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RE-EXAMINING THE RELATIONSHIP OF TOURISM, ECONOMIC GROWTH, ENERGY CONSUMPTION AND ENVIRONMENT: A CASE STUDY OF SOUTH ASIAN COUNTRIES

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Abstract

The current study examines the relationship of tourism, economic growth, energy consumption and CO_2 emissions in South Asian region. The sample of Pakistan, Nepal, Bangladesh, India, Maldives, Bhutan, and Sri Lanka is taken for the period of 1995-2020. The outcomes of this study show that there is no harmful effect of tourism on environment rather it helps in reducing CO_2 emissions. However, the interaction term of tourism and energy consumption is showing adverse effect on environment. It implies that the negative effect of energy consumption dominates and reverses the beneficial effect of tourism. The study also validates the U-shaped relationship between GDP and environmental degradation. Hence, environmental Kuznets curve hypothesis is not valid in South Asian region as in these countries more focus is given to economic growth instead of tackling environmental issues. Energy consumption, FDI and population is also bringing unfavorable impact on environment. The inflexible rule regarding environment friendly technology in developed countries moves the polluting industries from developed countries to developing countries. Hence, such industries emit more CO_2 emissions causing environmental degradation. These outcomes imply the importance of environment friendly growth and tourism policies for preserving the environmental quality in South Asian region in a best possible way.

Key words: Tourism, Carbon Emissions, Energy Consumption, FDI

JEL classification: P28, R11, L83

1. Introduction

Nowadays environmental degradation is considered as the most important area of concern, specifically in case of developing countries. One of the most challenging issues of environment is climate change. Many developing countries have been facing the problem of sustainable development as a result of climate changes. Greenhouse gases (GHG) are a vital part of our ecosystem that helps to maintain the earth's temperature which holds great significance in the survival of living species. A result of high usage of fossil fuels, and the

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rise in GHG emissions due to human activities results in global warming hence giving rise to climate change. Therefore, another significant problem faced by humans is global warming. The core point of government policies around the globe is to focus on climate change that restructure the course of economic development and improve the natural environment. It is mentioned in the 13th sustainable development goal that countries around the globe should develop a strategy that will help to fight climate change and its effects; also they should take steps that strengthen the capacity to recover from the damage that had been done and should have a plan for upcoming natural disasters. Finally, consolidate them into national policies and planning. To maintain environmental stability around the globe for GHGs all the nations including developed and the countries that are in process of development or in the initial stage of development are urged to sign Kyoto Protocol in 1997.

Many factors are affecting the environment some of them are tourism, energy consumption, economic growth, population growth, trade, and FDI inflows. Tourism is, undoubtedly, a broad term. It plays a vital role in the development of a green economy and growth. Tourism is recognized as an important instrument during the last few years in developing economies (Adnan and khan 2013). In the past few years, there has been a surge in tourism globally which contributes to the development of tourist countries (Alam et al. 2016). Tourism industry also helps in the improvement of economic condition of a country. However, natural environment is being destroyed by the human activities every day and it is increasing drastically due to tourism development over the decades. There are numbers of other activities being developed by tourism that are degrading the biodiversity. It also leads to the development of transportation industry which results in pollution.

Tourism affects economic and environmental conditions of developing countries, like Pakistan, Bangladesh, etc. differently. In developing economies, particularly Pakistan has been experiencing a high growth rate in tourists' numbers over the past few years. In 2018, Pakistan was ranked as the world's best adventure destination (Backpacker Society[2]). The tourism statistics of 2017 also showed that there is an increase of about 9.48% in tourism

[2]Backpacker society support and facilitates adventure travel in frontier tourism markets, in course of travel writing, documentary films and public lectures.

as compared to 2016. Tourism and CO_2 emission are closely linked to each other, with the increase in tourism there are harmful impacts on the environment such as air pollution, noise pollution and solid waste etc. According to the international civil aviation organization, there is an increase in international air passengers worldwide due to tourism which accounts for 60% of air travel which results in higher air emissions (Camarda and Grassini, 2003). The air quality index shows that Bangladesh, Pakistan, and India have the worst air quality in 2020 (IQ Air Pakistan).

Economic growth is of great importance for government policies since historical times. Due to rapid growth, there is a great pressure on natural resources which exerts load on the environment and hence results in environmental degradation. The association between environmental pollution and growth has been showed up in an important study of Grossman and Krueger (1995). This study emphasized on the significance of environmental degradation for the period of high economic growth, as higher economic growth rate needs high utilization of energy, wear out natural resources and thus results in environmental pollution (Khan et al. 2020). Population growth is increasing rapidly in the developing economies resulting in an increased demand of goods. High demands need high energy consumption and thus resulting in increasing carbon emissions.

Energy consumption is another important factor contributing to CO_2 emissions. As energy consumption plays a key role in the development of economy but it is directly affecting the environment. With the boost in energy consumption and production there is a great pressure on the environment. Energy consumption also increases due to tourism and tourist activities. The related tourists industries requires energy, hence, it will be important to observe the relation of tourism and energy consumption on environment. Therefore, in this study moderating role of energy consumption between tourism and CO_2 emissions has also taken into account. A favorable energy supply is considered as a noticeable problem prevailing globally. The effect on environment by energy consumption has appeared since 1980s that emphasized on the policies and innovations that would reduce the negative impact on environment (Wang, 2010).

The link between tourism and environmental degradation is complex. On one side, tourism boosts economic activities while on the other side it has adverse effect on environment.

Furthermore, achieving high growth is the main macroeconomic target of the developing economies but in various cases high growth is directly link with environment degradation. For instance, high growth results in high energy consumption which directly or indirectly effects the environment. The connection between tourism, economic growth, energy consumption and environment is not clear. There is a lack of empirical results in the sample of South Asian countries for the influence of tourism, economic growth and energy consumption on environment. Therefore, the sample of South Asian region is taken into account in this study. Moreover, this study also checks the validity of Environment Kuznets curve hypothesis (EKC) in the selected sample of South Asian Region.

The significance of South Asian region cannot be ignored. South Asia is a hub of one of the oldest civilizations. This region holds three heavyweight economies i.e., Bangladesh, Pakistan, and India. It serves as a center of global culture and holds great political, economic and social importance. Not only this region is becoming prominent, but a doorway towards promising opportunities and careers all over the globe. In addition, this region acts as bridge between the Indian Ocean and the Pacific Ocean, as well as the Mediterranean Ocean. Shipping of more than 80% of the Japan's and China's oil, and over two thirds of global oil also take place through this region. This region is home to a great variety of resources and almost one fourth of the world's population resides here. Therefore it holds a great significance for trade and water resources. It is a huge market for developed and trade rivalries.

The current study adds to the existing literature in various ways. First, it offers fresh evidence on the association between tourism, economic growth, energy consumption and environmental degradation in South Asian region. Most of the previous literature is focused on country specific cases but in this study, focus is given to South Asian region. It will help to formulate general policy to lessen adverse effect of environment. Moreover, limited literature has taken into account the tourism-energy nexus. In this context, the current study introduces the interaction term of tourism and energy to determine its impact on carbon emissions. Tourism development and energy consumption both can have impact on environment. Hence, the relationship is studied by taking the moderating role of energy consumption through tourism on carbon emissions. This study also checks the validity of

Environment Kuznet Curve (EKC). Moreover, it extends the empirical analysis by introducing a set of important control variables that can play an important role in studying the connection between tourism and environment. It includes foreign direct investment and population.

The study is organized as follows: Section two shows the literature review on the relationship between tourism, growth, energy consumption and environment, while Section three presents theoretical framework and models. Section four discusses the variable description and the sources of data. The results and discussions are presented in Section five. Finally, the last Section contains conclusion and recommendations.

2. Literature Review

The literature is divided into six sections. Section 2.1 deals with tourism and environment. Section 2.2 provides literature on economic growth and environment. Section 2.3 reports the studies that establish the connection of energy consumption and environment. Section 2.4 discusses the association between population and environment and the last section deals with FDI and environment.

2.1 Tourism and Environment

Tourism is considered as a delicate sector due to energy and transportation use. Tourism development has several positive impacts on a country's economy that have been explained in the study of Rahman and Hassan (2016), resulting in the enhanced economic condition. As international tourism is considered as world largest export of services, therefore, its impact on the environment cannot be ignored. Azam, et al. (2022) agreed that tourism is contributing positively to the country's welfare and it has positive impact on the economy. However, King and Pizam (1993) claimed that it is not necessary that tourism always bring positive affairs with it, it may have certain negative impacts as well. Saqib et al. (2019) also supported that tourism, undoubtedly, enhances the country's economy but it also bring certain negative impacts that cannot be overlooked. It is claimed that heavy tourism contributes a lot to negative behavior as well as negative attitude of local communities towards tourism and its development due to cultural, social, and environmental problems.

While, Moraru et al. (2021), claimed that the residents show a positive attitude towards tourism and its development.

Contradictory results are observed in relation to tourism and CO_2 emission. For instance, it is examined by Balsalobre-Lorente et al. (2020) that tourism in OECD economies increases air pollution and Gulistan et al. (2020) also found that tourism in 112 economies increases air pollution. In addition, Mikayilov et al. (2019) looked into this relationship for Azerbaijan over 1996 to 2014. The researchers confirmed that tourism is lowering climatic quality by using the time-varying coefficient technique. As an economic industry, tourism has the potential to boost consumption of energy. Fossil fuels are harmful to the environment when used to generate energy. It is further argued that 4.6% of global warming is caused by tourism sector and most of the CO_2 emissions are just because of tourism (Aziz et al., 2020). Furthermore, tourism in Southeast Asia degrades quality of environment, as stated by Zhang and Liu (2019). Tourism, on the other hand, has a favorable impact on the environment of European nations, as found by Dogan et al. (2017). Other studies, such as those conducted by Sharif et al. (2017) in Pakistan, Durbarry and Seetanah (2015) in Turkey, and León et al. (2014) in developed and developing states, have demonstrated that CO_2 emissions are increased by tourism.

2.2 Economic Growth and Environment

Economic growth- environment nexus has gained much importance with the passage of time because with the increase in economic development more CO_2 emissions have produced, resulting in environmental degradation. Economic growth and environment have a unique relationship. With the increase in GDP more production is carried out through more industries, it results in environmental degradation. Studies have been done in past that have showed negative impact of economic growth on environment in Pakistan (Khan et al. 2020). Hence, developing economies are facing this problem due to the increased number of economic activities. Same findings are observed in South Africa which shows the negative effect of growth on environment (Ehigiamusoe and Lean, 2019).The study by goodland (1995) showed that environment has an inadequate ability to absorb waste that is produced in the production process and as a result causes adverse impact on environment.

It is observed that economic growth has surged but at the cost of environmental degradation (Hussain et al. 2020).

The linkage between economic development and environment has also been elaborated in the framework of environmental Kuznets curve hypothesis. The EKC hypothesis depicts that there are some measures of environmental degradation (CO_2) that gets worse till the average income reaches its climax and after that environment starts to improve. It represents an inverted u-shaped non-linear link between economic growth and environment (Apergis and Payne, 2010). This typical connection has been observed in developing countries (Sarkodie and Strezov 2019). Similar results are found in few more studies that shows an inverted u-shaped non-linear link among GDP and environmental degradation (Wang, 2010). The survey of EKC hypothesis is somehow mixed most of the previous studies have shown inverted u-shaped EKC curve between real GDP and environmental degradation. In this context carbon emissions increase at first but with the technological advancement it may start to decline. However, a u-shaped curve is also observed when the increase in economic activities is associated with environmental degradation at the later stage of growth.

a. Energy Consumption and Environment

Energy consumption is perceived as an important tool for economic growth but due to extensive use of energy; production and end products have laid major pressure on environment. Energy consumption and its impacts on economic development are rising significantly as energy consumption is sharply increasing with GDP. Energy is a central factor for the development of an economy and is providing an essential service that improves the wellbeing of individuals. Energy is no doubt considered as a backbone of economic progress. Energy consumption along with economic growth is one of those factors that are responsible for environmental degradation (Khattak et al. 2020). Energy obtained from natural gas and oil in developing countries is the main factors for CO_2 emissions (Heidari et al. 2015). Increase in energy consumption results in more CO_2 emissions hence polluting the environment (Ang, 2008; Park and Hong, 2013 and Hossain, 2014). Pao and Tsai (2010) reported that CO_2 emissions are mostly caused by the usage of energy, which is quickly deteriorating the environment. While, renewable energy (RE) has

emerged as a viable industrial production option for improving quality of environment (Farhani and Shahbaz, 2014). It is demonstrated by multiple investigations that RE brings favourable impact on environmental quality (Khattak et al. 2020; Nathaniel et al. 2019; Elshimy and El-Aasar (2020) and Mehmood 2021).

2.4 Population and Environment

Population being a significant factor of economic growth is also a source of environmental degradation. Higher population generates more pressure on the environment therefore, causes environment deterioration. Population is considered as an important source of development but when it exceeds the limit of support system then it results in environmental degradation (Ray and Ray, 2011). Population impacts are visible on environment as population increases; there will be more utilization of natural resources and more wastes production. Shi (2003) found a direct link between population changes and CO_2 emissions in 93 countries for the period from 1975-1996. Similar results have been found in the study of Cole and Neumayer (2004) in 86 countries. Moreover, migration also effects the population growth, which consequently increases CO_2 emissions. Excessive increase in population growth rate results in high population density that pushes more people in poverty which contributes to environmental degradation due to more pressure on natural resources (Ray and Ray, 2011). However, some case studies have showed that agricultural escalation and population growth has come up with best rather than deteriorating water and soil resources (Woldetsadik, 2003).

2.5. FDI and Environment

Foreign direct investment (FDI) is another significant tool for growth. It is a potential mean of employment and a source through which higher technologies can be shifted to other countries (Sapkota and Basyola 2017). FDI not only encourages the economic growth directly but also does so via other interaction channels. The study of Moore and Chen (2010) shows that in recent years, FDI has gained more importance then international trade as the flow of merchandise has dropped in comparison to manufacturing investments. FDI has provided a direct path to the firms to set foot in secured markets by manufacturing in

those countries. FDI helps in increasing the productivity of the country (Demena and Murshed, 2018).

In case if FDI is connected with human capital, it shows positive impacts on the environment. While, its interaction with technological gap has negative impact on the environment (Li and Liu, 2005). There is a struggle among developing countries for attracting FDI which may direct to relaxing of environmental principles for foreign firms. Therefore, it motivates these countries to shift the pollutant technologies to developing countries (Golub et al. 2011).

Nevertheless, one major and commonly raised issue regarding FDI is its visibly dangerous results for the environment (Pao and Tsai, 2011; Zhu et al. 2016). Economic gain through increase in FDI may harm the environment because of higher CO_2 emissions. The increase in environmental emissions is casually ignored because of glittering growth of FDI. Despite the fact that the research favors a negative view of FDI's impact on the environment, it is feasible that FDI can help to clean up the environment. Particularly if foreign investments are accompanied by cleaner or environmentally friendly technologies. In poor nations, there is additional evidence that international companies are more environmentally conscious than native companies (Yoon and Heshmati, 2017). The study done by Zhu et al. (2016) also supported the idea that pollution intensity is reduced by FDI. It suggests that overseas firms use ecologically friendly technology and better management strategies, so they are more environmentally sensitive than their domestic counterparts.

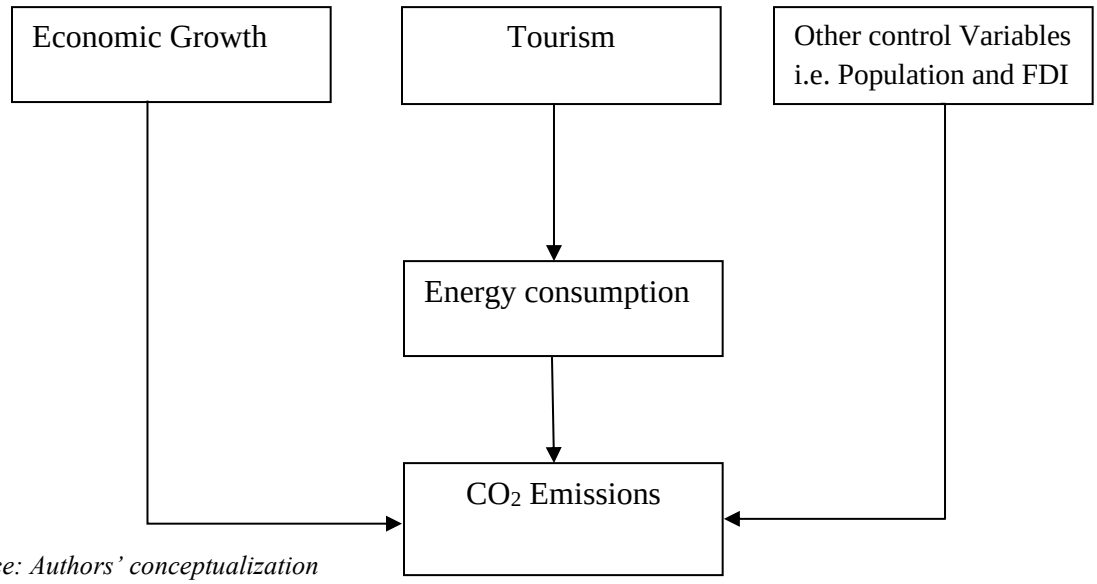
3. Theoretical Framework and Models

In this section theoretical framework is presented which shows the connection between tourism, economic growth, CO_2 emissions and energy consumption. There are various channels through which tourism effects environment as depicted in Figure 1. Tourism is considered as a mean to generate income, employment, and export revenue but the current situation is dismay about environmental costs and economic injustice. The reliance of developing economies is mainly on the agriculture sector due to several economic and financial constraints. In order to increase the share of exports, efforts have been made but these economies have shown smaller contribution in generating foreign revenues

(Durbarry, 2004). However, it is important to highlight that, tourism provides a basis for earning foreign exchange and it is considered as a defender for developing economies. But excessive reliance of developing economies on tourism is putting great stress on natural resources and leads to deforestation, water, air, and land pollution (Hardy and Beeton, 2001).

In Figure 1 the impact of tourism on the environmental pollution is highlighted. On one side tourism has multiple benefits but one the other side it may have negative impact on environment. Tourism is not only directly effecting environment but it is also indirectly putting pressure on environment. For instance, tourism related industries need more energy, hence both tourism and energy consumption may have influence on environment. In the current study the moderating role of energy consumption has been introduced through tourism on CO_2 emissions. Moreover, higher energy consumption affects the environment quality as developing economies are using old technologies which are dominated by inefficient energy use. Excess energy use and reliance on non-renewable resources is damaging the environment significantly (Munir and Riaz, 2019).

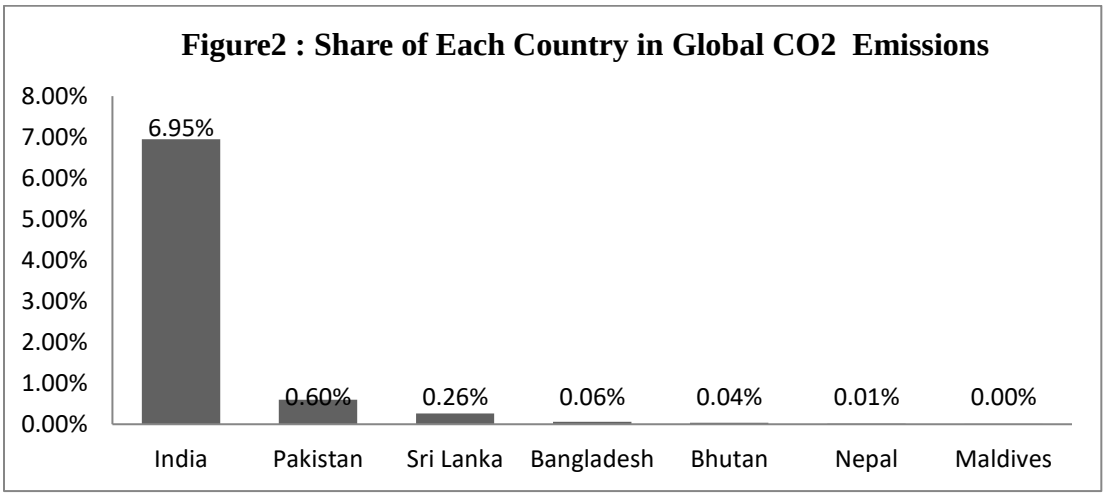
Figure 1: Relationship between Tourism, Economic Growth, Energy Consumption and Environmental Degradation



Source: Authors' conceptualization

Tourism is related to the capital investment since it causes large influx of people to a certain region bringing increased business and investment to the industry. This relates to the capital investment in tourism and travel which lifts economic activities, therefore, causing environmental degradation. Growth is also linked with environmental degradation. The focus of developing economies is to achieve the high growth and development therefore they ignore the environmental issues and putting great pressure on environment. The carbon emission has been significantly increased in recent years. Figure 2 shows the contribution of each country in global carbon emissions of the selected sample of South Asia in year 2020. India is at the top with 9.95%, while the remaining economies are contributing less than 1% in global CO_2 emissions.

Figure2: Share of Each Country in Global CO2 Emissions



Increased emissions of CO_2 in the environment are the leading cause of environmental pollution and are backed by number of factors. Finally, it can be concluded that tourism, economic growth higher energy consumption can be regarded as important factors that may have association with environment. These variables can be seen as the contributing factor to growing emissions of CO_2 in the environment thus leading to environmental pollution.

Following the theoretical framework, the link between tourism, energy consumption, economic growth and environment is specified in equation (1):

Environmental Degradation= f (Tourism, Economic growth, Energy consumption) (1)

CO_2 = f (T, GDP, EC) (2)

In equation (2) environmental degradation is presented with the help of CO_2 emissions, tourism is represented by T, GDP is used for economic growth and energy consumption is represented by EC, Following and extending the work of Jayasigh and Selvanath (2021), we specify model in equation (3) as follows:

$$CO_{2it} = \beta_0+\beta_1 T_{it}+\beta_2 GDP_{it}+\beta_3 GDP_{it}{}^2 + \beta_4 EC_{it} + \varepsilon_{it} \quad (3)$$

In equation (3) GDP^2 is squared GDP. ε is the stochastic disturbance term. GDP^2 is added in the model to check the EKC hypothesis for seven South Asian countries. All the variables are taken in natural logarithmic form. There are various studies which have used control variables in the estimation procedure (Tamazian, 2010 and Awan and Azam, 2021). Therefore, incorporating control variables i.e. population and FDI in equation (4) as follows:

$$CO_{2it} = \beta_0+\beta_1 T_{it}+\beta_2 GDP_{it}+\beta_3 GDP^2{}_{it} + \beta_4 EC_{it} + \beta_5 P_{it} + \beta_6 FDI_{it} + \varepsilon_{it} \quad (4)$$

In equation (4), P is for population and FDI represent foreign direct investment. Equation (5) introduces the interaction term of tourism and energy consumption in order to determine its impact on environment.

$$CO_{2it} = \beta_0+\beta_1 T_{it}+\beta_2 GDP_{it}+\beta_3 GDP^2{}_{it} + \beta_4 EC_{it} + \beta_5 (T_{it} * EC_{it}) + \beta_6 P_{it} + \beta_7 FDI_{it} + \varepsilon_{it} \quad (5)$$

The equations (3), (4) and (5) are the panel equations for selected seven South Asian countries. In this study standard panel data estimation technique is followed. Therefore, as

a pre-requisite first unit root test is applied to verify the stationarity of the variables. To estimate the long run coefficient, the procedure of dynamic ordinary least square has applied. This technique is suggested in Kao and Chiang (2000). There are various advantages of this technique as it overcomes the biasness due to serial correlation and endogeneity, which is common in traditional ordinary least squares procedure. The issue of serial correlation has been resolved by incorporating lags and leads and it corrects for endogeneity through introducing first differences among the regressors. The DOLS estimator is preferred over fully modified ordinary least square as it also takes into account the presence of outliers (Harris and Sollis, 2003). It also tackles the issue of small sample biases.

4. Variable Description and Data Sources

The annual data are collected for seven South Asian countries including Pakistan, Bangladesh, India, Nepal, Maldives, Bhutan, and Sri Lanka for the period of 1995-2020. Tourism is determined by tourist's arrival; tourist arrivals data for Pakistan are collected from the ministry of tourism and for the rest of South Asian countries i.e Nepal, Bangladesh, India, Maldives, Bhutan, and Sri Lanka the data are collected from World Bank Database. Economic growth is measured by GDP. The data of GDP for selected sample are collected from World Bank Database and can be acquired through the web link (www.worldbank.org). The data for energy consumption are also taken from World Bank Database. Kg oil per capita is considered as a measuring tool for energy consumption. Environmental degradation is measured with the help of CO_2 emissions, data for CO_2 emissions are also collected from World Bank Database. Data on population are taken in million and foreign direct investment is measure by the net inflow of FDI and data on both variables are also obtained from World Bank Database.

5. Results and Discussions

As a prerequisite panel unit root test of Levin and Fisher type are applied to check the stationarity of the data set. All the variables have null hypothesis which shows that the variables are non-stationary for all individuals. The alternative hypothesis states that all the variables are stationary. All the tests are normally distributed and the outcome shows that

tourism, FDI, CO_2, energy consumption, GDP, GDP^2 and population are stationary at first difference. Unit root test is represented in Table 1.

Table 1: Results of Unit Root Test

Variables	Levin, Lin & Chu t-test	Im, Pesaran and Shin W-stat	ADF - Fisher Chi-square	PP - Fisher Chi-square	Order of Integration
CO_{2it}	-5.1076	-10.965	40.8220	110.102	1(1)
	(0.0000)	(0.0000)	(0.0002)	(0.0000)	
T_{it}	-5.3450	-12.0985	130.749	128.945	1(1)
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	
GDP_{it}	-4.7490	-3.0960	37.0321	40.4596	1(1)
	(0.0000)	(0.0010)	(0.0000)	(0.0000)	
${GDP_{it}}^2$	-4.5185	-3.0960	35.7783	40.0295	1(1)
	(0.0000)	(0.0010)	(0.0000)	(0.0000)	
EC_{it}	-6.5411	-4.6989	47.2367	86.5510	1(1)
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	
FDI_{it}	-6.0092	-4.6825	47.0678	89.9543	1(1)
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	
P_{it}	-6.2424	-0.0627	54.4434	92.2319	1(1)
	(0.0000)	(0.0011)	(0.0000)	(0.0000)	

The next step is the estimation of coefficients by applying DOLS, lag and leads are selected by using Akaike information criterion (AIC). The results are presented in Table 2.

Table 2: Panel Dynamic Least Square Estimates

Variable	Equation (3)	Equation (4)	Equation (5)
T_{it}	-0.0294*	-0.1029**	-0.5372***
GDP_{it}	-0.8863***	-2.7751***	-6.0109***
$GDP_{it}{}^2$	0.2893****	0.5134****	1.0835***
EC_{it}	0.1794*	0.2864*	0.9852***
$(T_{it} * EC_{it})$	-	-	0.1539***
FDI_{it}	-	0.0362*	0.083*
P_{it}	-	0.4260***	0.4971***
R- squared	0.86	0.702	0.779
No. of observations	164	143	143

Note: ***, ** and * shows significance at 1%, 5% and10% level of significance respectively

The results show that with the increase in tourism there is a reduction in CO_2 emissions in all the specifications. Hence, the outcome displays favorable effect of tourism on environment. In the beginning, increase in tourism decreases environmental degradation to a certain point. Same findings have been found in Dogan et al (2017). It is observed that tourists are of different natures as some tourists do not show a caring attitude towards environment and the others have a deep relation with the environment in a way that they preserve its beauty and play a main role in improving the environmental conditions (Alexandru, 2015). Tourism helps to reduce the environmental degradation (CO_2) as

tourism has the power to make positive impacts on the environment by helping in environmental preservation. It is also an important source of making revenues that can be used to finance those authorities which are protecting the natural resources and helps in improving the environment. Hence, tourism has both direct and indirect effect on environment. The responsible behavior of the tourists helps to protect environment and therefore reduces environmental degradation. While, the revenue from tourist industry can be used to lessen environment challenges. Moreover, the effect of tourism on environment may vary due to involvement of government from micro to macro level in the management of tourism industry. Well organized and environmental friendly approach in tourism industry may reduce the severe environmental threats.

Numerous links, exists in tourism industry which are related to management services, and regional transportation. A number of rules aimed at reducing emissions are in place in some states, that reduces CO_2 emissions in South Asian countries. Finally, environmental protection, green tourist plans, and environmental laws enforcement may help in the reduction of environment degradation.

The outcome shows that GDP reduces CO_2 emissions. However, the squared GDP has a negative effect on environment as 1 % rise in squared GDP causes an increase in CO_2 by 0.29%, 0.51% and 1.08% in equation (3), (4) and (5) respectively. The findings of the current study show the U-shaped link between economic growth and environmental degradation. Hence, EKC hypothesis is not valid in South Asian Region. The plausible explanation for this finding can be that the South Asian countries are more focused in achieving higher economic growth and less importance is given to environment. Low level of growth corresponds to low level of environmental degradation while high level of growth is putting more pressure on environment. Due to the lack of commitments for using environmental friendly policy results in invalid EKC hypothesis. So in this case we have a U-shaped link between environment and economic growth. Similar findings have been observed in the study of Boluk and Mert (2015) and Massagony (2022). The result of current study is important in context of policy perspective. The trade-off between GDP and environment degradation is evident from the finding of the current study. This is a critical issue, which is showing that higher growth is associated with more environmental

degradation. The goal of higher growth is inevitable for the selected region but it is putting pressure on environmental challenges

Energy consumption has a significant and harmful influence on the environment as per findings of current study. It increases carbon emissions along with an upsurge in waste. Same conclusion has been drawn in the studies of Ang (2008, 2009) and Shahbaz et al. (2014). Renewable energy sources should be used in order to reduce CO_2 emissions. Wang (2010) suggested that renewable sources of energy are more successful in bringing environmental sustainability in a country then non-renewable energy sources.

Furthermore, a significant impact of FDI on the environment in South Asian countries is seen in Table 2 as with the increase in FDI, CO_2 emissions also increases. Hence, FDI is adversely affecting the environment in the sample of South Asian countries. The findings of Shahbaz et al (2015) also show that FDI raises environmental degradation. Most of the South Asian countries included in this study are developing countries where the link between environment (CO_2) and FDI is uncertain. The developing countries do not follow strict environmental laws and therefore, it attracts foreign direct investment from developed countries. However, it results in serious environmental degradation in low and middle income countries.

It is important to note that despite negative consequences of FDI on environment, it is desirable to attract more and more FDI. FDI plays a major role in economic development and poverty reduction by creating employment opportunities and increasing the capital investment but at the cost of environmental pollution. Cole et al. (2011) and Sapkota (2017) also shows that FDI has harmful effect on the environment.

Moving further in the table, the next variable is population. Population has a positive relation with the environment (CO_2) indicating that increase in population has a harmful impact on the environment. As with the increase in population, environmental degradation also increases. High population increases the demand of goods and services that result in environmental pollution. CO_2 is mostly linked with human activities which raises use of energy consumption, hence contributes to CO_2 emissions. The study of Liddle (2015) also shows the negative impact of population growth on environment.

The interaction term of tourism and energy consumption shows the adverse effect on environment. It is important to note that alone tourism is helpful in reducing CO_2 emissions but along with energy consumption the impact is reverse and contributes in environmental degradation. It implies the dominant adverse effect of energy consumption on CO_2 emissions which overshadows the beneficial effect of tourism.

5. Conclusion and Recommendations

The impact of tourism, energy consumption and economic growth on emissions of carbon in selected economies of South Asia is investigated in this study. The selected sample is relevant since South Asia ranks as the world's 2nd most popular tourism destination. In order to achieve the target of the study, dynamic ordinary least square is applied. As shown by findings, tourism is decreasing degradation of environment in South Asia through reduction in emissions of carbon dioxide. Therefore, the current study shows favourable effect of tourism on environment. Hence, it is suggested to promote tourism as it is not only beneficial for the domestic industries but it also helps to reduce CO_2 emission. The revenue from tourist industry can be used to achieve environment sustainability. Furthermore, tourists appreciate and protect natural beauty, thereby, generating favorable effect on environment

Additionally, the study utilized EKC hypothesis to get empirical estimates to report the problem of environmental pollution. The study does, however, reject the hypothesis of EKC, therefore, in this South Asian region the U-shaped curve is valid. It shows that at low level of GDP, environment degradation is lower while at high level it is associated with more environment degradation. It is important to know that environment sustainability is a global issue and developed economies need to transfer clean technology in low or middle economies rather than transferring polluting industries. Collaborative efforts are required to offset the negative consequence of environment with increase in GDP. The study also shows that population growth, FDI and energy consumption have adverse impact on the environment in South Asian countries.

The investigation shows that energy consumption has an adverse impact on emissions of CO_2 in selected South Asian nations. Higher energy consumption is linked with more

environmental degradation. Hence, it is important to emphasize on energy efficiency in these economies so that it affect the energy use and helps in protecting the environment. In addition, interaction term of tourism and energy consumption is also adding to the severity of environmental challenges as it has also adverse effect on environment. Higher energy consumption offset the beneficial effect of tourism.

GDP growth has also increasing the environmental challenges in South Asian countries. Growth is an inevitable target of all the economies. However, to achieve this target, most of the economies are compromising on environmental issues. Among the selected sample, India is the emerging economy, with high growth rate it is contributing to more CO_2 emissions. Therefore, it is necessary to align the growth target to environment sustainability. Economies should practically participate in sustainable growth to minimize environmental challenges. So government should adopt such measures that would increase GDP and reduces environmental degradation.

Finally, the current study suggests that there is no harm in promoting the tourism and tourism related industries as it has beneficial effect on carbon emissions. However, adverse effect of energy consumption and growth can be curtailed by focusing on energy efficiency. Energy efficient technology will reduce energy consumption and therefore it will help in reducing carbon emissions. Growth target should be more focused on environmental sustainability. In this regard, FDI can play an important role. Therefore, it is desirable to choose green FDI that promote an environmental prosperity and reduce negative effect on the existing conditions as well as it is in the favour of economic development.

The study's crucial weakness is that the outcomes of panel studies are generally hidden by aggregation bias, and various nations have various structures of economy; consequently, study at a more disaggregated level for the area of South Asia may offer greater insights in terms of ramifications for policy. To address this issue, using disaggregated information in upcoming investigations is one of the study's research goals in future.

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