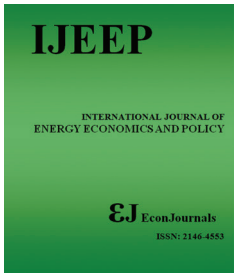

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Impact of Green Credit and Technological Innovations on Renewable Energy Consumption in Green Efficiency of Vietnam's Ecotourism Industry

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ABSTRACT

The prime objective of the current study is to explore the impact of green credit and technological innovations on the consumption of green energy to derive green efficiency in the ecotourism sector. The data is collected from the ecotourism sector of Vietnam over the period from 2013 to 2022. The data is analyzed using ARDL econometric model. The empirical outcomes reveal that issuance of green credit (bonds) and technology innovations have a significant and positive impact on the green efficiency of Ecotourism (GEET) in long-run, while in the short term technological innovation sheds consistent effects but the impact of green credit is insignificant on green efficiency of ecotourism in Vietnam. Both the exchange rate and consumer price index adversely influence the ecotourism industry in Vietnam in the long- as well as short-run. The study infers that the utilization of conventional energies results in climate deterioration; therefore, Government should discourage traditional construction methods of hotel projects to a sustainable environment construction approach which ultimately enhances the green energy deployment and efficiency in the ecotourism sector.

Keywords: Green Efficiency, Ecotourism, Green Credit, Technological Innovations, Globalization
JEL Classifications: L83, Q56, O32, Q55

1. INTRODUCTION

Environmental change has deteriorating effects on human life and natural ecology. Environmental changes have caused global warming, deforestation, ice melting, drought, damage to the ozone layer, and the spread of novel diseases. The issue of climate change is of vital importance for policymakers and international academicians, Governments also consider climate changes as important as human and animal rights, peace, and poverty. The international community is now focusing on agreements with other countries regarding climate issues. Paris Agreement in 2015 is one of the important agreements where all the countries have agreed to take corrective and positive actions to promote environmental quality. But on 1st June 2017, the USA withdrew from this agreement and this withdrawal posed a question mark on the reliability of the agreement. However, the agreement is still considered a significant document to ensure environmental quality (Maibach et al., 2021; Diaz-Rainey et al., 2021). But economists argue why such an international protocol document has failed to cope with climate deterioration. It is further argued there are many obstacles in the implementation of protocols of the Paris Agreement despite the stronger commitment of countries (Sun et al., 2022). The major hindrance to the attainment of environmental quality is the lack of government-level capital. The

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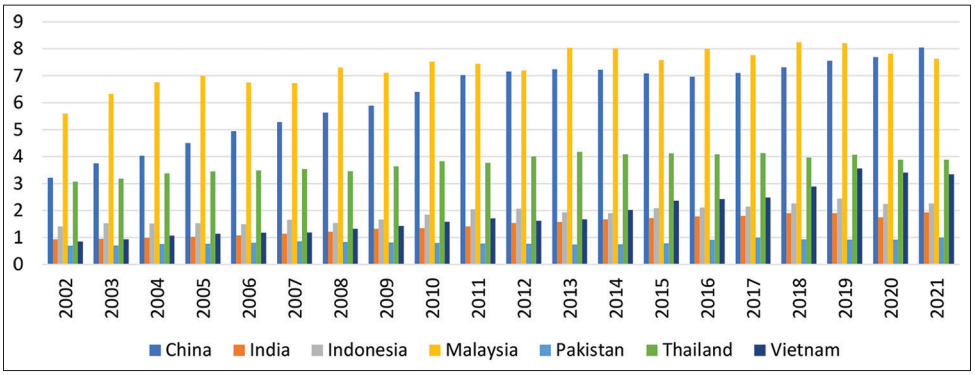
availability of enough capital can be used to advance ecologically friendly projects and the implementation of energy transition schemes (adaption to renewable energy consumption from fossil fuels) (Metawa et al., 2022). Moreover, a lack of finances is a prime hindrance in the way to achieving sustainable development goals. Apart from the budget constraints at governmental levels, green projects have also been proved as low- or late-yielding schemes. Hence, governments are reluctant to cope with the rapid trend of sustainable advancements. Green financing enhances investment in ecologically friendly projects (Hussain et al., 2024) and clean projects to attain sustainable development goals, environmental quality, and preservation of natural resources. Green finance instruments attract the attention and trust of private sector investors when these instruments are issued by governments and banks. Moreover, an increase in profit rate on such investments also triggers the attention of investors (Khan et al., 2022).

Wang et al. (2022) and Zhou and Li (2022) argue that COVID-19 has increased Government expenditure, therefore the ability of governments to cope with climate issues and environmental investment has diluted. In this scenario, green financing instruments play a crucial role to compensate for the environment-related budget deficit. Additionally, the tourism sector is considered a more profitable and successful pillar of the economy. The tourism industry has been a big source of huge foreign exchange, also helps in globalizing the cultural, social, and economic aspects, enhances infrastructure, promotes transportation (Rauf et al., 2021), drives economic advancements, creates jobs, and enhances social welfare. World Travel Tourism Council (2021) and Irfan et al. (2022) explain that tourism and travel contributed 1 trillion US $ to the global GDP in the year 2021 as compared to the year 2020. However, global tourism revenue decreased in the year 2020 due to the novel COVID-19 outbreak (Sigala, 2020; Yang et al., 2021). The unprecedented shock of COVID-19 has led the tourism industry toward a stern recession. However, economies have now adapted to COVID-19 (due to the public vaccination program), and have revived via different sectors, especially the tourism industry (Jeyacheya and Hampton, 2022). After the recovery of economies during post COVID. Green tourism and ecotourism have attracted the attention of visitors (Bai et al., 2022; Zhao et al., 2022). The tourism industry by implementing environmental laws can help the economies attain SDGs (Bhuiyan et al., 2018).

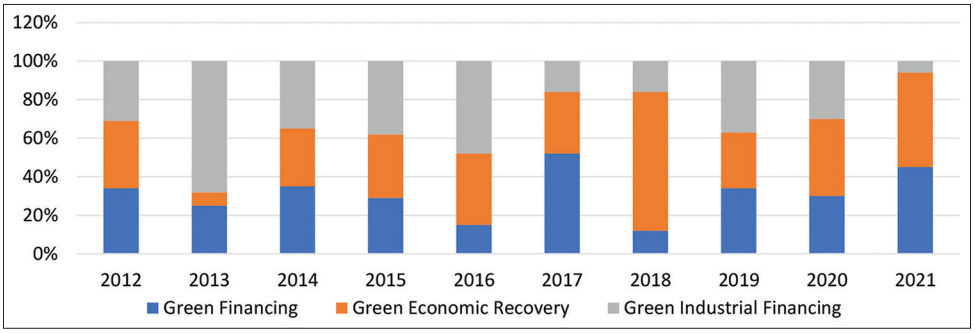
Ecotourism or green tourism requires the hotels to use clean energy at tourists' accommodations, but the hotels mostly use fossil fuels for tourists (He and Jiang, 2015; Ghimire, 2016; Işik et al., 2020; Iftikhar et al., 2022). The prosperity of the tourism sector has increased after COVID-19, which could result in increased pollution and enhanced emission of CO_2. Using green financing to promote clean energy consumption is vital in Vietnam's tourism sector. Although China, the US, Spain, and France are famous countries to attract tourists, Vietnam is also an important destination for tourists due to its cultural and historical heritage. Due to China and Malaysia, Asian countries are now becoming giants in carbon emissions. Vietnam is emitting carbon dioxide for many decades but its intensity to emit carbon is less than that of surrounding Asian countries like China, Malaysia, and Thailand (Figure 1), therefore Vietnam is attracted to ecotourism. Vietnam has a vast difference in the emission of carbon dioxides and the country is in the transition phase to recover the green economic growth. Figure 2 shows Vietnam has attained green economic recovery through the issuance of general and industrial green financing. Hung (2022) argues that Vietnam has a steady growth in green economic recovery via green financing. Till the year 2020, Vietnam has spent 14550 billion VND on environmental protection, while the outstanding green credit amount is 300,000 billion VND (NIF, 2021). The chief aim of the current research is to explore the influence of green credit on technological innovations (Feng et al., 2022; Jian and Afshan, 2022) and renewable energy in the ecotourism industry of Vietnam. The article extends the prevailing literature in the following ways, (1) the study is a pioneer in its nature by 1st time connecting the green financing and ecotourism industry of Vietnam, (2) the study uses green bonds to proxy the green credit where existing studies use different indices for green financing. The findings infer that green credit has a positive impact on the long-term green efficiency of the ecotourism industry in Vietnam, while coefficients are insignificant in the short term. We find an adverse and significant impact of CPI (consumer price index) on the ecotourism industry of Vietnam. The introduction of green fiscal policies, green construction of hotels and accommodations for tourists, adoption of new and innovative technologies, and protection of cultural and ecological sites are the recommendations of the study based on the findings inferred from data analysis. The literature is summarized in the next section along with the prevailing gap, section 3 depicts the model used in the study to investigate the data, while empirical findings are

Figure 1: Carbon emission of Vietnam in comparison with other important Asian economies 2002-2021



Source: Authors' own explanation of data from "Our World in Data"

Figure 2: Inter-temporal movements of financing indicators



exhibited in Section 4. Finally, conclusions and recommendations are explained in the last segment.

2. LITERATURE REVIEW

In recent years, researchers have highlighted the role of green credit in tourism development. In the first strand of literature, the study elaborates on how efficiently green finance promotes technological innovations and consumption of renewable energies in the ecotourism sector (Naradda Gamage et al., 2017; Khan et al., 2020; Masukujjaman et al., 2021). The other aspect of literature depicts the discourse of ecotourism.

As far as the first strand is concerned, numerous researchers have investigated the linkage of green credit and traditional economic growth (Anser et al., 2024; Khan et al., 2022) and recently the researchers are investigating the role of green finance in the enhancement of climate quality to help the universal community to attain SDGs as early as possible. From Indonesia, Ronaldo and Suryanto (2022), investigate the influence of green credit on SDGs, and find that green credit enhances technological innovations. The authors further infer that green finances as a sustainable indicator can enhance green technology. Chen and Zhao (2022) argue that green finance lowers the hazards associated with environmental projects. Investment risk associated with green projects is minimum because Governments guarantee the projects based on green credit. Over the period from 2015 to 2020, (Li et al., 2022) investigate the connectedness between green credit and green energy investments in China. The authors recommend that green regulations must be implemented in green financial markets to promote the deployment of green energy. Sharma et al. (2022) explains the importance of green finance in the enhancement of renewable energy consumption. The authors find indirect and direct spillover impacts of green financing on green energy utilization and energy efficiency. A country's total factor of productivity can be enhanced via green finance, the efficiency factor of productivity further promotes green economic advancement (Anser et al., 2025; Jiakui et al., 2023). Bei and Wang (2023) investigate developing economies and argue that green credit promotes environmentally responsive investments in the countries under study.

The other strand of literature elaborates on the different pillars of green innovations. Shasha et al. (2020) argue that ecotourism is a complex discourse and includes various climate aspects that enhance sustainable advancements. However, social adaptation and adequate infrastructure are required for sustainable ecotourism (Gyamfi et al., 2022; Sørensen and Grindsted, 2021). Ma et al. (2021) investigates the different facets of the supply chain that affect green ecotourism. They find that hotels and travel agencies should boost the deployment of green energy to achieve sustainable ecotourism. The connection between ecotourism and sustainable advancement is explored by (Xu et al., 2023). The authors find that ecotourism stimulates green economic recovery and also protects natural resources. Thompson (2022) elaborates on different challenges faced by the ecotourism industry which must be handled to encourage ecotourism.

The third strand sheds light on previous studies on ecotourism. Studies find that the ecotourism sector is the low carbon emission industry (Bhusal, 2007; Tang et al., 2011; Chang and McAleer, 2017; Dogan and Aslan, 2017). Ke (2012) addresses the weaknesses and strengths ecotourism sector of China and finds that financial support and information transparency of enterprises are required for the success of ecotourism. Sun et al. (2022) explore the green efficiency of ecotourism, and find that type of energy consumption technology attracts tourists in the ecotourism sector. Over the period from 2010 to 2019, Zhang et al. (2025) find that green growth sheds a positive impact on ecotourism in China. From the review of relevant literature, it is evident that the connection between technological innovation (Ma and Zhu, 2022; Tang et al., 2022; Saha et al., 2022), and ecotourism and between green finance tools and ecotourism is not very clear so far. Therefore, the current study is motivated to explore more insight into the said connection. Green finance promotes renewable energy consumption in the ecotourism industry (Katircioglu, 2014; Gao et al., 2020; Waheed et al., 2020). Khan et al. (2022) green credit act as climate-supportive finance and promote the global community to speed up the attainment of SDGs. Similarly, (Bai et al., 2022) argue that green credit promotes technological innovations and improves sustainable development. Ronaldo and Suryanto (2022) agrue that green economic recovery after the novel Corona, the topic of green tourism or ecotourism gets the attention of researchers and academicians. If the tourism sector actively addresses climate concerns, countries can actively attract tourists. In this regard, the climate concerns include the consumption of renewable energy in tourist accommodations and hotels. However, in the current era, hotels use traditional energy sources like fossil fuels, however after COVID-19, green financing tools and technological innovations can enhance the deployment of clean energy in the tourism sector to increase the prosperity of the ecotourism industry. Green

financing through the issuance of green bonds acts as a crucial tool for the green efficiency of the ecotourism sector in different countries. In this regard, consumer prices also shed positive impacts on the efficiency of green credit for the deployment of renewable energy in the ecotourism industry. The cost of goods and services diminishes the financial capacity of tourists in ecotourism; therefore, the exchange rate can also be an important factor in energy utilization. However, it is predicted that ecotourism will be negatively affected by the exchange rate because the increase in the exchange rate reduces the ability of a country for imports goods and services. Moreover, an upsurge in exchange rate results in difficulty in the deployment of technological innovations in the ecotourism industry. The green efficiency of ecotourism can also be influenced by globalization (Nan et al., 2022). Globalization results in the mitigation of geographical hazards, and investment hazards, promotes political economies, enhances the interactions among countries, and promotes the flow of funds into green projects related to ecotourism.

3. METHODOLOGY AND DATA DESCRIPTION

This segment elaborates on how to measure the influence of green credit on the deployment of renewable energy in the ecotourism of Vietnam. Similar to the study of Sun et al. (2022), we measure the green efficiency of the tourism industry of Vietnam. The Green efficiency of ecotourism (GEET) is considered an outcome (dependent) variable and proxied with the deployment of green energy to the ecotourism sector of Vietnam. The input and output indicators (i.e., innovation input, environmental and economic output, and technological and scientific output) are used to measure the GEET. The main independent (explanatory) variable is green which is proxied through green bonds and the data is collected through the National Bureau of Statistics of Vietnam. However, details of variables selected in the current study are presented in Table 1 which entails abbreviations and sources of data for each variable used in the current research work.

Exchange rate (EXR) (Sharma et al., 2022), consumer price index (CPI) (Chiu and Yeh, 2017), and Globalization KOF (GKOF) (Alola et al., 2021) are the other independent variables used in this study. The data is collected over the period from 2013 to 2022 and the coefficients are estimated using Autoregressive distributed lag (ARDL). The application of ARDL is appropriate because this model estimates the results regardless of the order of integration of data series (Latif et al., 2015). There are few data collection limitations for green bonds in Vietnam.

Based on the variables selected in the current study, the following econometric model is constructed for multivariate regression:

$$GEET = \alpha + \beta_1\, Ginno + \beta_2\, GBonds + \beta_3\, EXR + \beta_4\, CPI + \beta_5\, GKOF + \varepsilon_t \quad (1)$$

Equation 2 is constructed by transforming Equation (1) into logarithm form:

$$LnGEET = \alpha + \beta_1\, LnGinno + \beta_2\, LnGBonds + \beta_3.LnEXR + \beta_4\, LnCPI + \beta_5.LnGKOF + \varepsilon_t \quad (2)$$

Prior to estimating the ARDL model, the stationarity of the variables is checked using ADF (Augmented Dickey-Fuller) and PP (Phillip Perron) tests. These test account for the presence of Unit root. If the level or first difference indicates the stationarity of the series, if the series is stationary at level or at first differences, the presence of co-integration among variables can be detected by employing the ARDL bounds test. The study further used ECM (Error Correction Model) technique to observe the short-term and long-term estimates of coefficients. The ECM expression of equation 2 is presented in equation 3 as follows:

$$\begin{aligned}\Delta LnGEET_t &= \alpha_0 + \sum_{i-1}^{q} \delta_{1i}\, \Delta lnGinno_{t-i} \\ &+ \sum_{i-1}^{q^1} \delta_{2i}\, \Delta lnGBonds_{t-i} + \sum_{i-1}^{q^2} \delta_{3i}\, \Delta lnEXR_{t-i} \\ &+ \sum_{i-1}^{q^3} \delta_{4i}\, \Delta lnCPI_{t-i} + \sum_{i-1}^{q^4} \delta_{5i}\, \Delta lnGKOF_{t-i} \\ &+ \lambda_1 lnGinno_{t-i} + \lambda_2 lnGBonds_{t-i} + \lambda_3 lnEXR_{t-i} \\ &+ \lambda_4 lnCPI_{t-i} + \lambda_5 lnGKOF_{t-i} + \varepsilon_t\end{aligned} \quad (3)$$

The above equation presents the difference operator with Δ, while long- and short-term coefficients are presented with λi and δi respectively.

4. DISCUSSION OF EMPIRICAL OUTCOMES

First of all, the study employs the unit root test to account for the stationarity of data. ADF and PP tests are employed for stationarity detections as both tests are most popular to explore the stationarity of data series. The outcomes of both tests are presented in Table 2. Except for the exchange rate, we observe all the variables are non-stationary at the level I(0), but variables

Table 1: Fundamentals of variables

Variables	Symbol	Unit	Role of variable in the empirical model	Source
Green innovation	Ginno	Points	Independent	www.theglobaleconomy.com
Green finance	GBonds	Million US $	Independent	National Bureau of Statistics of Vietnam
Exchange rate	EXR	Exchange rate per US $	Control	WDI
Globalization KOF Index	GKOF		Control	KOF Swiss Economic Institute
Consumer price index	CPI	2010=100	Control	WDI
Green efficiency of ecotourism	GEET		Dependent	Measured as per (Sun et al., 2022).

Table 2: Basic unit-root results

Variable	Augmented Dickey-Fuller (ADF)		Phillips- Perron (PP)	
	I (0)	I (1)	I (0)	I (1)
Ginno				
GBonds	−0.438	−3.654**	−0.6459	−3.835**
EXR	−2.963**	−3.974**	−2.746**	−5.694***
CPI	−0.536	−4.453**	−0.553	−4.992**
GKOF	−0.837	−4.983**	−1.384	−4.053**
GEET	−0.363	−6.663***	−0.364	−4.719***

ADF and PP tests are employed. I (0) and I (1) present the stationarity values at the level and first difference respectively. *, **, *** is the indication of significance level at 10%, 5% and 1%

EXR: Exchange rate, GKOF: Globalization KOF index, CPI: Consumer price index, GEET: Green efficiency of ecotourism

become stationary when the first difference I(1) is taken for each series. Both ADF and PP tests support each other. As the series is stationary at the level and first difference, therefore, the variables are ready for the application of the ARDL model. For the application of the ARDL technique, an appropriate Lag model is required. For this purpose, HQ, AIC, LR, and SIC criterions are employed and outcomes ate presented in Table 3. It is clear from the Table that lag-1 is appropriate to employ the ARDL model. The decision is taken on the basis of the most objective criterion which is SIC: The criterion is robust in the determination of best lag order (Panel 1). After getting the appropriate lag value, the ARDL test is employed and the results are presented in Table 3. The Table confirms the existence of Co-integration in the data series (Panel 2). To confirm the existence or absence of co-integration among the constructs of the study, the Johansen co-integration model is employed. The model capture and gauge of the longer-run connectedness between the variables and the tests are presented in Table 4. The Table reveals that a longer-run association exists among the variables which is fruitful for long-term estimation. In this regard, an ECM-based ARDL model is applied to stem both longer-and shorter-run impacts of explanatory variables. The appropriate lags are determined using the AIC approach for independent variables (GBonds, Ginno, EXR, GKOF, and CPI) and find an ARDL order as (1, 0, 0, 0).

ARDL estimations are presented in Table 5. The table first presents the long-term estimations. It is clear from the table that the green efficiency of ecotourism (GEET) in Vietnam is positively and significantly influenced by the issuance of green bonds. The efficiency of ecotourism increases by 0.15% with a 1% upsurge in the volume of green bonds issued. It is also clear from the findings that green innovation has a significant positive association with ecotourism efficiency. One percent rise in green innovations in Vietnam brings a 0.027% upsurge in the efficiency of ecotourism. The official exchange rate of Vietnam has a significant and negative impact on GEET. A 1% upsurge in the value of the dollar against the Vietnamese Dong brings a 0.3058% decrease in the green efficiency of ecotourism in Vietnam in the long run. As the Dong depreciates against the US Dollar, the import of green technologies will become expensive, hence, hindering ecotourism to achieve green efficiency in the long run. CPI (consumer price index) adversely impacts

Table 3: Suitable lag-order estimation and ARDL

Panel 1: Suitable lag-order				
Lag	HQ	SIC	AIC	LR
0	−19.84	−21.104	−30.640	NA
1	−38.02	−45.235**	−53.043	394.432*
2	−32.75*	−41.357	−51.944*	128.638
Panel 2: ARDL bounds test				
Stat	90% LB	90% UB	95% LB	95% UB
W=31.1940	8.34	11.69	9.46	13.42
F=25.7402	2.94	3.76	3.80	4.43

*, **, *** is the indication of significance level at 10%, 5% and 1%

Table 4: Outcomes of Johansen co-integration test

No. of CE (s)	Trace Stat.		Maximum eigenvalue stat.	
None*	Test stat.	P-value	Test stat.	P-value
At most 1*	491.74***	0.000	203.56***	0.000
At most 2*	378.49***	0.000	178.82***	0.000
At most 3*	257.83***	0.000	120.49***	0.000
At most 4*	175.29***	0.000	58.52***	0.000
At most 5*	110.99***	0.000	34.01**	0.057
At most 6*	31.64	0.285	21.83*	0.201
At most 7*	24.48	0.393	8.60*	0.374

*, **, *** is the indication of significance level at 10%, 5% and 1%

Table 5: Results of ARDL estimations (1, 0, 0, 0)

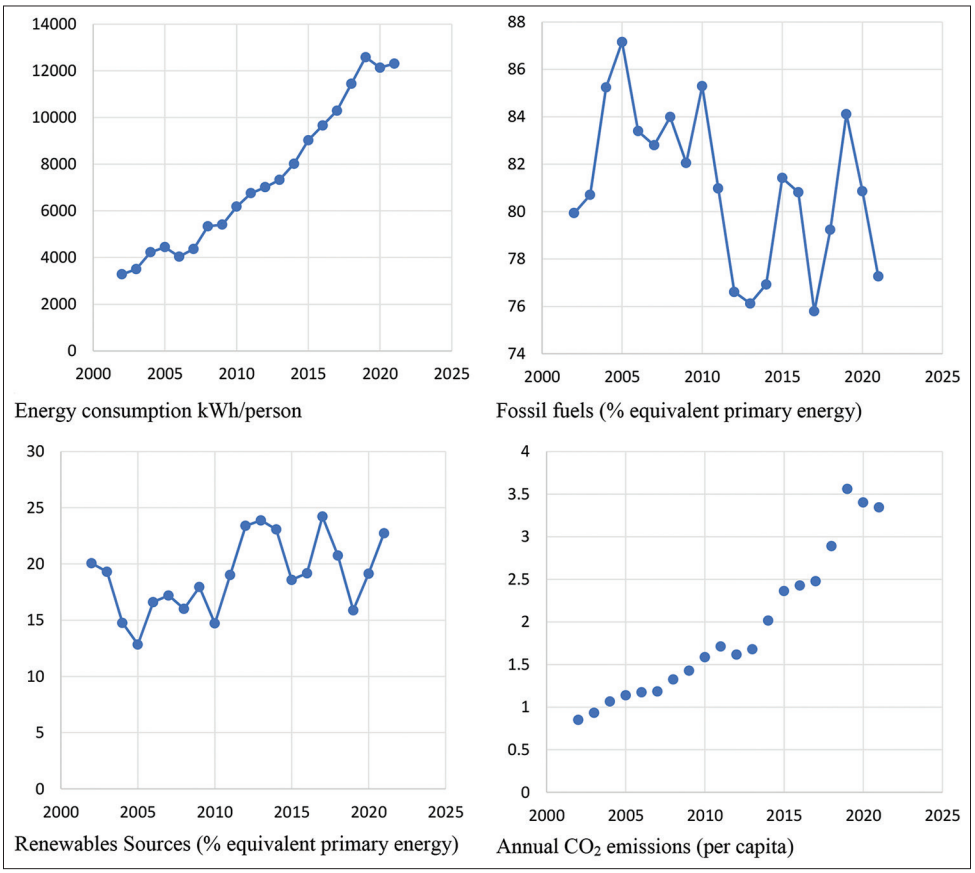
Variable	β	SE	P-value
Long-term estimation			
GBonds	0.1518	0.00448	0.0081
Ginno	0.0278	0.05464	0.0193
EXR	−0.3058	0.00203	0.0019
CPI	−0.1394	0.04956	0.0384
GKOF	0.2064	0.08740	0.0026
Short-term estimation			
GEET (Lag−1)	0.6493	0.07483	0.0001
Ginno	0.0338	0.06933	0.0186
Ginno (Lag−1)	0.0228	0.04969	0.0172
GBonds	0.0029	0.00184	0.2094
GBonds (Lag−1)	0.0749	0.00083	0.0015
EXC	−0.6504	−0.0562	0.0000
EXC (Lag−1)	−0.0078	0.002037	0.3925
CPI	−0.0739	0.0102	0.0052
CPI (Lag−1)	−0.1735	0.02846	0.0021
KOF	0.3103	0.02946	0.0006
KOF (Lag−1)	0.0028	0.08482	0.0001
CointEq (Lag−1)	−0.6979	0.06954	0.0015

β presents the coefficient values, and S.E stands for standard error

S.E: Standard error, EXR: Exchange rate, GKOF: Globalization KOF index, CPI: Consumer price index, GEET: Green efficiency of ecotourism

the GEET in Vietnam. An increase in the value of CPI results increase in the cost of implementation of green energy projects due to a rise in the cost of energy transfer, thus hiders the green efficiency in ecotourism. Finally, the long run exhibits the statistically significant and positive impact of GKOF (economic-globalization index) on GEET in Vietnam. The enhancement in economic globalization promotes the interaction among the countries for cheaper and accessible products and services, flow of factors of production, and transfer of technologies to the ecotourism of Vietnam.

Figure 3: Total Carbon Emission in Vietnam, energy %age from renewable sources and from fossil fuels. While the upper left graph shows the average energy consumed per person, and hence the same for tourists



As for as the results for the short run are concerned, the green efficiency of ecotourism shows a significant influence of one-period lag value. This shows that GEET has the ability to self-growth. The study further finds a negative impression of the issuance of green bonds on the efficiency of ecotourism in Vietnam. The reason for such findings is the long-term impacts of green bonds. The Government issues green bonds to promote green schemes and projects related to the tourism industry, but these projects take a longer time to become fruitful. Therefore, the ecotourism industry is unable to capture the short-term impacts of green bonds. The exchange rate and CPI have negatively and significantly influenced the green efficiency of ecotourism in Vietnam in the short run. A 1% rise in CPI and EXR in Vietnam causes a 0.073% and 0.65% decline in GEET respectively. The green efficiency of Vietnam's ecotourism improves with the rise in globalization in the short term because we find positive coefficients (Figure. 3).

The validity of the empirical model is ensured with different diagnostic tests and the outcomes are presented in Table 6. The diagnostic checks confirm the consistency and reliability of estimated models and empirical findings. Further robustness check is employed to validate the empirical results. For this purpose, the dependent variable GEET is replaced/substituted with green growth of ecotourism in Vietnam. The outcomes for independent variables are presented in Table 7 after re-estimation of the model. The findings support the results obtained and are presented in Table 5.

Table 6: Results of diagnostic checks

Diagnostic Tests	Stat.	P-value
LM test	0.398	0.784
Jarque-Bera test	1.754	0.167
ARCH test	0.965	0.742
Breusch-Godfrey	0.650	0.650
D.W. test	2.38	–

Table 7: Robustness check

Variable	β	S.E	P-value
Long-term estimation			
Ginno	0.0081	0.00395	0.0120
Ginno (−1)	0.0154	0.00647	0.0005
GBonds	0.0392	0.00921	0.0002
GBonds (−1)	0.0248	0.00109	0.0001
Short-term estimation			
Ginno	0.0739	0.00549	0.3942
Ginno (−1)	0.0644	0.00421	0.0394
GBonds	0.0873	0.00650	0.0193
GBonds (−1)	0.0512	0.00239	0.0209

β presents the coefficient values, and S.E stands for standard error. The robustness is checked using Green growth in the ecotourism sector as the outcome variable

5. CONCLUSION, PRACTICAL IMPLICATION AND RECOMMENDATION

The study explores how technological innovations and green credit enhance the deployment of green energy in the ecotourism

sector of Vietnam. The study uses the issuance of green bonds as a proxy for green credit. The green efficiency of Vietnam's ecotourism is proxied with the deployment of green energy. Over the period from 2013 to 2022, the study employs the ARDL model. The outcomes are estimated for the short- and well as long term. The study concludes that the green efficiency of ecotourism (GEET) in Vietnam is positively and significantly affected by the issuance of green bonds in the country. Moreover, green bonds eliminate the investment hazards associated with the deployment of green energy in the ecotourism sector. Low risk of investment also attracts private sector investors to promote ecotourism. The green bond market in Vietnam has a proactive vision where the country is currently boosting the issuance of green bonds and clear regulations regarding green credit. It is also clear from the findings that green innovation has a significant positive association with ecotourism efficiency.

CPI in the longer and shorter runs significantly and adversely influences the GEET in Vietnam. The rise in the value of the consumer price index leads to enhanced costs of transfer of technologies and implementation costs of green energy projects in Vietnam. Therefore, the desire of investors to invest in such projects will reduce. GEET is negatively affected by the rise in the exchange rate. A 1% rise in the price of the dollar against the Vietnamese Dong brings a 0.3058% decline in the green efficiency of ecotourism in Vietnam in the long run. The appreciation of the Dollar against the Dong results in the expensive import of green technologies, hence, hindering ecotourism to achieve green efficiency of energy in the long run. In both the short and long run, the green efficiency of ecotourism is favorably impacted by the economic globalization index (KOF) as we find significant-positive coefficients. The enhanced globalization brings cheaper and direct interaction among the countries, promoting the transfer of green technologies, labor, and capital, and attracting tourists. The study could not find a significant impact of green bonds on GEET in Vietnam in the short run. The reason is that the investment in green projects through green bonds will take a long time to capture favorable outcomes for the tourism industry in Vietnam, hence, the effect of green bonds on the green efficiency of Vietnam's ecotourism sector can be captured in the long run.

Based on the empirical findings, the current study recommends several strategic practical implications for Vietnam and other countries interested in green technologies, green credit, and ecotourism. The issuance of green bonds sheds favorable impacts on ecotourism in Vietnam only in the long run, therefore the Vietnam government should enhance the market of green bonds by refining the regulatory guidelines and removing the asymmetry of information for a strategic gain in the ecotourism industry. Similarly, (Lin and Hong, 2022) emphasize the effective part of governments in the prosperity and transparency of the market of green bonds. Proper implementation of green fiscal policy by the Vietnam Government can attract more actors to the market of green credit. Incentives like tax subsidies or exemptions can attract the private sector to constitute the bond financial markets to back the deployment of green energy in Vietnam's ecotourism sector. Green energy deployment and consumption can be enhanced in the ecotourism industry via proper planning of green construction of tourist accommodations and hotels. The tourism industry utilizes conventional energies (fossil fuels) for heating purposes which results in climate deterioration. Hence, the green construction of accommodations and hotels attracts ecotourists and is beneficial for ecotourism discourse. Zolfani et al. (2018) argue that governments should alter the traditional construction methods of hotel projects to a sustainable environment construction approach which ultimately enhances green energy deployment and efficiency in the ecotourism sector.

As the study finds positive short- and long-run impacts of globalization on the GEET industry in Vietnam, therefore, it is recommended that policymakers and governments should promote globalization for cheap and easy accessibility of total factor of productivity and green supply chain management. The promotion of globalization will also help Vietnam to achieve sustainable development because, in today's advanced world, an unaccompanied country without collaboration with other economies cannot attain the SDGs.

The study is novel in connecting green credit and technological innovations with the green efficiency of ecotourism in Vietnam via the consumption of green energy. The study has innovative and practical implications for governments and policymakers. Beyond the novel contributions to the prevailing body of knowledge, the study has a few limitations, (1) the study is only focused on one country's data, while a cross-country analysis may be more fruitful, (2) the study is based on an overall innovation index, however, the future studies may collect data of specific types of innovations or patents related to ecotourism, (3) future research work may be based on qualitative stance i.e., views and opinions of experts, (4) the further study may be based on the certain market conditions that affect the government policies in each sector of the economy, (5) moreover, the researchers in future may compare the ecotourism efficiency in different countries or provinces in the same country. The comparative analysis will be helpful for policymakers and governments to identify the weak areas in terms of ecotourism, (6) future studies may incorporate the SDGs to explore the importance of the deployment of green, clean, and renewable energies in the tourism sector, (7) the Ukraine-Russia war and effects of COVID-19 can be used to explore their effects on renewable energy consumption and ecotourism, and finally, (8) the future researchers may investigate the proposed connection of the current article in different national and international cultures, but we rest all these recommendations for future research works.

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