 2013) and linked with many other activities such as transportation (Gössling and Peeters, 2015; Gössling et al. 2015), and all of these activities need much energy consumption and emit an enormous quantity of carbon emissions (Becken and Simmons 2005). Many empirical studies find a nexus between tourism and energy usage (or carbon emissions) as the tourist destinations accrue considerable quantities of energy consumption, water usage, and waste disposal (Dwyer et al. 2010). Solarin (2014) finds the relationship between energy usage and tourism in Malaysia, whereas Katircioglu (2014) and Katircioglu et al. (2014) find the same evidence in the context of Turkey and Cyprus, respectively.

In another study, Gössling (2000) finds that tourism-related energy consumption has adverse environmental effects, like increased CO₂ emissions due to travel/transportation. Koçak et al. (2020) find that a possible co-movement exists between tourism and CO₂ emissions eventually. Land-use for tourism is another cause of environmental dilapidation, where this results in a decrease in forest areas (Al-Mulali et al. 2015; Bilgili et al. 2017; Raza et al. 2017; Sharif et al. 2017; Zaman et al. 2017; Pandey et al. 2020). A few studies argue that a sustainable tourism regime promotes an eco-friendly environment through eco-friendly transportation, green technologies, and renewable energy consumption (Paramati et al. 2017) and also argue that roads, railways, and sea

transportation networks can be improved in order to reduce CO₂ emissions and ensure environmental quality.

In a related study, Pan et al. (2018) investigate the barriers in sustainable tourism like high water consumption, increase in environmental pollution, and energy consumption. The effects of critical factors of sustainable tourism, i.e., green energy, green construction, green innovation and technologies, and green transportation, are also analyzed in the study. It is argued that the adoption of a green transport regime by using electric vehicles for tourism, recycling wasted water, and imposing a carbon tax to eliminate the carbon emissions can help to attain sustainable tourism and can also provide the solution to many environmental problems. So, the beforehand problem is to investigate the nexuses of essential factors responsible for sustainable tourism, namely renewable energy development, green technologies, natural resources, and green transportation services. Out of these critical determinants, natural resources and infrastructure development, besides renewable energy, are also considered among the critical determinants of sustainable tourism development (Nguyen and Su, 2021). There has been reported empirical findings of an increasing influence of tourism on pollution and the CO₂ emissions (e.g., Balli et al. (2019), whereas empirical evidences of decreasing impact or otherwise mixed evidences are also reported (e.g., Le and Nguyen (2021).

Overall, the present study is focused upon the following primary research objectives:

1. To explore the impact of Renewable Energy (RE) upon international Tourism (ITO).
2. To test whether Agriculture, Forestry, and Fishing (AFF) have any association with International Tourism (ITO) in Eastern European countries.
3. To test the association between GDP growth (GDP) and international tourism.
4. To test whether transport sector operations (T.S.) have any association with the volume of International Tourism (ITO) in the Eastern European countries.

Significance of the study

Though there is adequate evidence of a negative influence of tourism upon carbon emissions (e.g., Balli et al. 2019; Le and Nguyen 2021), less work is available on the relationship between renewable energy and sustainable tourism. This study is going to fill this gap in the literature. In order to achieve the objectives of environmental quality and reducing carbon emissions, the study investigates the dynamic relationship between renewable energy usage and the development of sustainable tourism. The tourism sector is very much related to the energy sector comprising transportation, accommodation, and illumination, which consume much energy (Becken et al.

2003; Tsagarakis 2011). As few studies have addressed the issue of environmental degradation due to tourism, the present research contributes towards the contemporary literature by checking the economic growth effect in the context of the alternate energy sources' consumption and sustainable tourism development. The findings of the study clarify the tourism-growth, energy-environment nexuses, where these nexuses have been scarcely investigated empirically (Işık et al. 2019). We have mixed evidence regarding the nexus between economic growth and tourism (Pablo-Romero and Molina 2013), which means this area needs further empirical investigations. Lee and Chang (2008) find the relationship between tourism and growth in OECD countries, whereas Isik and Radulescu (2017) find the same relationship for Greece. Paudyal (2012) finds similar evidence in Nepal; likewise, Chen and Chiou-Wei (2009) reach the same conclusion for Taiwan and Korea.

Furthermore, the bidirectional relationship is supported in many other studies (Seetanah 2011; Nissan et al. 2011; Cortés-Jiménez et al. 2011; Caglayan et al. 2012), whereas the findings of growth-led tourism (GLT) and tourism-led growth (TLG) relations are also mixed. Oh (2005) finds that economic growth leads to tourism in South Korea. Katircioglu (2009) finds evidence of GLT hypothesis for Cyprus; Tang (2011) finds evidence of GLT hypothesis in the Malaysian context, and while Cortés-Jiménez et al. (2011) find evidence of the same hypothesis in Tunisia; Lanza et al. (2003) report evidence for OECD countries. Contrary, several studies also endorse tourism leads growth hypothesis (Khalil et al. 2007; Hye and Khan 2018) in Pakistan, and Srinivasan et al. (2012) find the same evidence for Sri Lanka. Bilen et al. (2015) find that the TLG hypothesis holds in a few Mediterranean countries. The literature review concludes that tourism activities are primarily responsible for increased energy consumption. Therefore, the need of the hour is to study this topic in detail to address the critical issues and their remedies for the safety of our future generations.

Katircioglu (2014) opined that energy consumption, carbon emission, and international tourism to Turkey are cointegrated. The study further revealed that both energy consumption and international tourism worsen environmental quality in Turkey. Similarly, Zaman et al. (2016) examined the impact of tourism development and energy consumption on carbon emission in 34 developed and developing countries in the framework of EKC hypothesis. While the EKC hypothesis was validated by the study, it further affirmed a tourism-induced carbon emissions causal relationship. In addition, Eluwole et al. (2019) found a non-significant relationship between tourism and environmental sustainability in 10 pollutant emission countries while other related studies posited a significant relationship between tourism and pollutant emissions (Saint Akadiri et al. 2019; Lasisi et al. 2020).

Our study of EECs is justified due to several reasons. Firstly, the overall energy consumption is estimated to grow by 6% by the end of 2030 compared to that in 2011 and the energy consumption for the power sector is estimated to grow by 49% for the same time period (Lasisi et al. 2020), along with a rise in the CO₂ emissions by 0.5% (IEA 2019). In this context, present study contributes towards more comprehensive understanding of the linkages between environment and ITO beyond the scope of mixed empirical evidence on tourism-CO₂ emissions' nexus. Secondly, present study investigates the tourism-related environmental impact along with the influence of transport services. Thirdly, considering the vital role of tourism in the economic growth of EECs invariably provides adequate justification for identifying the STR-related policy implications and well-targeted development and environmental policies.

The rest of this research is structured as follows: Section 2 covers the relevant literature on sustainable tourism and its key determinants/factors; Section 3 describes the methodology and data source; Section 4 presents the analysis of results and discussion; Section 5 presents the conclusion of the study and the significant implications.

Literature review

The tourism industry is a significant contributor to the development of many economies, irrespective of their level of development (Dogru and Bulut 2018; Bella 2018; Isik et al. 2017). However, the increase in tourism activities has posed significant environmental challenges (De vita et al. 2015) like carbon emissions. An empirical examination of the tourism-environment hypothesis is based on Environmental Kuznets Curve (EKC), which has received increased attention from tourism researchers with respect to sustainable tourism development. In this context, the studies by De Vita et al. (2015), Shakouri et al. (2017), and Zaman et al. (2016) support the EKC hypothesis, whereas Gamage et al. (2017) and Sghaier et al. (2018) report evidence contradictory to the EKC hypothesis. This might be because EKC is dependent upon the level of development of an economy and its tourism industry. Economic growth can increase the ability and efficiency of a country to replace non-renewable energy and to use of renewable energy sources respectively (Isik et al. 2018), and thereby decreases CO₂ emissions (Etokakpan et al. 2020; Adedoyin et al. 2020c, d, e; Nathaniel et al. 2020b). It is also reported that testing EKC might be misleading if checked on a panel of countries (Granger 2003; Pesaran 2006), that can be due to the differences in their level of development, tourism industry, renewable energy usage, etc. in the sampled countries. Some also argue that the less developed countries are also following the course of action set by the developed countries, so there is a need to study the EKC hypothesis after incorporating the impact of renewable energy usage irrespective of the regions/countries.

Zhang and Liu (2019a, b) report tourism as a significant contributor to carbon emissions for different parts of the globe and conclude that renewable energy usage is the key to reducing carbon emissions. In another study, Zhang and Zhang (2020) check for the relationship between tourism and carbon emissions for China by employing Pedroni and Kao tests and find cointegration between the two variables with the conclusion that tourism eventually increases the levels of CO₂ emissions. In another study by Katircioglu (2014), long-run integration among the two variables for Turkey is found along with a positive influence of renewable energy usage on sustainable tourism development. In another study, Zhang and Gao (2016) find a negative impact of tourism on CO₂ emissions in the eastern region of China. In contrast, there is no significant influence upon CO₂ emissions in central and western regions of China.

Tang et al. (2017) conclude that the tourism sector is one of the major consumers of energy and also the major contributor to greenhouse gas emissions. They find a positive relationship between the scale of tourism and the level of carbon emissions. Zhang and Gao (2016) analyze the effects of international tourism and growth on energy consumption and CO₂ emissions in China and conclude that the tourism sector is one of the largest carbon emitters.

Tian et al. (2020) examine the impact of GDP growth and renewable energy consumption on tourism development and the quality of the environment, taking CO₂ emissions level as an indicator of environmental quality. Unit root test and cointegration tests are applied on 20 years' data of G-20 economies, and the results indicate a noteworthy decrease in pollution due to an increase in sustainable tourism development. Consumption of renewable energy resources is found as one of the significant contributors to the decrease in pollution. GDP growth shows a U-shaped relationship with environmental pollution which means that an increase in growth and development increases pollution in the beginning but, later in the long-run, the relationship becomes negative — a confirmation of the existence of EKC-based hypothesis. It is found that improvement in tourism development and replacing non-renewable resources with renewable energy can be helpful for pollution reduction in the G-20 economies of the world. The study argues the importance of renewable energy usage and establishes the link between GDP, pollution, and tourism development.

There are several other variables, which have a direct impact on sustainable tourism. In one of the studies, Ali et al. (2018) add some more variables and investigate the relationship between trade openness, sanitation facilities, financial development, renewable energy sources consumption (RESC), total reserves, and tourism in the nineteen Asian countries taking data for 20 years. The countries were divided based on the level of economic development, i.e., higher-income, middle-income, and lower-income countries.

Results of the Vector Error Correction Model (VECM) and cointegration model show that all variables have significant cointegration, while trade, financial development, and reserves have significantly positive relationships with each other in the high-income countries. In lower-income countries, correlation is found among all of the variables, namely sanitation facilities, financial development, and RESC. The total reserves increased due to the financial development in five countries; due to RESC in seven countries; on account of tourism in nine countries; due to improved sanitation facilities in fourteen countries whereas trade contributed to increase in the total reserves in six of the countries. The study also suggests that the improvement of sanitation and tourism increases foreign exchange reserves.

In another sustainable tourism study, Calderón-Vargas et al. (2019) investigate the nexus between renewable energy sources' consumption (RESC) and sustainable tourism by evaluating the wind/solar energy potential in conjunction with the spatial-temporal tourist flow evolution. They find a negative impact of lack of infrastructure upon the tourists' ability to stay overnight and, also propose green housing facilities using environmentally friendly energy sources, reduction in fixed costs through sustainable housing and lodging establishments, sustainable electrification, and heating arrangements besides the conventional systems.

Tourism development can make positive and negative impacts upon the environment depending upon the geography of the region. Dogru et al. (2020) investigate the relationship between carbon emissions, tourism, economic growth, and RESC in OECD nations, and find that tourism development exerts a negative impact on the level of CO₂ emissions in Turkey and Canada but a significantly positive impact in Italy, Slovak Republic, and Luxemburg. Most of the countries get the benefits of economic growth from tourism development and vice versa. Renewable energy consumption is found to be the critical determinant of sustainable tourism development and also a decrease in the level of carbon emissions.

Butowski (2021) investigates the key determinants of sustainable tourism and report that the tourists, host communities, and tourism businesses are collectively called tourism, whereas these actors have an equal stake in maintaining sustainable tourism. A qualitative survey conducted in seven different regions of Poland reveals that host communities living in the tourists' places can take maximum advantages from tourism. The study also proposes a human-centered approach to sustainable tourism. The study by Khan et al. (2019) further extends the literature by adding resources and agencies of workers in the study of sustainable tourism development. They also study the technological and organizational aspects of tourism governance. The impact of Covid-19, which has destroyed the tourism industry throughout the previous two years, is also checked. It is also argued that job creation in the tourism sector is also a significant and positive effect of tourism development.

The study by Moreno-Luna et al. (2021) examines the impacts of Covid-19 on tourism in different regions of Spain. The tourism sector in Spain has great economic importance, but due to Covid-19, the tourism industry has suffered the negative impacts of the pandemic. Balearic island is among the most affected areas of Spain, where almost 90% of the tourism activities decreased during the pandemic. Sustainable tourism is found to be among the essential pillars of sustainable development in most countries.

Calderón-Vargas et al. (2019) examine the combined impact of wind energy projects and sustainable tourism on local development in the Amazon region. The region is rich in biodiversity and suitable for tourism. Data is taken from the World Tourism Organization (WTO) to examine the contemporary trends of tourism. It is found that the world's third-largest waterfall, namely Gocta, can be the main focus of tourists. Lack of infrastructure restricts the tourists from visiting the region. The Wood houses in the region and clean energy sources can help the tourists to stay longer. Wind or solar energy can help provide the heating facility in the houses.

Pan et al. (2018) study the challenges of attaining sustainable tourism, i.e., high water consumption, increase in energy consumption, and environmental pollution. Some of the major factors required to have sustainable tourism are green building, green energy, green innovation, green technologies, and green transportation. These factors have a significantly positive impact on sustainable tourism. It is argued that green transport (electric vehicles) for tourism, recycling wasted water, and imposing a carbon tax to eradicate the carbon emission can help in attaining sustainable tourism and eradicating ecological issues.

The study by Zhang and Zhang (2020) also examines the determinants of ecological footprint that lead a country like Pakistan towards environmental sustainability. Institutional quality, economic growth, tourism, and renewable energy are the factors found to affect ecological footprint. It is concluded that the usage of renewable energy sources and improvement in tourism has a significant positive impact on environmental conditions in Pakistan, whereas economic growth and institutional quality have a positive impact in all aspects. It is suggested that government must play a significant role in the improvement of sustainable tourism, institutional quality, and developing renewable energy sources.

In a study by Hafeez et al. (2020), a significant link between CO₂ emission and globalization is found in the context of South Asian countries analyzing 40 years' data and causality between growth and CO₂ emissions. Hafeez et al. (2020) conclude that economic growth is the main reason for CO₂ emission in Nepal, Pakistan, and Bangladesh as these developing countries are focusing on economic growth, which also increases environmental pollution. It is necessary to control environmental pollution to get a competitive

advantage. At some level, globalization also helps in decreasing CO₂ emissions in Bhutan and Pakistan. In this regard, Pakistan must impose strict laws for the implementation of environmental policies to reduce CO₂ emissions.

Paramati et al. (2017) investigate the nexus between CO₂ emission, tourism investment, and tourism development in 28 European Countries by taking 24 years' data. Long-run and short-run causality tests are applied, and the results suggest that tourism development has a negative impact on CO₂ emissions in the short run but has a positive impact in the long run. It is suggested that more environmentally friendly policies should be implemented by E.U. countries to improve tourism development. This can help E.U. countries to reduce carbon emissions and will also assist in increasing the tourism revenue.

Lopez and Bhaktikul (2018) investigate the tourism policies that can improve sustainable tourism development in Thailand. Range table analysis and Friedman scale method are applied to analyze the data, and the results show that most of the tourism in Thailand is attributed to the availability of mountains for climbing, followed by the museums and then temples. National parks also have major tourism attractions.

In one of the empirical studies on the subject of sustainable tourism regime, Wanner et al. (2020) examine different policies implemented by the European countries to achieve the objective of sustainable tourism. Framework, assessment, comparison, and plans of European countries are discussed in the aforementioned study. Wanner et al. (2020) conclude that focus of sustainable policies needs the schemes of integrated management, healthy lifestyle, and sustainable tourism using green innovation. Goals of integrated management are more efficiently achieved by these policies as compared to achieving the goals of tourism and healthy lifestyle. From the careful review of the selected studies on the subject of sustainable tourism regime, it can be posited that the extant literature has focused on several philosophies related to the relationship between tourism and growth. The first is tourism-led economic development philosophy, whereby economic growth leads the tourism growth. The second is the feedback philosophy which focuses on the causal effects of tourism and growth. The third is the neutrality philosophy that advocates the absence of any relationship between tourism and growth (Razzaq et al. 2021; Fauzel 2020; Dogan and Inglesi-Lotz 2020; Ren et al. 2019; Fauzel et al. 2017). Chou (2013) argues that governments have made resolute efforts to undertake tourism development to achieve economic growth. The tourism industry also has a spill over effect on other industries. Asadzadeh and Mousavi (2017) find a positive nexus between the level of economic development and tourism growth. Economic development results in the advancement of technology, which can be used to upgrade environmental parameters. Rembeci (2016) argues that tourism affects the entire economy and

recommends further exploration of the role of economy, environment, and energy in the context of sustainable tourism, as also suggested by Wanner et al. (2020). Based on the critical literature review, we also take natural resources, transportation services and renewable energy, and green practices as the key determinants of sustainable tourism development. Besides all these factors, GDP is also a significant factor that positively affects sustainable tourism.

Methodology

This study investigates the impact of renewable energy and green practices (RE), transportation services and infrastructure (T.S.), GDP growth (GDP), and Forestry and natural resources (AFF) on the sustainable tourism development in the Eastern European Countries (EECs) namely Ukraine, Slovakia, Romania, Poland, Czech Republic, and Bulgaria, for the period from 1995 to 2018. Based on the objectives of the study, international tourism (ITO) stands as the dependent variable while economic growth (GDP), renewable energy (RE), transport services (T.S.) followed by agriculture, forestry, and fishing (AFF) are taken as influence variables in our study model (see Table 1 and Figure 1). The DCCE-based model equation is as follows:

$$ITO_{it} = \alpha_i ITO_{it-1} + \delta_i x_{it} + \sum_{p=0}^{P_T} \gamma_{xip} \bar{X}_{t-p} + \sum_{p=0}^{P_T} \gamma_{yip} \bar{Y}_{t-p} + \mu_{it} \quad (1)$$

In Eq. (1), ITO presents the international tourism, $\alpha_i ITO_{it-1}$ represents the lag of ITO as an exogenous variable, $\delta_i x_{it}$ represents other exogenous variables, and P_T represents the lags limit that is being included in the cross-sectional means. In the formulation presented (Eq. (1)), the association between the Transport sector (T.S.) and international tourism (ITO) is expected to be positive. This study incorporates the forestry and natural resources, GDP per capita, transportation services, and infrastructure beside renewable energy and green practices as the key determinants of sustainable tourism development and might be among the pioneering studies identifying the unique relationship between these variables and sustainable development that will be equally interesting for the policymakers and practitioners. We measured sustainable tourism development through international tourism receipts, whereas renewable energy and transport services variables are measured through the log of the value of consumption per capita of renewable energy and the relative % of services imports, respectively.

This study incorporates the forestry and natural resources, GDP per capita, transportation services, and infrastructure beside renewable energy and green practices as the key determinants of sustainable tourism development and might be among the pioneering studies identifying the unique

Table 1 Sources of data

Terms' acronyms	The variables	Unit of measurement	Sources of data
ITO	International tourism	International tourism, receipts (current US\$)	World Tourism Organization and Statistica website
GDP	GDP growth	Gross domestic product (annual %)	World Bank Database
RE	Renewable energy	Log Renewable energy consumption per capita (kWh)	Statistical Review of World Energy
T.S.	Transport services	Transport services (% of services imports)	International Monetary Fund
AFF	Agriculture, forestry, and fishing	Agriculture, forestry, and fishing, value added (annual % growth)	World Bank Database

relationship between these variables and sustainable development that will be equally interesting for the policymakers and practitioners. We measured sustainable tourism development through international tourism receipts, whereas renewable energy and transport services variables are measured through the log of the value of consumption per capita of renewable energy and transport services % of services imports, respectively.

The researchers did not consider the cross-sectional effects in earlier studies and have just dealt with homogeneous slopes using the econometric method for the time-series and panel data analysis. The techniques, namely OLS, the Fixed, and the Random Effects, and GMM, only indicate homogeneity's high degree. According to Meo et al. (2020), this assumption is wrong and may result in the misinterpretation of results. Alternatively, according to Pesaran et al. (1999), the panel data approach is applied more extensively and thus

appropriate for data analysis in the above-mentioned context. Table 2 presents the results of the dependence test employed, whereas Tables 3, 4, and 5 show the 1st and 2nd generation unit root tests respectively. Table 6 presents the results for the confirmation test of no cointegration between the variables involved, while Table 7 presents the results confirming the nexuses among the endogenous and exogenous factors as proposed by Westerlund and Edgerton (2008).

Analysis of results and discussion

Our study incorporated selected variables in the international tourism model for the economies of EECs. The current study investigates the relationships between renewable energy,

Fig. 1 Conceptual model of Sustainable Tourism Development

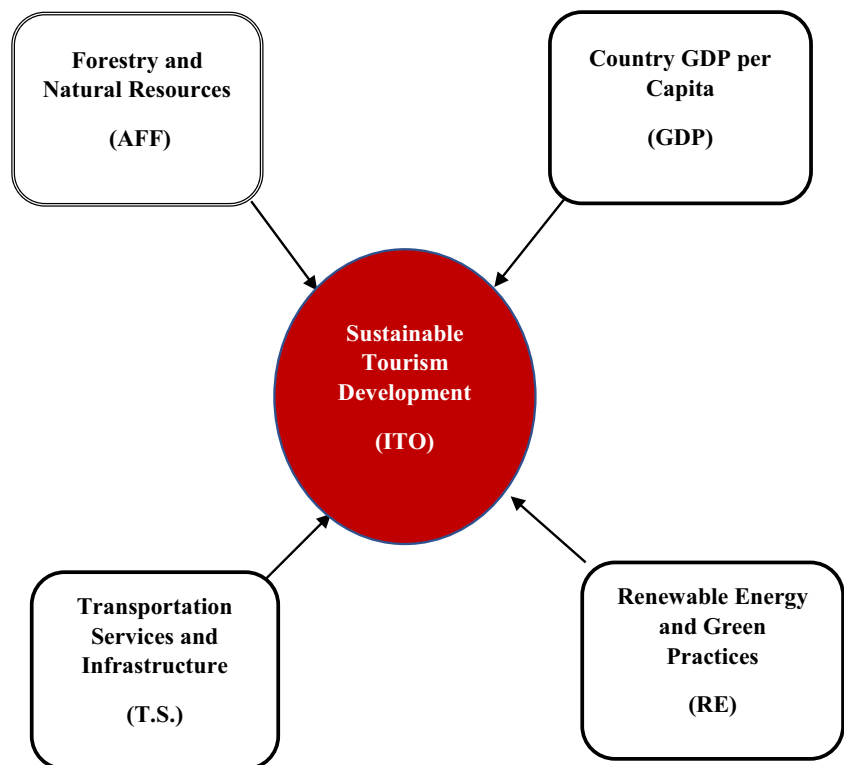


Table 2 Cross-sectional dependence test

Abbreviations	The variable	The CD test	The <i>P</i> -value
ITO	International tourism	11.13	*
GDP	GDP growth	9.18	*
RE	Renewable energy	7.94	*
T.S.	Transport services	9.71	*
AFF	Agriculture, forestry, and fishing	7.07	*

*indicating the test of significance at 1%

transportation services, GDP, natural resources, and tourism development. Analysis and discussion of the various tests and regression model are presented in the following sections:

Cross-sectional dependence and unit root tests

Testing for cross-sectional dependence is an important issue for two reasons. Firstly, given the interdependence across international economies, the dilemma of cross-sectional dependence among the macroeconomic indicators tends to exist and is much debated. The Pesaran (2006) cross-sectional dependence test (CD) was applied across pair-wise mean correlated residuals to avoid the issue of distorted parameters.

Table 2 presents cross-sectional dependence across entities confirmed by the CD test. Secondly, the CD test helps to determine as to which of the panel unit roots, whether the first-generation (Levin et al. 2002; Im et al. 2003) or those of the second-generation tests (Chang 2004 and Pesaran 2007) are appropriate for suggested variables of the study.

The unit root test identifies and accommodates cross-sectional dependence by assuming homogeneity, while the second-generation unit root test considers cross-sectional dependence (Kahia et al. 2017). The present study has commissioned both the first vis-à-vis second-generation unit root test to arrive at genuine speculations. Findings on the first-generation unit root test are displayed in Tables 3 and 4, while those of the second-generation unit root tests are presented in

Table 5. Table 3 reveals that the variables demonstrate mixed findings towards stationarity in different tests when these are at level but emerge as stationary while these are at the first difference in Table 4.

Prior to applying the dynamic common correlated effect estimation, we test the stationarity of panel variables by using the second-generation test CIP unit root.

Panel cointegration

As shown in Table 6, Pedroni's test of cointegration indicates the absence of cointegration among variables under consideration. The Westerlund and Edgerton (2008) tests in Table 7 do validate the existence of a long-run relationship among exogenous and endogenous variables. They further propose that majority of the cointegration tests cannot prevail over the issues of structural breaks, which ultimately lead to imprecise judgments. Compared to conventional tests of cointegration, the tests recommended by Westerlund and Edgerton (2008) are relatively reliable to counter the issues of cross-sectional dependence, heteroskedasticity, serial correlation, and structural breaks. The *p*-values of G.T., Ga, Pa, and Pt cointegration tests indicate the level of significance at 1%, which confirms rejection of the null hypothesis of no cointegration and reinforces the presence of cointegration across RE, T.S., AFF, GDP, and ITO in the analysis.

Table 3 The results of stationarity tests employed (ADF, IPS & LLC)

Abbreviations	The variables	LLC		IPC		ADF	
		The Stat.	<i>P</i> -value	The Stat.	<i>P</i> -value	The Stat.	<i>P</i> -value
RE	The Renewable energy	− 2.331	0.042**	0.692	0.947	11.766	0.597
TS	Transport services	− 0.512	0.346	0.479	0.371	17.631	0.551
GDP	GDP growth	− 1.411	0.061***	0.621	0.531	21.987	0.612
ITO	International tourism	0.761	0.031**	1.449	0.271	2.954	0.635
AFF	Agriculture, forestry, and fishing	0.137	0.631	1.212	0.593	8.442	0.712

*, **, and *** indicate significance on 1%, 5%, and 10% levels respectively

Table 4 First-generation unit stationarity tests at 1st diff. (LLC, IPS, & ADF)

Abbreviations	Variable name	Levin, Lin & Chu		I'm, Pesaran and Shin		ADF - Fisher	
		Statistics	P-value	Statistics	P-value	Statistics	P-value
GDP	GDP growth	- 6.236	0.004*	- 2.359	0.001*	36.252	0.000*
RE	Renewable energy	- 2.114	0.000*	- 2.112	0.000*	36.142	0.002*
T.S.	Transport services	- 7.342	0.003*	- 6.217	0.000*	58.322	0.001*
ITO	International tourism	- 4.256	0.000*	- 3.365	0.000*	35.551	0.000*
AFF	Agriculture, forestry, and fishing	- 4.243	0.000*	- 3.265	0.000*	23.154	0.000*

*, **, and *** indicate significance at 1%, 5%, and 10% levels respectively

PMG regression and DCCE model

The results of regression (PMG) reveal Agriculture, Forestry, and Fishing (AFF) and Renewable Energy (RE) have an insignificantly inverse nexus with International Tourism (ITO) (see Table 8). Contrarily, the Transport Services (T.S.) and GDP growth (GDP) tend to have a significantly positive effect on international tourism. This finding is really insightful and suggestive for the government administrators to strengthen their transportation sector (Daniel et al. 2021).

Results of PMG regression appear to be somewhat misleading, as the cross-sectional dependence test reveals. Hence, DCCE model was employed (see Table 9), revealing that renewable energy (RE), transport services (T.S.), agriculture, forestry and fishing (AFF), and GDP growth (GDP) have positive and significant effects upon international tourism, as also reported by Chen and Chiou-Wei (2009), Mbarek et al. (2017).

There is a positive association between tourism and renewable energy variables, as empirically pronounced by Bano and Alam (2021) also. They posit that the use of renewable energy helps in augmenting tourism, speeding up economic growth, and repelling CO₂ emissions. The green transportation services and RE both significantly and positively affect international tourism in Eastern European countries, and results tend to validate the positive association

between renewable energy and tourism, as pronounced by Jebli et al. (2019) and Zhang and Liu (2019a, b).

Transport services are indispensable for the development of the tourism sector (Gutiérrez and Miravet, 2016) and form an intrinsic part of the tourism industry. Transport tends to influence the other branches of the world economy, including international tourism, decisively. Without transportation, there won't be a travel and tourism industry; people won't have the means to reach other places that they desire to see (Dinu 2018). Hence, our findings agree to amplify the role of transport services towards tourism development. These are in line with the notions propagated by Celata (2007), Litman (2008), and Currie and Falconer (2014).

The connections across agriculture, forestry, & fishing (AFF) vis-à-vis tourism have the potential to help economies exploit the benefits of economic diversification. Both agriculture and tourism sectors appear to offer the best opportunities for inclusive economic growth globally (UNEP 2011). This might help generate economic prospects, develop compliance in rural communities, and enhance sustainable development across these sectors. Likewise, developing linkages between agriculture and tourism presents considerable prospects for stimulating local production, retaining tourism earnings in the vicinity, and improving the distribution of economic benefits of tourism to the rural class (Torres 2003). Our findings are converse to those reported by Mitchell and Coles (2009) and Welteji and Zerihun (2018), which pronounce that in terms of a perceived coexistence between agriculture and tourism, there is no syntrophic relationship between the two.

The significance of tourism has grown up worldwide asymptotically largely because of the multiple benefits that have loomed through employment generation, foreign exchange earnings, the balance of payment support, income to the society, and revenue to the government through multiplier effects (Paudyal 2012). Given this, the present research tends to support the tourism-led growth hypothesis (TLGH) offered by Balaguer and Cantavella-Jorda (2002), which proclaims that expansion of international tourism activities wields

Table 5 The results of CIPS 2nd generation unit root test

	The level	1 st diff.
RE	0.335	- 2.31*
T.S.	- 1.621	- 4.54*
AFF	- 1.234	- 6.75*
GDP	- 2.418	3.75*
ITO	- 1.26**	- 5.23*

* and ** show significance at 1% and 5%, respectively

Table 6 The results of cointegration test by Pedroni

	The t-stat	The p-value	Weight t-stat	The p-value
The HI: common coefficients (within the dimensions)				
The V-stat	- 0.61	0.51	- 0.42	0.52
The Rho-stat	0.63	1.82	0.87	0.62
The PP-stat	- 0.59	0.37	- 0.23	0.27
The ADF-stat	- 0.44	0.84	- 0.09	0.47
The HI: individual coefficients (between dimensions)				
The Rho-stat	1.38	0.69		
The ADF-stat	- 1.27	0.14		
The PP-stat	- 1.69	0.041**		

**shows the result significance at the 5%

economic growth. Our results tend to substantiate the findings by Rasool et al. (2021), Banday and Ismail (2017), Mallick et al. (2016), Dhungel (2015), and Kadir and Karim (2012).

Conclusion and recommendations

Sustainable tourism needs the focus of the authorities on some critical areas related to energy, environment, and natural resources. The current study examined the linkages among renewable energy, transportation services, agricultural, forestry, and fishing development, GDP growth, and international tourism using data for the Eastern European countries employing the DCCE model and incorporating cross-sectional dependence in the tourism model, which were not tested empirically in earlier studies.

Our findings reveal that our influence variables of renewable energy, transport services, agriculture, forestry and fishing (AFF), and GDP growth exert significantly positive effects on international tourism. There stands a need to encourage the stakeholders to invest in renewable energy areas, hence speeding up economic growth through renewable energy deployment. The role of renewable energy sources is vital towards promoting international tourism both in terms of cost

savings and ensuring better environmental quality for the tourists. However, the attitude towards the use of renewable energy seems to have been intimidated due to dispossessed policies by the governments in developing countries. As such, the policymakers are hereby recommended to devise appropriate policies for the development of T.I. by focusing upon the significant determinants identified in our study results. Moreover, for sustainable tourism, since some regions may be expected to confront energy and environment-related concerns, proper planning and monitoring by the concerned authorities is indispensable. A number of policy implications that are supposed to help in the development of sustainable tourism are as follows:

Policy implications and recommendations

- i. The currently available natural resources, as well as the carbon-less alternatives such as geothermal and ocean energy sources, bioenergy, hydro, wind, and solar power, must be deployed in the transportation and tourism-related sectors for achieving sustainable tourism development regime.

Table 7 Westerlund ECM tests

HI: cointegration	The value	The P-value
Gt	- 6.151	0.000*
Ga	- 21.234	0.000*
Pa	20.862	0.000*
Pt	- 13.118	0.000*

*shows significance on the 1% level

Table 8 Results of the PMG regression

Exon. var	Coefficient	p-value
RE	- 0.05	0.201
TS	0.09	0.02**
AFF	- 0.35	0.321
GDP	0.26	0.04**
C	14.03	0.00*

* and ** show the result significance at the 1% and 5% levels

Table 9 DCCE model output

Exon. var	The coefficient	The <i>p</i> -value
ITO (-1)	- 0.07	0.02**
RE	0.14	0.00*
TS	0.08	0.00*
AFF	0.05	0.03*
GDP	0.12	0.06**

* and ** show result significance at the 1% and 5% level

- ii. Through comprehensive plans of balancing, modernization, and replacement (BMR) strategies, the concerned quarters must strive to convert the traditional energy sources into green energy for ensuring an environmentally friendly and sustainable tourism regime.
- iii. The environmental regulations must be strengthened by the Government bodies along with embarking upon the mass awareness programs for stakeholders through all available media, which will not only help to increase awareness among the public, but also among the business enterprises, and thereby lead to switching towards green energy sources.
- iv. This study argues that non-renewable energy damages the quality of the environment, whereas renewable energy sources can improve the environment. The policymakers should formulate policies to monitor and decrease the consumption of non-renewable energy. Alternatively, the government should promote the use of renewable energy sources; there will be in line with the environmental agenda of Sustainable Development Goals 2030.
- v. In order to promote sustainable tourism regime, the policies can be designed in an inclusive manner, whereby the policies should focus on ecotourism and nature tourism. The consumption pattern of the tourism-related activities and the tourism destinations must be monitored and regulated properly. The policymakers should enforce renewable energy consumption at the tourist destinations, so the traditional energy solutions are steadily replaced with renewable energy sources.
- vi. Furthermore, the study demonstrates that the policymakers should focus on green growth as findings show that economic growth goes alongside improving environmental quality. In order to discourage the consumption of traditional and carbon-related sources of energy, specific incentives and exemptions should be offered to enable the desired shift towards the alternative energy sources mentioned above.
- vii. Last but not least, the policymakers may initiate vibrant policies to gear up the investment in the tourism sector and ensure its growth and development of sustainable tourism across the countries sampled in this study.

This study attempted to find the impact of essential variables, namely natural resources, transportation services, renewable energy and green practices, and GDP on sustainable tourism development. All of the policy initiatives mentioned above need a firm resolve by the policymakers and relevant authorities in order to devise and implement the policies related to sustainable tourism development. This study is also supposed to help the policymakers in the EECs to devise and implement successful sustainable tourism development policies by focusing on the sustainability aspects and green practices related to energy-growth nexus, forestry and natural resources, and transportation services.

Recommendations for future research

1. This study examines data related to the sampled Eastern European Countries, so the findings cannot be generalized to any individual country due to differences arising from country-specific conditions. Therefore, future studies may also focus on the country-specific analysis.
2. The moderating effect of political regimes and global uncertainties, the growth of the shadow economy, and governance effectiveness can also be checked in future studies.
3. Advanced quantile modelling can be carried out, as this approach is comparatively less employed in tourism literature.
4. The role of information and communication technologies in the development of sustainable tourism can also be studied in future studies.

Author contribution SARK and MUQ: conceptualization, methodology software. MUQ, MHA, AR, MH: data collection, writing-original draft preparation. SARK, MUQ, S.G., and Z.Y.: visualization, investigation. SARK and MHA, MH and S.G.: software, validation. MHA, SARK, Z. Y., and AR: writing-reviewing and editing.

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Data availability The datasets used and/or analyzed during the current study are available on reasonable request.

Declarations

Ethics approval and consent to participate Not applicable.

Consent for publication Not applicable.

Competing interests The authors declare no competing interests.

References

- Gutiérrez A, Miravet D (2016) The determinants of tourist use of public transport at the destination. *Sustainability* 8:908
- Adedoyin F, Abubakar I, Victor F, Asumadu S (2020c) Generation of energy and environmental-economic growth consequences: is there any difference across transition economies? *Energy Rep* 6:1418–1427. <https://doi.org/10.1016/j.egy.2020.05.026>
- Adedoyin F, Ozturk I, Abubakar I, Kumeka T, Folarin O (2020d) Structural breaks in CO₂ emissions: are they caused by climate change protests or other factors? *J Environ Manag* 266:110628. <https://doi.org/10.1016/j.jenvman.2020.110628>
- Adedoyin FF, Alola AA, Bekun FV (2020a) An assessment of environmental sustainability corridor: the role of economic expansion and research and development in E.U. countries. *Sci Total Environ* 713:136726. <https://doi.org/10.1016/j.scitotenv.2020.136726>
- Adedoyin FF, Bekun FV, Alola AA (2020e) Growth impact of transition from non-renewable to renewable energy in the E.U.—the role of research and development expenditure. *Renew Energy* 159:1139–1145. <https://doi.org/10.1016/j.renene.2020.06.015>
- Adedoyin FF, Gumede IM, Bekun VF, Etokakpan UM, Balsalobre Lorente D (2020b) Modelling coal rent, economic growth and CO₂ emissions: does regulatory quality matter in BRICS economies? *Sci Total Environ* 710:136284. <https://doi.org/10.1016/j.scitotenv.2019.136284>
- Ali Q, Khan MT, Khan MN (2018) Dynamics between financial development, tourism, sanitation, renewable energy, trade and total reserves in 19 Asia cooperation dialogue members. *Journal of Cleaner Production* 179:114–131
- Al-Mulali U, Fereidouni HG, Mohammed AH (2015) The effect of tourism arrival on CO₂ emissions from transportation sector. *Anatolia* 26(2):230–243. <https://doi.org/10.1080/13032917.2014.934701>
- An H, Razzaq A, Nawaz A, Noman SM, Khan SAR (2021) Nexus between green logistic operations and triple bottom line: evidence from infrastructure-led Chinese outward foreign direct investment in Belt and Road host countries. *Environmental Science and Pollution Research* 28:51022–51045. <https://doi.org/10.1007/s11356-021-12470-3>
- Dinu A-M (2018) the importance of transportation to tourism development. *Academic Journal of Economic Studies, Faculty of Finance, Banking and Accountancy Bucharest, "Dimitrie Cantemir" Christian University Bucharest* 4(4):183–187
- Ciacci A, Ivaldi E, Mangano S, Ugolini GM (2021) Environment, logistics and infrastructure: the three dimensions of influence of Italian coastal tourism. *Journal of Sustainable Tourism*:1–21. <https://doi.org/10.1080/09669582.2021.1876715>
- Asadzadeh A, Mousavi M (2017) The role of tourism on the environment and its governing law. *Electron J Biol* 13(2):152–158
- Balaguer J, Cantavella-Jorda M (2002) Tourism as a long-run economic growth factor: the Spanish case. *Appl Econ* 34(7):877–884
- Balli E, Sigeze C, Manga M, Birdir S, Birdir K (2019) The relationship between tourism, CO₂ emissions and economic growth: a case of Mediterranean countries. *Asia Pac. J. Tour. Res.* 24(3):219–232. <https://doi.org/10.1080/10941665.2018.1557717>
- Banday UJ, Ismail S (2017) Does tourism development lead positive or negative impact on economic growth and environment in BRICS countries? A panel data analysis. *Econ Bull* 37(1):553–567
- Becken S, Simmons DG (2005) Tourism, fossil fuel consumption and the impact on the global climate. *Tourism, recreation, and climate change pp.*:192–206
- Becken S, Simmons DG, Frampton C (2003) Energy use associated with different travel choices. *Tour Management.* 24:267–277
- Bella G (2018) Estimating the tourism induced environmental Kuznets curve in France. *Journal of Sustainable Tour.* 26:2043–2052
- Bilen M, Yilanci V, Eryüzü H (2015) Tourism development and economic growth: a panel Granger causality analysis in the frequency domain. *Curr Issue Tour* 2015:1–6. <https://doi.org/10.1080/13683500.2015.1073231>
- Bilgili F, Koçak E, Bulut Ü, Kuloğlu A (2017) The impact of urbanization on energy intensity: panel data evidence considering cross-sectional dependence and heterogeneity. *Energy* 133:242–256. <https://doi.org/10.1016/J.ENERGY.2017.05.121>
- Bölük G, Mert M (2015) The renewable energy, growth, and environmental Kuznets curve in Turkey: an ARDL approach. *Renew Sust Energy Rev* 52:587–595
- Brida JG, Cortes-Jimenez I, Pulina M (2016) Has the tourism-led growth hypothesis been validated? A literature review. *Current Issues in Tourism* 19(5):394–430
- Brida JG, Lanzilotta B, Pereyra JS, Pizzolon F (2015) A nonlinear approach to the tourism-led growth hypothesis: the case of the MERCOSUR. *Current Issues in Tourism* 18(7):647–666
- Buckley, R., (2011). *Tour. Environ. Annu. Rev. Environ. Resour.* 36, 397–416.
- Butowski L (2021) Sustainable tourism: a human-centered approach. *Sustainability* 13:1835. <https://doi.org/10.3390/su13041835>
- Caglayan E, Sak N, Karymshakov K (2012) Relationship between tourism and economic growth: a panel Granger causality approach. *Asian Econ Financ Rev* 2:591–602
- Calderón-Vargas F, Asmat-Campos D, Carretero-Gómez A (2019) Sustainable tourism and renewable energy: binomial for local development in Cocachimba, Amazonas, Peru. *Sustainability.* 11(18):4891
- Celata, Filippo. 2007. "Geographic marginality, transport accessibility and tourism development." Celant, A.: *Global Tourism and Regional Competitiveness*, Bologna, Patron, 37–46.
- Chang Y (2004) Bootstrap unit root tests in panels with cross-sectional dependency. *Journal of Economics.* 120(2):263–293
- Chen CF, Chiou-Wei SZ (2009) Tourism expansion, tourism uncertainty and economic growth: new evidence from Taiwan and Korea. *Tour Manag* 30(6):812–818
- Chien F, Anwar A, Hsu C-C, Sharif A, Razzaq A, Sinha A (2021) The role of information and communication technology in encountering environmental degradation: Proposing an SDG framework for the BRICS countries. *Technology in Society* 65:101587. <https://doi.org/10.1016/j.techsoc.2021.101587>
- Chou MC (2013) Does tourism development promote economic growth in transition countries? A panel data analysis. *Econ Model* 33:226–232
- Cortés-Jiménez I, Nowak JJ, Sahli M (2011) Mass beach tourism and economic growth: lessons from Tunisia. *Tour Econ* 17(3):531–547
- Croes R, Ridderstaat J, Bak M, Zientara P (2021) Tourism specialization, economic growth, human development and transition economies: the case of Poland. *Tour. Manag.* 82:104181. <https://doi.org/10.1016/j.tourman.2020.104181>
- Currie C, Falconer P (2014) maintaining sustainable island destinations in scotland: the role of the transport–tourism relationship. *Journal of Destination Marketing & Management, Transport And Destination Management* 3(3):162–172
- Balsalobre-Lorente D, Driha OM, Bekun FV, Adedoyin FF (2021) The asymmetric impact of air transport on economic growth in Spain: fresh evidence from the tourism-led growth hypothesis. *Current Issues in Tourism* 24(4):503–519. <https://doi.org/10.1080/13683500.2020.1720624>
- De Vita G, Katircioglu S, Altinay L, Fethi S, Mercan M (2015) Revisiting the environmental Kuznets curve hypothesis in a tourism development context. *Environ. Sci. Pollut. Res.* 22:16652–16663

- Dhungel KR (2015) An econometric analysis on the relationship between tourism and economic growth: empirical evidence from Nepal. *Int J Econ Financ Manag* 3(2):84–90
- Dogan E, Inglesi-Lotz R (2020) The impact of economic structure to the environmental Kuznets curve (EKC) hypothesis: evidence from European countries. *Environ Sci Pollut Res* 27:1–8
- Dogru T, Isik C, Sirakaya-Turk E (2019) The balance of trade and exchange rates: theory and contemporary evidence from tourism. *Tour Manag* 74:12–23
- Dogru T, Bulut U (2018) Is tourism an engine for economic recovery? Theory and empirical evidence. *Tour Management*. 67:425–434
- Dogru T, Bulut U, Kocak E, Isik C, Suess C, Sirakaya-Turk E (2020) The nexus between tourism, economic growth, renewable energy consumption, and carbon dioxide emissions: contemporary evidence from OECD countries. *Environmental Science and Pollution Research*. 27(32):40930–40948. <https://doi.org/10.1016/j.renene.2019.02.046>
- Dwyer L, Forsyth P, Spurr R, Hoque S (2010) Estimating the carbon footprint of Australian tourism. *J Sustain Tour* 18(3):355–376. <https://doi.org/10.1080/09669580903513061>
- Eluwole KK, Saint Akadiri S, Alola AA, Etokakpan MU (2019) Does the interaction between growth determinants drive for global environmental sustainability? Evidence from world top 10 pollutant emissions countries. *Sci Total Environ* 135972
- Etokakpan MU, Adedoyin FF, Vedat Y, Bekun FV (2020) Does globalization in Turkey induce increased energy consumption: insights into its environmental pros and cons. *Environ Sci Pollut Res*
- Gautam B.P. (2011) Tourism and economic growth in Nepal. *NRB Econ Re* 23:18–30
- Fauzel S (2020) FDI and tourism futures: a dynamic investigation for a panel of small island economies. In: *FDI and tourism futures: a dynamic investigation for a panel of small island economies*. J Tour Futur
- Fauzel S, Seetanah B, Sannasee R (2017) Analysing the impact of tourism foreign direct investment on economic growth: evidence from a small island developing state. *Tour Econ* 23(5):1042–1055
- Gamage SKN, Kuruppuge RH, Haq IU (2017) Energy consumption, tourism development, and environmental degradation in Sri Lanka. *Energy Sources B Econ Plan Policy*. 12:910–916
- Gasparatos A, Doll CNH, Esteban M, Ahmed A, Olang TA (2017) Renewable energy and biodiversity: implications for transitioning to a green economy. *Renew. Sust. Energ. Rev.* 70:161–184
- Gokmenoglu KK, Eren BM (2020) The role of international tourism on energy consumption: empirical evidence from Turkey. *Curr Issue Tour* 23(9):1059–1065
- Gössling S (2000) Sustainable tourism development in developing countries: some aspects of energy use. *J Sustain Tour* 8:410–425
- Gössling S (2013) National emissions from tourism: an overlooked policy challenge? *Energy Policy* 59:433–442
- Gössling S, Peeters P (2015) Assessing tourism's global environmental impact 1900–2050. *J Sustain Tour* 23(5):639–659. <https://doi.org/10.1080/09669582.2015.1008500>
- Gössling S, Scott D, Hall CM (2015) Inter-market variability in CO2 emission intensities in tourism: implications for destination marketing and carbon management. *Tour Manag* 46:203–212. <https://doi.org/10.1016/j.tourman.2014.06.021>
- Gössling S, Scott D, Hall CM, Ceron JP, Dubois G (2012) Consumer behavior and demand response of tourists to climate change. *Ann Tourism Res*. 39:36–58
- Granger CW (2003) Some aspects of causal relationships. *Journal of Economics*. 112:69–71
- Guarnieri M, Balmes JR (2014) Outdoor air pollution and asthma. *Lancet* 383(9928):1581–1592
- Hafeez M, Yuan C, Shah WUIH, Mahmood MT, Xiaolong M, Iqal K (2020) Evaluating the relationship among agriculture energy demand finance and environmental degradation in one belt and one road economies. *Carbon Management* 11(2) 139–154. <https://doi.org/10.1080/17583004.2020.1721974>
- Hall CM (2010) Changing paradigms and global change: from sustainable to steady-state tourism. *Tour. Retreat. Res.* 35:131–143
- Hye, A., and Khan, A., (2013) Tourism-led growth hypothesis: a case study of Pakistan. *Asia Pacific J Tourism Res* 18:303–313
- Ahir H, Bloom N, Furceri D (2018) The world uncertainty index. *SSRN Electron J*. <https://doi.org/10.2139/ssrn.3275033>
- IEA (2019) World Energy Balances. Retrieved September 05, 2021, from International Energy Agency website: <https://www.iea.org/reports/world-energy-balances-2019#oecd-countries>
- Im KS, Pesaran MH, Shin Y (2003) Testing for unit roots in heterogeneous panels. *Journal of Economics*. 115(1):53–74
- Isaeva, A., Salahodjaev, R., Khachaturov, A., & Tosheva, S. (2020). The impact of tourism and financial development on energy consumption and carbon dioxide emission: evidence from postcommunist countries. *Journal of the Knowledge Economy*.
- Isik C, Dogru T, Turk ES (2018) A nexus of linear and non-linear relationships between tourism demand, renewable energy consumption, and economic growth: theory and evidence. *Int J Tour Res* 20(1): 38–49
- Işik C, Ongan S, Özdemir D (2019) The economic growth/development and environmental degradation: evidence from the U.S. state-level EKC hypothesis. *Environ Sci Pollut Res* 26(30):30772–30781
- Isik C, Radulescu M (2017) Investigation of the relationship between renewable energy, tourism receipts and economic growth in Europe. *Statistika* 97(2):85–94
- Isik C, Kasimati E, Ongan S (2017) Analyzing the causalities between economic growth, financial development, international trade, tourism expenditure and/on the CO2 emissions in Greece. *Energy Sources B Econ Plan Policy*. 12:665–673
- Jebli MB, Youssef SB, Apergis N (2019) The dynamic linkage between renewable energy, tourism, CO 2 emissions, economic growth, foreign direct investment, and trade. *Latin American Economic Review* 28(1):1–19
- Kadir N, Karim MZA (2012) Tourism and economic growth in Malaysia: evidence from tourist arrivals from ASEAN-S countries. *Econ Res Ekonomska istraživanja* 25(4):1089–1100
- Kahia M, Ben Aissa MS, Kadria M, Charfeddine L (2017) Modelling the treatment effect of renewable energy consumption on economic growth: new evidence from the MENA Net Oil Exporting Countries (NOECs). *Energy*. 116:102–115
- Katircioglu S (2009) Tourism, trade, and growth: the case of Cyprus. *Appl Econ* 41(21):2741–2750
- Katircioglu ST, Feridun M, Kilinc C (2014) Estimating tourism-induced energy consumption and CO2 emissions: the case of Cyprus. *Renew Sust Energ Rev* 29:634–640
- Khalil S, Kakar MK, Malik A (2007) Role of tourism in economic growth: empirical evidence from Pakistan economy [with comments]. *Pak Dev Rev* 46:985–995
- Khan MT, Yaseen MR, Ali Q (2019) Nexus between financial development, tourism, renewable energy, and greenhouse gas emission in high-income countries: a continent-wise analysis. *Energy Economics* 83:293–310
- Khoshnevis YS, Salehi HK, Soheilzad M (2017) The relationship between tourism, foreign direct investment and economic growth: evidence from Iran. *Current Issues in Tourism* 20(1):15–26
- Kirikalleli D, Adedoyin FF, Bekun FV (2020) Nuclear energy consumption and economic growth in the U.K.: evidence from wavelet coherence approach. *J Public Aff*:1–11. <https://doi.org/10.1002/pa.2130>, 21
- Koçak E, Ulucak R, Ulucak ZŞ (2020) The impact of tourism developments on CO2 emissions: an advanced panel data estimation *Tourism Management. Perspectives* 33(2020):100611

- Lanza A, Temple P, Urga G (2003) The implications of tourism specialization in the long-run: an econometric analysis for 13 OECD economies. *Tour Manag* 24(3):315–321
- Lasisi TT, Alola AA, Eluwole KK, Ozturen A, Alola UV (2020) The environmental sustainability effects of income, labour force, and tourism development in OECD countries. *Environmental Science and Pollution Research* 27(17):21231–21242
- Le TH, Nguyen CP (2021) The impact of tourism on carbon dioxide emissions: insights from 95 countries. *Applied Economics* 53(2): 235–261
- Lee C-C, Chang C-P (2008) Tourism development and economic growth: a closer look at panels. *Tour Manag* 29(1):180–192
- Levin A, Lin CF, Chu CSJ (2002) Unit root test in panel data: asymptotic and finite sample properties. *J. Econ.* 108:1–24
- Li L, Wu B, Patwary AK (2021) How marine tourism promote financial development in sustainable economy: new evidences from South Asia and implications to future tourism students. *Environmental Science and Pollution Research*
- Litman, Todd. 2008. "Evaluating accessibility for transportation planning." March. <http://trid.trb.org/view.aspx?id=859513>.
- Lopez J, Bhaktikul K (2018) Sustainable environment and tourism industry: an institutional policy analysis of Northeastern Thailand. *Pol J Environ Stud* 27(1):31–37. <https://doi.org/10.15244/pjoes/75198>
- Mallick L, Mallesh U, Behera J (2016) Does tourism affect economic growth in Indian states? Evidence from panel ARDL model. *Theor Appl Econ* 23(1):183–194
- Mbarek MB, Saidi K, Rahman MM (2017) Renewable and non-renewable energy consumption, environmental degradation and economic growth in Tunisia. *Qual. & Quant.* 11:1–15
- Meo MS, Sabir SA, Arain H, Nazar R (2020) Water resources and tourism development in South Asia: an application of dynamic common correlated effect (DCCE) method. *Environ. Sci. Pollut. Res.* 27: 19678–19687. <https://doi.org/10.1007/s11356-020-08361-8>
- Mitchell J, Coles C. (2009) Enhancing private sector and community engagement in tourism services in Ethiopia, Project Report for the World Bank.
- Moreno-Luna L, Robina-Ramírez R, Sánchez MS-O, Castro-Serrano J (2021) Tourism and sustainability in times of COVID-19: the case of Spain. *International Journal of Environmental Research and Public Health* 18(4):1859. <https://doi.org/10.3390/ijerph18041859>
- Nathaniel S, Aguegboh E, Iheonu C, Sharma G, Shah M (2020b) Energy consumption, FDI, and urbanization linkage in coastal Mediterranean countries: re-assessing the pollution haven hypothesis. *Environ Sci Pollut Res* 27:1–14
- Nathaniel S, Barua S, Hussain H, Adeleye N (2020a) The determinants and interrelationship of carbon emissions and economic growth in African economies: fresh insights from static and dynamic models. *J Public Aff.*e2141
- Nathaniel S, Khan SAR (2020) The nexus between urbanization, renewable energy, trade, and ecological footprint in ASEAN countries. *J Clean Prod* 122709:122709
- Nguyen CP, Su TD (2021) Tourism, institutional quality, and environmental sustainability. *Sustainable Production and Consumption* 28: 786–801
- Nguyen CP, Binh PT, Su TD (2020) Capital investment in tourism: a global investigation. *Tour. Plann. Dev.* 1–27:1–27. <https://doi.org/10.1080/21568316.2020.1857825>
- Nissan E, Galindo MA, Méndez MT (2011) Relationship between tourism and economic growth. *Serv Ind J* 31(10):1567–1572
- Oh C-O (2005) The contribution of tourism development to economic growth in the Korean economy. *Tour Manag* 26:39–44
- Ohlan R (2017) The relationship between tourism, financial development and economic growth in India. *Future Business Journal* 3:9–22
- Okumus I, Erdogan S (2021) Analyzing the Tourism Development and Ecological Footprint Nexus: Evidence From the Countries With Fastest-Growing Rate of Tourism GDP. In: *Analyzing the tourism development and ecological footprint nexus: evidence from the countries with fastest-growing rate of tourism GDP*, In *Strategies in Sustainable Tourism, Economic Growth and Clean Energy* (pp. 141–154). Springer, Cham
- Pablo-Romero MDP, Molina JA (2013) Tourism and economic growth: a review of empirical literature. *Tourism Management Perspective* 8: 28–41
- Pan SY, Gao M, Kim H, Shah KJ, Pei SL, Chiang PC (2018) Advances and challenges in sustainable tourism toward a green economy. *Science of the Total Environment.* 635:452–469
- Pandey S, Dogan E, Taskin D, (2020) Production-based and consumption-based approaches for the energy-growth-environment nexus: evidence from Asian countries. *Sustainable Production and Consumption*
- Paramati SR, Sudharshan R, Alam MS, Chen CF (2017) The effects of tourism on economic growth and CO2 emissions: a comparison between developed and developing economies. *J Travel Res* 56 (6):712–724. <https://doi.org/10.1177/0047287516667848>
- Paudyal S (2012) Does tourism really matter for economic growth? Evidence from Nepal. *NRB Econ Rev* 24:48–66
- Peeters P, Dubois G (2010) Tourism travel under climate change mitigation constraints. *J. Transp. Geogr.* 18:447–457
- Pesaran MH (2006) Estimation and inference in large heterogeneous panels with a multifactor error structure. *Econometrica.* 74:967–1012
- Pesaran MH (2007) A simple panel unit root test in the presence of cross-section dependence. *Journal of Applied Economics.* 22:265–312
- Pesaran MH, Shin Y, Smith RP (1999) Pooled mean group estimation of dynamic heterogeneous panels. *J. Am. Stat. Assoc.* 94:621–634
- Pulido-Fernández JI, Cárdenas-García PJ, Espinosa-Pulido JA (2019) Does environmental sustainability contribute to tourism growth? An analysis at the country level. *J Clean Prod* 213:309–319
- Rasool H, Maqbool S, Tarique M (2021) The relationship between tourism and economic growth among BRICS countries: a panel cointegration analysis. *Futur Bus J* 7:1. <https://doi.org/10.1186/s43093-020-00048-3>
- Raza SA, Sharif A, Wong WK, Karim MZA (2017) Tourism development and environmental degradation in the United States: evidence from wavelet-based analysis. *Curr Issue Tour* 20(16):1768–1790. <https://doi.org/10.1080/13683500.2016.1192587>
- Razzaq A, Sharif A, Ahmad P, Jermisittiparsert K (2020) Asymmetric role of tourism development and technology innovation on carbon dioxide emission reduction in the Chinese economy: Fresh insights from QARDL approach. *Sustain Dev* 29(1):176–193
- Razzaq A, An H, Delpachitra S (2021) Does technology gap increase FDI spillovers on productivity growth? Evidence from Chinese outward FDI in Belt and Road host countries, *Technological Forecasting and Social Change* 172:121050. <https://doi.org/10.1016/j.techfore.2021.121050>
- Rembeci G (2016) Sustainable tourism as a smart alternative to boost economic development in Shkodra Region Godiva Rembeci, Elizabeta Susa
- Ren T, Can M, Paramati SR, Fang J, Wu W (2019) The impact of tourism quality on economic development and environment: evidence from Mediterranean countries. *Sustainability* 11(8):2296
- Roudi S, Arasli H, Akadiri SS (2019) New insights into an old issue—examining the influence of tourism on economic growth: evidence from selected small island developing states. *Current Issues in Tourism* 22(11):1280–1300
- Bano S, Alam M (2021) Anwar Khan and Lu Liu (2021) The nexus of tourism, renewable energy, income, and environmental quality: an empirical analysis of Pakistan. *Environment, Development and Sustainability* 23:14854–14877
- Saint Akadiri S, Alola AA, Akadiri AC (2019) The role of globalization, real income, tourism in environmental sustainability target.

- Evidence from Turkey. *Science of the Total Environment* 687:423–432
- Sarpong SY, Bein MA, Gyamfi BA, Sarkodie SA (2020) The impact of tourism arrivals, tourism receipts and renewable energy consumption on quality of life: a panel study of Southern African region. *Heliyon*. 6(11):e05351
- Seetanah B (2011) Assessing the dynamic economic impact of tourism for island economies. *Ann Tour Res* 38(1):291–308
- Sghaier, A., Guizani, A., Ben Jabeur, S., Nurunnabi, M., (2018). Tourism development, energy consumption and environmental quality in Tunisia, Egypt and Morocco: a tri-variate analysis. *Geo Journal*. 84, 593–609.
- Shakouri B, Khoshnevis Yazdi S, Ghorchebigi E (2017) Does tourism development promote CO2 emissions? *Anatolia* 28(3):444–452
- Sharif A, Afshan S, Nisha N (2017) Impact of tourism on CO2 emission: evidence from Pakistan. *Asia Pacific J Tourism Res* 22(4):408–421. <https://doi.org/10.1080/10941665.2016.1273960>
- Sharpley R (2000) Tourism and sustainable development: exploring the theoretical divide. *Journal of Sustain. Tour.* 8:1–19
- Solarin SA (2014) Tourist arrivals and macroeconomic determinants of CO2 emissions in Malaysia. *Anatolia* 25:228–241
- Srinivasan P, Kumar PS, Ganesh L (2012) Tourism and economic growth in Sri Lanka: an ARDL bounds testing approach. *Environ Urban ASIA* 3:397–405
- Tang CF (2011) Is the tourism-led growth hypothesis valid for Malaysia? A view from disaggregated tourism markets. *Int J Tour Res* 13:97–101
- Tang, C. F., & Abosedra, S. (2014). Small sample evidence on the tourism-led growth hypothesis in
- Tang C, Zhong L, Ng P (2017) Factors that influence the tourism industry's carbon emissions: a tourism area life cycle model perspective. *Energy Policy*. 109:704–718
- Tanizawa, A., Babalola, A., Bennis, K., Caltigirone, M., Manjarrez, L. J. (2011). Tourism cluster in Italy. *Microeconomics of Competitiveness- Final Report*. https://www.isc.hbs.edu/Documents/resources/courses/moc-course-at-harvard/pdf/student-projects/Italy_Tourism_2011.pdf
- Tian XL, Bélaïd F, Ahmad N (2020) Exploring the nexus between tourism development and environmental quality: role of Renewable energy consumption and income. *Structural Change and Economic Dynamics*. 56:53–63
- Torres R. Linkages between tourism and agriculture in Mexico. *Ann Tourism Res*. 2003;30(3):516–66. 7.
- Tsagarakis (2011) Tourists' attitudes for selecting accommodation with investments in renewable energy and energy-saving systems. *Renew Sustain Energy Rev*. 15:1335–1342
- Udemba EN (2019) Triangular nexus between foreign direct investment, international tourism, and energy consumption in the Chinese economy: accounting for environmental quality. *Environ Sci Pollut Res*
- Udi J, Bekun FV, Adedoyin FF (2020) Modeling the nexus between coal consumption, FDI inflow and economic expansion: does industrialization matter in South Africa? *Environ Sci Pollut Res*. <https://doi.org/10.1007/s11356-020-07691-x>
- UN, 2015. Transforming our World. The 2030 agenda for Sustainable Development. Resolution adopted by the General Assembly of the UN on Sept.25, 2015. New York, United Nations.
- UNEP and UNWTO, (2012). Tourism in the green economy: background report. United Nations Environment Programme (UNEP) and World Tourism Organization (UNWTO), Spain and Kenya, p. 167.
- United Nations Environment Programme (UNEP) (2011) Towards a green economy: pathways to sustainable development and poverty eradication a synthesis for policymakers. Paris, France. 2011. Retrieved from https://www.greengrowthknowledge.org/sites/default/files/downloads/resource/Green_Economy_Report_UNEP.pdf, Accessed 31 August 2021.
- Usman M, Kousar R, Makhdum MS (2020) The role of financial development, tourism, and energy utilization in environmental deficit: evidence from 20 highest emitting economies. *Environmental Science and Pollution Research* 27:42980–42995
- Wanner A, Seier G, Pröbstl-Haider U (2020) Policies related to sustainable tourism—an assessment and comparison of European policies, frameworks and plans. *Journal of Outdoor Recreation and Tourism*. 29:100275
- Welteji and Zerihun (2018) Tourism–agriculture nexuses: practices, challenges and opportunities in the case of Bale Mountains National Park. *Southeastern Ethiopia, Agric & Food Secure* 7:8
- Westerlund J, Edgerton DL (2008) A simple test for cointegration independent panels with structural breaks. *Oxf. Bull. Econ. Stat.* 70:665–704
- World Travel and Tourism Council (2019) Travel & tourism: generating job for youth January 2019. World Travel & Tourism Council, London
- Zaman K, Moemen MAE, Islam T (2017) Dynamic linkages between tourism transportation expenditures, carbon dioxide emission, energy consumption and growth factors: evidence from the transition economies. *Curr Issue Tour* 20(16):1720–1735. 10.1080/13683500.2015.1135107
- Zaman K, Shahbaz M, Loganathan N, Raza SA (2016) Tourism development, energy consumption and environmental Kuznets curve: trivariate analysis in the panel of developed and developing countries. *Tour Management*. 54:275–283
- Zhang J, Zhang Y (2020) Tourism, economic growth, energy consumption, and CO2 emissions in China. *Tourism Economics*. 26:1060–1080. <https://doi.org/10.1177/1354816620918458>
- Zhang L, Gao J (2016) Exploring the effects of international tourism on China's economic growth, energy consumption and environmental pollution: evidence from a regional panel analysis. *Renewable and Sustainable Energy Reviews*. 53:225–234
- Zhang S, Liu X (2019a) The roles of international tourism and renewable energy in environment: new evidence from Asian countries. *Renewable Energy*. 139:385–394
- Zhang S, Liu X (2019b) The roles of international tourism and renewable energy in environment: new evidence from Asian countries. *Renewable Energy*. 139:385–394