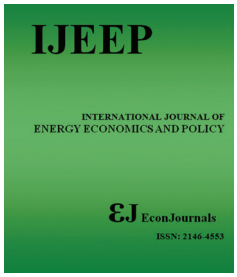

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Harnessing Sustainable Energy Transition, Eco-tourism, and Carbonization for Effective Environmental Management: Evidence from China

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ABSTRACT

The increasing pressure from various resources such as market demand, international community participation being put on government institutions to enhance the engagement of countries in environmental initiatives. These factors, however, play distinctive roles in different development eras. Initially, it used to be viewed as an option, however, with increasing climate complexities, it has now become essential to address environmental challenges and adopt corrective measures. Ecotourism development such as introduced to safeguard environment and natural resources. However, it cannot be developed in the absence of high-quality ecotourism environment. Thereby, it is imperative to build an understanding regarding carbonization, ecotourism and energy transition to design effective environmental management and the study, in this lieu, is of greater significance to highlights the role of said constructs and provide empirical baseline from the perspective of China. The study used time series data covering the period from 1985 to 2022 and employed NARDL approach to assess the relationship. From the findings, it is revealed that ecotourism, RE output, RE consumption, industrialization, and population growth help in building effective environmental management in case of China due to positive association. Thus, offering the policy makers to take full participation in the promotion and designing of such systems so that high emitting industries are encouraged to adopt their business procedures.

Keywords: CO_2 Emissions, GHG Emissions, Effective Environmental Management in China, RE Output, RE Consumption, Industrialization, Population Growth
JEL Classifications: Q4, Q5, Q56, C32

1. INTRODUCTION

Nature, which acts as a catalyst for human activities, is inescapably molded by human interventions. Environmental performance, in this regard, measures the accountability of individuals, society and business while they pursue their objectives. It encompasses the responsible use of natural resources and elements (Zhang et al., 2019). Environmental management is established to improve environmental performance. It is to shape the individual's and organizations' practices, processes, and consumption patterns as they may not leave an adverse impact on the environment, including its atmosphere, geographical characteristics, and potential to produce resources. Its objective is to preserve the environment and ensure a comfortable, productive environment for future generations (Younis and Sundarakani, 2020). Environmental protection, as a result of environmental management, is leading to an economy surviving, growing, and improve public well-being. People may have a better quality of life, with a comfortable atmosphere to breathe in, healthful nutrient food, pure water, and prime resources (Burritt et al., 2019).

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Sustainability in environmental performance gives surety of quality raw materials, safe and productive infrastructure, and actively working human resources for the economic industries, with quality living and non-living resources. In such circumstances, quality resources can be preserved and stored for the future, bringing sustainability to economic growth and social welfare (Pujara et al., 2019). There are some factors that may cause environmental pollution and create challenges for environmental management, like carbon dioxide (CO_2) emissions (Hashmi and Alam, 2019; Homroy and Slechten, 2019). But sustainable energy technologies like RE output and RE consumption are a solution to environmental issues. RE is the kind of energy that can be recycled, replenished, and has no waste. The production of REs, such as wind power, biogas, biofuel, geothermal power, solar energy, hydropower, etc., reduces the polluting elements from air, soil, and water, controls the earth's temperature, and cleans the environment. The increasing RE output is also helpful in mitigating the environmental issues caused by fossil fuels. So, the environmental performance is better with RE output (Caglar et al., 2025; Ratner et al., 2020). RE consumption concentrates renewable resources for attaining energy to run different processes or undertaking activities. RE consumption, unlike fossil fuels, does not emit harmful particles or hazardous wastes which pollute the environment. Rather, the transition to RE consumption from traditional sources of energy overcomes the GHG emission, soil and water pollution (Zafar et al., 2021).

Further to discussion, Tangential and emerging regions are generally distinguished by less human effect in natural habitats and higher rate of biodiversity. However, due to limited economic resources, constructive policies and infrastructure, natural assets protection and conservation becomes shaky which ultimately affect remote mountainous regions and other spots. Ecotourism development opposite mass tourism is viewed as a worthwhile and functional solution to address such issues, hence, fulfil natural resources conservation objectives and sustainable regional development (Pata et al., 2025; Rasheed et al., 2025). There are several reported cases in the literature which argue that travelling in natural areas causes potential damage to the ecosystem. Also, there exists conflicts about its management and reaped benefits. Sometimes, the deliberate misuse of eco concepts attract consumers or hide unstainable activities that hit the country's natural resources. In academia, studies conducted recently took critical standpoint when there is a talk about ecotourism and its effectiveness towards environmental management. Thus, there is calling for a rigorous approach in terms of research design to unveil the benefits. The reason is that scholars thin that statements such as eco-tourism ineffectiveness might be exaggerated and overstated because of potential flaws in research methods and "absence of spatial and temporal methodology scaling." Besides, due to absence of unified definition, confusion occurs in the academic world as well, as different studies analyzed different concepts under the name of ecotourism, hence, making the comparison more difficult (Jong et al.,2022; Jong et al., 2020).

Specifically talking about China, the country provides multitude natural hotspots along with flourished tourism sector that is already injected by massive travelling population. In 2016, "National Ecotourism Development Plan 2016-2025" was introduced that aimed to provide guidance regarding present and future development. These turning points highlight the effort Chinese government regarding eco-tourism that how the country intends to enhance offering destination especially where natural reserves are. In 1990, the country had 600 hotspots which extended to 2700 in 2016 (El Menyari, 2021; Feng et al., 2020). Figure 1 presents the general tourist sites in China, while Figure 2 reports the annual revenue from tourism in China. It should also be noted that due to growth in Chinese middle-class population, there is a calling for

Figure 1: Density of ecotourism and general tourism sites in China, by province

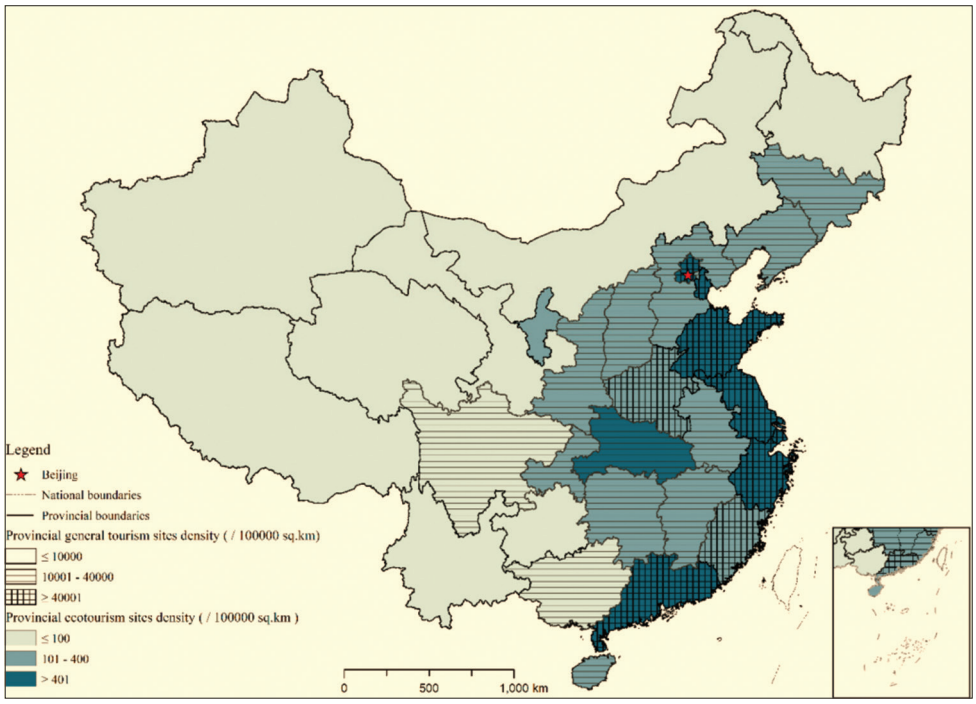
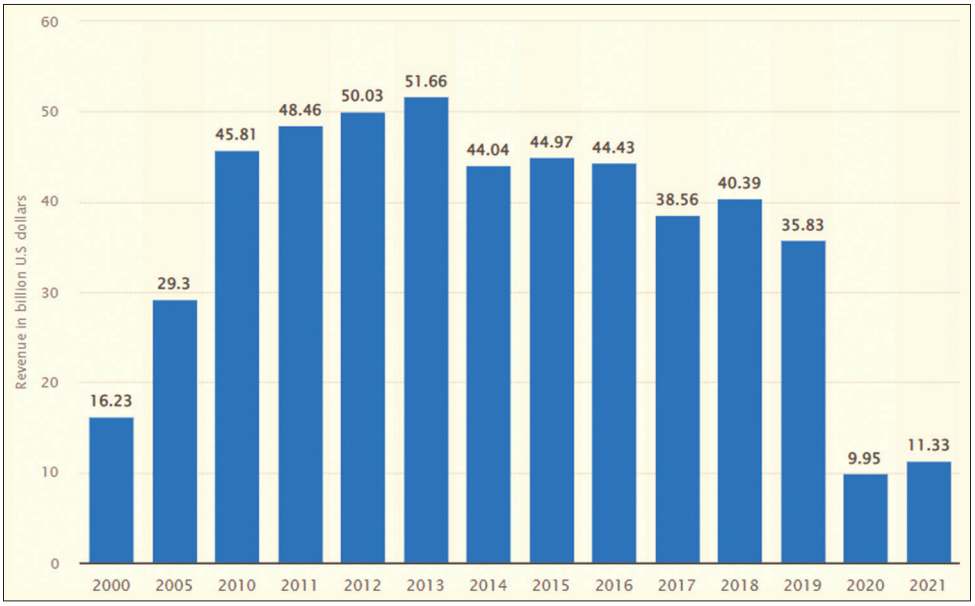


Figure 2: Revenue of China from International Tourism



Source: Statista

nature-based recreation which indicates the high interest of local tourists. Sadly, the evident success of ecotourism development comes up with cost. Even though considerable surveys evidently claim that mostly provinces of China spill positive ecotourism performance in terms of forest parks, however, few of the provinces reports different results. Literature also found that there is intense pressure on natural resources and ecosystems because of the high number of visitors, tourists' behavioral issues, inadequate and poor management of natural resources. Besides, other fundamental aspects of ecotourism framework regarding income equality and fair environmental management have rarely been achieved (Dogru et al., 2020; Li et al., 2019).

China is the world's largest country and considered an upper-middle-income economy. Its nominal gross domestic product (GDP) shows the country at second rank, whereas the purchasing parity shows the country as the first largest in the economy. China's GDP for 2022 is $18.321 trillion, and the country makes an 8.1% rise in annual economic growth (Yousefi et al., 2019). There are three economic sectors of China agriculture, industry, and service, having 7.9%, 40.6%, and 51.6% contribution to annual GDP. The operation of firms engaged in agriculture creates pollution a little. Rather it serves as a natural eraser that cleans the environment. But on the other hand, the rest of the businesses in industry and services adversely affect the environmental quality because they tend to use large energy, chemicals, resources, technologies, infrastructure, logistics, and reductive strategies that may cause pollution (Li et al., 2020).

The comparison of the country with others across the world with respect to GHG emissions, China is the largest one that experiences CO_2 emissions into the air. Out of the analysis of this comparison, the regulators and governments consider the fact that it is China that is largely responsible for world climate Change. But the inner reality is quite different, and one must deeply analyze the situation from different perspectives. Having analyzed, one may say that China is the biggest source of pollution into the environment and planet destruction (Cao et al., 2021). Contrary to this, the deeper observation reveals that the measurement of environmental conditions in the form of per capita emissions, China is the country that emits 7.10 tons of CO_2 and is the 48th largest state. Even if China's emissions get doubled as it is 16 tons, China is still at the 14th rank in the world. The environmental statistics of China denoted that China's emissions of 10.21 billion metric tons of CO_2 are double those of the US. The statistics also reveal that the comparison of per capita emissions shows China's rant as far less than the US. The Russia-Ukraine conflict has damaged the economies and environment of the regions around. The Chinese economy and its environment are no exception (Li et al., 2022).

China is a state with an emerging economy, but all its efforts toward sustainability are unsatisfactory. It is because of environmental problems causing a lack of resources for the future generation. There is a need to create awareness of how to improve environmental performance and, thus, enable the country to sustain social and economic performance (Chen et al., 2021). Thus, the study finds an opportunity to explore the influences of carbonization, like CO_2 emissions and GHG emissions, sustainable energy technologies, environmental management and sustainable tourism development. This way, the study addresses the following gaps identified in the literature. First, in the previous studies, authors have written about the role of carbonization and sustainable energy technologies in environmental performance. But carbonization and sustainable energy technologies have opposite roles in environmental performance and, therefore, have been discussed differently in literature. The current removes the gap with collective analysis of carbonization and sustainable energy technologies' impacts on environmental management. Second, in previous literature, authors have either discussed the RE output or RE consumption role in environmental performance in the existing literature. The present study, which examines both

the RE output and RE consumption as drivers of environmental performance, adds to the literature. Third, though China is a source of terrible environmental degradation and has environmental influences of the Russia-Ukraine conflict, there are few detailed and to-the-point studies on environmental management.

The remaining portion of the study has the following parts: the second part concentrate on the concrete literature review related to study variables. The third part explains which methods authors apply to conduct the research and find the exact relationship among factors. The study results are discussed with a comparison to studies with similar opinions. In the last part, the study's implication, conclusion, and limitations are given.

2. LITERATURE REVIEW

The environment, which is a context where humans breathe and survive, provides natural resources (living and non-living) for humans to live on and perform their functions. These natural phenomena, atmosphere, and natural resources are necessary not only for social practices but for the growth of economic sectors. Under effective environmental management, there is responsible interaction with natural phenomena and environmental resources (Ahmed et al., 2019). It determines how humans should design their practices and consumption patterns so that they do not have a damaging influence on the environment but protect them. For better environmental performance, preserved environment not only provides resources for current use but sustains the productivity of natural resources and the availability of a comfortable natural environment. So, it assures social sustainability and sustainable economic development leading to human well-being. But then, environmental management and environmental performance are influenced by several factors like carbonization and sustainable energy technologies (Liao, 2023).

Humans, as a natural source, do not affect the presence of CO_2 and do not allow it to damage the earth's protecting shield, as photosynthesis in plants maintains the balance of CO_2 in the air. But human activities, which include choices and use of resources as well as the performance of different processes, emit CO_2 and imbalance natural CO_2 volume and role in nature. The environmental performance of a country is lower if CO_2 emissions from the country are larger in volume (Ikram et al., 2020). In an article about the role of energy, economic growth, and population growth in the environment, Mohsin et al. (2019) claimed that increasing economic practices cause huge CO_2 release, and environmental quality is low, showing poor environmental management. Altıntaş and Kassouri (2020), examines CO_2 emissions and environmental performance in an economy and reported that while there is an increase in CO_2 emissions, the country's environmental management is poor and environmental performance is low.

Human activities like generating energy from fossil fuel consumption, energy infrastructure, manufacturing, transportation, cutting trees, forests fire, and too much consumption of resources cause GHGs emissions. The GHG emissions with the exploitation of the ozone layer bring and confine the harmful radiation from the sun into the earth. The resultant change in the natural weather cycle affects the environment and the volume of natural resource production. The GHG emissions have a poor impact on the country's environmental performance (Alessi et al., 2021). Khan et al. (2020) also examined the association between GHG emissions, along with public health expenditures, logistics, renewable energy and environmental performance. The study implies that in economic sectors, while there is economic progress and energy is utilized in excessive amounts to carry the processes, CO_2 is emitted in large amounts. With the rise in CO_2 volume, the environment gets polluted and does not perform as expected traditionally. Thus, environmental performance is higher. Heller et al. (2019), identify the relation between food wastes, GHG emissions, and environmental performance. The authors obtained data from the food packaging industries. The study posits that the waste from food products get rioted and emit hazardous gases like GHGs. The greenhouse gas effect under which heat is trapped into the earth causes global warming, and climate change disrupts the weather patterns, natural balance, and resource quality. Thus, the country shows poor performance.

Energy is a crucial factor in society and the economy. Fossil fuels and common creations are the traditional sources of energy, and most people rely on these sources to generate energy and accomplish social welfare and economic goals. These sources provide plenty of energy but generate harmful gases, smoke, radiation, and toxic waste as byproducts. Contrary to this, the production of RE provides fuel for the economy and many social activities and is free from pollution. With the encouragement of RE production to generate economic and domestic fuel, sustainable environmental performance can be assured (Bamati and Raoofi, 2020). Razmjoo et al. (2021) acquired data from the meteorological organization and performed techno-economic analysis through HOMER software. It is revealed that If the RE output increases by 72%, the CO_2 emissions can be reduced by 2000 Kg, and environmental performance is higher. Abbasi et al. (2022) also identified the role of RE output in environmental management. For effective environmental management, the regulators bring suitable changes in public consumption patterns, especially patterns of energy consumption. If the RE output increases and the supply of clean energy is higher, the public can turn to clean energy consumption. Consequently, the regulators can improve environmental performance. Hence, RE output positively influences environmental management.

The International Ecotourism Society, known as TIES, defines ecotourism as a "*responsible travel to natural areas that conserves the environment*, *sustains the well-being of the local people*, *and involves interpretation and education*". Other organizations such as world tourism organizations also proposed similar views and agree fully on fundamental principles that make ecotourism different from conventional tourism. Ecotourism concentrates on "small-scale travel" that subdue ecological, social and cultural impacts. There are several terms which are used interchangeable including "ecotravel", "nature-based tourism", or "green tourism" (Sofi et al., 2022; Soh et al., 2019). Since there is an absence of clear and unified framework to provide guidance to tourism industry. Managers and promoters interpretate and implement the concept in their own and best suited way, hence, widening the gap between theoretical and practical eco-tourism concepts. Confusion

also exists among consumers as they are exposed to different options of tourism products which confuse them about their credibility and authenticity (Puah et al., 2018; Ribeiro et al., 2019).

One should know the environment is the material baseline for survival and development of societies and communities. Tourism is considered a higher-level need of humans which triggers the spiritual side of humans. It is a wild desire of humans to travel when "social productivity is low, or material life is not abundant." As economies are growing rapidly and the standard of living is increasing constantly, citizens start taking interest in luxurious activities other than necessities (Rogerson, 2016; Shang et al., 2023). Since people have enough amount to bear travelling expenses, thereby, they become more interested in novel and endowed spiritual activities to find the meaningful purpose. Regarding this, tourism is one of the critical aspects as the tourism industry relies on its existence. However, for that environmental quality is the foundational principle of tourism existence. Ecotourism development means protection. However, it cannot be done in the absence of structured and well-planned tourism. Besides, energy is also required to take care of factors like transportation and allied amenities. Studies argued that the more tourism activities happen, the more energy is required to fulfill the goal (Thompson, 2022; Zhang et al., 2020). Studies also claim that tourism demands higher consumption of primary energy resources, thus, countries where fossil fuels are utilized as a primary resource, faces severe environmental challenges. Moreover, mass tourism not only abuses ecosystems but also damages "landscapes, cultural assets, and disposal of solid waste." This ineffectiveness and disorganization lead to major losses in terms of resources, biological processes as well as public health risk (Sharma et al., 2021; Shvets, 2020).

In an economy, multiple tasks are performed, and in accomplishing these tasks, the economic actors require fuel. In the economy, still traditional technologies and sources of energy like fossil fuels are utilized. But these technologies and energy sources cause too much heat, toxic gases, smoke, and harmful material in the form of waste. The firms which turn to RE consumption and prefer to consume it to traditional sources of every overcome the harmful byproducts and show better environmental performance (Iorember et al., 2020). Destek and Aslan (2020), investigates the relationship between RE consumption, economic growth, and environmental performance. Authors take hydroelectricity, wind, solar, and biomass as RE sources. Data was acquired from G7 countries during a long period from 1991 to 2014. The panel bootstrap causality method and augmented mean group estimator were used for considering the cross-sectional dependence and heterogeneity across these countries. The increase in biomass energy consumption improves environmental performance in France, Japan, Germany, and the United States. Increasing hydroelectric power consumption is effective in overcoming environmental pollution in the United Kingdom and Italy. Wind energy and solar power consumption improve the environmental performance in Canada and France. Adebayo et al. (2023), also examines the role of RE consumption in environmental performance. The firms where RE energy is generated from solar plates and employed in manufacturing processes and other operational practices, the total consumption of fossil fuels decreases, and the harms associated with the fossil fuels are reduced. So, RE consumption improves firms' environmental performance.

The increasing population growth leads to country development and economic growth. It clears the ways to reduce environmental issues and improve environmental performance. Vo (2021) posits that population growth has a positive association with environmental performance. It's the population growth rate is higher; there is efficient human capital within the economy, and economic practices are performed efficiently without any destructive strains on the environment. Shah et al. (2021), examines the relationship considering South Asian countries. The study claims that higher population growth brings the economy towards economic development and opens ways to overcome environmental issues.

It is commonly considered that industrialization, for its consistent use of energy, machines, and different technologies, creates GHGs, waste, and other harmful substances. It is true to some extent, but it is also an admissible fact that industrialization is also linked to economic growth and country development (Ahmed et al., 2022). Munir and Ameer (2020), investigated the impacts of industrialization, foreign direct investment, economic growth, and environmental performance determined by CO_2 emissions. The data were collected from Pakistan for the time of 1975-2016. The nonlinear autoregressive distributive lag methodology was applied to check the short-run and long-run association, and Granger causality tests were applied to check the causality direction among variables. The study implies that industrialization increases environmental awareness, technological knowledge, and technical skills. Thus, people can understand the environmental situation and find a solution. Consequently, the environmental performance of the country is better. Mahmood et al. (2020), also claims that in the long term, the expansion in industrialization overcomes environmental issues, so it helps in environmental management and preserves the environment.

3. RESEARCH METHODS

The research used secondary data to investigate the impact of CO_2, GHG emissions, RE output, RE consumption, industrialization,

Table 1: Variables with measurements

S#	Variables	Unit of measurement	Source
01	Effective Environmental Management (EFI)	Environmental Performance Index	SEDAC
02	Carbonization	CO_2 emissions (metric tons per capita)	WDI
		GHG emissions (% change from 1990)	WDI
03	Sustainable Energy Transition	REO (% of total energy output)	WDI
		REC (% of total energy consumption)	WDI
04	Ecotourism (ECT)		
05	Population Growth (PG)	Population growth (Annual percentage)	WDI
06	Industrialization (IND)	Industry value added (% of GDP)	WDI

Table 2: Descriptive statistics

Variable	Mean	Std. Dev.	Min	Max	Skewness	Kurtosis
EPI	69.962	27.173	21.24	101.160	−0.213	2.142
CO_2E	4.362	2.365	1.468	8.426	−0.410	2.013
GHGE	171.825	154.442	−7.199	398.796	0.318	1.345
REO	19.413	3.004	15.037	26.338	0.175	−0.312
REC	22.980	9.449	11.34	36.907	0.220	−1.303
ECT	10.478	34.324	6.421	14.535	0.432	2.451
PG	0.835	0.406	0.089	1.610	0.102	−2.134
IND	43.997	2.805	37.843	47.557	0.291	2.341

Table 3: Descriptive statistics (years)

Years	EPI	CO_2E	GHGE	REO	REC	ECT	PG	IND
1985	21.240	1.468	−7.199	20.394	36.907	0.453	1.362	42.712
1986	22.460	1.562	−4.125	20.156	36.291	1.541	1.487	43.514
1987	24.620	1.655	−1.052	19.918	35.676	1.521	1.604	43.318
1988	27.370	1.749	2.022	19.680	35.060	1.664	1.610	43.525
1989	28.920	1.843	5.096	19.442	34.445	1.678	1.533	42.496
1990	31.240	1.915	8.170	20.408	34.084	1.453	1.467	41.033
1991	34.760	2.001	−0.510	18.471	33.258	2.532	1.364	41.487
1992	38.080	2.076	10.003	17.585	32.931	4.556	1.226	43.115
1993	42.600	2.245	19.307	18.125	31.678	3.234	1.150	46.177
1994	48.320	2.322	33.719	18.088	31.249	3.245	1.130	46.163
1995	55.550	2.563	28.340	19.214	29.472	4.532	1.087	46.751
1996	54.610	2.522	32.602	17.552	30.537	5.343	1.048	47.104
1997	59.310	2.548	48.891	17.512	30.183	7.023	1.023	47.099
1998	64.040	2.606	3.670	18.061	29.740	8.960	0.960	45.798
1999	67.510	2.517	42.467	16.681	30.506	8.166	0.866	45.360
2000	68.860	2.650	69.206	16.639	29.630	10.788	0.788	45.536
2001	70.170	2.775	28.826	18.959	28.360	12.726	0.726	44.793
2002	72.060	2.976	78.877	17.619	27.000	12.670	0.670	44.451
2003	75.190	3.427	221.342	15.037	23.860	17.623	0.623	45.623
2004	77.890	3.954	187.092	16.223	20.170	14.594	0.594	45.900
2005	81.850	4.468	230.791	16.175	17.440	18.588	0.588	47.023
2006	84.190	4.910	287.588	15.593	16.390	25.558	0.558	47.557
2007	84.270	5.306	260.465	15.263	14.880	18.522	0.522	46.884
2008	88.360	5.435	293.969	17.737	14.140	25.512	0.512	46.971
2009	91.430	5.798	295.656	17.864	13.430	23.497	0.497	45.957
2010	93.730	6.335	306.140	18.623	12.260	29.483	0.483	46.498
2011	94.190	6.901	306.140	16.762	11.340	27.546	0.546	46.529
2012	97.520	7.046	306.140	19.966	11.530	34.678	0.678	45.423
2013	98.680	7.324	326.518	20.296	11.450	32.666	0.666	44.177
2014	100.220	7.294	335.552	22.609	11.940	31.630	0.630	43.086
2015	99.990	7.146	344.587	23.927	12.180	35.581	0.581	40.841
2016	99.790	7.115	353.622	22.895	12.560	36.573	0.573	39.581
2017	100.530	7.231	362.657	23.584	13.130	40.605	0.605	39.852
2018	101.160	7.487	371.691	24.272	13.710	39.468	0.468	39.687
2019	94.710	7.606	380.726	24.961	14.450	41.355	0.355	38.587
2020	95.820	8.191	389.761	25.649	14.051	42.238	0.238	37.843
2021	97.356	8.426	398.796	26.338	14.341	44.089	0.089	39.426

and population growth on effective environmental management in China. The time covered in the study was from 1985 to 2021. The data for the year 2022 is not available. So, only 37 years of data is used for the analysis. Table 1 presents the variables, their measurement, and data sources. The present research has established the study equation given below:

$$EPI_t = f(CO2E_t, GHGE_t, REO_{it}, REC_t, ECT, PG_t, IND_t) \quad (1)$$

First, the study applied basic tests to confirm the strength and weakness among variables and characteristics of data. For that, descriptive statistics and correlation were performed. Descriptive statistics allow researchers to analyze features of data and gauge basic information about variables from data set. Similarly, correlation not only helps to identify the relationship among variables is either strong or weak but also helps researchers to identify the similarities among variables to get rid of multicollinearity issue. Besides, the study then applied of Phillips-Perron (PP) and augmented Dickey–Fuller test (ADF) test to give concluding remarks regarding unit root among constructs.

The study further follows ARDL bound test to assess co-integration in the proposed model and finally applied ARDL technique to identify the significance among constructs. The reason to know about co-integration existence is because ARDL can't be applied if there is no co-integration. Also, it is necessary

Table 4: Correlation

Variables	EPI	CO_2E	GHGE	REO	REC	ECT	PG	IND
EPI	1							
CO_2E	−0.714	1						
GHGE	−0.617	0.976	1					
REO	0.293	0.565	0.463	1				
REC	0.655	−0.954	−0.968	−0.32	1			
ECT	0.231	−0.341	−0.431	0.341		1		
PG	0.542	−0.846	−0.869	−0.242	0.878		1	
IND	0.121	−0.388	−0.321	−0.876	0.147	−0.143	0.104	1

Table 5: Unit root test

Series	ADF		PP	
	Level	First difference	Level	First difference
EPI	−3.109***	-	−2.102***	-
CO_2E	−3.002***	-	−2.133***	-
GHGE	-	−5.337***	-	−4.207***
REO	-	−5.232***	-	−4.242***
REC	-	−5.491***	-	−4.393***
ECT	-	−3.271***	-	−5.123***
PG	−2.102***	-	−2.392***	-
IND	−2.211***	-	−2.347***	-

Table 6: Bound test of nonlinear ARDL

Model specification	F-statistics	Lower bound	Upper bound	Decision
Linear ARDL	0.755	1.442	2.332	No co-integration
Asymmetric ARDL	4.564	1.334	2.341	Co-integration

that some variable must be positioned stationary at level and first level (Qamruzzaman and Jianguo, 2018). ARDL is also helpful for researchers as it not only helps in the detection of heteroscedasticity and autocorrelation but also provide control to suppress their severe effects and produce authentic evidences (Sohail et al., 2021). The ARDL approach estimation equation is mentioned below:

$$\Delta EPI_t = \alpha_0 + \sum \delta_1 \Delta EPI_{t-1} + \sum \delta_2 \Delta CO2E_{t-1} + \sum \delta_3 \Delta GHGE_{t-1} + \sum \delta_4 \Delta REO_{t-1} + \sum \delta_5 \Delta REC_{t-1} + \sum \delta_6 \Delta ECT_{t-1} + \sum \delta_7 \Delta PG_{t-1} + \sum \delta_8 \Delta IND_{t-1} + \varphi_1 EPI_{t-1} + \varphi_2 CO2E_{t-1} + \varphi_3 GHGE_{t-1} + \varphi_4 REO_{t-1} + \varphi_5 REC_{t-1} + \varphi_6 REC_{t-1} + \varphi_7 PG_{t-1} + \varphi_8 IND_{t-1} + \varepsilon_t \quad (1)$$

Lastly, the NARDL approach was applied to identify the association among study constructs as the prime purpose of the study is to examine the asymmetric linkage among PG, IND, and EPI. Therefore, the asymmetric function is given as under:

$$EPI = f(CO2E, GHGE, REO, REC, ECT, PG^+, PG^-, IND^+, IND^-) \quad (2)$$

Hence, the empirical model with asymmetric linkages is established below:

$$EPI_t = \alpha_0 + \beta_1 CO2E_t + \beta_1 GHGE_t + \beta_3 REO_t + \beta_1 REC_t + \beta_5 ECT_t + \beta_6 PG_t^+ + \beta_7 PG_t^- + \beta_8 IND_t^+ + \beta_9 IND_t^- + e_t \quad (3)$$

Table 7: Nonlinear ARDL results

Variables	Coefficients	Std. Err.	t-statistics
C	0.785	0.154	5.097
FPI (-1)	0.875	0.156	5.609
CO_2E (-1)	−1.894	0.339	−5.587
GHGE (-1)	−1.903	0.673	−2.828
REO (-1)	0.488	0.029	16.828
ECT (-1)	3.321	0.891	4.311
REC (-1)	0.584	0.102	5.725
PG-P (-1)	2.019	0.781	2.844
PG-N (-1)	3.201	0.930	3.442
IND-P (-1)	3.884	1.098	3.537
IND-N (-1)	4.392	1.291	3.402
Adj. R Square	0.675		
F-statistics	47.103		
Prob.(F-statistics)	0.004		

The aim regarding the asymmetric linkages' investigation among PG, IND, and EPI also demands a partial sum of positive and negative alteration among constructs, and these alterations are given below:

$$IND^+ = \sum_{i=1}^{t} \Delta IND_i^+ = \sum_{i=1}^{t} \max(\Delta IND_i 0) \quad (4)$$

$$IND^- = \sum_{i=1}^{t} \Delta IND_i^- = \sum_{i=1}^{t} \min(\Delta IND_i 0) \quad (5)$$

$$PG^+ = \sum_{i=1}^{t} \Delta PG_i^+ = \sum_{i=1}^{t} \max(\Delta PG_i 0) \quad (6)$$

$$PG^- = \sum_{i=1}^{t} \Delta PG_i^- = \sum_{i=1}^{t} \min(\Delta PG_i 0) \quad (7)$$

4. RESULTS AND DISCUSSION

Table 2 revealed that the EPI average figure is 69.962%, CO2E mean figure is 4.362 metric tons per capita, GHGE average figure is 171.825%, and REO mean figure is 19.413%. In addition, the outcomes revealed that the REC average figure is 22.980%, the PG average figure is 0.835%, and the IND mean figure is 43.997%.

In addition, year-wise descriptives were also presented in Table 3. From the table, it is revealed that EPI was maximum 2018, CO2E in 2021, GHGE in 2021, and REO in 2021. In addition, the outcomes revealed that the REC was highest in 1985 while PG was in 1988 followed by IND in 2006.

Table 4 reveals that the value between carbon emissions and EPI is −0.714 which means these two variables share strong correlation. Similarly, in the case of GHGE the correlation also seems to be strong. The value of REO and EPI are 0.293, it means that a weak correlation exists among these variables. Whereas in case of PG and EPI, the correlation is moderate and in case of IND the correlation is negligible. However, REC and EPI have strong correlations.

Table 5 shows ADF test results and exposed variables such as EPI, carbon emissions, IND and PG appear to be stationary at level while rest of the variables are stationary at 1st difference.

Since ARDL approach has been employed to observe co-integration existence, hence, Table 6 shows that f-stats are higher than recommended critical values which ensure the presence of co-integration. Hence, the authors can proceed further with NARDL testing. Table 7 estimates NARDL figures and it is quite clear that asymmetric linkage exists among PG, IND and EPI. This confirms the consistency with previous literature as it is argued by scholars that higher population growth measure higher human capital and economic activities which could be helpful for countries to build effective environmental management systems. Similarly, it also implies that when population growth is higher, there is infrastructure development, a better drainage system, and innovative technologies are being introduced. As a result, pollution spreading can be controlled. Moreover, novel technologies can be built and introduced by human capital and its usage could reduce the emissions of harmful gases into the air and protects the natural atmosphere (Burian et al., 2019; Genet, 2020; Gomes da Silva et al., 2020). Also, the expansion of industries over a greater area brings innovation and development to the country. The citizens who turn to innovative techniques for social and economic objectives as well as have the facility of developed infrastructure, do not make much use of energy. The reduction in energy use, while having the same outcomes, improves environmental performance. Further, when the industrial sector of an economy grows, it has the potential to make technological development and the use of advanced technologies which do not release toxic substances into air and water overcome environmental hazards. So, environmental performance gets better (Dang and Tran, 2020; Hemakumara and Dissanayake, 2020; Rehman et al., 2022).

Further, the results also show that higher emissions questions effective environmental management due to negative association, hence, showing consistency with prior findings (Bekun, et al., 2019; Cheng et al., 2019; Dutta, 2020; Milousi et al., 2019; Röck et al., 2020; Wagner et al., 2020). It implies that that many of the activities in the business world, like transportation, fertilization, manufacturing, cement production, and building infrastructure, all cause CO_2 emissions and the increasing CO_2 emissions create breathing problems, damage the ozone layers, and disturb the weather cycle. When CO_2 emissions increase, it becomes difficult to manage the environmental quality and productivity of the environment. Moreover, if there is the emission of a large amount of GHGs because of the increasing use of machines and technical processes, people must face many environmental issues which may affect their health, the resources they use, and their performance. This weakens organizations' ability to implement environmental management effectively.

Lastly, outcomes from Table 7 also confirms that RE out and consumption both increases the effectiveness of environmental management system due to positive relationship. By showing consistency with prior studies, it implies that the production of recyclable or reproductive energy improves the country's ability to raise the energy reserves and pile of clean energy sources. Also, the increasing supply of clean energy sources enables firms to bring changes in energy consumption patterns and avoid the use of fossil fuels or nuclear power in routine processes and firms can achieve their goal of environmental performance (Levenda et al., 2021; Mayer et al., 2020; Moslehpour et al., 2022). Besides, when there is an increasing tendency of individuals and organizations to utilize RE sources whenever they must carry the activities requiring energy, they spread pollution in the least amount. Consequently, the environmental performance is better (Assi et al., 2021).

5. CONCLUSION

The objective of the study was to examine the influences of CO_2 emissions, GHG emissions, RE output, and RE consumption on environmental management. The results indicated that humans, because of their consumption patterns and different types of activities in their personal, social, and commercial lives, cause CO_2 emissions. CO_2 emissions affect the natural weather pattern quality and environmental performance. The results also showed that the GHG emissions, because of human activities, destroy the protective layer around the earth and imbalance the natural environment. Thus, environmental management is effective in achieving the goal of higher environmental performance.

The results revealed that ecotourism can build effective environmental management as the foundational principle of ecotourism dictates the planned and structured tourism. Since ecotourism models are vocal about nature and identification of risks associated with natural resources vulnerabilities, uniform standards should be developed concretely with the help of established market admission systems. This would help China to be more compliant about rating systems, which further echoes more authenticity of adopted ecotourism policies. Besides, proper hoc laws must be communicated which preach about development of evaluation and enforcement systems that may discourage environmental abuse and reduce ecological deficit. In addition to this, government institutions must also provide training services to individuals to promote environmental sustainability. China should design a mechanism of community participation related to environmental management of tourism industry. Government should provide multiple benefits to resident from ecotourism so that enthusiasm can be built among residents and they participate more in ecological environmental management. This way, residents may be helpful for the government to manage resource and ecotourism environment consciously.

The results also revealed that when RE production units produce a large amount of energy or agriculture is promoted to produce RE, the excessive carbon and temperature can be reduced directly, or the lower use of fossil fuels reduce environmental pollution. Thus, environmental management is effective in RE output increase. Similarly, individuals and firms' total reliance on fossil fuels for providing fuel to domestic or business practices create pollution and damage the environment. But the increasing RE consumption reduces fossil fuel use and improves environmental performance. The results indicated that the population of a region matters in the environmental performance of that region. If the population is large, regulators are attentive. There is better infrastructure development, human capital development, and environmental awareness. This improves the effectiveness of environmental management and triggers environmental performance. Moreover, the authors found that the establishment of industries and the growth of these industries develop environmental awareness, technical knowledge, and technological advancement. In these circumstances, the emission of GHGs, waste, and other pollutants can be reduced.

REFERENCES

Abbasi, K.R., Shahbaz, M., Zhang, J., Irfan, M., Alvarado, R. (2022), Analyze the environmental sustainability factors of China: The role of fossil fuel energy and renewable energy. Renewable energy, 187, 390-402.

Adebayo, T.S., Kartal, M.T., Ağa, M., Al-Faryan, M.A.S. (2023), Role of country risks and renewable energy consumption on environmental quality: Evidence from MINT countries. Journal of Environmental Management, 327, 116884.

Ahmed, F., Ali, I., Kousar, S., Ahmed, S. (2022), The environmental impact of industrialization and foreign direct investment: Empirical evidence from Asia-pacific region. Environmental Science and Pollution Research International, 29, 29778-29792.

Ahmed, N., Thompson, S., Glaser, M. (2019), Global aquaculture productivity, environmental sustainability, and climate change adaptability. Environmental Management, 63, 159-172.

Alessi, L., Ossola, E., Panzica, R. (2021), What greenium matters in the stock market? The role of greenhouse gas emissions and environmental disclosures. Journal of Financial Stability, 54, 100869.

Altıntaş, H., Kassouri, Y. (2020), Is the environmental kuznets curve in Europe related to the per-capita ecological footprint or CO_2 emissions? Ecological Indicators, 113, 106187.

Assi, A.F., Isiksal, A.Z., Tursoy, T. (2021), Renewable energy consumption, financial development, environmental pollution, and innovations in the ASEAN + 3 group: Evidence from (P-ARDL) model. Renewable Energy, 165, 689-700.

Bamati, N., Raoofi, A. (2020), Development level and the impact of technological factor on renewable energy production. Renewable Energy, 151, 946-955.

Bekun, F.V., Alola, A.A., Sarkodie, S.A. (2019), Toward a sustainable environment: Nexus between CO_2 emissions, resource rent, renewable and nonrenewable energy in 16-EU countries. Science of the Total Environment, 657, 1023-1029.

Burian, A., Karaya, R., Wernersson, J.E., Egberth, M., Lokorwa, B., Nyberg, G. (2019), A community-based evaluation of population growth and agro-pastoralist resilience in Sub-Saharan drylands. Environmental Science and Policy, 92, 323-330.

Burritt, R.L., Herzig, C., Schaltegger, S., Viere, T. (2019), Diffusion of environmental management accounting for cleaner production: Evidence from some case studies. Journal of Cleaner Production, 224, 479-491.

Caglar, A.E., Daştan, M., Ahmed, Z., Mert, M., Avci, S.B. (2025), A novel panel of European economies pursuing carbon neutrality: Do current climate technology and renewable energy practices really pass through the prism of sustainable development? Gondwana Research, 139, 260-271.

Cao, S., Nie, L., Sun, H., Sun, W., Taghizadeh-Hesary, F. (2021), Digital finance, green technological innovation and energy-environmental performance: Evidence from China's regional economies. Journal of Cleaner Production, 327, 129458.

Chen, J., Lu, L., Gong, Q., Lau, W.Y., Cheung, K.H. (2021), Techno-economic and environmental performance assessment of radiative sky cooling-based super-cool roof applications in China. Energy Conversion and Management, 245, 114621.

Cheng, C., Ren, X., Wang, Z., Yan, C. (2019), Heterogeneous impacts of renewable energy and environmental patents on CO_2 emission - evidence from the BRIICS. Science of the Total Environment, 668, 1328-1338.

Dang, T.D., Tran, T.A. (2020), Rural industrialization and environmental governance challenges in the red river delta, Vietnam. The Journal of Environment and Development, 29(4), 420-448.

Destek, M.A., Aslan, A. (2020), Disaggregated renewable energy consumption and environmental pollution nexus in G-7 countries. Renewable Energy, 151, 1298-1306.

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 International, 27(32), 40930-40948.

Dutta, P. (2020), Determinants of voluntary sustainability assurance: The importance of corporate environmental performance. Social Responsibility Journal, 16(8), 1403-1414.

El Menyari, Y. (2021), Effect of tourism FDI and international tourism to the economic growth in Morocco: Evidence from ARDL bound testing approach. Journal of Policy Research in Tourism Leisure and Events, 13(2), 222-242.

Feng, Y., Liu, R., Chiu, Y.H., Chang, T.H. (2020), Dynamic linkages among energy consumption, environment and health sustainability: Evidence from the different income level countries. Inquiry, The Journal of Health Care Organization, Provision, and Financing, 57, 1-18.

Genet, A. (2020), Population growth and land use land cover change scenario in Ethiopia. International Journal of Environmental Protection and Policy, 8(4), 77-85.

Gomes Da Silva, F.J., Gouveia, R.M., Gomes Da Silva, F.J., Gouveia, R.M. (2020), Global population growth and industrial impact on the environment. Cleaner Production Toward a Better Future, 6, 33-75.

Hashmi, R., Alam, K. (2019), Dynamic relationship among environmental regulation, innovation, CO_2 emissions, population, and economic growth in OECD countries: A panel investigation. Journal of Cleaner Production, 231, 1100-1109.

Heller, M.C., Selke, S.E., Keoleian, G.A. (2019), Mapping the influence of food waste in food packaging environmental performance assessments. Journal of Industrial Ecology, 23(2), 480-495.

Hemakumara, M.A.P.S., Dissanayake, D.M.K.T. (2020), The impact of industrialization on environmental sustainability: A case study in Gampaha district. NSBM Journal of Management, 6(1), 26-55.

Homroy, S., Slechten, A. (2019), Do board expertise and networked boards affect environmental performance? Journal of Business Ethics, 158, 269-292.

Ikram, M., Zhang, Q., Sroufe, R., Shah, S.Z.A. (2020), Towards a sustainable environment: The nexus between ISO 14001, renewable

energy consumption, access to electricity, agriculture and CO_2 emissions in SAARC countries. Sustainable Production and Consumption, 22, 218-230.

Iorember, P.T., Goshit, G.G., Dabwor, D.T. (2020), Testing the nexus between renewable energy consumption and environmental quality in Nigeria: The role of broad-based financial development. African Development Review, 32(2), 163-175.

Jong, M.C., Puah, C.H., Arip, M.A. (2020), Modelling tourism demand: An augmented gravity model. Jurnal Ekonomi Malaysia, 54(2), 105-112.

Jong, M.C., Soh, A.N., Puah, C.H. (2022), Tourism sustainability: Climate change and carbon dioxide emissions in South Africa. International Journal of Energy Economics and Policy, 12(6), 412-417.

Khan, A., Bibi, S., Ardito, L., Lyu, J., Hayat, H., Arif, A.M. (2020), Revisiting the dynamics of tourism, economic growth, and environmental pollutants in the emerging economies-sustainable tourism policy implications. Sustainability, 12(6), 2533.

Levenda, A.M., Behrsin, I., Disano, F. (2021), Renewable energy for whom? A global systematic review of the environmental justice implications of renewable energy technologies. Energy Research and Social Science, 71, 183-197.

Li, Y., Dai, J., Cui, L. (2020), The impact of digital technologies on economic and environmental performance in the context of industry 4.0: A moderated mediation model. International Journal of Production Economics, 229, 107-125.

Li, Y., Zhang, L., Gao, Y., Huang, Z., Cui, L., Liu, S., Fang, Y., Ren, G., Fornacca, D., Xiao, W. (2019), Ecotourism in China, misuse or genuine development? An analysis based on Map browser results. Sustainability, 11(18), 4997.

Li, Z., Wu, B., Wang, D., Tang, M. (2022), Government mandatory energy-biased technological progress and enterprises' environmental performance: Evidence from a quasi-natural experiment of cleaner production standards in China. Energy Policy, 162, 112-128.

Liao, S. (2023), The Russia-Ukraine outbreak and the value of renewable energy. Economics Letters, 4, 111-128.

Mahmood, H., Alkhateeb, T.T.Y., Furqan, M. (2020), Industrialization, urbanization and CO_2 emissions in Saudi Arabia: Asymmetry analysis. Energy Reports, 6, 1553-1560.

Mayer, M.J., Szilágyi, A., Gróf, G. (2020), Environmental and economic multi-objective optimization of a household level hybrid renewable energy system by genetic algorithm. Applied Energy, 269, 115058.

Milousi, M., Souliotis, M., Arampatzis, G., Papaefthimiou, S. (2019), Evaluating the environmental performance of solar energy systems through a combined life cycle assessment and cost analysis. Sustainability, 11(9), 2539-2557.

Mohsin, M., Abbas, Q., Zhang, J., Ikram, M., Iqbal, N. (2019), Integrated effect of energy consumption, economic development, and population growth on CO_2 based environmental degradation: A case of transport sector. Environmental Science and Pollution Research International, 26(32), 32824-32835.

Moslehpour, M., Shalehah, A., Wong, W.K., Ismail, T., Altantsetseg, P., Tsevegjav, M. (2022), Economic and tourism growth impact on the renewable energy production in Vietnam. Environmental Science and Pollution Research, 29(53), 81006-81020.

Munir, K., Ameer, A. (2020), Nonlinear effect of FDI, economic growth, and industrialization on environmental quality: Evidence from Pakistan. Management of Environmental Quality: An International Journal, 31(1), 223-234.

Pata, U.K., Kartal, M.T., Ahmed, Z., Sinha, A. (2025), Relationship between green bonds and carbon neutrality: Evidence from top five emitting countries' sectoral CO_2 emissions. Financial Innovation, 11, 10.

Puah, C.H., Jong, M.C., Ayob, N., Ismail, S. (2018), The impact of tourism on the local economy in Malaysia. International Journal of Business and Management, 13(12), 147-153.

Pujara, Y., Pathak, P., Sharma, A., Govani, J. (2019), Review on Indian Municipal Solid Waste Management practices for reduction of environmental impacts to achieve sustainable development goals. Journal of Environmental Management, 248, 109-127.

Qamruzzaman, M., Jianguo, W. (2018), Nexus between financial innovation and economic growth in South Asia: Evidence from ARDL and nonlinear ARDL approaches. Financial innovation, 4(1), 20.

Rasheed, M.Q., Yuhuan, Z., Nazir, M., Ahmed, Z., Yu, X. (2025), How do semiconductors, artificial intelligence, geopolitical risk, and their moderating effects shape renewable energy production in leading semiconductor manufacturing countries? Technology in Society, 80, 102761.

Ratner, S., Gomonov, K., Revinova, S., Lazanyuk, I. (2020), Eco-design of energy production systems: The problem of renewable energy capacity recycling. Applied Sciences, 10(12), 4339-4357.

Razmjoo, A., Kaigutha, L.G., Rad, M.V., Marzband, M., Davarpanah, A., Denai, M. (2021), A technical analysis investigating energy sustainability utilizing reliable renewable energy sources to reduce CO_2 emissions in a high potential area. Renewable energy, 164, 46-57.

Rehman, A.U., Malik, A.H., Bin Md Isa, A.H., Jais, M.B. (2022), Dynamic impact of financial inclusion and industrialization on environmental sustainability. Social Responsibility Journal, 7, 52-64.

Ribeiro, M.A., Moritomo, M., Woosnam, K.M. (2019), Residents' support for and participation in sustainable tourism development in rural areas: The case of Karuizawa, Japan. In: Handbook of Research on Resident and Tourist Perspectives on Travel Destinations. United States: IGI Global.

Röck, M., Saade, M.R.M., Balouktsi, M., Rasmussen, F.N., Birgisdottir, H., Frischknecht, R., Passer, A. (2020), Embodied GHG emissions of buildings-the hidden challenge for effective climate change mitigation. Applied Energy, 258, 114-129.

Rogerson, C.M. (2016), Climate change, tourism and local economic development in South Africa. Local Economy, 31(1-2), 322-331.

Shah, A.A., Hussain, M.S., Nawaz, M.A., Iqbal, M. (2021), Nexus of renewable energy consumption, economic growth, population growth, FDI, and environmental degradation in south asian countries: New evidence from Driscoll-Kraay standard error approach. IRASD Journal of Economics, 3(2), 200-211.

Shang, Y., Lian, Y., Chen, H., Qian, F. (2023), The impacts of energy resource and tourism on green growth: Evidence from Asian economies. Resources Policy, 81, 103359.

Sharma, G., Thomas, A., Paul, J. (2021), Reviving tourism industry post-COVID-19: A resilience-based framework. Tourism Manag Perspect, 37, 100786.

Shvets, I.Y. (2020), Multiplier effects of the development of socially responsible tourism. EurAsian Journal of BioSciences, 14, 3753-3758.

Sofi, A.A., Bhat, M.Y., Ahmad, L., Aara, R.R., Aswani, R.S. (2022), Renewable energy and transitioning towards sustainable tourism: Inferences from kernel density and nonparametric approach. Renewable Energy, 193, 963-975.

Soh, A.N., Puah, C.H., Arip, M.A. (2019), Construction of tourism cycle indicator: Asignalling tool for tourism market dynamics. Electronic Journal of Applied Statistical Analysis, 12(2), 477-490.

Sohail, M.T., Ullah, S., Majeed, M.T., Usman, A. (2021), Pakistan management of green transportation and environmental pollution: A nonlinear ARDL analysis. Environmental Science and Pollution Research, 28(23), 29046-29055.

Thompson, B.S. (2022), Ecotourism anywhere? The lure of ecotourism and the need to scrutinize the potential competitiveness of ecotourism developments. Tourism Management, 92, 104568.

Vo, D.H. (2021), Renewable energy and population growth for sustainable development in the Southeast Asian countries. Energy Sustainability and Society, 11(1), 1-15.

Wagner, A., Sahm, C.D., Reisner, E. (2020), Towards molecular understanding of local chemical environment effects in electro-and photocatalytic CO_2 reduction. Nature Catalysis, 3(10), 775-786.

Younis, H., Sundarakani, B. (2020), The impact of firm size, firm age and environmental management certification on the relationship between green supply chain practices and corporate performance. Benchmarking An International Journal, 27(1), 319-346.

Yousefi, N., Lu, X., Elimelech, M., Tufenkji, N. (2019), Environmental performance of graphene-based 3D macrostructures. Nature Nanotechnology, 14(2), 107-119.

Zafar, M.W., Saeed, A., Zaidi, S.A.H., Waheed, A. (2021), The linkages among natural resources, renewable energy consumption, and environmental quality: A path toward sustainable development. Sustainable development, 29(2), 353-362.

Zhang, C., Zeng, G., Huang, D., Lai, C., Chen, M., Cheng, M., Huang, B. (2019), Biochar for environmental management: Mitigating greenhouse gas emissions, contaminant treatment, and potential negative impacts. Chemical Engineering Journal, 373, 902-922.

Zhang, S., Chan, E.S. (2020), A modernism-based interpretation of sustainable tourism. International Journal of Tourism Research, 22(2), 223-237.