frontiers | Frontiers in Environmental Science

CONCEPTUAL ANALYSIS
published: 03 August 2022
doi: 10.3389/fenvs.2022.959850

The Influence of Foreign Direct Investment and Tourism on Carbon Emission in China

Hong Wang[1], Dinghong Xu[2], Zainab Mufarreh Elqahtani[3], Zhang Juan[4], Muneeb Ahmad[5], Asad Ali[6], Yousaf Ali Khan[6]* and Amir Saghir[7]*

[1]School of Tourism, Hainan University, Haikou, China, [2]Business School, Newcastle University, Newcastle upon Tyne, United Kingdom, [3]Department of Physics, College of Science, Princess Nourah bint Abdulrahman University, Riyadh, Saudi Arabia, [4]Graduate School, Southeast Asia University, Bangkok, Thailand, [5]School of Finance, Jiangxi University of Finance and Economics, Nanchang, China, [6]Department of Mathematics and Statistics, Hazara University Mansehra, Mansehra, Pakistan, [7]Department of Statistics, Mirpur University of Science and Technology (MUST), Azad Jammu and Kashmir, Pakistan

The aim of this research is to examine the potential influence of FDI inflows and tourism industry on carbon dioxide emissions in China using System GMM models for a sample period of 1980–2019. Using FMOLS and DOLS models, this research examines the long-term relationship between the variables, as well as the long-term association among components. Co-joining the boards of FMOLS and DOLS models shows a general correlation between the investigation elements and CO_2 emissions in China. FDI, tourism sector, and environment-friendly electricity use have all been major contributors to rising CO_2 emissions in China for a long time. Using System GMM, FMOLS, and DOLS models in China, we examined the influence of the travel sector on carbon dioxide emissions as well as environment-friendly electricity usage and foreign direct investment. The government of China is being pushed to attract more foreign direct investment in order to improve the system and expand the transportation industry. As a reasonable responsibility to an unnatural climate change, methods for developing the movement business and theories relating to the movement business should be adopted.

Keywords: CO_2 emissions, foreign direct investment, tourism industry, environmental changes, multivariate analysis, fully modified ordinary least square model

OPEN ACCESS

Edited by:
Ehsan Elahi,
Shandong University of Technology, China

Reviewed by:
Shan Shan,
Coventry University, United Kingdom
Jin Guo,
University of Lincoln, United Kingdom

****Correspondence:***
Yousaf Ali Khan
yousaf_hu@yahoo.com
Zhang Juan
m15181445326_1@163.com

Specialty section:
This article was submitted to Environmental Economics and Management, a section of the journal Frontiers in Environmental Science

Received: *02 June 2022*
Accepted: *21 June 2022*
Published: *03 August 2022*

Citation:
Wang H, Xu D, Mufarreh Elqahtani Z, Juan Z, Ahmad M, Ali A, Khan YA and Saghir A (2022) The Influence of Foreign Direct Investment and Tourism on Carbon Emission in China. Front. Environ. Sci. 10:959850. doi: 10.3389/fenvs.2022.959850

INTRODUCTION

A different type of research examines the impact of income and the tourism sector on CO_2 emissions (Peng et al., 2020a; Zhao et al., 2022). While using inventive examination strategies on diverse topographical settings, a writing hole is still obvious, and adding additional components necessary to include the muddled relationship between human monetary activities and natural corruption is important to consider. Regardless, the connections between the transportation industry and the rise in carbon dioxide emissions are not clear. Additionally, Qi et al. (2020) studied the relationship between China's GDP and the spread of carbon dioxide (CO_2) in China. Low carbon emissions should be linked to an increase in financial outcomes (Peng et al., 2021b;

Abbreviations: CO_2, Carbon Dioxide emissions; DOLS, Dynamic Ordinary Least Square Model; FDI, Foreign Direct Investment; FMOLS, Fully Modified Ordinary Least Square; GDP, Gross Domestic Product; RE, Renewable Energy; SGMM, System Generalized Method of Moments; TOUR, Tourism.

Wang et al., 2021), according to the researchers, who used cointegration and fragmented mix methodologies to arrive at this conclusion. An investigation conducted by Mahrinasari et al. (2019) found a positive correlation between rising carbon emissions and trade activity in Asian countries. As Katircioglu et al. (2020) have shown, China's transportation industry is a major source of fossil fuel byproducts. Carbon surge has been found to have a negative influence on the movement industry in the evaluation test economies, according to Tugcu and Topcu. As an example, Sadorsky (2009) has examined the relationship between the use of viable power assets and financial development and discovered that a gain in yield is supported by the activity of such assets. Many factors contribute to a location's popularity, but environmental degradation, excessive energy consumption, and abundant water use are the most critical (Sheng et al., 2019; Ciacci et al., 2021; Elahi et al., 2022a; Elahi et al., 2022b). No matter how you slice it, the data reveal a drop in the amount of people who want to express themselves in countries that were founded (Khan et al., 2020). Framework GMM and FMOLS models will be used to study the impact of sustainable power and direct speculation on carbon emissions in China, as well as global exchange and tourism industry interactions. During the 1980s to the present, the transportation industry, international commerce, and economic growth were all impacted by carbon emissions (Tu et al., 2019). Even without an event to create countries that illustrate this global expansion in movement business raise release, the transportation industry has a good impact on carbon spread.

The current research provides significant insight into the role of various financial activities in CO_2 emissions in order to better understand the impact of various financial elements on environmental pollution. In addition, the same technique used in the focus enables us to understand the differences in environmental change relief methods between developed and agrarian countries. According to Yu and Xu (2019), the FDI in China played a substantial role in the country's decreased CO_2 emissions on a national level. The travel industry's CO_2 emissions have been measured using a variety of monetary models in order to indicate environmental change (Zhao et al., 2020; Peng et al., 2021a; Zhao et al., 2021) (Balsalobre-Lorente, et al., 2020). For the most part, the econometric models focused on the direct link between the travel industry's growth and climate change (Wu et al., 2021; Agbanike et al., 2019). It is becoming increasingly clear that environmental change, particularly in high-emanation areas, will have a significant impact on the tourism industry's long- and medium-term prospects (Lemieuxa, 2010). Research on financial and environmental impacts of travel industry activities has increased in recent years (Croes and colleagues 2021), and the earthy people have also been concerned about the development of an ITO that is manageable (Usman et al., 2020).

The remaining of this manuscript is structured as follows: Brief Literature is presented in Segment 2. Methods and data used are explained in Segment 3, while results and dialogues are provided in Segment 4. Finally, Segment 5 concludes this investigation with recommendations on how to proceed.

LITERATURE REVIEW

Effectively advance the good impact of the travel industry advancement on the environment and work on the natural familiarity with tourists via preparation of instruction and remove the unrefined conduct of eradicating the climate in exercises of the travel industry (Jing Zhao, 2018). The travel sector globally is positively impacted by our environmental effect variables, such as environmentally sustainable electricity and transportation administrations; agriculture, ranger service, and fishery (AFF); and gross domestic product development (Khan, 2021). It has emerged as one of the fastest-growing ventures in the world, creating a large number of positions, expanding the global pay, halting expansion, and causing foundation advancement for what it is worth, as it is considered essential for the development of the travel industry open doors (Meo et al. (2020)).

Manageable travel industry advancement implies an integrated approach that points practically at future amicable preparation with inclusion of all its social, financial, and ecological aspects by making and securing a beneficial harmony between the needs of people and the greatest conceivable supportability of normal assets, including the travel industry objections (Lasisi et al., 2020). A few challenges for policymakers are posed by the growth of the travel business economically and by its executives; thus, an investigation into the relationship between natural quality and travel industry improvement is necessary (Okumus and Erdogan 2021). Progress in the tourism industry's biological aspects depends heavily on monetary measures that have an impact on environmental concerns (Lasisi et al., 2020). The country's monetary growth enables it to endure consumption on ecological maintainability and strengthens its power to exhibit natural practices that are environmentally friendly (Peng et al., 2020b; Tu et al., 2020; Nguyen and Su 2021; Zhong et al., 2021). The travel business is a major consumer of energy; therefore, understanding the interrelationships among the key variables associated with the economy, climate, energy, and the travel industry is vital to developing an economically viable travel industry system (Lasisi et al., 2020).

A global transition to the use of renewable energy sources, such as wind and solar, is being promoted from coast to coast in order to reduce emissions of ozone-depleting greenhouse gases (GHGs) (Zhang et al., 2020) (An et al., 2021). For Li et al. (2021), financial development is measured by gauging the contributions, spending, and contributions of tourists and merchants, particularly those from outside China. Higher GDP growth also has an important role in the growth of the outbound tourism sector. The expectations of eight South African nations for day-to-day comforts based on twenty years of information were investigated by Sarpong et al. (2020) in another review. It has been suggested by several researchers, including Nguyen and Su (2021) and Gössling et al. (2012), travelers will pay a premium for destinations that can be maintained. Despite protests from tourists, one option to make the tourism sector more viable is to use renewable energy sources. In spite of the fact that it will cost more money for the passengers, they will choose to pay the

additional fee because of their moral convictions (Nguyen et al., 2020). As a result, the travel industry has a direct impact on four of the previously mentioned economic sectors (Buckley 2011). The improvement of the travel industry and travel system that ensures a proper balance between all four previously mentioned perspectives, as now sightseers consider these four viewpoints essential for their decision of objective and extreme fulfilment, can be characterized as the sustainability of the travel industry (Sharpley 2000).

In order to protect the climate and the environment, the most pressing concern for the travel industry's bottom line is the amount of fossil fuel waste it generates (Nguyen and Su 2021). One of the challenges the travel industry will be facing in the future is the need for a drastic change to reduce CO_2 emissions to prevent environmental degradation (Peeters and Dubois 2010). Access to and use of energy assets are critical determinants of financial outcomes (Udi et al., 2020), and as a result, nations lacking sufficient energy assets face obvious financial issues (Peng et al., 2021c). The tourism sector has recently been viewed as a source of natural corruption (Işk et al., 2019). Travel sector energy nexus research is scarce and linked to a variety of activities, including transportation, as compared with research on the travel industry's overall development nexus. Travelers' concerns about energy usage, water use, and waste management have led to several observational studies concluding that the two industries are intertwined (Dwyer et al., 2010).

Solarin (2014) investigates the relationship between Malaysia's tourism sector and the country's energy use. According to a separate analysis, the usage of travel industry-related energy has negative ecological implications, such as increased CO_2 emissions as a result of movement and transportation. Travel and CO_2 emissions might eventually co-develop, according to Koçak et al. (2020). The travel industry's usage of land is another cause of ecological incapacity. Green transportation, green technology, and the efficient use of renewable energy are all part of an eco-friendly travel system (Paramati et al., 2017; Shen et al., 2019; Zhong et al., 2020; Huang et al., 2021). High water use, ecological pollution, as well as increased energy use are all factors that limit the travel sector's ability to sustain itself (Skillet et al., 2018). Observational findings show that the travel business has a growing influence on contamination and CO_2 emissions (2019). A large portion of the energy used by the travel and tourism business is used by transportation, convenience, and education (Tsagarakis 2011). Travel sector development and energy-climate nexuses are explained by the review's findings, which have not previously been seen (Işk et al., 2019). In 10 contaminated emissions nations, Eluwole et al. (2019) found a non-critical link between the tourism sector and ecological maintainability, whereas other studies found a significant link between travel and toxin emissions (Lasisi et al., 2020). With the goal of finding a link between China's tourism business and fossil fuel goods, Zhang and Zhang (2020) investigated the relationship between these two industries. Zhang and Gao (2016) found that the tourism sector had a negative impact on CO_2 emissions in China's eastern region. On the other hand, emissions of CO_2 in China's central and western regions are mostly unaffected. Predicted by Tang et al. (2017), the travel sector is a major consumer of energy and a major contributor to the emission of ozone-damaging substances. They found a link between the scale of the travel sector and the amount of waste produced as a result of using fossil fuels. As a result of global travel industry and development, Zhang and Gao (2016) conclude that the travel sector in China is one of the top carbon producers in the country. The industrial sector contributed to environmental emissions enormously and damaged human health (Gu et al., 2019; Gu et al., 2020a; Gu et al., 2020b). As an indicator of ecological quality, Tian and colleagues (2020) use CO_2 emission levels as a measure of gross domestic product (GDP) growth and sustainable power consumption in the travel industry's progress and the climate. The travel sector is impacted by a number of variables, some of which are directly related.

Calderón-Vargas et al. (2019) analyzed the relationship between RESC and the travel industry by examining the potential for breeze/sun-based energy based on the progress of the spatial-worldly traveler stream in another maintainable travel industry research. A study by Dogru et al. (2020) found that although improvements in the travel business have a detrimental influence on CO_2 emissions in Turkey and Canada, they basically have a certain effect on emissions from the European Union countries of Italy, Slovakia, and Luxemburg. Travel industry groups, sightseers, and travel industry networks are all together referred to as the travel industry by Butowski (2021), even if these entertainers have an equal stake in preserving reasonable travel business. According to Khan et al. (2019), the impact of Coronavirus, which has decimated the tourism sector over the last two years, is also being examined. The study by Moreno et al. (2021) examines the impact of Coronavirus on the tourism business in different regions of Spain. The Spanish travel sector is very valuable, but it has been hit hard by the pandemic's effects due to the Coronavirus outbreak. The combined impact of wind energy projects and the tourism sector on neighborhood progress in the Amazon region is examined by Calderón et al. (2019).

In terms of biodiversity, it is an ideal location for the tourism business. Environmentally friendly electricity, green advancements, and green transportation are among the key factors that Skillet et al. (2018) believe are necessary for a sustainable travel sectors. Using 40 years of data and causation between development and CO_2 emissions, Hafeez et al. (2020) discovered a vital link between CO_2 emissions and globalization in South Asian countries. The findings of Paramati et al. (2017) show that improving the travel sector has a negative impact on CO_2 emissions in the near term, but a beneficial impact in the long term. According to Lopez and Bhaktikul's (2018) research, a big part of Thailand's tourism sector can be traced back to the mountains' easy ascent, which is followed by visits to historical sites and then sanctuaries. Relative methods should be focused on the plans of integrated administration, a healthy lifestyle, and a sustainable tourism business that uses green technology. Lastly, there must be no preconceived notions that argue that the tourism business is unrelated to growth (Razzaq et al., 2021).

A favorable correlation was found between the degree of financial change and the development of the travel sector by

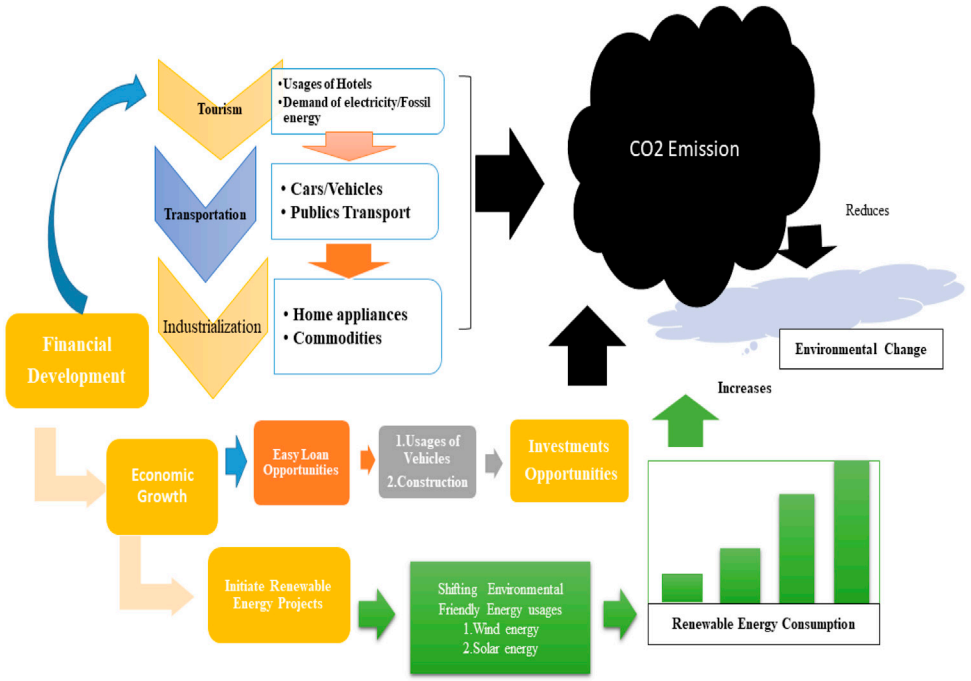

FIGURE 1 | Conceptualization of the anticipated research.

Asadzadeh (2017). An increase in financial resources leads to more innovation, which may be used to reimagine natural boundaries. According to Rembeci, (2016), the travel sector has a significant impact on the economy, and he recommends greater research into the role of economics, climate, and energy in managing the travel industry (2020). The next year, (Abdouli M, 2020) the GMM assessor was used to investigate the link between financial development, FDI, ecological quality, and monetary advancement, and found that FDI is a decent driver of financial development, but it reduces the character of the climate (Abdouli M, 2020). Foreign direct investment (FDI) in SSA countries has increased moderately, although new projects by global organizations rely on the host nation's usual assets, such as agriculture, assembly and oil production (Adegboye et al., 2020). It also determines their utility by taking into account activities such as the tourism sector, urbanization, and population growth (Shahzad et al., 2021).

A recent study by Jiang and Ma (2019) found that rising prices for fossil fuel waste are a positive development. He said that FMOLS assessors rely heavily on parametric assessment to answer concerns about sequential linkage and endogeneity, as well as to evaluate the long-term consequences of the chosen illustrative factors on FDI in BRICS economies (Muhammad Azam, 2021). For example, FMOLS and DOLS assessors were designed to correct for the OLS assessor's endogeneity and sequential connection (Phillips, 1995). In contrast to FMOLS assessors, Kao and Chiang (2001) found that the DOLS assessor is less biased and has unmatched small example features. A board co-combination approach is then used to examine the long-term relationship between the variables under consideration.

To begin, we use the board fully modified ordinary least square (FMOLS) and dynamic normal least square (DOLS) to examine the relationship that has existed for some time (Nikolaos Dritsakis, 2017). A standard pooling OLS for sequential relationship and endogeneity is critical for FMOLS assessors here (Baltagi and Kao, 2001). As soon as the long-term run relationship is established by the cointegration test, we use FMOLS strategic approach to examine long-term links between oil shocks and genuine absolute exchange balance, real oil exchange equilibrium, and genuine non-oil exchange balance (Shudhasattwa Rafiq, 2016). Using the DOLS and FMOLS, Doan et al. (2019) discovered that financial complexity had a positive effect on ecological corruption. It was predicted that the Ramzan et al. (2021) study on Latin American economies using the FMOLS and DOLS would have a negative and crucial influence on the byproducts of fossil fuels. The theoretical framework of the current research is visualized in **Figure 1** below.

RESEARCH METHODS AND DATA COLLECTION

The exploration has connected with fixed, energetic, and since quite a while ago run assessors to find the intense and since a long time ago run connections among the chose factors. We have retrieved all information from the World Development Indictor of the World Bank. The reliant variable of the review is CO_2 emissions estimated in metric tons per capita. The free factors incorporate unfamiliar direct venture (FDI) estimated as net

inflows as a percent of gross domestic product, per capita gross domestic product, environmentally friendly power utilization (RE) determined as the level of absolute last energy, and the travel industry (Visit) as worldwide travel industry receipt. Additionally, the metropolitan populace, public consumption, exchange receptiveness, and workforce are utilized as control factors in the static and dynamic models. Following (Dong, and Jiang, 2020) the basic direct useful connection among CO_2 and informative factors can be depicted as follows:

$$CO_{2it} = \int (RE_{it}, TOUR_{it}, IT_{it}, FDI_{it}, GDPPC_{it}, X_{it}). \quad (1)$$

Eq. 1 can be rewritten as follows after adding a constant term (S_0) and an error term ε_{it} where in (S_k) (k = 1,2,..,6) represent the coefficients. The error term is assumed to be normally distributed at zero mean value and constant variance (Elahi et al., 2021; Zhang et al., 2022).

$$CO_{2it} = S_0 + S_1\, RE_{it} + S_2\, TOUR_{it} + S_3\, IT_{it} + S_4\, FDI_{it} + S_5\, GDP_{it} + S_6\, X_{it} + \varepsilon_{it}. \quad (2)$$

We have applied customary least square (OLS) fixed-impact model, completely adjusted standard least square (FMOLS), dynamic conventional least square model (DOLS), and framework summed up strategy for minutes (SGMM) to analyze the since a long time ago run relationship among factors. The SGMM model is useful as it is the chiefly capable assessor of OLS and set result models and has been tried by numerous observational investigations. The test model can be shown as follows:

$$CO_{2it} = S_0 + S_1\, CO_{2\,it-1} + S_2\, RE_{it} + S_3\, TOUR_{it} + S_4\, IT_{it} + S_5\, FDI_{it} + S_6\, GDPPC_{it} + S_7\, X_{it} + \varepsilon_{it}. \quad (3)$$

In this situation, CO_2, RE, FDI, GDPPC, and Visit represent carbon dioxide, environmentally friendly power usage, unfamiliar direct speculation, total national output per capita, and the global travel industry. $CO_{(2\ it\text{-}1)}$ is the main slack of distinct factors in condition (1), which specifies the earlier year strain on the current year. Simultaneously, X_{it} addresses the control factors of the examination. The control factors remembered for the model are city individuals, public use, exchange receptiveness, and workforce. The addendums in the situation assign (I = 1,....., N), (t = 2000,....,2020) index country and example, correspondingly.

The linear ε_{it} addresses the since quite a while ago run evenness divergences from the since quite a while ago run. Following the board unit root and reconciliation tests, the since a long time ago run assessment was determined. For long-term assessment of model coefficients, the review connected since quite a while ago run evaluation of FMOLS and DOLS models, which were liked over OLS model to stay away from one-sided outcomes. Fortifying the motivation behind lessening assessor favoritism, (Pedroni 2004) technique is used for the co-mix of factors by using the FMOLS model. They involve non-parametric cycles in FMOLS model for progressive association and endogeneity concerns adjustment. Furthermore, DOLS model of assessment proposed by Imprint and Sul, (2003) was also carried out for the heartiness of the board information examination results.

EMPIRICAL RESULTS AND DISCUSSION

Test Results of Panel Unit Root and Co-Integration

The consequence of four assorted board unit root tests directed on the chose factors at level and first contrasts for the time of 1980–2019 are given in **Table 1**. All of the unit root tests disposed of the invalid speculation of participation of unit root and set up the stationarity of all factors at level or first qualification.

The co-joining in the sheet is undaunted after testing the stationarity of the factors by utilizing board unit root tests. For this reason, Pedroni (2004) procedure was utilized to examine the turnout of co-coordination among the researching factors. The aftereffects of all board co-mix tests dismissed the invalid theory of no cointegration and affirmed the cointegration among factors of the examination. In **Table 2**, the consequences of board co-mix test for Asia Pacific and European nations from 1980 to 2019 are shown.

The Outcomes of Long-Run Estimates

Table 3 shows the outcomes of consistent effect model and method GMM appraisal to check the relationship among CO_2, overall trade and OLS, harmless to the ecosystem power usage, new direct theory, and the movement business of the picked country's board. The eventual outcomes of the system GMM for China particularly show the strong quantifiable significance of the loosened subordinate elements which exhibits the sensibility of the model. Basically, the p-assessments of Sargan test, autoregressive of solicitation 1(AR1) and (AR2) similarly show that the picked model is reasonable. The surveyed coefficient of reasonable power shows negative association with carbon transmission for China attesting the diminishing in carbon outpouring as indicated by extended usage of feasible power sources. Even more expressly, the outcome of OLS model exhibits that 1% improvement in practical power use diminishes CO_2 emissions by 0.335 and 0.459% in China respectively. Nevertheless, as demonstrated by fixed effect models, 1% development in supportable power utilization decreases carbon dioxide emissions by 0.137 and 0.459%, respectively, for China. Basically, the system GMM results in the like manner shows that 1% development is harmless to the ecosystem power utilization and will reduce carbon dioxide emissions by 0.46 and 0.214% in China independently. The results additionally uncovered that the evaluated coefficient of new direct endeavor on carbon dioxide emissions is significantly enormous through OLS, set effect model, and structure GMM for European countries. The result shows that a percent increase in new tourist adventure, it will assemble carbon dioxide emissions by 0.0011% in fixed effect model while decrease carbon dioxide emissions by 0.035% in the structure GMM model.

Moreover, for China, the coefficient of the development business is also essentially fundamental in all models. The relationship among

TABLE 1 | Panel unit root tests.

Variables	Levin Linchu		Pearson		Bruiting		Hadri	
	Level	**2**nd Difference	**Level**	**2**nd Difference	**Level**	**2**nd Difference	**Level**	**2**nd Difference
CO3	0.32	−32.9	3.54	−35.35	9.07	−39.719	30.95	−5.739
	(0.000)a	(000)b	(0.000) a	(0.000) b	−2	(0.000) b	(0.000) a	(0.000) b
FDI	−7.54	−95.39	−9.32	−50.72	−9.95	−19.73	20.52	5.39
	(0.000) a	(0.000)b	(0.000) a	(0.000) b	(0.000) a	(0.000) b	(0.000) a	(0.000) b
RE	−3.75	−25.52	−0.07	−18.79	3.39	−9.75	19.19	20.54
	(0.005) a	(0.000)b	−0.48	(0.000) b	−0.73	(0.000) b	(0.000) a	(0.000) b
TOUR	−0.59	−20.48	3.93	−20.07	5.39	−2.35	19.39	35.03
	−0.32	(0.000)b	−0.73	(0.000) b	−2	(0.000) b	(0.000) a	(0.000) b
GDP	−3.73	−30.75	−3.97	−37.39	−3.37	−18.73	18.73	20.79
	(0.0002) a	(0.000)b	(0.000) a	(0.000) b	(0.009) a	(0.000) b	(0.000) a	(0.000) b
Urba	−19.5	−30.2	−32.75	−52.93	−27.95	−19.37	27.07	30.54
	(0.000) a	(0.000)b	(0.000)a	(0.000) b	(0.000) a	(0.000) b	(0.000) a	(0.000) b

"a" *and* "b" *in the table represent the probability of no unit root at first difference.*

TABLE 2 | Panel co-integration test results.

Alternating Hypothesis: Regular AR coefficients. (Within component) weighted				
	Statistics	Probability	Statistics	Probability
Panel v-statistics	5.376382	0.000***	4.126126	0.000***
Panel rho-statistics	−4.374541	0.000***	−4.135654	0.000***
Panel PP-statistics	−7.627476	0.000***	−23.72385	0.000***
Panel ADF-statistics	−7.562387	0.000***	−23.26256	0.000***
Alternating hypothesis: Ordinary AR coefficients. (Inside constituent)				
	Statistic	Prob.	—	—
Group rho-statistics	−0.382617	0.000***	—	—
Group PP-statistics	−16.26256	0.000***	—	—
Group ADF-statistics	−17.14265	0.000***	—	—

****Significance at the 1% level.*

TABLE 3 | Results of OLS, fixed effect, and system GMM models.

Variables	OLS	FE	(SGMM)
COit-2	—	—	−1.970***
	—	—	−7.08
Renewable energy	−0.629***	−0.626***	−0.282***
	−0.016	−0.016	−0.004
FDI	−0.002	0.0016**	−0.062***
	−0.027	−0.024	−0.024
TOUR	−0.000***	0.049***	0.065***
	0	−0.008	−0.004
RE	0.424***	0.248***	0.428***
	−0.04	−0.024	−0.02
URB	0.416***	−2.040**	0.326***
	−0.032	−4.96	−0.006
GDP	0.802***	0.442***	0.749***
	−0.028	−0.016	−0.007
GTI	1.780***	4.420***	2.280***
	−2.652	−1.92	−6.016
Constant	−27.28***	−2.494***	−24.70***
	—	—	−0.097
Observations	2,616	2,616	1,680
Number of id	—	162	162
R squared	0.965	0.649	—
AR(2)	—	—	−2.48(0.002)
AR(2)	—	—	−0.87(0.497)
Sargan test	—	—	26,565.7(0.202)

*OLS is ordinary least square; FE is fixed effect model; and SGMM is system generalized method of moments. ** and *** show significance level at 2–7% level, respectively.*

development industry and carbon dioxide transmission is productive in long-lasting outcome models in structure GMM for Asia Pacific nations, in any case on the other hand, essential for Asia Pacific nations in OLS and framework GMM. For representation, the results of framework GMM for Asia Pacific nations show that 1% improvement in the development business builds the carbon dioxide freedom by .024%. As indicated by the outcomes, there is a critical coefficient for China of exchange receptiveness in all models together while in OLS, FE, and SGMM models the relationship through carbon dioxide emissions is agreed for Asia Pacific nations appearing to some development consequently straight imposition will expand carbon dioxide ejection. Considerably, further unequivocally, the postponed results of OLS and fixed impact models show 1% augmentation in widespread business; it will broaden carbon dioxide emissions by 0.41% in Asia Pacific nations.

Fundamentally, on the off chance, the SGMM result also displays that here there is a 1% improvement in overall exchange and it will develop carbon dioxide freedom by 0.33% in Asia Pacific nations. For European countries, the trade openness coefficient is fundamentally essential with the relationship through carbon dioxide freedom in all negative models which shows that assuming exchange straight imposition increases by 1%, carbon dioxide conveyance will diminish by 0.66% in OLS, 0.24% in structure GMM model, and 0.31% in set outcome model. Meanwhile, per capita gross domestic product is besides found fundamental to paying little mind to models

TABLE 4 | Long-run valuation of DOLS and FMOLS models.

Variables	FMOLS			DOLS		
	Co-efficient	t-statistics	*p*-value	Co-efficient	t-statistics	Probability
FDI	12.401	435,671	0.000***	0.1332	16.978	0.000***
RE	48.324	516,278.42	0.000***	−0.142	−8.2314	0.000***
TOUR	−89.526	−1426551	0.000***	2.467	25.342	0.000***
GDP	−25.81	−18272811	0.000***	−0.006	−5.876	0.000***
URB	−16.42	−2371812	0.000***	0.324	7.627	0.000***

****Significance level at 1%.*

from the OLS model anyplace. The relationship through carbon dioxide emissions is positive in framework GMM. Similarly, for China to create in per capita, absolute public result will develop carbon dioxide freedom. The outcomes of fixed effect model are opposite; that is increase in per capita gross domestic product reduces carbon dioxide emissions.

FMOLS and DOLS Model Long-Run Measurement

Table 4 shows extended results of all the examination factors together for Asia Pacific and European nations by since using FMOLS and DOLS techniques for long -run association among variables. The estimation of the outcomes shows that all common coefficients are quantifiably essential. On the other hand, for Asia Pacific countries, the short-term outcomes of FMOLS incorporate that FDI and legitimate power use are the basic drivers for developing CO_2 removal. Our exposures show that expansion in the development business decreases CO_2 conveyances can be related with green the development business speculation since there have been adding to the zone by remaining beneficial level of voyagers which transport princely bio combination and tidiness also untamed greatness.

Also, our disclosures show that expansion in cash-related progression of Asia Pacific nations lessen carbon dioxide ejection which are contrasting with the results of (Ben Jebli, 2015) who depicts to enhance in monetary improvement rot carbon dioxide freedom in Tunisia. The results of DOLS model show that travel industry business, worldwide exchange, and FDI are the significant drivers to develop carbon dioxide release. Our revelations with respect to FDI are in understanding through the disclosures of (Salahud racket et al., 2018) acquainting with FDI redesigns CO_2 emissions in Kuwait, however, contrary to the outcomes of Zhu et al. (2016). The revelations of DOLS of the force examination on feasible power use and 1% extension in harmless to the ecosystem power use reduces CO_2 emissions by 0.8% which can be achieved by substitutability of harmless to the ecosystem power in addition to remnant while increase the activity of viable impact as opposed to going before energy.

According to **Table 4**, European countries' results of FMOLS and DOLS tests are shown, where FDI, movement business, and supportable power use are the primary drivers of increasing carbon dioxide expulsion in Europe, but supportable power use and financial turn of events and trade openness are primarily responsible for decreasing carbon dioxide expulsion in Europe. The results of our analysis, while different when compared to those of Salahuddin et al. (2018), challenge that design changes in FDI increase emissions, and this is reflected in our disclosures about FDI (Zhu et al., 2016). CO_2 emissions are reduced by 0.15 percent and 1.50 percent in FMOLS and DOLS models, respectively, when a 1% increase in practical power consumption is taken into account. This is consistent with FMOLS and DOLS results as for supportable power use. Similarly, Ben Jebli and Ben Youssef (2015) found that CO_2 emissions decreased in Tunisia as a result of an increase in the country's GDP.

CONCLUSION AND SUGGESTIONS

When it comes to carbon dioxide emissions in China, the review looks at how FDI inflows and tourism have an influence using OLS, fixed effect, and system GMM models. Using FMOLS and DOLS models, the examination examines the long-term link between the variables, as well as the long-term association between components. The combination of FMOLS and DOLS models shows a general correlation between the investigation elements and CO_2 emissions in China.Using system of GMM,FMOLS and DOLS model China gross domestic product , foreign direct investment (FDI), the tourism industry, and environmentally friendly electricity use have all been major contributors in rising CO2 emissions for some time in China..

We examined the influence of the travel sector on carbon dioxide emissions as well as environmentally friendly electricity usage and foreign direct investment (FDI). A negative correlation was found between direct ventures and the travel sector and carbon emissions. They are seen as useful in the development of environmentally friendly power consumption, foreign direct investment (FDI), travel industry plans, and exchange receptivity to work on natural grandeur in the future FDI and the tourism sector which are the two major sources of artificial carbon dioxide emissions, as shown by the DOLS model for China. As a result of China's rapid economic growth and increased consumption of electricity, carbon dioxide emissions have risen. More FDI in the system-building process is also encouraged in China, which will help the transportation sector grow as a result. As a reasonable responsibility to an unnatural climate change, methods for developing the movement business and theories relating to the movement business should be adopted.

Future Research Work

In order to develop in a way that is not harmful to the environment, it may be helpful to look at how approaches related to the mobility business region may be implemented. A large capacity for

environmental corruption also necessitates greater trade openness between the two countries.

ETHICS STATEMENT

Ethics review and approval/written informed consent was not required as per local legislation and institutional requirements.?

AUTHOR CONTRIBUTIONS

Conceptualization: YAK, MA, ZM, and HW; methodology: YAK, AS and DX; formal analysis and (field/laboratory) investigation: HW ,YAK and AA; writing—original draft preparation: YAK, ZI and HW; and writing—review and editing: YAK, AS, AA.

FUNDING

This research is funded by "Key Development Project of Department of Science and Technology (2015C03bd051)".

ACKNOWLEDGMENTS

The authors express their gratitude to Princess Nourah bint Abdulrahman University Researchers supporting Project (Grant No. PNURSP2022R124).

REFERENCES

Abdouli, M., and Hammami, S. (2020). Economic Growth, Environment, Fdi Inflows, and Financial Development in Middle East Countries: Fresh Evidence from Simultaneous Equation Models. *J. Knowl. Econ.* 11 (2), 479–511. doi:10.1007/s13132-018-0546-9

Adegboye, F., Osabohien, R., Matthew, O., and Olokoyo, F. (2020). Foreign Direct Investment, Globalization Challenges and Economic Development: An African Sub-regional Analysis. *Int. J. Trade Glob. Mark.* 13 (4), 1. doi:10.1504/ijtgm.2020.10023026

Agbanike, T. F., Nwani, C., Uwazie, U. I., Anochiwa, L. I., Onoja, T. G. C., et al. (2019). Oil Price, Energy Consumption and Carbon Cioxide (CO_2) Emissions: Insight Into Sustainability Challenges in Venezuela. *Lat. Am. Econ. Rev.* 28, 1–26.

An, H., Razzaq, A., Nawaz, A., Noman, S. M., and Khan, S. A. R. (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. *Environ. Sci. Pollut. Res.* 28, 51022–51045. doi:10.1007/s11356-021-12470-3

Balsalobre-Lorente, D., Driha, O. M., Bekun, F. V., Sinha, A., and Adedoyin, F. F. (2020). Consequences of COVID-19 on the Social Isolation of the Chinese Economy: Accounting for the Role of Reduction in Carbon Emissions. *Air Qual. Atmos. Health* 13 (12), 1439–1451.

Baltagi, B. H., and Kao, C. (2001). "Nonstationary Panels, Cointegration in Panels and Dynamic Panels: A Survey," in *Nonstationary Panels, Panel Cointegration, and Dynamic Panels*. Editors B. H. Baltagi, T. B. Fomby, and R. C. Hill (Bingley: Emerald Group Publishing Limited), 7–51.15.

Buckley, R. (2011). Tourism and Environment. *Annu. Rev. Environ. Resour.* 36, 397–416. doi:10.1146/annurev-environ-041210-132637

Butowski, L. (2021). Sustainable Tourism: a Human-Centered Approach. *Sustainability* 13, 1835. doi:10.3390/su13041835

Calderón-Vargas, F., Asmat-Campos, D., and Carretero-Gómez, A. (2019). Sustainable Tourism and Renewable Energy: Binomial for Local Development in Cocachimba, Amazonas, Peru. *Sustainability* 11 (18), 4891. doi:10.3390/su11184891

Ciacci, A., Ivaldi, E., Mangano, S., and Ugolini, G. M. (2021). Environment, Logistics and Infrastructure: the Three Dimensions of Influence of Italian Coastal Tourism. *J. Sustain. Tour.* 1 21, 1–21. doi:10.1080/09669582.2021.1876715

Doğan, B., Saboori, B., and Can, M. (2019). Does Economic Complexity Matter for Environmental Degradation? an Empirical Analysis for Different Stages of Development. *Environ. Sci. Pollut. Res. Int.* 26 (31), 31900–31912. doi:10.1007/s11356-019-06333-1

Dogru, T., Bulut, U., Kocak, E., Isik, C., Suess, C., and Sirakaya-Turk, E. (2020). The Nexus between Tourism, Economic Growth, Renewable Energy Consumption, and Carbon Dioxide Emissions: Contemporary Evidence from OECD Countries. *Environ. Sci. Pollut. Res.* 27 (32), 40930–40948. doi:10.1007/s11356-020-10110-w

Dwyer, L., Forsyth, P., Spurr, R., and Hoque, S. (2010). Estimating the Carbon Footprint of Australian Tourism. *J. Sustain. Tour.* 18 (3), 355–376. doi:10.1080/09669580903513061

Elahi, E., Khalid, Z., Tauni, M. Z., Zhang, H., and Lirong, X. (2021). Extreme Weather Events Risk to Crop-Production and the Adaptation of Innovative Management Strategies to Mitigate the Risk: A Retrospective Survey of Rural Punjab, Pakistan. *Technovation* 2021, 102255. doi:10.1016/j.technovation.2021.102255

Elahi, E., Khalid, Z., and Zhang, Z. (2022a). Understanding Farmers' Intention and Willingness to Install Renewable Energy Technology: A Solution to Reduce the Environmental Emissions of Agriculture. *Appl. Energy* 309, 118459. doi:10.1016/j.apenergy.2021.118459

Elahi, E., Zhang, Z., Khalid, Z., and Xu, H. (2022b). Application of an Artificial Neural Network to Optimise Energy Inputs: An Energy- and Cost-Saving Strategy for Commercial Poultry Farms. *Energy* 244, 123169. doi:10.1016/j.energy.2022.123169

Gössling, S., Scott, D., Hall, C. M., Ceron, J. P., and Dubois, G. (2012). Consumer Behaviour and Demand Response of Tourists to Climate Change. *Ann. Tour. Res.* 39, 36–58. doi:10.1016/j.annals.2011.11.002

Gu, H., Bian, F., and Elahi, E. (2020a). Effect of Air Pollution on Female Labor Supply: an Empirical Analysis Based on Data of Labor Force Dynamic Survey of China. *Soc. work public health* 35, 187–196. doi:10.1080/19371918.2020.1764433

Gu, H., Cao, Y., Elahi, E., and Jha, S. K. (2019). Human Health Damages Related to Air Pollution in China. *Environ. Sci. Pollut. Res. Int.* 26, 13115–13125. doi:10.1007/s11356-019-04708-y

Gu, H., Yan, W., Elahi, E., and Cao, Y. (2020b). Air Pollution Risks Human Mental Health: an Implication of Two-Stages Least Squares Estimation of Interaction Effects. *Environ. Sci. Pollut. Res.* 27, 2036–2043. doi:10.1007/s11356-019-06612-x

Hafeez, M., Yuan, C., Shah, W. U. I. H., Mahmood, M. T., Li, M., and Iqbal, K. (2020). Evaluating the Relationship Among Agriculture, Energy Demand, Finance and Environmental Degradation in One Belt and One Road Economies. *Carbon Manag.* 11 (2), 139–154. doi:10.1080/17583004.2020.1721974

Huang, Q., Peng, B., Elahi, E., and Wan, A. (2021). Evolution and Driving Mechanism of Ecological Security Pattern: a Case Study of Yangtze River Urban Agglomeration. *Integr. Environ. Assess. Manag.* 17, 573–583. doi:10.1002/ieam.4358

Isik, C., Ongan, S., and Özdemir, D. (2019). The Economic Growth/development and Environmental Degradation: Evidence from the US State-Level EKC Hypothesis. *Environ. Sci. Pollut. Res.* 26 (30), 30772–30781. doi:10.1007/s11356-019-06276-7

Jiang, J., Zhang, Z., Zhao, J., and Liu, Y. (2018). The Effect of Non-Covalent Interaction of Chlorogenic Acid With Whey Protein and Casein on Physicochemical and Radical-Scavenging Activity of *in vitro* Protein Digests. *Food Chem.* 268, 334–341.

Jiang, C., and Ma, X. (2019). The Impact of Financial Development on Carbon Emissions: A Global Perspective. *Sustainability* 11 (19), 5241. doi:10.3390/su11195241

Kao, C., and Chiang, M-H. (2001). "On the Estimation and Inference of a Cointegrated Regression in Panel Data," in *Advances in Econometrics, Non-stationary Panels, Panel Cointegration, and Dynamic Panels*. Editors B. H. Baltagi, T. B. Fomby, and R. C. Hill (Amsterdam: JAI Press), Vol. 15.

Katircioglu, S., Saqib, N., Katircioglu, S., Kilinc, C. C., and Gul, H. (2020). Estimating the Effects of Tourism Growth on Emission Pollutants: Empirical Evidence from a Small Island, Cyprus. *Air Qual. Atmos. Health* 13, 391–397. doi:10.1007/s11869-020-00803-z

Khan, M. T., Yaseen, M. R., and Ali, Q. (2019). Nexus between Financial Development, Tourism, Renewable Energy, and Greenhouse Gas Emission in High-Income Countries: a Continent-wise Analysis. *Energy Econ.* 83, 293–310. doi:10.1016/j.eneco.2019.07.018

Khan, Y. A., Abbas, S. Z., Chu, Y. M., Ahmad, M., and Haider, M. A. (2020). "Study of Environmental Dynamic through Optimized Potential Variables: Renewable Energy" in *Air Quality, Atmosphere and Health*. Berlin, Germany: Springer Nature B.V, 1–8. doi:10.1007/s11869-020-00869-9

Koçak, E., Ulucak, R., and Ulucak, Z. Ş. (2020). The Impact of Tourism Developments on CO2 Emissions: An Advanced Panel Data Estimation. *Tour. Manag. Perspect.* 33 (2020), 100611. doi:10.1016/j.tmp.2019.100611

Lasisi, T. T., Alola, A. A., Eluwole, K. K., Ozturen, A., and Alola, U. V. (2020). The Environmental Sustainability Effects of Income, Labour Force, and Tourism Development in OECD Countries. *Environ. Sci. Pollut. Res.* 27 (17), 21231–21242. doi:10.1007/s11356-020-08486-w

Li, L., Wu, B., and Patwary, A. K. (2021). How Marine Tourism Promote Financial Development in Sustainable Economy: New Evidences from South Asia and Implications to Future Tourism Students. *Environ. Sci. Pollut. Res.* doi:10.1007/s11356-021-15709-1

Lopez, J., and Bhaktikul, K. (2018). Sustainable Environment and Tourism Industry: an Institutional Policy Analysis of Northeastern Thailand. *Pol. J. Environ. Stud.* 27 (1), 31–37. doi:10.15244/pjoes/75198

Mahrinasari, M. S., Haseeb, M., and Ammar, J. (2019). Is Trade Liberalization a Hazard to Sustainable Environment?: Fresh Insight From ASEAN Countries. *Pol. J. Manag.* 19.

Mekni, M., and Lemieux, A. (2014). Augmented Reality: Applications, Challenges and Future Trends. *Appl. Comput. Sci.* 20, 205–214.

Meo, M. S., Sabir, S. A., Arain, H., and Nazar, R. (2020). Water Resources and Tourism Development in South Asia: an Application of Dynamic Common Correlated Effect (DCCE) Model. *Environ. Sci. Pollut. Res.* 27, 19678–19687. doi:10.1007/s11356-020-08361-8

Moreno-Luna, L., Robina-Ramírez, R., Sánchez, M. S-O., and Castro-Serrano, J. (2021). Tourism and Sustainability in Times of COVID-19: the Case of Spain. *Int. J. Environ. Res. Public Health* 18 (4), 1859. doi:10.3390/ijerph18041859

Muhammad Azam, M. H. (2021). Determinants of Foreign Direct Investment in BRICS- Does Renewable and Non-renewable Energy Matter? *Energy Strategy Rev.* 2021, 01–10.

Nguyen, C. P., Binh, P. T., and Su, T. D. (2020). Capital Investment in Tourism: a Global Investigation. *Tour. Plan. Dev.* 2020, 1–27. doi:10.1080/21568316.2020.1857825

Nguyen, C. P., and Dinh Su, T. D. (2021). Tourism, Institutional Quality, and Environmental Sustainability. *Sustain. Prod. Consum.* 28, 786–801. doi:10.1016/j.spc.2021.07.005

Nikolaos Dritsakis, P. S. (2017). Foreign Direct Investment, Exports, Unemployment and Economic Growth in the EU Members-A Panel Data Approach. *Int. Econ.* 2017, 443–468.

Okumus, I., and Erdogan, S. (2021). "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* (Cham: Springer), 141–154. doi:10.1007/978-3-030-59675-0_8

Paramati, S. R., Alam, R., Chen, M. S., and Chen, C. F. (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. doi:10.1177/00472875166678481

Pedroni, P. (2004). Panel Cointegration: Asymptotic and Finite Sample Properties of Pooled Time Series Test With an Application to the PPP Hypothesis. *Econ. Theory* 20 (3), 597–625.

Peeters, P., and Dubois, G. (2010). Tourism Travel under Climate Change Mitigation Constraints. *J. Transp. Geogr.* 18, 447–457. doi:10.1016/j.jtrangeo.2009.09.003

Peng, B., Chen, H., Elahi, E., and Wei, G. (2020a). Study on the Spatial Differentiation of Environmental Governance Performance of Yangtze River Urban Agglomeration in Jiangsu Province of China. *Land Use Policy* 99, 105063. doi:10.1016/j.landusepol.2020.105063

Peng, B., Chen, S., Elahi, E., and Wan, A. (2021a). Can Corporate Environmental Responsibility Improve Environmental Performance? an Inter-temporal Analysis of Chinese Chemical Companies. *Environ. Sci. Pollut. Res.* 2021, 1–12.

Peng, B., Zhang, X., Elahi, E., and Wan, A. (2021b). Evolution of Spatial–Temporal Characteristics and Financial Development as an Influencing Factor of Green Ecology. *Environ. Dev. Sustain.* 2021, 1–21.

Peng, B., Zhao, Y., Elahi, E., and Wan, A. (2021c). Investment in Environmental Protection, Green Innovation, and Solid Waste Governance Capacity: Empirical Evidence Based on Panel Data from China. *J. Environ. Plan. Manag.* 2021, 1–24.

Peng, B., Zheng, C., Wei, G., and Elahi, E. (2020b). The Cultivation Mechanism of Green Technology Innovation in Manufacturing Industry: From the Perspective of Ecological Niche. *J. Clean. Prod.* 252, 119711. doi:10.1016/j.jclepro.2019.119711

Phillips, P. C. B. (1995). Fully Modified Least Squares and Vector Autoregression. *Econometrica* 63 (5), 1023–1078. doi:10.2307/2171721

Qi, Y., Beriot, N., Gort, G., Lwanga, E. H., Gooren, H., and Yang, X. (2020). Impact of Plastic Mulch Film Debris on Soil Physicochemical and Hydrological Properties. *Environ. Pollut.* 266, 115097.

Rembeci, G. (2016). Sustainable Tourism as a Smart Alternative to Boost Economic Development in Shkodra Region Godiva Rembeci. *Elizabeta Susa*.

Ramirez, M. D. (2006). *A Panel Unit Root and Panel Co Integration Test of the Complementarity Hypothesis in the Mexican Case, 1960-2001, Center Discussion Paper No. 942*. New Haven: Economic Growth Center Yale University, P.O. Box 208629. CT 06520-8269.

Ramzan, M., Adebayo, T. S., Iqbal, H. A., Awosusi, A. A., and Akinsola, G. D. (2021). The Environmental Sustainability Effects of Financial Development and Urbanization in Latin American Countries. *Environ. Sci. Pollut. Res.* 2021, 1–14.

Razzaq, A., An, H., and Delpachitra, S. (2021). Does Technology Gap Increase FDI Spillovers on Productivity Growth? Evidence from Chinese Outward FDI in Belt and Road Host Countries. *Technol. Forecast. Soc. Change* 172, 121050. doi:10.1016/j.techfore.2021.121050

Salahuddin, M., Alam, K., Ozturk, I., and Sohag, K. (2018). The Effects of Electricity Consumption, Economic Growth, Financial Development and Foreign Direct Investment on CO*2* Emissions in Kuwait. *Renew. Sustain. Energy Rev.* 81, 2002–2010.

Sadorsky, P. (2009). Renewable Energy Consumption, CO2 Emissions and Oil Prices in the G7 Countries. *Energy Econ.* 31 (3), 456–462. doi:10.1016/j.eneco.2008.12.010

Sarpong, S. Y., Bein, M. A., Gyamfi, B. A., and Sarkodie, S. A. (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. doi:10.1016/j.heliyon.2020.e05351

Shahzad, U., Fareed, Z., Shahzad, F., and Shahzad, K. (2021). Investigating the Nexus between Economic Complexity, Energy Consumption and Ecological Footprint for the United States: New Insights from Quantile Methods. *J. Clean. Prod.* 279, 123806. doi:10.1016/j.jclepro.2020.123806

Sharpley, R. (2000). Tourism and Sustainable Development: Exploring the Theoretical Divide. *J. Sustain. Tour.* 8, 1–19. doi:10.1080/09669580008667346

Shen, D., Xia, M., Zhang, Q., Elahi, E., Zhou, Y., and Zhang, H. (2019). The Impact of Public Appeals on the Performance of Environmental Governance in China: A Perspective of Provincial Panel Data. *J. Clean. Prod.* 231, 290–296. doi:10.1016/j.jclepro.2019.05.089

Sheng, X., Peng, B., Elahi, E., and Wei, G. (2019). Regional Convergence of Energy-Environmental Efficiency: from the Perspective of Environmental Constraints. *Environ. Sci. Pollut. Res.* 26, 25467–25475. doi:10.1007/s11356-019-05749-z

Shudhasattwa Rafiq, P. S. (2016). Asymmetric Oil Shocks and External Balances of Major Oil Exporting and Importing Countries. *Energy Econ.* 2016, 01–36. doi:10.1016/j.eneco.2016.02.019

Solarin, S. A. (2014). Tourist Arrivals and Macroeconomic Determinants of CO2emissions in Malaysia. *Anatolia* 25, 228–241. doi:10.1080/13032917.2013.868364

Tang, C., Zhong, L., and Ng, P. (2017). Factors that Influence the Tourism Industry's Carbon Emissions: a Tourism Area Life Cycle Model Perspective. *Energy Policy* 109, 704–718. doi:10.1016/j.enpol.2017.07.050

Tian, X. L., Bélaïd, F., and Ahmad, N. (2021). Exploring the Nexus between Tourism Development and Environmental Quality: Role of Renewable Energy Consumption and Income. *Struct. Chang. Econ. Dyn.* 56, 53–63. doi:10.1016/j.strueco.2020.10.003

Tsagarakis, K. P., Bounialetou, F., Gillas, K., Profylienou, M., Pollaki, A., and Zografakis, N. (2011). Tourists' Attitudes for Selecting Accommodation with Investments in Renewable Energy and Energy Saving Systems. *Renew. Sustain. Energy Rev.* 15, 1335–1342. doi:10.1016/j.rser.2010.10.009

Tu, Y., Peng, B., Elahi, E., and Wu, W. (2020). Initiator or Intermediary? A Case Study on Network Relation of Environmental Regulatory Capture in China. *Ijerph* 17, 9152. doi:10.3390/ijerph17249152

Tu, Y., Peng, B., Wei, G., Elahi, E., and Yu, T. (2019). Regional Environmental Regulation Efficiency: Spatiotemporal Characteristics and Influencing Factors. *Environ. Sci. Pollut. Res.* 26, 37152–37161. doi:10.1007/s11356-019-06837-w

Udi, J., Bekun, F. V., and Adedoyin, F. F. (2020). Modeling the Nexus between Coal Consumption, FDI Inflow and Economic Expansion: Does Industrialization Matter in South Africa? *Environ. Sci. Pollut. Res.* 27, 10553–10564. doi:10.1007/s11356-020-07691-x

Usman, M., Kousar, R., and Makhdum, M. S. (2020). The Role of Financial Development, Tourism, and Energy Utilization in Environmental Deficit: Evidence from 20 Highest Emitting Economies. *Environ. Sci. Pollut. Res.* 27, 42980–42995. doi:10.1007/s11356-020-10197-1

Wang, F., Cai, W., and Elahi, E. (2021). Do Green Finance and Environmental Regulation Play a Crucial Role in the Reduction of CO2 Emissions? an Empirical Analysis of 126 Chinese Cities. *Sustainability* 13, 13014. doi:10.3390/su132313014

Wu, B., Peng, B., Wei, W., and Ehsan, E. (2021). A Comparative Analysis on the International Discourse Power Evaluation of Global Climate Governance. *Environ. Dev. Sustain.* 2021, 1–22. doi:10.1007/s10668-020-01180-4

Ye, Y., Khan, Y. A., Wu, C., Shah, E. A., and Abbas, S. Z. (2021). The Impact of Financial Development on Environmental Quality: Evidence From Malaysia. *Air Qual. Atmos. Health* 14 (8), 1233–1246.

Yusof, M. S., Fadilullah, M. Z. N., Hassan, S., Maksud, M. I., and Yunos, M. Z. (2018). Development of Coated Peanut Separator and Frying Skillet Machine. *Int. J. Integr. Eng.* 10 (5).

Zhang, H., Yang, J., Ren, X., Wu, Q., Zhou, D., and Elahi, E. (2020). How to Accommodate Curtailed Wind Power: A Comparative Analysis between the US, Germany, India and China. *Energy Strategy Rev.* 32, 100538. doi:10.1016/j.esr.2020.100538

Zhang, J., and Zhang, Y. (2020). Tourism, Economic Growth, Energy Consumption, and CO2 Emissions in China. *Tour. Econ.* 27, 1060–1080. doi:10.1177/1354816620918458

Zhang, L., and 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. *Renew. Sustain. Energy Rev.* 53, 225–234. doi:10.1016/j.rser.2015.08.040

Zhang, Z., Li, Y., Elahi, E., and Wang, Y. (2022). Comprehensive Evaluation of Agricultural Modernization Levels. *Sustainability* 14, 1–17. doi:10.3390/su14095069

Zhao, H., Zhao, X., Elahi, E., and Wang, F. (2022). Policy Evaluation of Drama-Related Intangible Cultural Heritage Tourism for Boosting Green Industry: An Empirical Analysis Based on Quasi-Natural Experiment. *Sustainability* 14, 5380. doi:10.3390/su14095380

Zhao, X., Peng, B., Elahi, E., Zheng, C., and Wan, A. (2020). Optimization of Chinese Coal-Fired Power Plants for Cleaner Production Using Bayesian Network. *J. Clean. Prod.* 273, 122837. doi:10.1016/j.jclepro.2020.122837

Zhao, Y., Peng, B., Elahi, E., and Wan, A. (2021). Does the Extended Producer Responsibility System Promote the Green Technological Innovation of Enterprises? an Empirical Study Based on the Difference-In-Differences Model. *J. Clean. Prod.* 319, 128631. doi:10.1016/j.jclepro.2021.128631

Zhong, Z., Peng, B., and Elahi, E. (2021). Spatial and Temporal Pattern Evolution and Influencing Factors of Energy-Environmental Efficiency: A Case Study of Yangtze River Urban Agglomeration in China. *Energy & Environ.* 32, 242–261. doi:10.1177/0958305x20923114

Zhong, Z., Peng, B., Xu, L., Andrews, A., and Elahi, E. (2020). Analysis of Regional Energy Economic Efficiency and its Influencing Factors: A Case Study of Yangtze River Urban Agglomeration. *Sustain. Energy Technol. Assessments* 41, 100784. doi:10.1016/j.seta.2020.100784

Zhu, H., Duan, L., Guo, Y., and Yu, K. (2016). The effects of FDI, economic growth and energy consumption on carbon emissions in ASEAN-5: evidence from panel quantile regression. *Economic Modelling,* 58, 237–248.

Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's Note: All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors, and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.