Investigating the Environmental Impacts of Economic and Tourism Activity

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ABSTRACT

One of the serious problems that the world faces today is environmental degradation and there is a dire need to find the extent of this degradation due to macroeconomic activities, as almost every country aims for rapid economic growth, so this present study throws light on the interrelationship among these variables. This study aims to analyse the effects of economic growth, energy usage and tourism activity on environmental degradation in Asian Emerging and Developing Economies from 1995 to 2022. The study employed the fixed effect, random effect models, along with the FGLS model. The existing literature does not reach a consensus on how different macroeconomic variables affect the environment, hence it's necessary to have a deeper understanding of how these variables interact. The empirical analysis indicates negative significant effects of economic expansion and tourism, while energy consumption positively influenced the environmental indicator. These findings could be utilised for drafting regulatory measures in the selected countries, taking into account the fragile balance between economic prosperity and the environment.

INTRODUCTION

Environmental concerns are among the main problems that the world is facing currently. Asian Emerging nations are the most populated and swiftest-moving nations, emitting the highest amount of greenhouse gases, releasing over half of global carbon dioxide emissions (International Monetary Fund [IMF], 2021). The present study has undertaken these nations because the next decade belongs to Asia, the steps taken by Asian nations in response to climate change will decide the future of our planet to a large extent.

In recent years, significant attention has been drawn from researchers, policymakers and environmental advocates in the context of the link between environmental deterioration and economic expansion. As countries grow, the requirement for resources rises and many times this results in a surge in pollution and environmental harm. This trade-off between economic development and ecological sustainability has led to continuous discussions: while economic growth can strengthen living standards and mitigate poverty, it might also risk natural ecosystems if growth is supported by practices that damage the environment. Assessing this nexus is essential to determine policies that can maintain the environment while balancing economic progress, directing initiatives towards growth that is sustainable, which considers the long-term economic and environmental well-being.

The most frequently recognised greenhouse gases (GHGs) include carbon dioxide (CO_2), released when fossil fuels are burned, nitrogen dioxide (NO_2), largely originating from particular manufacturing procedures, burning fossil fuels and applying nitrogen fertilisers, methane (CH_4), largely generated from raising cattle.

The report from the World Meteorological Organization (WMO) 2020 claims that the atmospheric concentration of CO_2 hit a new peak. This took place despite pollutants released via fossil fuels dropping in the midst of the COVID-19 outbreak. Significantly, in 2020, the airborne CO_2 levels attained 413 parts per million (ppm), which shows 149% rise from levels before the beginning of large-scale manufacturing. It's the need of the hour to address the issue of global warming, which is mainly due to the emissions of greenhouse gases.

It is notable that a critical aspect of this environmental damage is ascribed to a selected group of nations. For example, China is liable for about 30% of world emissions, whereas the United States is accountable for around 14%.

Tourism has recently become a viable alternative for environmental and economic development, but it has drawbacks. When there is a lack of essential actions to safeguard the environment, the deterioration of the environment is the opportunity cost of tourism.

Considering the fact that tourism contributes a major role in the host economy, it is currently among the most significant and rapidly growing economic sectors in the world. One of the sectors with the quickest rate of growth is tourism and it particularly affects employment, income production and advancement of the host country's culture as a whole.

The countries, including India, China, Indonesia and Vietnam, are undergoing fast urbanization and industrialization, leading to unusual economic growth and improved standards of living. Though this growth

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frequently comes at a substantial cost to the environment. Higher usage of energy and fossil fuels, deforestation and enhanced agricultural practices led to carbon emissions, high levels of water and air pollution and deterioration of habitat. As these nations aspire to prosperity, they also confront the dual hurdle of addressing poverty and inequality while dealing with the severe impacts on the environment that follow growth.

For Asian emerging economies, the consequences are particularly elevated due to their dense populations, which worsens the social and environmental effects of unsustainable growth patterns. Consequently, these nations are at the focal point of the international debates on sustainable development, looking for approaches that permit economic advancement without making concessions for ecological balance. The linkage between economic expansion and environmental deterioration in these areas is complicated, as many ecological challenges extend beyond national boundaries and regional cooperation is needed to handle them. For this reason, comprehending this connection is vital for formulating policies that not only lead to economic progress but also ascertains that it is in line with the sustainability goals of the environment, like those described in the United Nations Sustainable Development Goals (SDGs).

This article intends to explore the consequences on the environment of rapid economic growth within Asian emerging countries, evaluate the current environmental regulations and explore possible routes for sustainable development. By examining the particular difficulties and opportunities these countries encounter, this study provides a wider exchange on sustainable economic models that balance development that safeguards natural resources for future generations.

LITERATURE REVIEW

Diverse research has been conducted to find the nexus between environmental deterioration and economic expansion, resulting in various conclusions.

Ridzuan *et al.* (2022) explored the EKC hypothesis between 1971 and 2019 using ARDL analysis for Malaysia. In the short and long term, they observed an inverted and direct U-shaped EKC, respectively.

Beton Kalmaz and Adebayo (2023) looked for the EKC hypothesis for BRICS countries from 1990 to 2018 by using FMOLS, DOLS and fixed-effect OLS. They validated this hypothesis and therefore observed the positive impact of GDP on CO_2.

Tran *et al.* (2023) examined linkage between economic expansion and ecological deterioration for 47 middle-income countries by using the ARDL model between 1991 and 2018. They validated the EKC hypothesis, therefore observed a positive and an inverse relation in the near and distant future, respectively.

Alshehry and Belloumi (2024) looked for the linkages between economic expansion and ecological deterioration from 1990 to 2020 by employing linear and nonlinear panel ARDL models in MENA countries. They validated the

EKC hypothesis and observed that economic expansion results in ecological deterioration in the long term.

Wang *et al.* (2024) explored the link between economic advancement and ecological deterioration between 1995 and 2018 by using a nonlinear threshold panel model in 147 countries. They supported EKC for the selected countries. They observed that the extent of ecological deterioration due to economic growth is relatively low in low-income nations. Simultaneously, the values of coefficients became relatively greater for middle-income and high-income nations.

Gulistan *et al.* (2020) assessed the influence of increase in economic activity and some other variables on environmental deterioration in 112 nations from 1995 to 2017. They used Pooled OLS, fixed and random effect models and GLS for estimation. They observed a direct relation between CO2 emissions and Energy usage and this signified that most of this energy is non-renewable and based on oil.

Usman *et al.* (2022) explored effect of utilization of energy and other variables on CO2 release between 1995 and 2017 using FMOLS and discovered that non-sustainable energy usage has a direct influence on ecological deterioration, whereas the application of sustainable means of energy production can somewhat enhance the quality of the environment in South Asian Nations.

Tran *et al.* (2024) examined the nexus among carbon release, energy usage and economic prosperity in ASEAN countries in the previous thirty years by using the panel vector autoregressive model, FMOLS and DOLS. They observed that carbon release is related to energy usage, while sustainable energy consumption reduces carbon pollutants. Economic growth leads to higher energy consumption, which consequently results in carbon release.

Osman (2024) assessed the effect of energy usage by various sectors on CO_2 release in Saudi Arabia from 1979 to 2022 by using the ARDL technique and found that energy usage in the logistics and industrial sectors has a direct influence on CO_2 release, while energy consumption in the agriculture sector negatively affects CO_2 release.

Rahman *et al.* (2024) investigated the applicability of the environmental Kuznets Curve (EKC) theory with respect to energy usage, human capital index and population density by using fixed effects, random effects and dynamic panel methodology in five South Asian nations and found an inverted U-shaped EKC curve.

Since the existing literature does not reach a consensus on how various macroeconomic variables impact the environment, the present study seeks to shed further light on this relationship.

MATERIALS AND METHODS
Data Sources and Model Formulation
The purpose of this paper is to look at the influence of economic expansion, energy usage and tourism on environmental deterioration between 1995 and 2020 for

Emerging and Developing Asian Economies. Panel data will be used for this purpose. Gross Domestic Product per capita and Green House Gas (GHG) emissions per capita will be used as the proxy of economic growth and environment degradation, respectively. GDP, Energy usage and tourism data were obtained from the World Bank, whereas data on GHG emissions were obtained from Our World in Data. According to the World Economic Outlook (2023), there are thirty emerging and developing economies, out of which twelve economies are chosen on the basis of data availability. All the variables are presented in their logarithmic transformation.

Table 1 presents the description of each variable under consideration.

Table 1: Description of Variables

Variable Types	Name	Notation	Units
Explained Variable	Green House Gas Emissions	GHG	GHG per capita, CO_2 equivalents
Explanatory Variable	Gross Domestic Product	GDP	GDP per capita, constant 2015 US$
Explanatory Variable	Energy Consumption	EC	kWh per person
Explanatory Variable	Tourism	Tourism	Number of arrivals

Table 2 shows summary statistics based on 312 observations.

Table 2: Descriptive Statistics

Variables	lnGHG	lnGDP	lnEC	lnTourism
Mean	1.411316	7.604194	8.584625	14.84214
Standard Deviation	.8081339	.8531185	1.134581	1.866396
Maximum	.0862168	5.349685	5.937852	11.11095
Minimum	3.466943	9.316011	10.54069	18.90642
Observations	312	312	312	312

Table 2, shows that mean GHG emissions for Asian Emerging and Developing Economies are 1.411316 CO2 eq. from 1995 to 2020. Per capita GDP is on average equal to 7.604194 US$ whereas mean energy consumption is equal to 8.584625 kWh per person and on average around 14.84214 tourists arrived from 1995 to 2020 in the selected area.

Econometric Methodology
The following basic model will be used:

$$lnGHG_{i,t} = \gamma + \Theta_1 lnGDP_{i,t} + \Theta_2 lnEC_{i,t} + \Theta_3 lnTourism_{i,t} + \varphi_{i,t}$$

where γ is the intercept term, Θ_1, Θ_2 and Θ_3 are slope coefficients, φ is the error term, i is cross cross-section and t is time period.

RESULTS AND DISCUSSION
Initially, the Fixed Effects and Random Effects models were used, along with the Hausman test, to figure out the best-suited methodology for further analysis. The results propose that the Fixed Effect model will be applied.

Table 3: Panel Data Regression Results

Variable	OLS	Fixed Effects	Random Effects
GDP	-.3681877***	.3060402***	.2752862***
	(0.00)	(0.000)	(0.00)
EC	.8572978***	.1208867	.1630829**
	(0.00)	(0.39)	(0.04)
Tourism	-.0449811	-.067599**	-.0654784**
	(0.16)	(0.03)	(0.03)
Constant	-2.480877	-.9503251	-1.110179
Observations	312	312	312
Hausman test p – value	0.0078		

*** significant at 1%, ** significant at 5%, * significant at 10%

Table 4: Pesaran's test of cross-sectional independence

Statistic	0.692	P-value 0.4891

*** significant at 1%, ** significant at 5%, * significant at 10%

The above results reflect that the value of test statistic is 0.692 and p- value is 0.4891, that exceeds 0.05, so null hypothesis cannot be rejected and hence there is no cross-sectional dependence in our model.

Multicollinearity Testing

Table 5: Variance Inflation Factors (VIF)

Variable	Random Effects
GDP	4.84
Tourism	4.55
EC	1.80

Source: Author's calculation

It is employed to check the model for multicollinearity. As a general norm, the VIF score needs to be below 10. Therefore, multicollinearity is not a problem.
Heteroscedasticity Test: Lagrange Multiplier, Likelihood Ratio and Wald Test are conducted in order to examine the panel groupwise heteroscedasticity with :

Ho: Panel Homoscedasticity
Ha: Panel Groupwise Heteroscedaticity

Table 6: Heteroscedasticity Test

	Wald Test	LM Test	LR Test
Chi2 value	2045.0794	124.5087	165.7499
P value	0.00	0.00	0.00

The outcomes give enough evidence to reject the null hypothesis; there persists the issue of heteroscedasticity, so FGLS model will be applied.
The outcomes of FGLS regression are illustrated in the

Table 7: Cross-sectional time-series FGLS regression

Variable	Coefficient	P-value
GDP	-.3681877	0.00***
Tourism	-.0449811	0.015**
EC	.8572978	0.00***
Constant	-2.480877	0.00***

*** significant at 1%, ** significant at 5%, * significant at 10%*

above table, according to which GDP, Tourism have a significant statistical negative effect on carbon release of the chosen Asian countries. The results signify that economic prosperity and tourism activity may be related to environmental improvement. But, Energy consumption appears as a significant and positive determinant, reflecting that enhanced energy usage amplifies environmental impact. Further, the constant term is also substantial, which strengthens the robustness of the model.
Simultaneously, FGLS methodology eliminated the issue of heteroscedasticity and the results thus acquired are reliable.

CONCLUSION
Asian Emerging Economies are on the path of development with the aim of high economic growth, but at the same time, their environmental repercussions need to be addressed. As is evident from the data, GDP, which is a proxy of economic growth, leads to reduced environmental pressure. Tourism also contributes to environmental sustainabilitywhereas Energy Usage remains a key environmental pressure. Therefore, these economies should encourage green economic growth along with sustainable tourism and work in the area to adopt clean energy technologies.

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