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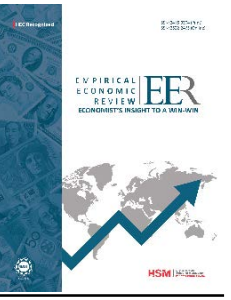

Title:	**Exploring and Evaluating the Association between Environmental Sustainability and Economic Progress: A Cross-Country Analysis of Green Tourism**
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Exploring and Evaluating the Relationship between Environmental Sustainability and Economic Progress: A Cross Country Analysis of Green Tourism

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Abstract

Environment plays a pivotal role in the development of both developed as well as developing countries. The whole world has faced an enormous change in the global climatic conditions over the past few years. This study is a cross-section study and it employed ordinal regression using Least Square methods to examine the impact of threatened species, environmental performance, tourism income, tourism expenditure, GDP per capita, environment related treaties and CO_2 emissions on the tourism income, threatened species and GDP per capita of 106 countries in 2019. The study included countries from Sub Saharan Africa; South and Southeast Asia; South America; Oceania; North Asia; North America; North Africa; Mesoamerica; East Asia; Caribbean Island; Antarctic; West and Central Asia. The results of the study varied across region and countries. The study was based on three clusters formulated on their highest number of threatened species, higher GDP per capita and highest environmental sustainability score on 1-7 scale as measured by WEF. The three models were estimated for each cluster using tourism income, threatened species and GDP per capita as the dependent variable and remaining as independent variables. Various sources of data were used including WEF reports, World Bank, UN Red List and Atlas big. In all three models for all the clusters, improvement in environmental performance had a positive impact on GDP per capita and tourism income. For all clusters poor climatic conditions in terms of CO_2 emissions and poor environmental performance further increased number and percentage of threatened species. The study proposed a policy to protect endangered species through improved environmental conditions and quality tourism infrastructure, tourism expenditure and increased environment related treaties.

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JEL Classification: O44, O57, Z3, Q01

Introduction

World has experienced a dynamic change in tourism revenue over the past few years, globally. Our mother earth is facing a drastic decrease of various species with a high extinction risk (Leidner & Neel, 2011; Larkin et al., 2021; Reyne, 2021). Mass exploitation of resources has greatly affected biodiversity and global ecosystems (Weinert, 2021). Forest coverage, number of butterflies, and fishes have declined over the years due to global warming (Matskovsky, 2021).

The importance of endangered species must be realized (Huan et al., 2021). To reap full socio-economic advantages; protection of these endangered species must be kept into account (Coppa et al., 2021; Gruber, 2021; Kayode & Okunrinopo, 2021). Tourism can also be enhanced through wildlife protection and environmental sustainability (Aquino et al., 2021; Dick, 2021).

In present times, our planet earth is experiencing the Holocene extinction famously known as the 6th great period of extinction (Crees, & Turvey, 2014, Eldredge, 2001; Elewa, 2008; Turvey, 2009; Dulvy et al., 2009; Turvey, 2007). The beauty of planet Earth lies in the notion that biodiversity must be sustained.

There are certain animal species that are going extinct at a rapid rate (Bailey et al., 2021). The climate vulnerability associated with human activity, over exploitation, agricultural monocultures, and human borne invasive species have contributed to such a drastic level of extinction (Maskay & Nyachhyon, 2010).

Many studies suggest that extinction of various species has an unprecedented rate of approximately one species per million annually; with new species replacing the lost ones in a sustainable manner (Eckholm, 1978; Eckholm, 1981; Emery, 2021; Gibbs 2001; Heleno et al., 2020; Myers, 1979; Oguntade, 2013; Phillips, 1990; Reader, 1987; Schloegel, 2006; Young, 2005; Vermeulen & Bräger, 2015).

According to new findings of IUCN red list, the social and environmental scientists agree upon the notion that the extinction puzzle is much complex as previously thought of. Furthermore, the rate at which the extinction of various species is occurring is highly alarming. The World Conservation Union has highlighted that one fourth of mammals and one third of conifers and reptiles have either become extinct or are on the verge of extinction.

Linking Environment, Threatened Species, and Tourism Income

The sustainable development goals (SDGs) of United Nations (UN) demand taking an urgent step to combat climate change and its impact (SDG 13). Another important goal of sustainable development is "to conserve and sustainably use oceans, seas, and marine resources for sustainable development". The current study focused to establish a relationship between sustainability of environment, tourism, and number of threatened species (SDG 1). Another sustainable goal that is directly linked to this study is "to protect, restore, and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss" (SDG 15).

Tourism revenue has a direct relationship with conservation for which management plans are needed (Birendra, 2021). There are two views that link tourism and environment where one assumes that improved environment leads to increased tourism income for countries and the other one is based upon the assumption that increased tourism leads to environmental degradation (Buckley, 2004).

If environmental performance rankings are considered, then it can be observed that it varies across regions. The maps reflecting rankings of countries in specific regions have been shown below in appendix B (see Figure B1-B7). The data used was collected by Environmental Performance Index (EPI) which used 32 performance indicators and 180 countries are ranked based on their environmental health and ecosystem vitality. The current study used the available data of most recent year, that is, (2019).

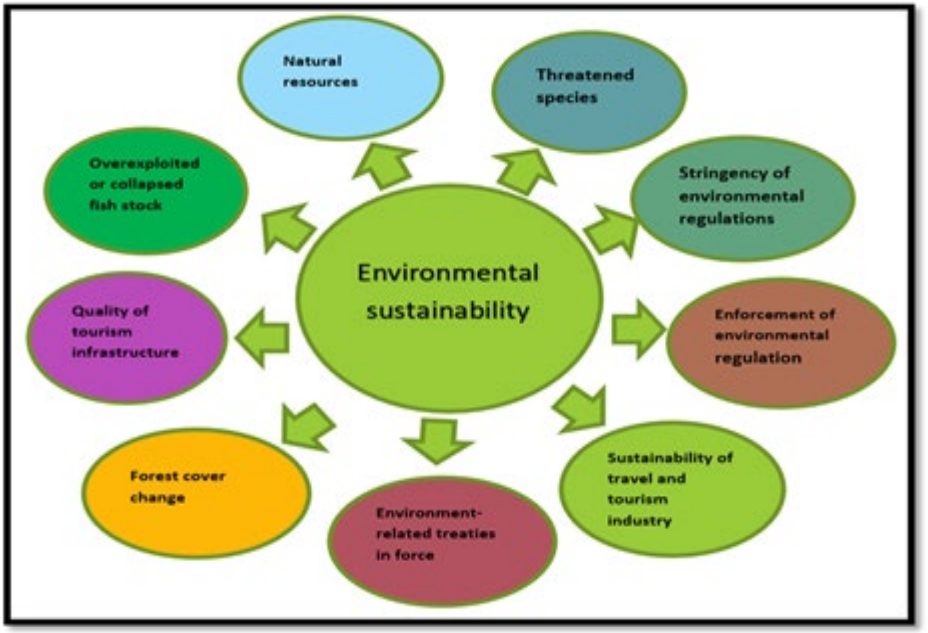
Determinants of Environmental Sustainability

There are certain factors which determine the sustainability of environment. Figure 1 represents the factors included to measure

environmental sustainability in the current study. Apart from these factors, other variables were also incorporated to the impact of environmental sustainability, such as GDP per capita, percentage of tourism expenditure, and total known species, in the countries taken for analysis.

Figure 1

Factors Determining Environmental Sustainability



The factors which determine environmental sustainability have been represented in Figure 1 above. Using these indices, a separate index of environmental performance was constructed to be incorporated in the model estimations to avoid multicollinearity between them. Quality of tourism infrastructure includes number of hotels, rooms, resorts, and entertainment facilities in countries under analysis. The index of environmental treaties was analyzed on 0-29 scale where 29 referred to the best. The index of stringency of environmental regulations was measured on a scale of 1-7 where 1 meant very relaxed and 7 meant amongst worlds' most rigorous in terms of stringency of environmental regulations. All these determinants were available in WEF's Travel and Tourism Index report (2019). The study combined these stated indices and incorporated them in model estimation to attain meaningful and reliable results.

Literature Review

The performance of tourism industry in each region is a complex phenomenon to evaluate. While increased tourism in a particular region brings increased economic opportunities for residents and a broader infrastructure development in that region (usually aggregated as economic growth). It may also lead to environmental degradation and deterioration as an unintended consequence. There is a growing body of evidence of this phenomenon in recent times.

Literature regarding the relationship between tourism and economic growth is extensive, competing, and conflicting which is distributed in four categories. The first category of studies relates tourism led growth with a unidirectional causality from tourism towards economic growth (see, e.g., Dritsakis, 2004; Gunduz & Hatemi, 2005; Dritsakis, 2012). These studies suggest that economic growth through tourism occurs with respect to various channels. These channels include foreign currency earnings, generation of employment, improvement in balance of payments, and development of infrastructure. Most of the studies, such as Balaguer and Cantavella- Jorda (2002), and Narayan et al. (2010) employed different time series and panel data approaches including Auto Regressive Distributed Lag Model (ARDL), Granger Causality, and Vector Error Correction Model (VECM) for econometric analysis.

The studies related to second category, such as Lee & Chang (2008) and Ridderstaat et al. (2014) suggested a bidirectional causality between development of tourism and economic growth. Dritsakis (2004) studied the impact of tourism on economic growth in long run employing a multivariate autoregressive model. The study signified a bidirectional causality among variables in Greece. The comparative analysis of Lee & Chang (2008) explored the tourism led growth hypothesis in OECD and Non-OECD countries. The study revealed that the hypothesis was held true for OECD countries, whereas a reciprocal causal linkage was determined in non-OECD countries. Similarly, Chen et al. (2009) provided strong empirical evidence that there was a two-way causality between tourism and economic growth in South Korea as compared to Taiwan where there was a unidirectional causality from expansion of tourism towards GDP growth.

The third category of literature enforces the significance of economic growth causing expansion in tourism industry. The claim supporting this category suggests better tourism, safety protocols, and economic development aids in attracting more tourists. In support of this argument, Narayan (2004) applied computable general equilibrium model and suggested that economic development was a major factor influencing tourism in a positive manner in Fiji. Similarly, Tang & Jang (2009) applied granger causality test and found a unidirectional causality from economic growth to tourism. The fourth category of studies suggested that there existed no relationship between tourism and economic growth. Notable studies covering the fourth category are Katircioglu (2009) for Turkey and Kasimati (2011) for Greece.

However, there is conflicting and competing evidence on the relationship between tourism and economic growth and there is relatively consistent evidence of the implications of tourism growth on environment. Becken and Simmons (2002) found that the expansion of tourism industry aggravates the energy consumption (CO_2 emissions) and thereby negatively affecting the environment. Kartircioglu (2014) investigated the tourism-CO_2 emission nexus for Singapore and found that there existed tourism induced Environmental Kuznets Curve in the region suggesting an initial deterioration of environment which was subsequently reversed with the growth in tourism. Furthermore, Lee and Brahmasrene (2013) highlighted that tourism causes a significantly negative impact on the CO_2 emissions by applying fixed effect model. While examining the developed and less developed countries, León et al. (2014), through the application of GMM model suggested that tourism development acts like a catalyst for high energy consumptions and CO_2 emissions in both types of countries. Similarly, Durbarry and Seetanah (2015) suggested that an increase in the number of tourists caused a substantial positive impact on CO_2 emissions. Moreover, Raza et al. (2016) also found that the tourism development adversely impacted the environment in the United States by conducting a wavelet-built analysis.

Although, considerable research has been conducted both in exploring the impact of tourism on growth and environment separately and very few have tested the relationship among tourism, economic growth, and environmental sustainability in one study. Virtually, no study has added the factor of endangered species in tourism, economic growth, and

environmental sustainability nexus. The current study aided in taking the variable for endangered species into account while evaluating the nexus.

Methodology and Data

The current research attempted to determine the status of endangered species in various countries in twelve different regions including Sub Saharan; South and Southeast Asia; South America; Oceania; North Asia; North America; North Africa; Mesoamerica; East Asia; Caribbean Island; Antarctic; West, and Central Asia. It also aimed to highlight the benefits of wildlife protection and environmental sustainability on tourism in Pakistan along with conservation policy needs and their implications.

The study also aimed to examine the impact of environment on tourism revenue of countries that are selected based on data availability on UN Red list. The study was cross sectional and the data on environmental stability score, number of endangered species, stringency of environmental regulations, population growth, area and density, base line water stress, forest cover change was obtained from Travel and Tourism Competitiveness report of World Economic Forum report issued in 2019.

Figure 2

Distribution of Sample of Countries by Region and Income Group

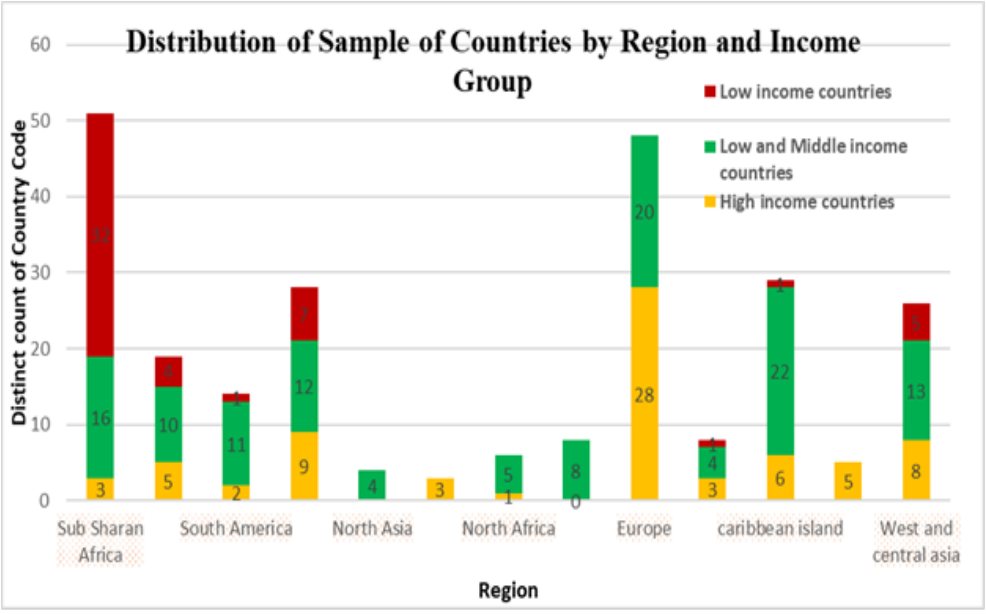
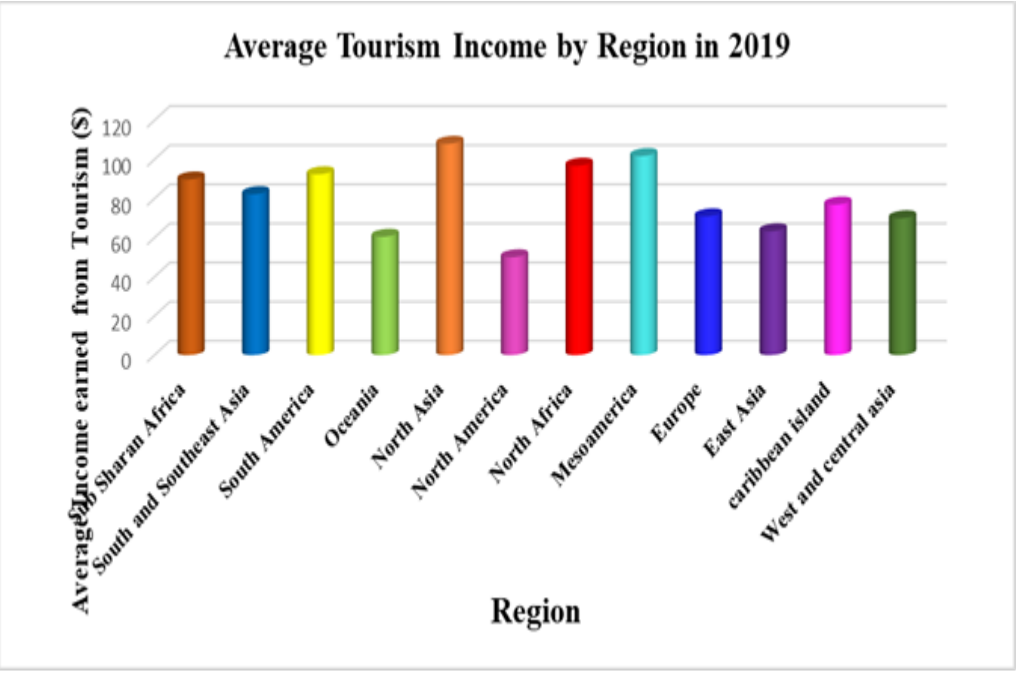


Figure 2 represents the distribution of sample of countries by Region and Income Group. Figure 3 shows the average tourism income that each of these regional countries earned in 2019. North Asia, Mesoamerica, and South America had higher average income earned from tourism sector. North America, Oceania, and East Asia were amongst those that earned lower average tourism income in 2019.

Figure 3

Average of Tourism Income for each Region



Results and Discussion

The results were estimated for various regions under analysis; however, they were not meaningful due to many missing values for some variables. Therefore, the study estimated and analyzed three models for three clusters of data based on improved environmental sustainability, percentage of threatened species, and GDP per capita of those countries in all 13 regions. It also employed ordinal regression analysis on clusters to obtain results for developed and underdeveloped countries in these regions. Cluster 1 included countries having improved environmental sustainability scores on a scale of 1-7. Cluster 2 included countries based

on highest percentage of threatened species, while cluster 3 was selected based on highest GDP per capita (high income countries).

The following three equations were estimated for each cluster.

$$TourismIn_i = \beta_o + EnvP_i + \beta_1 GDP_i + \beta_2 TourismExp_i + \beta_3 CO2_i + \mu_i$$

$$Th\_species_i = \beta_o + EnvP_i + \beta_1 GDP_i + \beta_2 TourismExp_i + \beta_3 CO2_i + \mu_i$$

$$GDP_i = \beta_o + EnvP_i + \beta_1 Th\_species_i + \beta_2 TourismExp_i + \beta_3 CO2_i + \mu_i$$

The three questions stated above were estimated for all three clusters. Logarithmic transformation (natural log) for some variables was taken to normalize the skewness of the data. The standard errors in the estimation provided robust results.

Table 1

Results of Countries with Highest Environmental Sustainability Score

Cluster 1	Coefficients	*p*-Value	Prob > *F*
Model 1. Dependent variable: Log Tourism Income (US dollars)			
Environmental Performance	.5199233 (.2475997)	0.000	0.0000
Log GDP per capita (US dollars)	0.02005 (.2864635)	0.000	
Log Tourism Expenditure	0.6107799 (.0987857)	0.000	
CO2 emissions	-.031173 (.0487027)	0.003	
Number of threatened species	.0036939 (.0007699)	0.000	
Environment related treaties	0.394308 (.0548594)	0.000	
Model 2. Dependent variable: Log Number of threatened species			
Log Tourism Income (US dollars)	.7688734 (.1157944)	0.000	0.0000
Log GDP per capita (US dollars)	-.6226537 (.2206921)	0.010	
Environmental Performance	.4516345 (.1904927)	0.027	
Log Tourism Expenditure	-.3008084 (.1048202)	0.009	

Cluster 1	Coefficients	*p*-Value	Prob > *F*
CO2 emissions	-.0624997 (.0355743)	0.093	
Model 3. Dependent variable : Log GDP Per capita			
Log Tourism Income (US dollars)	.5272038 (.1223516)	0.000	
Log Number of threatened species	-.4267068 (.1512411)	0.010	
Tourism Expenditure	-.1580249 (.0959853)	0.114	0.0000
CO2 emissions	.0402569 (.0302537)	0.197	
Environmental Performance	.1247372 (.174684)	0.483	

The results in table 1 represent countries with highest environmental sustainability score from regions considered. The theory and literature showed that environmental sustainability has a positive impact on tourism income GDP per capita which contributes positively to tourism income. On the other hand, tourism expenditure, number of environment related treaties also contribute positively to tourism income. The coefficient attached to threatened species depicted that increased tourism led to an increase in threatened species which is reflected in the nature of relationship between tourism income and threatened species in model 1 of cluster 1. However, CO2 emission in countries with improved environmental performance contributes negatively to tourism income as 1 metric ton per capita CO2 emission would lead to a decrease in tourism income by 0.04 dollars decrease in those countries. Moreover, for every 1% increase in GDP per capita, tourism income increases by 0.020% increase in tourism income in environmentally sustainable economies. Similarly, 1% increase in tourism expenditure leads to 0.7% increase in tourism expenditure of environmentally sustainable economies.

If number of threatened species is considered, then one unit increase in threatened species decreases tourism income by 0.3 % for economies that have improved environmental score on 1-7 scale. Additionally, 1% increase in income earned from tourism (tourism dependence) leads to 0.89% decrease in tourism income.

Results of model 2 for cluster represent a positive relationship of tourism income, environmental performance, and negative relationship between tourism expenditure and CO2 emissions with threatened species for countries that had good environmental performance. Model 3 for cluster 1, however, showed a negative relationship between threatened species and GDP per capita.

Table 2

Results of Countries with Highest Number of Threatened Species

Cluster 2	Coefficients	*p*-Value	Prob > *F*
Model 1. Dependent variable: Log Tourism Income (US dollars)			
Environmental Performance	.2297228 (.2021406)	0.000	0.0000
Log GDP per capita (US dollars)	.55439 (.3552445)	0.000	
Log Tourism Expenditure	.7067718 (.1361846)	0.000	
CO2 emissions (metric tons per capita)	-.0219215 (.0617964)	0.000	
Tourism Dependence(% of GDP earned from tourism)	.1012645 (.0546995)	0.003	
Model 2. Dependent variable: Percentage of threatened species			
Log Tourism Income (US dollars)	.1989704 (.569167)	0.000	0.0000
Environmental Performance	-.9308422 (.8343712)	0.000	
Log Tourism Expenditure	-0.979878 (.5546912)	0.001	
CO2 emissions (metric tons per capita)	.2914587 (.2225024)	0.000	
Model 3. Dependent variable : Log GDP Per capita			
Log Tourism Income (US dollars)	.0686526 (.103084)	0.000	0.0000
Log Number of threatened species	-.3655374 (.2436608)	0.000	
Log Tourism Expenditure (US dollars)	.342014 (.1109274)	0.000	

Cluster 2	Coefficients	*p*-Value	Prob > *F*
CO2 emissions(metric tons per capita)	.0774918 (.0401377)	0.000	
Environmental Performance	.1659444 (.1520239)	0.000	

Table 2 represents the results of countries with highest GDP. The results of cluster 2 showed that number of threatened species, environmental performance, GDP per capita, and tourism dependence had a positive impact on tourism income. While CO2 emissions revealed a negative impact on tourism income of countries with highest percentage of threatened species. Environmental performance impedes tourism development (Ragab & Meis, 2016). For one-unit increase in score of environmental sustainability, tourism income would increase by 77%. The results also revealed that a 1% increase in GDP per capita would lead to 0.55% increase in tourism income. Moreover, tourism income multiplier (coefficient attached with the tourism expenditure variable) showed that a 1% increase in tourism expenditure would lead to 0.71% increase in tourism income with p value of 0.000 (<0.05). The results of model 2 for cluster 3 where number of threatened species was high, revealed that at every 1% increase in tourism income, the percentage of threatened species would decrease by 0.0029% reflecting that tourism income had weak impact on percentage of threatened species. Similar results were seen in case of environmental performance variable where an increase in score contributes negatively to percentage of threatened species. Literature shows that funds obtained from tourism can be utilized to conserve endangered species listed on IUCN Red List (Buckley et al., 2012).

Table 3

Results of Countries with High GDP Per Capita

Cluster 3	Coefficients	*p*-Value	Prob > *F*
Model 1. Dependent Variable ; Log Tourism Income (US dollars)			
Environmental Performance	.4152242 (.1926594)	0.000	0.0000
Log GDP per capita (US dollars)	.3934909 (.3827134)	0.000	
Log Tourism Expenditure	.8158768 (.0975754)	0.000	

Cluster 3	Coefficients	*p*-Value	Prob > *F*
CO_2 emissions (metric tons per capita)	-.0321177 (.0246385)	0.000	
Tourism Dependence(% of GDP earned from tourism)	.0747868 (.0232556)	0.000	
Model 2. Dependent Variable: Number of threatened species			
Tourism Income (US dollars)	.5935841 (.034638)	0.000	0.0000
GDP per capita (US dollars)	.0074914 (.0030592)	0.000	
Environmental Performance	-.109885 (.039719)	0.000	
Tourism Expenditure	-1.45724 (.0033332)	0.000	
CO2 emissions(metric tons per capita)	.93852 (0.8345)	0.000	
Environment related treaties	-2.84178 (.086712)	0.002	
Model 3. Dependent Variable : GDP Per capita			
Tourism Income (US dollars)	0.9354787 (0.04589)	0.000	0.0000
Number of threatened species	-0.71109 (.36376)	0.000	
Tourism Expenditure	.6142612 (.157005)	0.000	
CO2 emissions(metric tons per capita)	0.761832 (.17799)	0.000	
Environmental Performance	0.8310185 (.217236)	0.000	

GDP and tourism are positively related to each other in countries that have higher GDP per capita as shown by the results and similar results were seen in literature (Castro-Nuño, 2003). The results for all the three clusters confirmed tourism-led economic growth hypothesis as seen in literature (Eeckels et al., 2012; Canale & De Siano, 2021).

Table 4

Direction of Variables

Clusters	Independent Variables							
	Tourism Expenditure	Threatened species	Tourism Income	CO2 emissions	Environment related treaties	Environmental Performance	Tourism dependence	GDP per capital
Cluster 1								
Model 1 Dep; tourism income	+	+		-		+		+
Model 2 Dep ; threatened species	-		+	+		+		-
Model 3 Dep; GDP per capita	+	-	+	+		+		
Cluster 2								
Model 1 Dep; tourism income	+		+	-		+		+
Model 2 Dep ; Threatened species	-		+	+		-		+
Model 3 Dep; GDP per capita	+	-	+	+		+		
Cluster 3								
Model 1 Dep; tourism income	+			-		+	+	+
Model 2 Dep ; Threatened species	-		+	+	-	-		+
Model 3 Dep; GDP per capita	+	-	+	+		+		

Policy Proposal

The results revealed that a general policy cannot be applied to all the clusters. Although, the impact of certain variables, such as CO2 emissions on tourism income and GDP per capita was more or less the same in all models across three clusters.

However, the point of concern for all these countries across these clusters is that there must be a national policy to conserve endangered species and improved environmental performance is not a measure to determine the decreasing number of threatened species in those countries. Tourism income can be enhanced through promotion of cultural tourism and quality of tourism infrastructure. NGOs and other organizations are required to protect and conserve the ever declining number of already threatened species. Moreover, it is important to protect the natural habitat of animals that need specific land and naturally available food for their prey.

Conclusion

Globally, the world has experienced a dynamic change in tourism revenue over the past few years. The results concluded that countries across the regions can reap benefits from higher tourism expenditure, improved environmental performance, reduced number of threatened species, lower CO2 emissions, and increased environment related treaties. For all clusters, poor climatic conditions in terms of CO2 emissions and poor environmental performance further increased number and percentage of threatened species. In all three clusters of used samples, tourism income was positively related to GDP thereby leading to the acceptance of tourism-led economic growth in countries across the regions. Moreover, the impact of CO2 emissions was seen to be positive on tourism income, threatened species, and GDP per capita for all three clusters. There is a need to realize the importance of endangered species and food chain in such a scenario where world is busy in production and mass consumption and the most beautiful species, on the other hand, are declining at a rapid rate.

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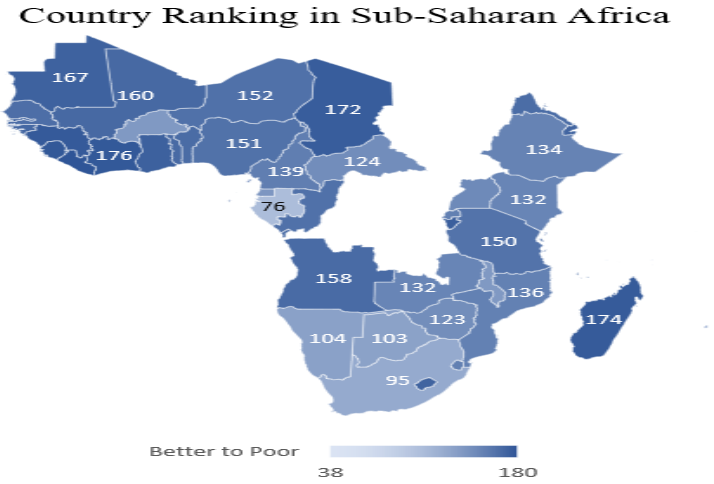
Appendix A

Cluster 1: Countries with highest environmental sustainability score (2019)	Cluster 2: Countries with highest number of threatened species (2019)	Cluster 3: Countries with higher GDP per capita (2019)
Switzerland	Ecuador	Luxembourg
Norway	Mexico	Singapore
Austria	Indonesia	Qatar
Finland	Malaysia	Switzerland
Luxembourg	United States	United Arab Emirates
Denmark	Australia	Norway
Netherlands	Brazil	United States
Slovenia	Colombia	Brunei Darussalam
France	Tanzania, United Republic of	Denmark
Germany	Philippines	Netherlands
Estonia	China	Austria
Sweden	India	Iceland
United Kingdom	Cameroon	Germany
Croatia	Peru	Sweden
Canada	Viet Nam	Belgium
Costa Rica	South Africa	Australia
Lesotho	Spain	Kuwait
Belgium	Venezuela, Bolivarian Republic of	Canada
Bulgaria	Thailand	Finland
Hungary	Sri Lanka	Saudi Arabia
Iceland	Kenya	United Kingdom
Egypt	Congo, The Democratic Republic	France
Panama	of the	Bahrain
Latvia	Japan	Malta
Malta	Guatemala	Japan
Montenegro	Greece	Spain
Slovakia	Costa Rica	Israel
Spain	Portugal	Cyprus
		Slovenia
		Lithuania
		Estonia
		Portugal
		Poland
		Hungary
		Slovakia
		Panama
		Latvia
		Romania
		Greece
		Seychelles
		Croatia
		Turkey
		Malaysia
		Oman
		Russian Federation
		Trinidad and Tobago
		Chile
		Bulgaria
		Mauritius
		Argentina

Appendix B

Figure B1

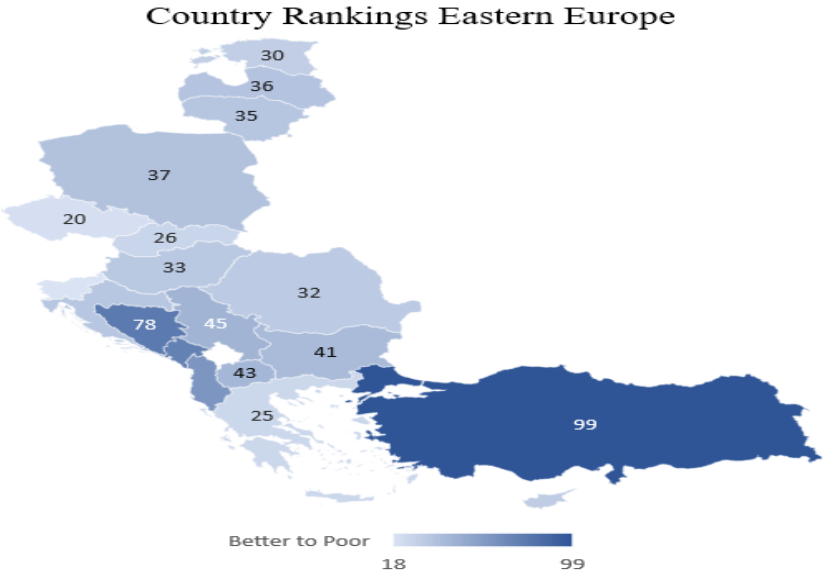
Environmental Performance Index of Sub Sharan Africa



Note. Data sources: https://epi.yale.edu/epi-results/2020/component/epi

Figure B2

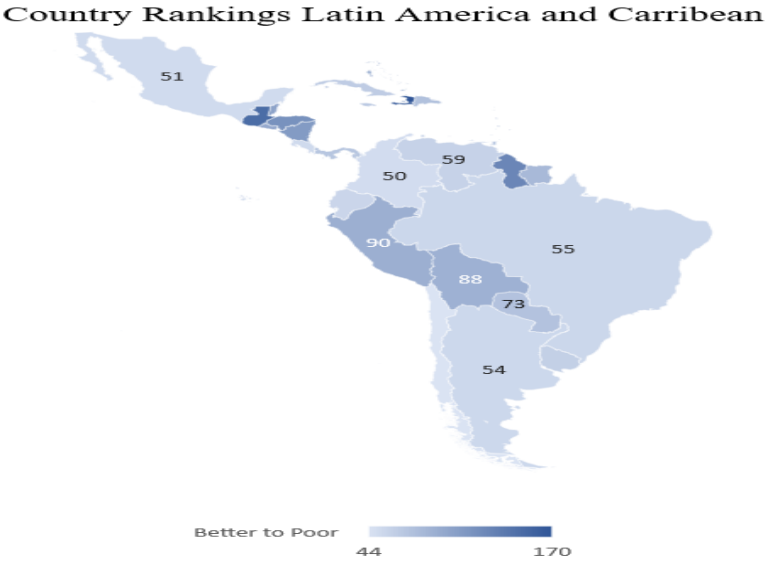
Environmental Performance Index of Eastern Europe



Note. Data sources: https://epi.yale.edu/epi-results/2020/component/epi

Figure B3

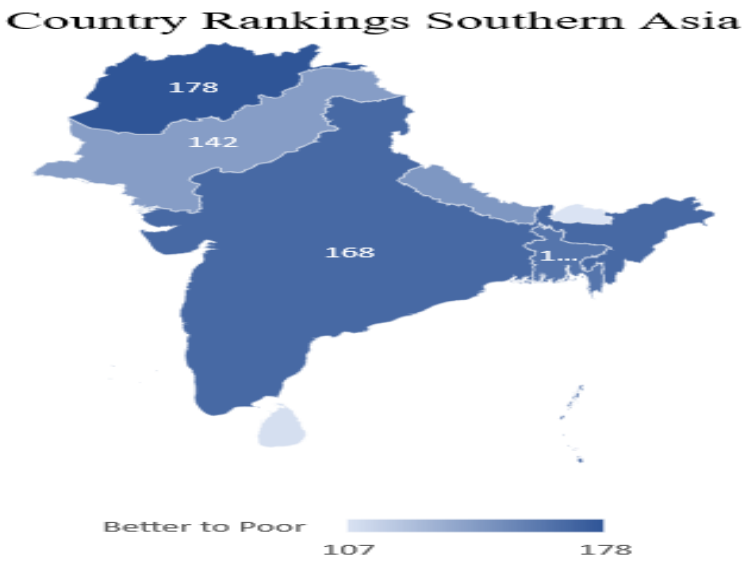
Environmental Performance Index of Latin America and Caribbean



Note. Data sources: https://epi.yale.edu/epi-results/2020/component/epi

Figure B4

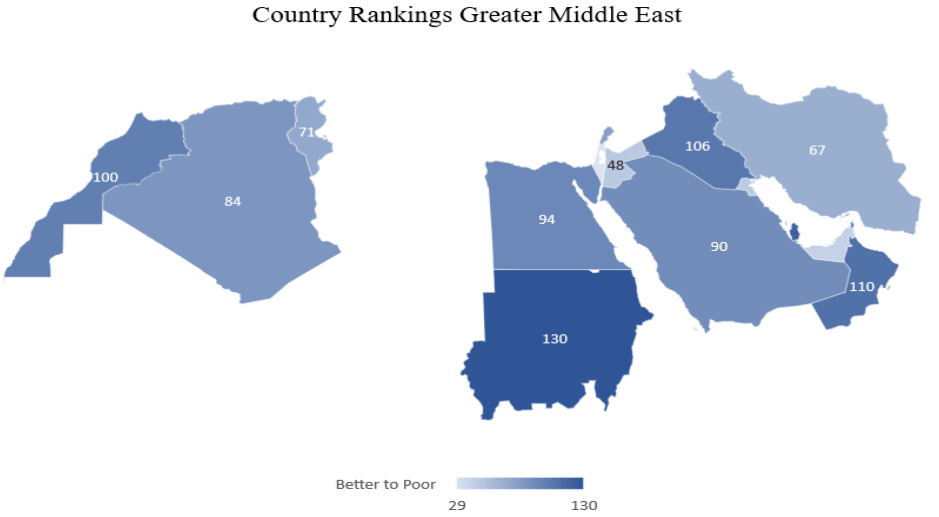
Environmental Performance Index of Southern Asia



Note. Data sources: https://epi.yale.edu/epi-results/2020/component/epi

Figure B5

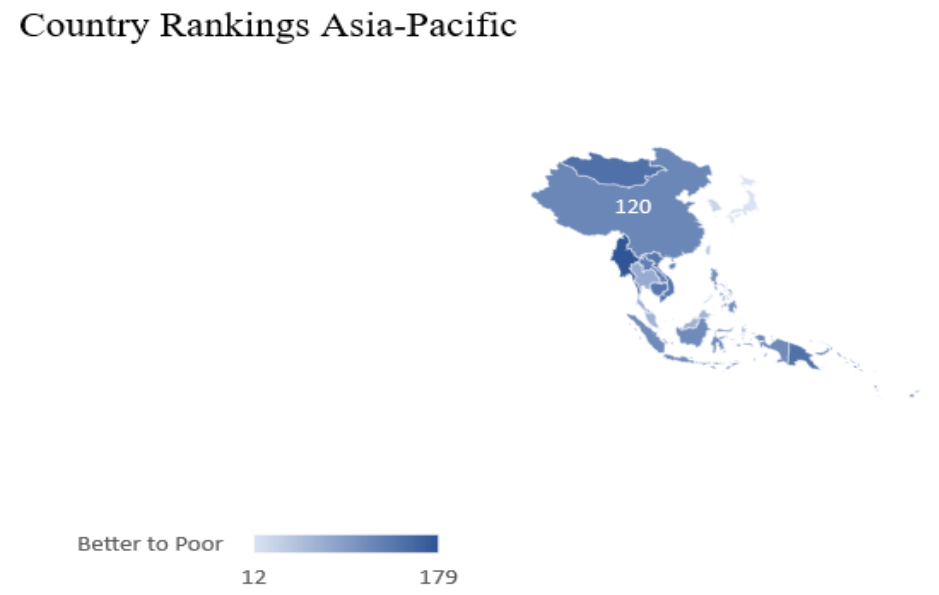
Environmental Performance Index of Greater Middle East



Note. Data sources: https://epi.yale.edu/epi-results/2020/component/epi

Figure B6

Environmental Performance Index of Asia-Pacific



Note. Data sources: https://epi.yale.edu/epi-results/2020/component/epi

Figure B7

Environmental Performance Index of Soviet States

Note. Data sources: https://epi.yale.edu/epi-results/2020/component/epi