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Article

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The Role of Green Marketing and Promotion of Green Energy Bonds to Reduce Carbon Emissions in Indonesia

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ABSTRACT

This paper investigates the impact of green marketing on the adoption of green bonds. Using econometric methods, the study uses panel data of Indonesia 560 Indonesian firms regulated under the Indonesia Stock Market from 2002 to 2021. The findings show that green marketing can increase the demand for green bonds. This is because green marketing can raise awareness of the benefits of green bonds and can make them more attractive to investors. The study also finds that income and trade openness positively correlate with carbon dioxide emissions, while human capital is negatively correlated with carbon dioxide emissions. This suggests that countries with higher incomes and more trade openness tend to emit more carbon dioxide. In contrast, countries with higher levels of human capital tend to emit less carbon dioxide. Overall, the study's findings offer important new information about how green marketing affects the adoption of green bonds and the connection between economic variables and carbon dioxide emissions. The findings could encourage the use of green bonds and lower carbon dioxide emissions. They also have ramifications for investors and governments.

Keywords: Green Marketing, Green Energy, Green Bonds, Carbon Emission, Indonesia
JEL Classifications: A1, M31, F43

1. INTRODUCTION

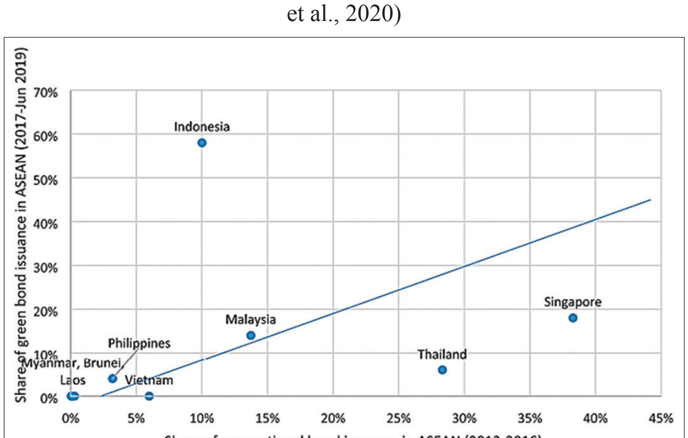
Anthropogenic global warming presents a common concern for humanity (Ahmad et al., 2019). After that, governments from many countries have prioritized environmental sustainability to promote a solid and eco-friendly economy (Li, 2023). Additionally, green business initiatives can be an effective way to achieve net zero emissions. According to Ordonez et al. (2022), Indonesia's carbon dioxide emissions remained nearly unchanged between 2014 and 2016 due to the country's heavy reliance on coal for electricity generation. However, there are some signs of progress. For example, in 2022, emissions have fallen significantly from previous years. This is probably because of several things, such as the government's initiatives to reduce coal use and develop renewable energy sources. To lower carbon emissions and increase production and self-sufficiency, governments worldwide employ various tactics and green marketing laws (Becchetti et al., 2022). This leads to significant differences in their approaches and priorities, such as the distribution of green bonds and the management of circular debt in the primary market are significantly different. This has led to significant changes in the energy sector and electricity production (Li and Wang, 2023). It is essential to assess the performance of nine climate finance initiatives, such as target lending and green bond programmes (Ranyard et al., 2020). The market for green bonds was established when the European Investment Bank issued the first one in 2004, and it grew significantly once reliable green bond values were revealed in 2016 (Cicchiello et al., 2022; Gabr and Elbannan, 2023). Green bond issuance has consistently surpassed all others, especially between 2004 and 2010 and 2014 and 2018 (Ali et al., 2022). In 2014, green bonds comprised <1% of all bonds issued (Teti et al., 2022). However, their rapid growth meant that by 2018, they accounted for more than 4% of all global bond issuance. The demand for recycling and renewable materials has also increased, leading to a more significant contribution from green bonds to infrastructure investments (Teti et al., 2022; Agoraki et al., 2023). Indonesia, one of the ASEAN countries with a quickly growing trend towards green bonds, had initiated to address this problem by the issuance of an Islamic bond, green sukuk, which is worth a whopping amount of US$1.25 billion. Despite the issuance of the green bonds a year after two other states. Singapore and Malaysia, Indonesian state is among the significant ASEAN countries to issue green bonds, contributing (58%) to the total, followed by Singapore (18%) and Malaysia (14%) (Azhgaliyeva et al., 2020). Singapore and Thailand issued fewer green bonds than Indonesia despite having more experience in ASEAN issuing conventional bonds, as seen in Figure 1. The proportion of conventional and green bonds issued is shown in Figure 1.

The Indonesian government has prioritized environmental protection, committing to achieving a carbon dioxide balance in the atmosphere by the end of the century.

This commitment aligns with the climate change pact known as Paris Agreement on and country's desire to protect its environment. The green bonds are chiefly issued by Indonesia in the ASEAN region, accounting for 99% of all issuances. In contrast, the private sector is the primary issuer of green bonds in other ASEAN nations (Reyseliani et al., 2022; Ma et al., 2023; Manurung and Rezasyah, 2021).

Green Marketing promotes the green bonds type of debt security used to finance environmentally friendly projects. They are becoming increasingly popular in Indonesia, as the country is a signatory to several international environmental treaties. However, no research exists on the variables influencing Indonesia's green bond market's expansion. By analyzing the variables that affect the development of the green bond market in Indonesia and making recommendations for fixes, this study seeks to close this gap. This research makes three novel contributions to the literature on green marketing and carbon emissions. First, it examines the impact of green marketing on carbon emissions in different types of cities. Second, the study examines how green marketing affects carbon emissions using panel data from 2002 to 2021. Third, the study contrasts how various forms of green marketing affect carbon emissions. Previous research studies were focused on the impact of green marketing on carbon emissions in general, but this research shows that the impact of green marketing can vary depending on the type of city and the type of green marketing. Also, more studies need to be conducted in Indonesia on green marketing and bonds. The study's findings are novel in several ways. The study is one of the first to examine how green marketing affects the uptake of green bonds. Second, the study discovers that carbon dioxide emissions are favourably connected with wealth and trade openness but adversely correlate with human capital. This brand-new discovery has not been discussed in the literature before. Third, the paper presents some forecasts on the impact of monetary policy on the economy. These predictions have yet to be previously made in the literature.

Figure 1: ASEAN Countries Green Bonds Issuance data (Azhgaliyeva et al., 2020)



2. LITERATURE REVIEW

According to the IRENA (2018), the Indonesian government has set high goals to minimize greenhouse gas emissions. The administration wants to cut emissions by 29% by 2030 compared to the status quo. By 2025 and 31% by 2050, the total primary energy supply will be 23% renewables. The government has plans of installing climate friendly renewable energy sources such as solar (6400 MW) and wind (1800 MW) by 2025. These targets are necessary to address the climate crisis, and the Indonesian government is committed to taking action to reduce emissions and protect the environment. In order to create its national framework and regulations for the issuance of green bonds, as well as the national Framework of both the Green Bond and Green Sukuk, the Indonesian government did so in 2017. The effects of green marketing techniques on organizations' financial and non-financial performance were examined by Eneizan et al. (2016) and Ahmad et al. (2022). It finds that green marketing practices positively impact financial performance through increased profitability and cost savings.

Additionally, it enhances non-financial performance by improving brand image, customer loyalty, and market reputation. Successful implementation requires leadership commitment, employee engagement, and adherence to environmental regulations. Overall, green marketing strategies contribute to long-term success and sustainability for firms. According to Boztepe (2012), green purchasing behaviours are positively impacted by environmental awareness, green product attributes, green promotion strategies, and green prices. Ali et al. (2022) found that green marketing can persuade customers to purchase eco-friendly goods. Karginova-Gubinova et al. (2020) the effectiveness of the green bond market was examined, and it was discovered that green bonds significantly contribute to the advancement of economic sustainability. It enhances financial stability by attracting investors and diversifying funding sources for nature friendly plans. The development of the green bond market and the implementation of sustainable policies at the local level are favorably associated as per the studies. Adekoya et al. (2021) examine that green bond, compared with traditional bonds, has higher levels of market efficiency to reduce volatility. In the context of the COVID-19 pandemic, Naeem et al. (2021) investigate and contrast the effectiveness of green and conventional bonds. The study evaluates the effectiveness of both varieties of bonds before and after the pandemic using an asymmetric multiracial detruded fluctuation analysis. Study findings suggested that green bonds exhibit higher efficiency than conventional bonds, indicating their potential as a more stable and resilient investment option during times of crisis.

Phung Thanh (2022) investigates how the growth of the green bond market has affected Asian economies economically. Study findings indicated that the market for green bonds is growing and positively influences economic indicators such as GDP growth, employment, and investment. The study emphasizes the importance of sustainable financing mechanisms like green bonds in promoting economic growth and sustainability in Asian economies.

Green bonds are becoming increasingly popular as governments and international organizations recognize their potential to contribute to a strong economy (Gibon et al., 2020; Beddu et al., 2022). To truly work on addressing the climate challenges, plethora of nations are required to include green bonds. However, there are also disadvantages to using green bonds, including higher certification fees and a limitation on the projects that can be done.

Anugrahaeni (2017) analyzed the characteristics, structure, and performance of green financial instruments that Indonesia has issued, namely sovereign green bonds also green sukuk. The study found that these instruments have the potential to finance environmentally friendly projects and promote sustainable development in Indonesia. The research also emphasizes the potential of green bonds and sukuk in attracting domestic and international investors while contributing to the country's efforts in mitigating climate change and achieving environmental targets. Therefore, nations like China and Indonesia need strong state support, favourable public image, and market forces to build a reliable green financing system.

No direct modelling of the association between CO_2 emissions and green bonds exists. Li (2023) examined how provincial environmental legislation affected corporate bond yield spreads and credit ratings. The study's goal is to find out how investor interest impacts the markets for green bonds. This is because the attention of regular investors will be essential to the market's expansion for green bonds. Green bond markets are also more vulnerable to certain risks than traditional financial markets, such as those brought on by ambiguous policy regarding energy on a national level or the utter lack of the regulations for green bonds. Implementing green credit rules significantly reduces rent-seeking behaviours and enhances the environmental performance of businesses that produce much pollution (Zhong et al., 2022).

Wu et al. (2023), with a focus on the mediating function of eco-innovation, researchers examined the relationship between green credit, enterprise environmental performance, and economic performance. According to their research, green credit positively affects economic and environmental performance, and eco-innovation significantly mediates this effect. This study addresses a research gap by presenting innovative and practical perspectives for experts and decision-makers. The need for clear standards makes distinguishing green products from conventional financial products challenging. To address this issue, the authors propose granting financial institutions the authority to establish guidelines for green products, thereby offering a solution for better differentiation and clarity in the market.

3. DATA AND METHODS

The major contribution of green marketing to Indonesia's efforts to minimize emissions of carbon in Indonesia four data sources were used to collect data the Indonesia Environment Statistical Yearbook, the Indonesia stock markets and about 560 listed companies associated with green marketing and green bonds data collected; Data from the Bank of Indonesia's 2017 green lending and green bond issuance as well as the OJK (Financial Services Authority) strategy for finance in Indonesia sustainably from 2015 to 2019 are also available. The study also examined other data variables related to performance of the market of Indonesian green bond. This paper explores the relationship between uncertainty and various indices, including the Green Bond Index (GBI), Indonesia Security Policy Index (ISPI), and Low Carbon Index (LCI). It also examines the relationship between Green Bond Credit Spread (GBC), Financial Development (FD), and Economic Policy Uncertainty (EPU).

The study uses a conditional data distribution approach to examine long-term relationships using the general vector autoregressive (VAR) model. Unlike traditional approaches that only consider the conditional mean, this method considers different quantile levels to analyze the dynamic connections between variables. Specifically, based on order invariance, it determines the connectivity series indicators for the middle, upper, and lower shocks utilizing the quantile vector autoregressive approach. The study estimates the directed connection of indices by measuring the effect of one indicator to the quantile green bond of another indicator. This gives essential information on how uncertainty and different indices relate.

3.1. Econometric Analysis

The model of logistic regression estimates the coefficient vector of the latent variable |W_n^X (s)|^2. If individual I, placed in the area of green marketing called j, receives the index of green bond, this latent variable has a value of 1; otherwise, it has a value of 0. The specific form of the model is as follows in Equation (1)

$$yij = dij * \beta1 + eij * \beta2 + bij * \beta3 + ij \quad (1)$$

Where:

yij is a binary variable that indicates whether person I in area j of green marketing received an index of green bond

dij is a vector of sociodemographic variables for the person I

eij is a vector of socioeconomic variables for person I

A dummy variable in the vector bij indicates if the family of the subject I switched energy suppliers within the preceding 5 years.

ij is a logistically distributed error component

The model is estimated utilizing a mixed-effects multilevel logistic regression. This type of regression allows the estimation of the model's coefficients to vary across different levels of the data, such as different green marketing areas.

$$Q_\tau^Y\left(Y_t \Big/ I_t^Y \; I_t^Y\right) = \alpha(\tau) + \beta(\tau)' Z_t + \sum_{j-k}^{k} {}'' Z'_{t-j}\Pi_j + F_u^{-1}(\tau) \quad (2)$$

Equation 2 represents a constant vector; the specific form of the model is as follows: j, the variable of interest, is determined by the bij, which incorporates a dummy variable that effectively indicates whether the household of person I changed power providers during the previous 5 years, along with a term accounting in case the two variables had any interactions. The error component ij follows a logistic distribution.

The given GBI hypothesis concept was evaluated by the researchers using a quantitative research approach. They performed a literature review to determine the reliability and validity of the following green advertising ideas: the carbon stock cost (GSC), the green bond index (GBI), and green economic growth (GEG). As stated in Equations 3 and 4, the four constructs were evaluated using the mean-variance adaptive Gauss-Hermite quadrature method (O'Hagan, 1991; Jin and Andersson, 2020).

$$\begin{aligned}
C_{GB} &= c_h\left[\int_0^{t_1} \mathrm{GBI}q(t)\,dt + \int_{t_1}^{t_2} \mathrm{EPU}q(t)\,dt + \int_{t_2}^{T} \mathrm{GBI}q(t)\,dt\right] \\
&= c_h[\int_0^{t_1}\left\{P(1-x) - at + bpt - c\alpha t\right\}dt + \\
&\int_{t_1}^{t_2}\left\{R(t-t_1) - (a-bp)t - c\alpha t + P(1-x)t_1\right\}dt + \\
&\int_{t_2}^{T}(a-bp+c\alpha)(T-t)\,dt] = c_h[P(1-x)(t_1t_2 - \frac{t_1^2}{2}) \qquad (3) \\
&+ \frac{R}{2}(t_2-t_1)^2 + (a-bp+c\alpha)(\frac{T^2}{2} - Tt_2)]
\end{aligned}$$

In our cross-sectional study, we cannot establish a causal link. However, our logistic regression model includes a wide range of covariates, which helps account for most potential confounding effects. It is possible that this paper evaluates demand-side impacts in lieu of supply-side ones. For example, the people who use power in one area may have strong opinions about the environment and back political personalities or groups that are enthusiastically engaged in politics that are based on the environment. This might motivate vendors to supply eco-friendly goods like carbon stock cost (GSC). However, as we take into account spatial heterogeneity, the majority of these supply-side impacts should be taken into account, as shown in Equation 4.

$$Q_\tau^Y\left(Y_t \Big/ I_t^Y \; I_t^Y\right) = \alpha(\tau) + \beta(\tau)' Z_t + \sum_{j-k}^{k} {}'' Z'_{t-j}\Pi_j + F_u^{-1}(\tau) \quad (4)$$

The finding is significant because it highlights the importance of reducing emissions during this specific phase of the process. The values and the weights of the materials or any other factors did not show any association. However, the limited data availability makes it difficult to assess the foundation's potential acidification benefits compared to other studies. Green Energy and embedded carbon dioxide are two other fascinating research areas.

4. RESULTS ANALYSIS AND DISCUSSION

Table 1 provides statistical summaries for seven GBI, GEG, CSP, CGBR, LCI, EPU, and FD variables. Additionally, the data includes the mean, standard deviation (SD), skewness, kurtosis, Jarque-Bera test statistic, autoregressive distributed lag (ARDL), and augmented Dickey-Fuller (ADF) values. Statistics are reported. GBI shows a mean of 0.028; it exhibits positive skewness (0.608) and positive kurtosis (22.657), indicating a slightly right-skewed and leptokurtic distribution. The Jarque-Bera test statistic is exceptionally high (76657.4), suggesting a departure from normality. Similar statistics are reported for other variables such as "GEG," "CSP," "CGBR," "LCI," "EPU," and "FD."

The table shows that all variables have a positive mean except for FD. The fact that the variables' standard deviations are all rather high indicates that the data are highly variable. All of the variables have quite high skewness and kurtosis values, which indicates that the distributions of the variables are not normal. All of the variables' Jarque-Bera statistics are significant, which implies that the null hypothesis of normality can be disproved. The null hypothesis of stationarity can be disproved because all of the ADF statistics for the variables are significant. Overall, the table demonstrates that the variables are non-stationary and non-normally distributed. This means that further analysis of the data will need to take this into account.

4.1. Bond Marketing

The findings of a regression study of the association between green finance and economic growth over the short-and long terms are presented in Tables 2 and 3. The independent variables are the logarithms of GBI, GSC, and FD, while the dependent variable is the output logarithm. The coefficients for GBI and FD are positive

Table 1: Descriptive analysis of GBI, GEG, CSP, CGBR, LCI, EPU, and FD

Variable	Mean	SD	Skewness	Kurtosis	Jarque.Bera	April	ADF
GBI	0.035	0.080	0.0702	21.749	76657.4*	322.546*	−6.768*
GEG	0.021	0.133	0.908	24.455	45553.7*	30.456*	−6.008*
CSP	0.023	2.066	−0.211	16.009	98675.6*	70.583*	−34.765*
CGBR	0.04	2.098	0.240	17.344	23456.4*	233.455*	−5.080*
EPU	0.004	1.091	−0.455	6.311	6912.4*	502.701*	−7.912*
LCI	0.014	2.441	−1.201	09.546	9243.4*	155.235*	−30.901*
FD	0.019	2.749	0.821	5.379	34445.6*	278.876*	−18.389*

(*) indicates that the P-value for the test is <0.05

and significant in all three models, as shown by both tables. This suggests that green finance marketing is positively associated with economic growth. The coefficient for GSC is negative and significant in the first two models but not in the third model. This shows that there may only sometimes be a direct link between GSC and economic growth. Partners from downstream as well as upstream have an impact on the implementation of green initiatives. The table shows that green finance and e-commerce are positively associated with economic growth. It is not always clear how GSC and economic growth are related.

To summarize, several factors have contributed to Indonesia's green bond market's growth. These include modest initiatives for deregulating and privatization, as well as improvements in national democracy and the financial industry as a whole. The interplay between these factors and the challenging policies governing the Indonesian green bond market collectively influences individuals' intentions to engage in green purchasing. The findings of more intricate models, incorporating sociodemographic and socioeconomic characteristics, are presented in columns 2, 3, and 4, while column 1 exclusively focuses on the moderating variables. As businesses transition from the "firm-to-firm" method to a "supply chain-to-distribution network" approach, establishing strong relationships becomes crucial (Ozturk et al., 2022).

Table 2: Short-term green marketing and carbon emission

Variable	Output (log)		
	lnGBI	lnGSC	lnFD
Constant	4.678*** (0.564)	6.018*** (0.455)	6.076*** (0.456)
GBI	0.007 (0.044)	0.006 (0.075)	0.064 (0.098)
GEG	−0.073 (0.060)	−0.109 (0.055)	−0.078 (0.081)
CSP	0.678*** (0.066)	0.789*** (0.061)	2.040*** (0.077)
CGBR	0.089 (0.078)	0.172** (0.086)	0.079 (0.097)
LCI	0.094 (0.081)	0.210 (0.079)	0.098 (0.059)
EPU	−0.003 (0.005)	0.007 (0.002)	0.0001 (0.005)
E-commerce	YES	YES	No
R2	0.987	0.916	0.917
F-statistics	76.89	53.77	48.09

*, **, *** at the 1%, 5%, and 10% significant levels, respectively

Excluding the liquidity spread from the green bond index (GBI) is a way to estimate it. Table 3 provides statistical information on the dependent and independent variables used in the initial model. If compared to its conventional equivalents, green bonds provide a higher ask yield, as evidenced by the median difference in green economic growth (GEG), 178.03%. Additionally, green financial development (FD) has way less bid-ask spread as compared to traditional bonds, with lnGBI mode one and mode two values of 1.546% and 0.089%, respectively. The Indonesian bond market's exceptional performance can be attributed to stringent financial market regulations and a unique regulatory framework.

4.2. DIF-GMM

Dynamic Indirect Inference Generalized Method of Moments (DI-GMM) is a statistical method used to estimate parameters in dynamic panel data models. DIF-GMM is a more efficient estimator than traditional methods, such as ordinary least squares (OLS), because it considers the data's dynamic nature. A study by Ahmad et al. (2019) shows that people with negative attitudes towards climate change are less likely to sign up for a green electricity tariff. Watching how this group would react differently if opt-out tariffs were made available would be interesting. In other words, we are interested in seeing if those with negative environmental sentiments are more likely to reject a green tariff outright. This study uses the SYS-GMM model (Xu, 2012) to assess how lnGBI and ln have affected Chinese energy marketing. The estimation results are displayed in Table 4's rows (4) through (6). The SYS-GMM model is an excellent option for flexible panel data evaluation with small time intervals and significant a cross-section dependency.

Table 5 provides observations and coefficients for variables related to the Green Bond Index (GBI), Indonesia Security Policy (CSP), Low Carbon Index (LCI), Financial Development (FD), and Green Economic Growth (GEG). However, to better align with the context, Indonesia. These coefficients estimate the effects of these variables on the dependent variable, CO_2 emissions. The coefficients suggest that in the Indonesian context, GBI and

Table 3: Green marketing and long-term carbon emission

Variable	lnGBI		lnGSC		lnFD	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Constant	0.912 (0.62)	5.641*** (0.521)	119.149** (108.031)	4.289*** (0.456)	4.547 (6.244)	5.490*** (0.408)
GEG	0.561 (0.40)	−0.071* (0.031)	3.242*** (1.891)	−0.079* (0.082)	1.810 (0.91)	−0.082* (0.039)
CSC	0.993 (0.42)	0.671*** (0.091)	0.405 (0.41)	0.697*** (0.012)	0.096 (0.712)	0.892*** (0.049)
GBI	5.289** (0.29)	0.089 (0.071)	4.21** (1.094)	0.029 (0.042)	1.091 (0.725)	0.019 (0.049)
EPU	1.975 (1.019)	0.801 (0.102)	4.432 (2.023)	2.601 (1.032)	2.926 (2.018)	1.052 (1.0302)
LCI	1.54** (0.58)	0.245*** (0.034)	1.134 (0.01)	0.215*** (1.035)	1.125* (0.24)	0.642*** (2.005)
FD	2.558* (0.29)	−4.367*** (2.078)	1.421* (1.156)	−1.278*** (1.06)	0.128*** (2.3)	−1.219*** (1.07)
GBI	3.578 (0.559)	4.378** (0.036)	3.222 (1.277)	3.033* (4.045)	1.337* (0.138)	0.340* (0.117)
Inputs	3.448 (4.765)	−0.449*** (1.08)	4.765 (1.448)	−1.185*** (2.234)	2.397 (1.430)	−2.137*** (3.089)
GB (log)	1.987 (0.36)	−3.021 (0.039)	0.329 (0.221)	2.031 (0.032)	2.281 (0.49)	−2.024 (2.20)
Carbon price (log)	5.436 (0.768)		2.436** (1.968)		6.755 (1.690)	
Green stock cost (log)	0.766 (0.234)		4.897*** (2.654)		1.678 (0.453)	
Other Green costs (log)	4.178** (1.76)		0.789 (0.489)		1.489 (0.765)	
Inputs	**Satisfactory**	**Satisfactory**	**Satisfactory**	**Satisfactory**	**Satisfactory**	**Satisfactory**
GB (log)	1.68	2.89	1.67	3.87	1.61	1.93
Carbon price (log)	33.66	22.33	288.03	88.26	72.85	72.94
Log-likelihood	−287.449	37.77	−435.5199	66.39	−353.578	

*, **, *** at the 10%, 5%, and 1% significant levels, respectively

CSP significantly positively impact reducing CO_2 emissions. Conversely, LCI, FD, and GEG do not significantly influence CO_2 emissions.

The results in Table 5 are consistent, with all five variables having the same sign and significance. For example, GB may expand by 639% or 0.709% with a 1% increase in either financial development (FD) or green economic growth (GEG), consequently. The positive effect of GEG on EPU suggests that the Chinese green economy can be effectively promoted through GEG. This finding contradicts previous studies, which found that economic growth can increase the green bond index (Moreno and Ocampo-Corrales, 2022).

The second finding suggests that the development of the green economy is associated with increasing green funding. Indonesia is actively promoting the development of green energy marketing to reach its target of 79% of markets of new energy by 2030 (Logo et al., 2021). However, creating green economic structure requires significant financial support and a high start-up cost (Tang and Zhou, 2023).

Table 4: Regression with random effects of GBI and carbon

Variables	GBI 7698	CO_2 4523
GBI	1.5246**	1.9766***
	(0.639)	(0.709)
CSP	1.4859***	1.4527***
	(0.243)	(0.264)
LCI	−0.7698	−0.8756
	(0.567)	(1.177)
FD	−0.7645	−0.1249
	(0.453)	(1.456)
GEG	−0.7613	−0.8961

*, **, *** at the 1%, 5%, and 10% significant levels, respectively

4.3. Mediation Analysis

The regression results for green economic growth (GEG) are shown in Table 6, columns two and three. The regression coefficient for GEG and green finance is 0.6698, which, at 1%, is statistically significant. This implies that a rise in green finance is linked to a rise in green economic expansion. This result supports the notion that green finance can aid in reducing carbon emissions and encouraging green economic expansion. As carbon emissions are a negative component of green development, increasing the usage of green energy can help reduce the release of carbon dioxide and promote sustainable growth in the economy (Saba and Ngepah, 2022; Lago et al., 2021).

According to Guo et al., (2022); Ahmad et al., (2019) and Beddu et al. (2022), green marketing can also reduce environmental deterioration while preserving sustainability of both the economy and the environment. The quick rise of the green bond index can help other businesses regarding the green energy get started and increase the number of jobs available, promoting green growth. We predict that people less concerned about climate neutrality will be less likely to respond favourably to a green default. This is because they may reject it more readily since they may value other product attributes more highly than climate neutrality. Table 6, columns two and three, displays the GBI regression results. The regression coefficient for the GBI and green finance relationship is 0.02148, statistically significant at the 1% level. This means a positive relationship exists between GBI and green finance and that a 1% increase in green finance is associated with a 0.02148% increase in GBI.

4.4. Robustness Test

Test 1: We lagged the explained variable by one period. The results, shown in test 1 of Table 7, show that the control variables and the main explanatory variable are all significant, with P-values under 0.01. This indicates the reliability of the first regression model.

Table 5: Endogenous Regression of GBI, FDI and FDI

Variable		lnGBI			lnFD	
Constant	−0.244 (1.08)	5.455*** (0.9)	6.766*** (0.67)	2.557** (1.49)	7.622*** (0.67)	7.947*** (0.89)
Inputs						
GBI	−0.213 (0.768)	0.567** (0.08)	0.008 (0.055)	−0.088 (0.199)	0.108** (0.090)	−0.006 (0.040)
GEG	−0.166 (0.566)	−0.078 (0.099)	−0.076 (0.0456)	0.890*** (0.678)	0.088 (0.097)	−0.155* (0.07)
CGBR	0.542*** (0.208)	−0.094 (0.117)	0.053 (0.044)	0.574** (0.241)	−0.045 (0.066)	0.123** (0.051)
CSP	0.003 (0.009)	0.002 (0.004)	−0.002 (0.002)	0.002 (0.008)	−0.0005 (0.002)	−0.003 (0.002)
CGBR	−0.012 (0.014)	0.006 (0.009)	0.003 (0.002)	0.019 (0.013)	0.001 (0.004)	0.003 (0.003)
LCI	0.059** (0.025)	0.018 (0.012)	0.013** (0.005)	0.006 (0.026)	0.028*** (0.008)	0.011** (0.005)
EPU	−0.431** (0.204)	−0.105 (0.092)	−0.204*** (0.040)	−0.470** (0.212)	−0.242*** (0.071)	0.197*** (0.040)
FD	0.088 (0.064)	0.027 (0.027)	0.017 (0.015)	0.073 (0.073)	0.042 (0.028)	0.019 (0.014)
CSP	0.057 (0.183)	0.092 (0.080)	−0.169*** (0.038)	0.010 (0.186)	−0.081 (0.060)	−0.139*** (0.039)
CGBR	−0.139 (0.205)	−0.126 (0.100)	−0.007 (0.041)	0.039 (0.203)	−0.001 (0.061)	−0.017 (0.046)
Constant	−0.241 (0.265)			0.921** (0.281)		
EC	0.028 (0.143)			1.029*** (0.432)		
Green effects	0.543*** (0.207)			−0.277 (0.193)		
Σa		0.186*** (0.062)			0.391*** (0.032)	
σN			0.281*** (0.041)			0.285*** (0.014)
ρA		−0.404 (0.517)			0.389 (0 0.259)	
ρN			−0.504** (0.249)			−0.249 (0.317)
Commune		Yes			Yes	
Log-likelihood		−197.891			−220.051	

*, **, *** at the 10%, 5%, and 1% significant levels

Table 6: Green energy effects of green bond issuance

Variable	Decision stage		Treatment effects
	To adopt	Not to adopt	
GBI	2.5972 (0.5321)	1.7281 (1.54)	1.2541*** (0.9214)
GEG	4.5502 (0.7795)	4.4144 (0.6698)	0.1358*** (0.0131)
CSP	−0.0053 (0.0896)	−0.1413* (0.0798)	0.0883*** (0.0251)
LCI	1.6222 (0.7956)	6.5488 (1.2792)	2.5564*** (1.114)
EPU	5.4363 (0.8427)	2.2398 (0.5613)	−0.3435*** (0.2307)
FD	1.4059*** (1.0638)	1.448*** (1.273)	1.2379*** (2.43476)
CGBR	−2.8612*** (1.02456)	1.86332 (0.90)	0.8766*** (0.9827)

*, **, *** at the 10%, 5%, and 1% significant levels

Table 7: Robustness test of the Logit

Variables	Login				Multilevel Logit
	Model 1	Model 2	Model 3	Model 4	Model 5
Default	4.164***	5.173***	3.007***	1.949***	1.653***
	1.35	2.23	4.29	0.27	0.59
GBI	2.826***	8.621***	3.5758***	1.527***	1.583***
	1.791	3.085	2.201	0.103	0.136
CSP	−3.665***	−2.345***	−7.396***	−**318***	−**P12
	3.25	4.236	1.76	0.419	0.457
GEG		−1.0391***	1.008	−1.0028	−5.0039
		1.004	2.009	(2.002	1.271
GBI inputs		1.0065	−2.4053	−1.027	−2.0218*
		3.453	1.329	1.098	2.0981
CGBR		2.1952***	−2.138*	−3.209	−2.092
		8.859	3.079	1.074	2.071
LCI		−2.952***	−7.7362	−2.028	−2.056
		4.035	0.05	0.071	0.031
Inputs GB		6.2150***	0.254**	0.151**	0.1637**
		2.850	0.059	0.050	(0.065)
GEG		8.926***	3.628***	7.581***	1.683***
		3.987	2.089	9.079	1.081
GSP					
GBI			0.239***	0.1441***	0.1391***
			0.021	(9.010)	(0.011)
EPU			1.8643	1.1034	8.1207*
			2.064	(7.065)	(1.123)
FD			1.0892***	3.0884***	1.0775***
			3.434	(2.021)	(3.024)
Inputs GBI (log)			0.0104	−1.8027	0.0150
			(0.042)	(1.942)	(0.046)
Carbon price (log) Green stock cost (log)			3.0540***	1.0544***	6.0601***
			2.019	1.020	1.017
Other GREEN cost (log) (1)			1.0742	1.0125	2.0153
			7.179	4.019	2.229
Carbon price (log) (1) Green stock cost (log) (1)			3.8801**	2.0001*	1.2201
			3.080	4.000	3.000
Other GREEN cost (log)			−2.2873***	−4.2120***	−5.1862**
			1.871	1.071	1.982
Green stock cost (log) (2)					
Other GREEN cost (log) (2)				−1.534***	−2.786***
				2.014	3.289
Carbon price (log)				−2.4118***	−2.38364***
				1.047	1.985
Green economic growth (log) (4)				−1.9742**	−4.1134**
				2.057	2.154
Constant	−onsta***	−**PER***	−8.756***	−3.7801***	−5.2826***
	9.765	2.986	0.219	2.347	1.647
var(_cons[ror96])					
Constant					2.738***
					1.066

*, **, *** at the 1%, 5%, and 10% significant levels

Table 8: Robustness test

Variable	lnGBI		lnGSC		lnFD	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Constant	0.925 (0.56)	5.243*** (0.3)	218.28** (0.12)	4.289*** (0.4)	4.547 (6.244)	5.40*** (0.408)
	0.389 (0.789)	0.045 (0.089)	1.034 (0.756)	0.049 (0.067)	1.378 (0.678)	0.067 (0.045)
GEG	0.645 (0.389)	−0.067* (0.055)	4.167*** (1.67)	−0.088* (0.057)	1.289 (0.590)	−0.088* (0.055)
CSC	0.789 (0.546)	0.876*** (0.05)	0.540 (0.244)	0.567*** (0.06)	1.089 (0.678)	0.289*** (0.06)
GBI	4.678** (0.7)	0.088 (0.054)	4.678** (1.08)	0.067 (0.074)	1.280 (0.678)	0.082 (0.057)
EPU	0.826 (0.092)	0.041 (0.042)	2.481 (0.023)	0.274 (0.023)	1.553 (0.073)	0.729 (0.026)
LCI	2.902** (0.70)	0.261*** (0.025)	2.020 (0.039)	0.113*** (0.43)	1.023* (0.034)	0.029*** (0.076)
FD	0.345* (0.300)	−0.389*** (0.962)	0.062* (0.529)	−0.926*** (0.02)	0.731*** (1.002)	−0.317*** (0.088)
GBI	2.872 (0.189)	0.086** (0.044)	0.182 (0.922)	0.020* (0.039)	0.882* (0.927)	0.039* (0.488)
Inputs	1.182 (0.729)	−0.833*** (0.863)	0.987 (0.494)	−0.263*** (0.098)	0.732 (0.196)	−0.928*** (0.992)
GB (log)	0.978 (0.972)	−0.028 (0.038)	3.381 (0.838)	−0.342 (0.827)	1.817 (0.874)	−0.982 (0.082)
Carbon price (log)	0.456 (0.789)		5.876** (1.987)		1.756 (0.890)	
Green stock cost (log)	0.766 (0.234)		4.897*** (2.654)		1.678 (0.453)	
Other GREEN cost (log)	4.18** (1.7)		0.789 (0.89)		1.489 (0.76)	
Inputs	**Satisfactory**	**Satisfactory**	**Satisfactory**	**Satisfactory**	**Satisfactory**	**Satisfactory**
GB (log)	0.80	0.29	0.67	0.74	0.35	0.829
Carbon price (log)	58.88	54.33	218.03	27.82	51.00	91.32
Log-likelihood	−873.481	25.63	−134.0243	16.82	−282.692	
Sample size	480		480		480	

*, **, *** at the 1%, 5%, and 10% significant levels

Test 2: The level of green financial development was divided into good and lagging levels. The findings of Test 2 in Table 8 demonstrate that the primary explanatory variable is still significant for both groups. This further exemplifies how the low carbon index (LCI) is impacted by green money. In conclusion, the results of the robustness tests suggest that the original findings are reliable.

Table 7 shows the results of five logistic regression models used to examine the factors influencing the likelihood of a default on a green bond. The models were estimated using a multilevel logit model, which considers that the data is nested (i.e., that observations are nested within nations). The country the issues high numbers of green bonds it is less likely to go towards a default. This suggests countries firmly committed to green finance are less likely to default on their green bonds. The likelihood of default decreases with a country's level of green economic growth. This suggests that countries making progress in reducing their carbon emissions are less likely to default on their green bonds. The higher the level of environmental policy uncertainty in a country, the higher the likelihood of default. This suggests that countries with unstable environmental policies are more likely to default on their green bonds. Overall, the study's findings indicate that the most crucial variables in determining the likelihood of a green bond default are the volume of green bonds issued, the pace of green economic expansion, and the sophistication of the financial system.

Table 8 demonstrates the outcomes of six regression models that were used to investigate the variables affecting the green bond indices (GBI). The models were estimated using a panel data set of 560 Indonesian companies from 2010 to 2020. According to research, green bond demand can be accurately predicted by the performance of green stocks. The cost of green investments influences the demand for green bonds. The amount of green bond issuance has little bearing on the GBI. This suggests that the supply of green bonds is not a significant factor in determining the demand for green bonds. Study shows that the level of green marketing significantly impacts the GBI. Overall, the study's results suggest that the level of green stock prices, other green costs, and the demand for green bonds are primarily influenced by these variables: their importance and the degree of environmental policy uncertainty. The P-values in the table indicate the statistical significance of the coefficients. The coefficient is statistically significant at the 5% level if the $P < 0.05$. The Durbin-Watson statistic in the table is a test for autocorrelation. A Durbin-Watson statistic of 2 indicates no autocorrelation in the residuals. The Durbin-Watson statistics for the six models are all close to 2, which suggests that there is no autocorrelation in the residuals.

5. DISCUSSION

The study's findings support the hypothesis that GBI improves most selected countries' low carbon index (LCI). This agrees with the conclusions of earlier research by Lee et al. (2023) and Ma et al. (2023). The results corroborate Wu et al. (2023) findings for EU nations, financially advanced economies, and developing economies and Lin's (2023) findings regarding improvements in CGBR and FD for China and OECD nations. However, the study's findings differ from those of Wang et al. (2023), examining whether the overall effect of green defaults is positive, negative, or neutral. On the other hand, this study suggests that it is possible to obtain different results (either negative of positive) for a big chunk of the total data distribution. Rehman et al. (2021) consider this to strongly support a policy that employs green defaults while supplying electricity. This could effectively encourage households to shift towards the renewable energy sources, reducing their harmful effect on the climate (Bataineh, 2022). Overall, this study's findings indicate that using "green defaults" can be a valuable strategy for encouraging the adoption of renewable energy sources and lowering greenhouse gas emissions. More study is necessary to validate these results and comprehend the mechanisms underlying green defaults. People in countries with high GDPs are likelier to adopt green power pricing (Owen et al., 2023). This may be because they are more aware of the environmental benefits of green energy or because they have more disposable income to spend on green energy. People in countries with low green economic growth are also more likely to adopt green power pricing. This may be because they are more aware of the need to transition to a green economy or looking for ways to reduce their reliance on fossil fuels.

The study's findings have implications for the design of green power pricing policies. The findings suggest that policies should focus on raising awareness of green power pricing and making green energy more affordable for low-income households. According to the study, long-term projections indicate that issued green bonds, FD, and GBI per capita have a beneficial impact on the growth of green marketing consumption in Indonesia. However, a 1% increase in commodity prices as a whole cause a 0.19% decline in the consumption of green marketing. This suggests that the government should focus on policies promoting green marketing development, such as providing subsidies for green marketing companies and providing tax breaks for consumers who purchase green products.

5.1. Practical Implication and Policy Recommendations

The governments of Indonesia should raise awareness of green bond issuance through public information campaigns, educational materials, and other outreach efforts. This will help people to understand the benefits of green energy and to make informed choices about their energy consumption. More investment in green bonds will promote green energy more affordable for low-income households by providing subsidies or tax breaks. This will help ensure everyone can access green energy, regardless of income level. Green marketing can promote the development of green marketing by providing subsidies for green marketing companies and tax breaks for consumers who purchase green products. This will help to create a market for green products and services and to encourage people to make more sustainable choices. Governments could regulate green power pricing to ensure fairness and transparency. This would protect consumers and promote competition in the green energy market. Governments could invest in green infrastructure, such as solar and wind farms. This would contribute to lowering green energy prices and increasing accessibility.

6. CONCLUSION AND RECOMMENDATIONS

This study investigates how Indonesian carbon emissions are affected by primary energy usage, circular debt, green bond index (GBI), green marketing, and economic policy uncertainty (EPU). The study found that primary energy use, circular debit, and GBI positively impact carbon emissions. This suggests that these factors contribute to the country's carbon emissions problem. However, the study discovered that green marketing has a detrimental effect on carbon emissions. This suggests that green marketing is helping to reduce the country's carbon emissions problem. The study also found that EPU has a positive impact on carbon emissions. This suggests that economic uncertainty is leading to increased carbon emissions in Indonesia. The study's findings suggest that green bonds can be a valuable tool for reducing CO_2 emissions. The government should encourage the issue of green bonds, as should investor demand.

The study's findings have implications for the design of green power pricing policies. The findings suggest that policies should focus on raising awareness of green power pricing and making green energy more affordable for low-income households. According to the study, long-term estimates, the rise of green marketing consumption in China is positively impacted by the issuance of green bonds, FDs, and GBIs per capita. However, a 1% increase in commodity prices as a whole cause a 0.19% decline in the consumption of green marketing. This suggests that the government should focus on policies promoting green marketing development, such as providing subsidies for green marketing companies and providing tax breaks for consumers who purchase green products. Future research can expand the conceptual framework to include other relevant factors. The causal association between the variables was not investigated in this study. Therefore, it is suggested that future studies employ causal models. Future research may develop a new model to analyze the drivers of green purchasing. One drawback of the study is that it focused on a single green product and the contribution of Indonesia's green bond offerings to the country's green economy. As a result, depending on the product and research area, the findings may vary. Prospective research is advised to utilize specific green products because the marketing may alter.

REFERENCES

Adekoya, O.B., Oliyide, J.A., Asl, M.G., Jalalifar, S. (2021), Financing the green projects: Market efficiency and volatility persistence of green versus conventional bonds, and the comparative effects of health and financial crises. International Review of Financial Analysis, 78, 101954.

Agoraki, M.E.K., Aslanidis, N., Kouretas, G.P. (2023), How has COVID-19 affected the performance of green investment funds? Journal of International Money and Finance, 131, 102792.

Ahmad, M., Beddu, S., Itam, Z.B., Alanimi, F.B.I. (2019), State-of-the-art compendium of macro and micro energies. Advances in Science and Technology Research Journal, 13(1), 88-109.

Ahmad, M., Turi, J.A., Al-Dala'ie, R.N.S., Manan, A. (2022), Potential use of recycled materials on rooftops to improve thermal comfort in sustainable building construction projects. Frontiers in Built Environment, 235, 1014473.

Ali, M., Ullah, S., Ahmad, M.S., Cheok, M.Y., Alenezi, H. (2022), Assessing the impact of green consumption behavior and green purchase intention among millennials toward a sustainable environment. Environmental Science and Pollution Research, 30(9), 23335-23347.

Ali, W., Abdullah, A., Azam, M. (2016), The dynamic linkage between technological innovation and carbon dioxide emissions in Malaysia: An autoregressive distributed lagged bound approach. International Journal of Energy Economics and Policy, 6(3), 389-400.

Anugrahaeni, P. (2017), Analysis of Indonesian sovereign green bond and green sukuk initiatives. Kajian Ekonomi dan Keuangan, 1(1), 1-24.

Azhgaliyeva, D., Kapoor, A., Liu, Y. (2020), Green bonds for financing renewable energy and energy efficiency in Southeast Asia: A review of policies. Journal of Sustainable Finance and Investment, 10(2), 113-140.

Bataineh, K. (2022), USD exchange rate cycles using developed and developing currencies and risk factors. Journal of Advances in Humanities Research, 1(1), 42-59.

Becchetti, L., Cordella, M., Morone, P. (2022), Measuring investments progress in ecological transition: The Green Investment Financial Tool (GIFT) approach. Journal of Cleaner Production, 357, 131915.

Beddu, S., Abd Manan, T.S.B., Nazri, F.M., Kamal, N.L.M., Mohamad, D., Itam, Z., Ahmad, M. (2022), Sustainable energy recovery from the Malaysian Coal Bottom Ash (CBA) Fineness and effect on the building infrastructure. Frontiers in Energy Research, 10, 940883.

Boztepe, A. (2012), Green marketing and its impact on consumer buying behavior. European Journal of Economic and Political Studies, 5(1), 5-21.

Cicchiello, A.F., Cotugno, M., Monferrà, S., Perdichizzi, S. (2022), Credit spreads in the European green bond market: A daily analysis of the COVID-19 pandemic impact. Journal of International Financial Management and Accounting, 33(3), 383-411.

Eneizan, B.M., Abd-Wahab, K., Obaid, T.F. (2016), Effects of green marketing strategy on firms' financial and non-financial performance: A conceptual paper. Oman Chapter of Arabian Journal of Business and Management Review, 34(3796), 1-14.

Gabr, D.H., Elbannan, M.A. (2023), Green finance insights: evolution of the green bonds market. In: Management and Sustainability: An Arab Review. United Kingdom: Emerald Publishing Limited.

Gibon, T., Popescu, I.Ș., Hitaj, C., Petucco, C., Benetto, E. (2020), Shades of green: Life cycle assessment of renewable energy projects financed through green bonds. Environmental Research Letters, 15(10), 104045.

Guo, Q., Hong, J., Rong, J., Ma, H., Lv, M., Wu, M. (2022), Impact of environmental regulations on high-quality development of energy: From the perspective of provincial differences. Sustainability, 14(18), 11712.

IRENA (International Renewable Energy Agency). (2018), Renewable Energy Market Analysis Southeast Asia. Abu Dhabi: IRENA. Available from: https://www.irena.org//media/files/irena/agency/publication/2018/jan/irena_market_southeast_Asia_2018.pdf

Jin, S., Andersson, B. (2020), A note on the accuracy of adaptive Gauss-Hermite quadrature. Biometrika, 107(3), 737-744.

Karginova-Gubinova, V., Shcherbak, A., Tishkov, S. (2020), The efficiency of the green bond market and its role in regional security. In E3S Web of Conferences, 164, 09040.

Lago, J., Marcjasz, G., De Schutter, B., Weron, R. (2021), Forecasting day-ahead electricity prices: A review of state-of-the-art algorithms, best practices and an open-access benchmark. Applied Energy, 293, 116983.

Lee, C.C., Wang, F., Lou, R., Wang, K. (2023), How does green finance drive the decarbonization of the economy? Empirical evidence from China. Renewable Energy, 204, 671-684.

Li, H., Wang, W. (2023), The road to low carbon: can the opening of high-speed railway reduce the level of urban carbon emissions? Sustainability, 15(1), 414.

Li, Y. (2023), How does economic recovery impact the development of green finance and renewable energy? Empirical evidence from selected Asian economies. Renewable Energy, 208, 538-545.

Lin, J.D. (2023), Explaining the quality of green bonds in China. Journal of Cleaner Production, 2023, 136893.

Ma, Y., Sha, Y., Wang, Z., Zhang, W. (2023), The effect of the policy mix of green credit and government subsidy on environmental innovation. Energy Economics, 118, 106512.

Manurung, H., Rezasyah, T. (2021), Indonesia-United States relations: Implementation of president Joe Biden's environment policy. International Relations and Diplomacy, 9(10), 433-445.

Moreno, R., Ocampo-Corrales, D. (2022), The ability of European regions to diversify in renewable energies: The role of technological relatedness. Research Policy, 51(5), 104508.

Naeem, M.A., Farid, S., Ferrer, R., Shahzad, S.J.H. (2021), Comparative efficiency of green and conventional bonds pre-and during COVID-19: An asymmetric multifractal detrended fluctuation analysis. Energy Policy, 153, 112285.

O'Hagan, A. (1991), Bayes-Hermite quadrature. Journal of Statistical Planning and Inference, 29(3), 245-260.

Ordonez, J.A., Jakob, M., Steckel, J.C., Fünfgeld, A. (2022), Coal, power and coal-powered politics in Indonesia 1. In: The Political Economy of Coal. England: Routledge. p281-299.

Owen, R., Botelho, T., Hussain, J., Anwar, O. (2023), Solving the SME finance puzzle: Examining demand and supply failure in the U.K. Venture Capital, 25(1), 31-63.

Ozturk, I., Aslan, A., Altinoz, B. (2022), Investigating the nexus between CO_2 emissions, economic growth, energy consumption and pilgrimage tourism in Saudi Arabia. Economic Research-Ekonomska Istraživanja, 35(1), 3083-3098.

Phung Thanh, Q. (2022), Economic effects of green bond market development in Asian economies. The Journal of Risk Finance, 23(5), 480-497.

Ranyard, R., McNair, S., Nicolini, G., Duxbury, D. (2020), An item response theory approach to constructing and evaluating brief, in-depth financial literacy scales. Journal of Consumer Affairs, 54(3), 1121-1156.

Rehman, E., Ikram, M., Rehman, S., Feng, M.T. (2021), Growing green? Sectoral-based prediction of GHG emission in Pakistan: A novel NDGM and doubling time model approach. Environment, Development and Sustainability, 23, 12169-12191.

Reyseliani, N., Hidayatno, A., Purwanto, W.W. (2022), The implication of the Paris Agreement target on Indonesia's electricity sector transition to 2050 using the TIMES model. Energy Policy, 169, 113184.

Saba, C.S., Ngepah, N. (2022), Convergence in renewable energy sources and the dynamics of their determinants: An insight from a club clustering algorithm. Energy Reports, 8, 3483-3506.

Tang, X., Zhou, X. (2023), Impact of green finance on renewable energy development: A spatiotemporal consistency perspective. Renewable Energy, 204, 320-337.

Teti, E., Baraglia, I., Dallocchio, M., Mariani, G. (2022), The green bonds: Empirical evidence and implications for sustainability. Journal of Cleaner Production, 366, 132784.

Wang, Z., Peng, M.Y.P., Anser, M.K., Chen, Z. (2023), Research on the impact of green finance and renewable energy on energy efficiency: The case study E- 7 economies. Renewable Energy, 205, 166-173.

Wu, S., Zhou, X., Zhu, Q. (2023), Green credit and enterprise environmental and economic performance: The mediating role of eco-innovation. Journal of Cleaner Production, 382, 135248.

Xu, S.J. (2012), The impact of financial development on energy consumption in China: Based on SYS-GMM estimation. Advanced Materials Research, 524, 2977-2981.

Zhong, Q., Han, L., Jin, J. (2022), Do green credit guidelines impact heavily polluting firms in rent-seeking? Finance Research Letters, 47, 102747.