ISRG Journal of Multidisciplinary Studies (ISRGJMS)

ISRG PUBLISHERS
Abbreviated Key Title: isrg j. multidiscip. Stud.
ISSN: 2584-0452 (Online)
Journal homepage: https://isrgpublishers.com/isrgjms/
Volume – II Issue - VIII (August) 2024
Frequency: Monthly

The Role of Financial Development and Capital Formation in Promoting Renewable Energy in Bangladesh

Jannat Rahat Jui[1], Dr. Partho Sarathi Laskar[2*]

[1]Lecturer, Department of Economics, Mawlana Bhashani Science and Technology University, Tangail, Bangladesh-1902

[2] Corresponding author and Associate Professor, Department of Economics, Islamic University, Kushtia-7003, Bangladesh.

| **Received:** 14.08.2024 | **Accepted:** 16.08.2024 | **Published:** 30.08.2024

Abstract

Bangladesh, endowed with abundant resources, is at a crucial juncture where the potential for sustainable renewable energy use can be significantly expanded. This study examines the influence of financial development, foreign direct investment (FDI), economic growth, carbon dioxide emissions, and capital formation on renewable energy consumption in Bangladesh, using time series data from 1991 to 2020 and the ARDL bounds testing approach to cointegration. The findings show a long-term positive correlation between financial development and capital formation with renewable energy consumption, while FDI and economic growth have no significant long-term impact. Carbon dioxide emissions, however, negatively affect renewable energy consumption in both the short and long term. In the short term, capital formation and FDI also negatively impact renewable energy use, whereas financial development has a positive and significant effect. These results highlight the importance of understanding how financial development and capital formation can promote renewable energy, not only in Bangladesh but also in other developing and developed countries. To mitigate environmental harm and boost renewable energy use, it is essential to eliminate fossil fuel subsidies and implement a carbon tax on non-renewable energy. Additionally, Bangladeshi policymakers should promote green financing and increase investment in clean renewable energy projects to build a strong renewable energy economy.

Keywords: *Financial development, Environmental degradation, Renewable energy, ARDL, Bangladesh.*

Introduction

Financial development significantly impacts the adoption of renewable energy sources in Bangladesh. Research indicates a positive relationship between financial development and renewable energy consumption, suggesting that a robust financial sector

Copyright © ISRG Publishers. All rights Reserved.
DOI: 10.5281/zenodo.13590319

facilitates the financing and implementation of renewable energy projects. This is further supported by findings that highlight the role of financial institutions in promoting green energy initiatives, particularly in developing economies like Bangladesh. Moreover, the interplay between foreign direct investment (FDI) and financial development also enhances renewable energy consumption, as FDI inflows contribute to the growth of renewable energy infrastructure. However, challenges remain, as traditional financial institutions often favor carbon-intensive energy production, which can hinder the transition to renewable sources. Overall, fostering financial development, improving access to financial resources, and encouraging FDI are crucial for advancing renewable energy adoption in Bangladesh, aligning with global trends towards sustainable energy solutions.

Financial development significantly influences renewable energy investment through various mechanisms, as evidenced by multiple studies. In BRICS countries, a positive correlation exists between financial development and renewable energy consumption, with domestic credit and economic growth facilitating increased adoption of renewable sources. Conversely, in EU and ASEAN nations, traditional financial institutions often favor carbon-intensive projects, which hampers renewable energy investment, while developed capital markets positively impact green energy initiatives. In China, financial development through bank credit and bond markets is crucial for the growth of the renewable energy sector, particularly in regions with robust financial environments. Additionally, foreign direct investment (FDI) and gross capital formation are shown to enhance renewable energy consumption, although the nature of FDI can yield mixed results depending on regional contexts. Overall, while financial development can drive renewable energy investment, the effectiveness varies by region and the type of financial support available.

As the world undergoes an energy transition, the role of renewable energy is increasingly recognized as a critical element in shaping effective policy. To realign policies towards renewable energy, a robust financial structure is essential. According to the UNDP, achieving the goals of Sustainable Development Goal (SDG) 7 will require annual investments in renewable energy ranging from $442 to $650 billion, with an additional $560 billion needed to enhance energy efficiency, and $52 billion required for inclusive electrification (UNDP, 2021). However, the global energy transition is facing significant challenges due to a persistent annual funding gap. One of the primary reasons for this gap is the financial risk associated with renewable energy projects. To mitigate these risks, public financial interventions through local financial institutions and external funding sources are necessary (UNDP, 2019).

Despite the declining costs of research and deployment, investment in renewable energy projects continues to fall short of expectations. The International Renewable Energy Agency's (IRENA) 2016 Renewable Energy Investment Assessment Report highlights that risks such as political and regulatory uncertainties, transmission losses, currency fluctuations, refinancing difficulties, and liquidity issues disrupt the flow of finance into renewable energy projects. These risks deter private sector investment in renewable energy production. To address this, policymakers must take action to mitigate these risks and restore investor confidence.

The United States Agency for International Development's (USAID) Scaling Up Renewable Energy (SURE) program has played a significant role in addressing these challenges in Bangladesh. By collaborating with 61 institutions, SURE addressed various clean energy issues, produced four white papers that guided the development and implementation of renewable energy projects, and trained 153 individuals in this field. SURE also worked closely with regulators and the Bangladesh Ministry of Power, Energy, and Mineral Resources to create favorable conditions for renewable energy success. Through the adoption of supportive laws and regulations, the Bangladeshi government was able to facilitate the integration of variable renewable energy sources and attract private investment. USAID's efforts under the SURE program accelerated Bangladesh's transition to clean energy, helping the government reduce greenhouse gas emissions while reaping the social and economic benefits of renewable energy (USAID, 2022).

The proportion of energy from renewable sources relative to the total gross inland energy consumption for a given calendar year is termed renewable energy consumption. This is calculated by summing up the gross domestic consumption of renewable energy (IEA, 2013). Renewable energy refers to energy derived from natural resources that replenish faster than they are consumed, such as solar and wind energy. These resources are abundant and constantly renewed. In contrast, fossil fuels like coal, oil, and gas, which take millions of years to form, are non-renewable. When fossil fuels are used for energy, they emit harmful greenhouse gases like carbon dioxide. Common sources of renewable energy include solar, geothermal, wind, hydropower, ocean energy, and bioenergy (biomass), according to the United Nations. In Bangladesh, the most prevalent renewable energy sources are hydroelectric power, biogas, solar, and wind energy.

The Karnaphuli Hydro Power Station, which generates 230 MW of electricity, is currently the only hydroelectric power plant in Bangladesh. Renewable energy is a promising sector for the country, which ranks among the top 20 economies in terms of GDP growth, as noted by the World Bank. To meet the Sustainable Development Goals (SDGs) by 2030 and achieve advanced nation status by 2041, Bangladesh must increase energy consumption while simultaneously reducing CO_2 emissions. Given that Bangladesh is also highly vulnerable to climate change, renewable energy could play a vital role in maintaining economic growth and environmental protection. The Bangladesh Institute of Governance and Management (BIGM) has found statistically significant positive correlations between GDP, non-renewable energy, and CO_2 emissions, whereas the correlation with renewable energy is negative. Econometric analysis suggests that a 1% increase in the use of non-renewable energy leads to a more than 0.75% increase in CO_2 emissions.

Bangladesh's renewable energy policy, which is relatively recent, began with the policy strategies released by the Ministry of Power, Energy, and Mineral Resources in 2008. The country has made slow but steady progress up to 2022. The slow pace is partly due to natural challenges such as limited land availability and low solar and wind potential, along with other obstacles like lengthy land acquisition processes, high equipment costs, potential project cancellations, and delays in project approvals. Additionally, renewable energy has high initial costs and slow utilization rates. Therefore, there is a need to encourage the government to invest more in renewable energy sources and modern equipment to ensure efficient energy production.

Adopting alternative energy consumption practices will be crucial for environmental sustainability and could inspire further

Copyright © ISRG Publishers. All rights Reserved.
DOI: 10.5281/zenodo.13590319

exploration of new energy solutions. Consequently, further research into energy parameters is needed to set standards for sustainable energy consumption, which will require international investment (Sharmin, 2022).

Bangladesh still has significant potential to reduce CO2 emissions by switching from non-renewable to renewable energy sources. However, as shown in Figure 1, the country has not increased the share of renewable energy in its total energy consumption over the past 30 years and still lags behind the levels seen in the 1990s. This decline in renewable energy consumption could be due to various internal and external challenges facing Bangladesh. The heavy reliance on non-renewable energy sources is harming the environment and delaying investments in renewable energy. In this context, Renewable Energy Certificates (REC) are crucial for environmental protection and achieving sustainable economic growth. This study examines the impact of economic growth, foreign direct investment, carbon dioxide emissions, capital formation related to renewable energy projects, and financial development on renewable energy consumption in emerging countries like Bangladesh between 1991 and 2020. Unlike most previous research, which focused on the effects of financial development, carbon dioxide emissions, economic growth, and foreign direct investment, this study includes capital formation as a variable. Using the ARDL technique, the study will explore how these factors influence renewable energy consumption in Bangladesh.

The ARDL bound testing approach to cointegration will be used to study the long- and short-run interactions among economic growth, FDI, financial development, carbon dioxide emission, capital formation, and use of renewable energy during the period from 1991 to 2020.

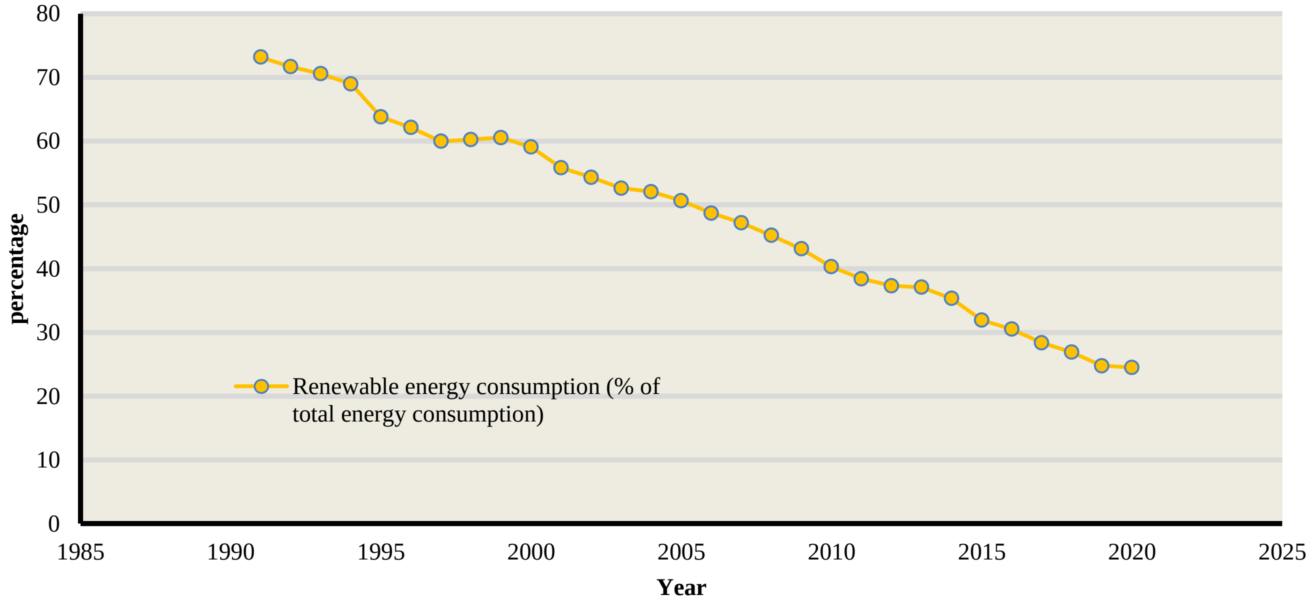


Figure 1: Renewable energy consumption (% of total final energy consumption) over the period from 1991 to 2020. (World Development Indicator, 2022).

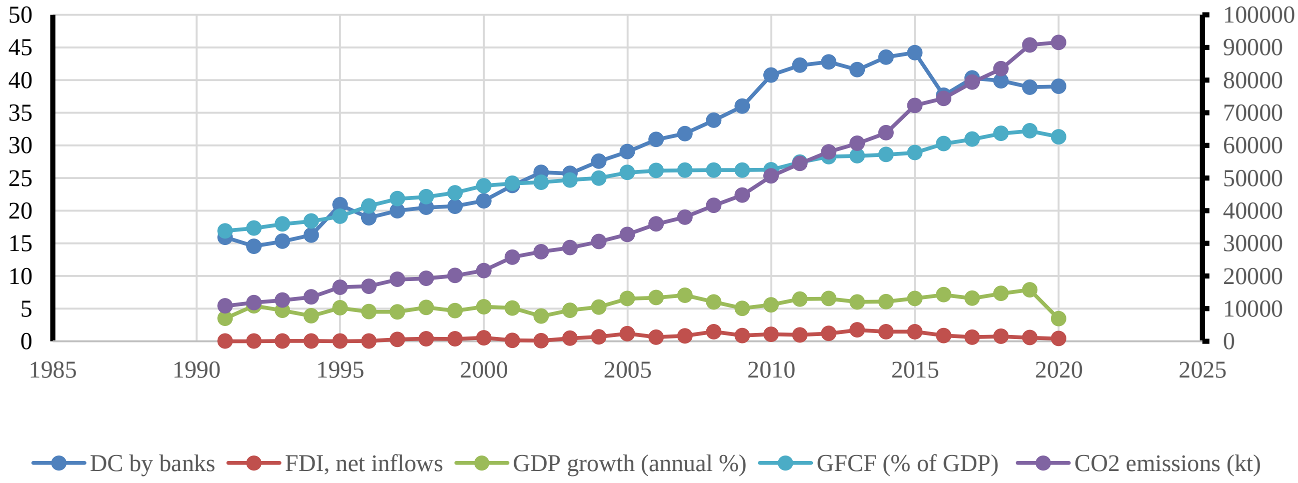


Figure 2: Trend of five indicators of renewable energy

Copyright © ISRG Publishers. All rights Reserved.
DOI: 10.5281/zenodo.13590319

This study aims to contribute to the existing literature in several significant ways. Firstly, it seeks to be a pioneering investigation into how various factors influence the consumption of renewable energy. Unlike previous studies, this research introduces crucial variables to provide a broader perspective on how these factors impact renewable energy usage within the framework of environmental regulations and constraints in emerging economies like Bangladesh. By exploring the interconnectedness of energy, economic growth, and environmental sustainability, this study addresses gaps left by earlier research, where such relationships were often overlooked. The inclusion of new variables is intended to mitigate the bias typically associated with omitted variables, thereby offering a more comprehensive analysis. Policymakers can use the insights gained from examining the relationships between specific variables and renewable energy consumption to develop energy policies that improve energy security and environmental quality.

The study employs the Autoregressive Distributed Lag (ARDL) bound testing approach to cointegration to examine the existence of short-run and long-run equilibrium relationships. This method is beneficial in avoiding issues such as serial correlation, heteroscedasticity, specification errors, and abnormality, and it also facilitates forecasting future stable relationships through CUSUM and CUSUM square tests.

By applying advanced time series data methodologies, this study offers a thorough analysis of the dynamic relationships between CO2 emissions, GDP, capital formation, foreign direct investment, financial development, and renewable energy consumption in developing economies. It is widely recognized that economic growth tends to increase energy consumption. However, emerging nations face pressure to boost their renewable energy consumption, often without sufficient capital for renewable energy projects, while also being subject to international demands to reduce CO2 emissions. In this context, the study seeks to fill existing research gaps by employing alternative empirical methods. For instance, it aims to explore the nuanced relationship between capital formation and the demand for renewable energy, and how reducing CO2 emissions can enhance renewable energy consumption through the development of relevant policies—insights that could be valuable for policymakers.

Previous research often neglected the role of capital formation specifically related to renewable energy projects, typically following the "conventional approach," which does not fully address the bias introduced by omitted variables. This study, however, incorporates capital formation based on renewable energy projects. According to this perspective, the development of renewable energy infrastructure in Bangladesh can lead to the creation of new green jobs, which would help meet increasing energy demands, reduce unemployment, and promote a shift towards renewable energy sources. This shift is essential as reliance on non-renewable energy is costly and detrimental to both human health and the environment. Consequently, by reducing the costs associated with energy consumption and increasing the use of renewable sources, Bangladesh can enhance its renewable energy consumption more effectively than before.

Moreover, Bangladesh's commitment to renewable energy, driven by international pressure and the need to address environmental challenges, underlines the importance of this research. The findings of this study are expected to offer valuable insights into the economic conditions and favorable environment that promote the demand for and adoption of renewable energy sources.

Research gap

This succinct assessment of the literature reveals that research have generally pinpointed different factors that influence the production and consumption of renewable energy. There is a policy gap in the scholarly literature about risk mitigation for renewable energy project funding, unfortunately. Even though studies have examined the connections between financial development, foreign direct investment, economic growth, and the use of renewable energy sources, questions about how these factors relate to risk management still exist. And none of those studies specifically looked into the effects of capital formation based on the use of renewable energy. This study addresses this research gap by recommending capital formation based on renewable energy project by isolating the long-run and short-run effects on renewable energy consumption and this study also investigate the environmental degradation impact on renewable energy consumption. This study addresses this research gap by recommending capital formation based on renewable energy project by isolating the long-run and short-run effects on renewable energy consumption and this study also investigate the impact of environmental degradation on renewable energy consumption. In a few research, it was discovered that there is a weak negative correlation between carbon dioxide emissions and the demand for renewable energy. But by utilizing the ARDL framework to demonstrate the short- and long-term effects of carbon dioxide emissions on the use of renewable energy in Bangladesh, this study has filled the knowledge vacuum.

Objective of the study

Bangladesh is a resource-rich but impoverished developing nation. However, these assets are being wasted. In this nation, the consumption of non-renewable energy sources like fossil fuels and natural gas is rising daily, which contributes to environmental damage like the release of greenhouse gases. The environment is not well-served by carbon dioxide emissions. The growth of the financial sector, the creation of capital based on renewable energy projects, and foreign direct investment all contribute to an increase in the use of renewable energy. To increase the use of renewable energy in Bangladesh, the government must take immediate action. This includes granting domestic credit to the private sector which is a component of financial development, raising public awareness, developing methods to reduce carbon dioxide emissions, and raising capital to fund renewable energy projects. The ARDL bound testing approach to cointegration will be used to study the long- and short-run interactions among economic growth, FDI, financial development, carbon dioxide emission, capital formation, and use of renewable energy during the period from 1991 to 2020.

In particular, the study will use an ARDL technique to investigate how foreign direct investment, financial development, economic growth, and carbon dioxide emissions affect the use of renewable energy in Bangladesh.

Relevant literature review

Financial development and Renewable energy consumption

The relationship between financial development and renewable energy adoption has been extensively explored in academic literature, revealing a complex interplay between economic growth, energy consumption, and investment in sustainable

Copyright © ISRG Publishers. All rights Reserved.
DOI: 10.5281/zenodo.13590319

resources. Financial development plays a crucial role in fostering renewable energy initiatives, which can reduce reliance on fossil fuels and promote the use of cleaner energy sources. This positive impact is supported by various studies, including Riti et al. (2017) and Wu & Broadstock (2015), who highlight how financial development leads to an increase in renewable energy usage. Zeren & Mustafa (2014) further demonstrate a reciprocal relationship between financial progress and renewable energy use, showing that advancements in finance can stimulate renewable energy consumption and vice versa.

Additional research from Japan, conducted by Rafindadi and Ozturk (2016), confirms that financial development positively influences renewable energy adoption. Similarly, Anton & Nucu (2020) and Koengkan et al. (2020) find that financial transparency and openness contribute to long-term investments in renewable energy. However, some studies suggest a different perspective, arguing that financial development may favor fossil fuels over renewables due to lower costs and established infrastructure. For example, research by Omri (2014) and Sadorsky (2010) indicates that financial growth can sometimes lead to increased fossil fuel consumption, thereby hindering the transition to renewable energy.

The debate extends to the broader economic impact of energy consumption, with studies by Shahbaz et al. (2013) and Rafindadi (2016) showing that financial market development can drive productivity and energy demand, further complicating the relationship between financial progress and renewable energy. In Turkey, Dumrul (2018) observed a positive correlation between financial development and energy use, while Brunnschweiler (2010) found a strong link between economic growth and renewable energy adoption in non-OECD countries. Despite the nuanced findings, the overall consensus is that financial development has the potential to support renewable energy, but its effects can vary depending on specific economic and policy contexts.

Carbon dioxide emission and Renewable energy consumption

The study hypothesizes that reducing carbon dioxide (CO_2) emissions will lead to an increase in renewable energy consumption, aligning with the findings of Paramati et al. (2016). Various researchers, including Rafique (2021), Menegaki (2011), Salim (2012), and Sbia et al. (2014), have observed that CO_2 emissions negatively impact the demand for renewable energy. Irandoust (2016) explored the relationship between CO_2 emissions and renewable energy in Nordic countries, finding that in Denmark and Finland, renewable energy usage reduces CO_2 emissions, while in Sweden and Norway, the relationship is bidirectional. Assi et al. (2021), analyzing data from 1998 to 2018, confirmed a negative correlation between environmental pollution and renewable energy consumption. The World Bank (2021) noted that Turkey, with one of the fastest-growing rates of greenhouse gas emissions, has significant potential to reduce CO_2 emissions by shifting to renewable energy. Bhattacharya et al. (2016) and Lu (2017) further emphasize that lower CO_2 emissions contribute to cleaner environments and more sustainable energy systems, as countries increasingly transition to renewable energy. Omri and Nguyen (2014) highlight that renewable energy, by providing clean energy, can effectively reduce CO_2 emissions.

Capital formation and Renewable energy consumption

The study hypothesizes that capital formation increases renewable energy consumption. Rafindadi & Mika'Ilu (2019) and Paramati et al. (2017) examined how domestic and foreign capital influenced sustainable energy development in the EU, G20, and OECD countries from 1993 to 2012, finding that both types of capital support clean energy use. However, earlier studies have not thoroughly explored the connection between capital formation and renewable energy consumption. This study aims to fill that gap by examining how capital formation from renewable energy projects influences energy consumption, using more advanced econometric methods to yield reliable results with policy implications.

Additionally, the study hypothesizes that foreign direct investment (FDI) increases renewable energy consumption. While Lin et al. (2016) found that FDI decreased renewable energy consumption in China, other studies, like Mielnik and Goldemberg (2002), showed that FDI can reduce energy intensity in emerging economies. Contradictory findings by Antweiler et al. (2001) suggest that FDI impacts domestic production but not energy intensity. Cole (2006) noted that FDI's impact on energy consumption varies by country due to economic differences. Some research, like Hubler (2009) and Lee (2013), found that FDI promotes energy efficiency and clean energy use. More recent studies, such as Kilicarslan (2019) and Yahya & Rafiq (2019), have shown mixed results, with FDI both positively and negatively affecting renewable energy consumption depending on the context. Overall, the relationship between FDI and renewable energy is complex, with both positive and negative effects observed across different regions and time periods.

Economic growth and Renewable energy consumption

The study hypothesizes that economic growth increases renewable energy consumption. Gozgor et al. (2020) found that higher economic growth in OECD countries boosts renewable energy usage. However, findings vary across regions. For instance, Maji (2015) noted a short-term negligible and long-term negative relationship between economic growth and renewable energy in Nigeria. Tiwari (2011) found that increases in renewable energy significantly impact GDP, while Fuinhas and Marques (2012) identified a bidirectional causal link between growth and energy consumption in Southern Europe.

Other studies offer mixed results: Soytas et al. (2007) found no relationship between energy use and income in the USA, while Assi et al. (2021) reported a negative correlation between GDP per capita and renewable energy use. Lin et al. (2014) and Sadorsky (2009) demonstrated a bidirectional relationship, showing that economic growth can both drive and be driven by renewable energy adoption in developing nations.

Conversely, some research suggests that economic growth may actually increase fossil fuel demand, reducing renewable energy use. Shahbaz (2017) and Abdouli (2017) found that higher economic growth leads to greater fossil fuel consumption. Similarly, Ocal (2013) and Menegaki (2011) observed no significant correlation between renewable energy use and GDP, while Yoo (2006) and Yildirim (2012) reported mixed causal relationships between different energy types and economic growth.

Overall, the relationship between economic growth and renewable energy is complex. While growth can promote renewable energy adoption, it may also increase reliance on fossil fuels, particularly in industrial sectors. The impact of economic growth on energy use varies depending on regional, economic, and sectoral contexts.

Copyright © ISRG Publishers. All rights Reserved.
DOI: 10.5281/zenodo.13590319

Methodological framework

We implement the ARDL bound test cointegration strategy from the literature reviews that were based on the Autoregressive Distributed Lag approach since it has many benefits and it cannot break the periodicity or flexibility. It is dynamic and has an error correction model (ECM) that is derivable from the ARDL bounds testing using just a straightforward linear transformation.

This study will examine how consumption of renewable energy is impacted by financial development, economic growth, carbon dioxide emissions, foreign direct investment, and capital formation based on renewable energy projects. This study will use five independent variables and one dependent variable.

Definition of variables:

Renewable energy consumption (REC): This study will use Renewable Energy Consumption (% of total final energy consumption) as variable from World bank data. Renewable energy consumption is the share of renewable energy in overall final energy consumption.

Economic growth (EG): This study will use GDP growth (annual %) as variable from World bank data. The annual average rate of change of the gross domestic product (GDP) at market price based on constant local currency, for a given national economy, during a specified period of time.

Domestic credit to private sectors (DCB): This study will use Domestic credit to private sectors by banks (% of GDP) as variable from World bank data. It refers to financial resources provided to the private sector by other depository corporations (deposit taking corporations except central banks)

Foreign direct investment (FDI): This study will use Foreign direct investment (% of GDP) as variable from World bank data. Foreign direct investment is the net inflows of investment meant to acquire a prolonged managerial interest (up to 10% or more of voting stock) in an enterprise operating in an economy other than the investor.

Carbon dioxide emission (CO2): This study will use Carbon dioxide emissions (metric tons per capita) as variable from World bank data. It is used as a measure for environmental degradation.

Gross Fixed capital formation (GFCF): This study will use Gorss fixed capital formation (% of GDP) as variable from World bank data. It is the variable of the capital of the country over the period. It provides a financial support such as the building of different infrastructure based on renewable energy project.

Estimation strategy:

Unit root test: These series splits have univariate integration qualities that can be used to validate the degree; this work used tests for unit root stationarity. The ideal test to establish the presence of a unit root is the augmented Dickey-Fuller (ADF). In this study, the ADF test was applied. At certain level of confidence, the hypothesis that there is a unit root is strongly rejected the more negative it is.

Lag length selection: By adding all of our variables in non-difference data, a vector auto regression (VAR) model is estimated, which is the method used most frequently to determine the ideal lag duration. This VAR model should be estimated for a significant number of lags before being reduced by re-estimating the model for each subsequent lag until zero lags are reached. The study examines the values of the Schwar information criterion (SIC) and the Akaike information criterion (AIC) for that model. The model with the ideal lag length is the one that minimizes the AIC and SIC.

Cointegration analysis: The Pesaran et al. ARDL method tests will be used in this study to measure co-integration. Because the ARDL bounds test approach has numerous significant advantages over other tests that have been demonstrated by Monte Carlo evidence, it is preferred over other typical co-integration tests. The estimations exhibit favorable small example features and the ARDL technique effectively adjusts for any explanatory variable endogeneity. Another notable benefit of ARDL techniques is that they can eliminate unit root pre-testing issues because the test can be applied whether the series are I(0), I(1) or a combination of both. The short-run and long-run relationships can be estimated simultaneously in this way. In this case, applying the ARDL technique to cointegration will produce accurate and reliable predictions. The Autoregressive Distributed Lag (ARDL) technique to cointegration, in contrast to the Johansen and Juselius(1990) cointegration procedure, aids in locating the cointegrating vector (s). That is, a single long-term relationship equation can be written for each of the underlying variables. The ARDL model of the cointegrating vector is reparameterized into ECM if only one cointegrating vector (i.e., the underlying equation) is found. The reparameterized result provides the long-run relationship of the variables in a single model as well as short-run dynamics (i.e., regular ARDL). The ARDL is a dynamic single model equation and has the same form as the ECM, making re-parameterization possible. However, the approach developed by Johansen and Juselius (1990) can be used when there are several cointegrating vectors.

Diagnostic tests: Stability and diagnostic tests are also carried out to confirm the model's fitness; the diagnostic test looks at the serial correlation, functional form, normality, and heteroscedasticity related to the chosen model.

Heteroscedasticity testing: There are various types of methods to determine the heteroscedasticity of our data. This study will use Breusch-Pagan test as a method for heteroscedasticity testing. A more complete theoretical procedure explanation of Breusch-Pagan test can be seen here. This test uses two hypothetical assumptions:

- H_0 (Null Hypothesis): Homoscedasticity is present (the residuals are distributed with equal variance)
- H_1 (Alternative Hypothesis): Heteroscedasticity is present (the residuals are not distributed with equal variance)

If the p-value of the test results is smaller than alpha (significance level) then we can reject H_0 and conclude that the data is heteroscedastic. We will use 0.05 as the significance level parameter.

If the p-value of the test results is smaller than alpha (significance level) then we can reject H_0 and conclude that the data is heteroscedastic. We will use 0.05 as the significance level parameter.

Serial Correlation test: The Breusch–Godfrey serial correlation LM test is a test for autocorrelation in the errors in a regression model. It makes use of the residuals from the model being considered in a regression analysis, and a test statistic is derived from these. The null hypothesis is that there is no serial correlation of any order up to p.

Copyright © ISRG Publishers. All rights Reserved.
DOI: 10.5281/zenodo.13590319

Normality test: The normality tests are used to identify whether a data set is well-modeled by a normal distribution or to figure out how likely a related random variable is to be normally distributed. The aim of this test was to test whether the residuals are normally distributed or not. The hypotheses testing for the normality are as follow:

Null hypothesis (H_0): the residuals are normally distributed

Alternative hypothesis (H_1): the residuals are not normally distributed

Ramsey Reset test: Ramsey Regression Equation Specification Error Test (RESET) test (Ramsey, 1969) is a general specification test for the linear regression model. More specifically, it tests whether non-linear combinations of the fitted values help explain the response variable. The intuition behind the test is that if non-linear combinations of the explanatory variables have any power in explaining the response variable, the model is mis-specified. The hypotheses testing for the RESET Test are as follow:

Null hypothesis (H_0): Model is not mis-specified.

Alternative hypothesis (H_1): Model is mis-specified.

Research Design
This study uses annualized secondary time series data for the 30 years period from 1991 to 2020 from the World Bank dataset of global development indicators. Based on past study and data availability, the variables and years analyzed were chosen. In this study, we have used five independent variables and one dependent variable.

For data analysis in this study, E-views software has been used.

The purpose of this research is to look into the influence of economic growth, foreign direct investment, and financial sector expansion on REC in Bangladesh. The general form of Renewable energy consumption model is created as following:

$REC_t = f(EG_t, FDI_t, DCB_t, GFCF_t, CO_2)$ (1)

The following is the tested model for economic growth, financial sector development, FDI, Capital formation and REC in Bangladesh:

$\ln REC_t = \beta_0 + \beta_1 \ln EG_t + \beta_2 \ln FDI_t + \beta_3 \ln DCB_t + \beta_4 \ln GFCF_t + \beta_5 \ln CO2_t + \varepsilon_t$ (2)

In Equation (2), the REC is the percentage of the renewable energy consumption from the total nonrenewable energy consumption; the EG is the Bnagladesh's GDP growth (annual %); DCB is the credits provided by the banks to the private sector as a percentage of the GDP; FDI is the foreign direct investment; GFCF is the gross fixed capital formation as a percentage of GDP; CO_2 is the carbon dioxide emissions which is used as environmental degradation. The natural log was used to convert all of the tested series.

Estimation strategy:

Unit root test: The ideal test to establish the presence of a unit root is the augmented Dickey-Fuller (ADF). In this study, the ADF test will be applied. For example, ADF test consists of estimating the following regression:

$\Delta Y_t = \beta_1 + \beta_2 + \delta Y_{t-1} + \alpha_i \sum_{i=1}^{m} \Delta Y_{t-I} + \varepsilon_t$ (3)

Lag length selection: The study examines the values of the Schwar information criterion (SIC) and the Akaike information criterion (AIC) for that model. The model with the ideal lag length is the one that minimizes the AIC and SIC.

Cointegration analysis: The conditional ARDL model is specified in the following manner to carry out the bound test for co-integration:

$\Delta \ln REC_t = \alpha_0 + \sum_{i=1}^{p} \beta_{1i} \Delta \ln REC_{t-i} + \sum_{i=1}^{q} \beta_{2i} \Delta \ln EG_{t-i} + \sum_{i=1}^{q} \beta_{3i} \Delta \ln FDI_{t-i} + \sum_{i=1}^{q} \beta_{4i} \Delta \ln DCB_{t-i} + \sum_{i=1}^{q} \beta_{5i} \Delta \ln GFCF_{t-i} + \sum_{i=1}^{q} \beta_{6i} \Delta \ln CO2_{t-i} + \gamma_1 \ln REC_{t-1} + \gamma_2 \ln EG_{t-1} + \gamma_3 \ln FDI_{t-1} + \gamma_4 \ln DCB_{t-1} + \gamma_5 \ln GFCF_{t-1} + \gamma_6 \ln CO2_{t-1} + \varepsilon_t$ (4)

In equation (3), p denotes the lag length for dependent variables, q denotes lag length for independent variables, Δ indicates the first difference of those variables. The coefficient values of β_1 to β_6 represent short-run dynamics while γ_1 to γ_6 represent long-run effect. ε_t is the white noise error term. The hypothesis that the coefficients of the lag level variables are zero is to be tested.

The null of non-existence of the long-run relationship is defined by;

Ho: $\gamma_1 = \gamma_2 = \gamma_3 = \gamma_4 = \gamma_5 = \gamma_6 = 0$ (i.e. the long run relationship does not exist)

H1: $\gamma_1 \neq \gamma_2 \neq \gamma_3 \neq \gamma_4 \neq \gamma_5 \neq \gamma_6 \neq 0$ (i.e. the long run relationship exists)

A comparison is made between the computed F-statistics value and two sets of critical values provided by Pesaran et al (2001). One set considers all variables to be I (0), while the other set considers them to be I (1). Regardless of whether the variable is I(0) or I (1), the null hypothesis of no cointegration would be rejected if the estimated F State exceeds the upper critical value. The null hypothesis of no cointegration cannot be ruled out if it is below the lower number. The test is inconclusive if it falls inside the crucial value band. The researchers may need to perform unit root tests on variables entered into the model at this stage of the estimating procedure (Pesaran and Pesaran 1997).

In the second stage, the researchers use the chosen ARDL model to estimate the long-term association using AIC or SIC. There is an error correction representation when there is a long-term link between the variables. Therefore, in the third stage, the following error correction model (ECM) is estimated:

$\Delta \ln REC_i = \alpha_0 + \sum_{i=1}^{p} \delta_{1i} \Delta \ln REC_{t-i} + \sum_{i=1}^{q} \delta_{2i} \Delta \ln EG_{t-i} + \sum_{i=1}^{q} \delta_{3i} \Delta \ln FDI_{t-i} + \sum_{i=1}^{q} \delta_{4i} \Delta \ln DCB_{t-i} + \sum_{i=1}^{q} \delta_{5i} \Delta \ln GFCF_{t-i} + \sum_{i=1}^{q} \delta_{6i} \Delta \ln CO2_{t-i} + \Theta ECM_{t-1} + e_t$ (5)

In equation (4), coefficients δ1 to δ6 represent the short-run dynamics, while the Error Correction Mechanism (ϴ) indicates the adjustment towards long-run equilibrium after a short-run shock. The Wald test evaluates whether the independent variables significantly influence the dependent variable by testing the joint significance of the coefficients. If the p-value is less than 0.05, the variables are considered statistically significant.The null hypothesis states there is no causality among the independent variables, while the alternative suggests causality exists. A larger test statistic increases the likelihood of rejecting the null hypothesis.

Diagnostic and stability tests ensure the model's validity. The CUSUM and CUSUMSQ stability tests check for coefficient stability, with the null hypothesis of stability not being rejected if the plots remain within the 5% significance boundaries.

Copyright © ISRG Publishers. All rights Reserved.
DOI: 10.5281/zenodo.13590319

Methodology structure:

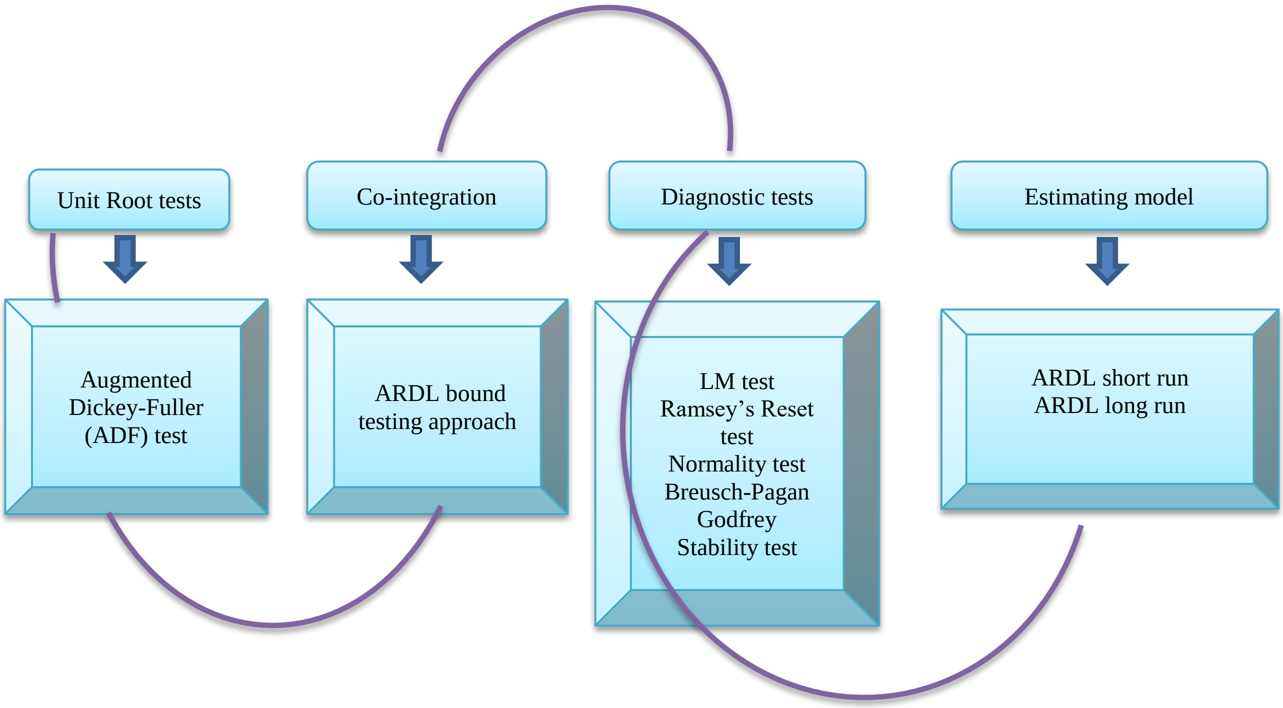


Figure 2: The structure of methodology

Results Analysis and Discussion

Table 2 presents descriptive information of 30 observations for the time series variables used in this study. It demonstrates that the majority of the variables have changed significantly over time. Gross Domestic Product (GDP), for instance, goes from a low of 1.24 to a high of 2.06. Gross Fixed Capital Formation (GFCF), which ranges from 2.83 to 3.47, is similar. The study's observations supported the moderate degree of variability among the variables. For instance, the LNREC has a mean of 3.83 and a standard deviation of 0.33. The mean and median values for carbon dioxide emissions are the greatest. The variable with the biggest standard deviation is foreign direct investment. The analysis is completed by applying the logarithmic transformation to all variables.

Table 2: Descriptive Statistics

Variables	LNREC	LNGDP	LNFDI	LNDCB	LNCO2	LNGFCF
Mean	2.43	1.76	-3.19	5.34	3.44	1.21
Median	3.51	2.34	-0.44	1.39	8.44	1.26
Maximum	1.19	2.76	0.75	4.78	1.42	7.47
Minimum	1.19	1.00	-2.70	1.67	7.29	1.82
Std. Dev.	1.43	0.32	1.41	0.36	0.34	0.13
Observations	48	48	48	48	48	48

Unit Root Test: Finding the proper order of integration for each of the variables is necessary for the assumption of a fair co-integrating connection between the time series variables. This study looked into the variable's order of integration first. Table 3 reports the outcomes of the unit root test under the null hypotheses of non-stationarity and stationarity. Table 3 demonstrates that the variables utilized in this study have not been integrated in the same sequence. Certain variables are integrated at I(0) whereas others are integrated at I(1). Gross Domestic Product (GDP) and Gross Fixed Capital Formation (GFCF) are confirmed to be stationary at level I(0) by the ADF test, and the other variables also become stationary after the first difference I(1) when just intercept is assumed in the test equations. No variable is integrated at I(2), which leads to the Autoregressive Distributed Lag Model (ARDL) bounds testing approach (Pesaran et al. 2001) being used to represent the long-run equilibrium relationship between the variables, is one of the significant findings presented in Table [3].

Table 3: ADF tests results

Variable	Intercept				
	Level		First difference		Remarks
	t-stat	p-value	t-stat	p-value	I (d)
LNREC	1.123	0.234	-3.960	0.005	I (1)

Copyright © ISRG Publishers. All rights Reserved.
DOI: 10.5281/zenodo.13590319

LNGDP	-4.768	0.432			I (0)
LNFDI	-1.124	0.569	-4.746	0.000	I (1)
LNDCB	-2.518	0.238	-6.236	0.000	I (1)
LNCO2	-1.120	0.327	-3.123	0.000	I (1)
LNGFCF	-3.011	0.021			I (0)

Lag selection for vector error correction model: Finding the ideal lag for the VEC model comes after running the unit root test. To choose the best lag for the cointegration test in the research analysis, Vector Autoregression (VAR) lag order selection criteria are employed.

Table 4: Lag order selection criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	100.5038	NA	4.72e-11	-6.750271	-6.464799	-6.663000
1	273.5847	259.6214*	2.81e-15*	-16.54176	-14.54346*	-15.93086*
2	311.6725	40.80839	3.60e-15	-16.69090*	-12.97975	-15.55636

LR: Likelihood ratio; FPE: Final prediction error; AIC: Akaike information criterion; SC: Schwarz criterion; HQ: Hannane Quinn criterion. Optimal lag length. *indicates lag order selected by the criterion.

Table 4 presents the lag order selection for the VAR model, where the criterion with the lowest value is chosen. The AIC, at -16.69090, is lower than Schwartz's criterion of -14.54346, indicating that AIC is the better choice. Based on this, the optimal lag length for the model is 2, which is used for further empirical analysis due to AIC's greater explanatory power. Choosing the correct lag length is crucial as it impacts cointegration results.

The cointegration test, following the ARDL Bound testing strategy, shows a stable long-term relationship between renewable energy consumption (REC) and financial development (FD). The F-statistic of 8.55 exceeds the upper bound critical value of 4.68 at the 1% significance level, rejecting the null hypothesis and confirming cointegration between the variables. This suggests that any short-run divergence is temporary, as the long-run equilibrium is stable.

Table 5: ARDL Bound testing result for long-run co-integration

		Lag: AIC	**F-statistics**	**Result**
Model F_{LNREC}(LNREC/LNGDP, LNFDI,LNDCB,LNCO2,LNGFCF)		ARDL(1,0,1,2,1,1)	9.65	Cointegration
Critical value	**K**	**1%**	**5%**	**10%**
I(0) Lower bound	5	3.41	2.62	2.26
I(1) Upper bound	5	3.68	4.54	3.21

Note: AIC = Akaike information criterion. All the variables are in the natural log form and rejection of null hypothesis of no cointegration at the 1% level.

It becomes customary to report the normalized cointegrating coefficients of exogenous variables as produced from the level equation object of the ARDL model framework once it has been demonstrated that there is a long-run association between the consumption of renewable energy and the pertinent predictors. Table 6 presents the outcomes.

Table 6: Long-run estimate of the ARDL model

Dependent Variable: LNREC				
Variable	Coefficient	Std. error	t-statistic	Prob.
LNGDP	-0.040819	0.043509	-0.858299	0.4034
LNFDI	0.003988	0.056309	0.302115	0.7665
LNDCB	0.721763***	0.12434	5.025083	0.0001
LNCO2	-1.214386***	0.455691	-8.425905	0.0000
LNGFCF	0.84560***	0.233769	3.214507	0.0054

***denotes significance at the 1% level.

Copyright © ISRG Publishers. All rights Reserved.
DOI: 10.5281/zenodo.13590319

Table 6 reveals that domestic credit to the private sector (DCB), carbon dioxide emissions (CO2), and capital formation (GFCF) are statistically significant, while GDP growth and foreign direct investment (FDI) are not. However, all variables align with theoretical expectations based on the signs of the coefficients. Specifically, fixed capital formation (GFCF), domestic credit (DCB), and FDI positively influence renewable energy consumption, while GDP growth and CO2 emissions have a negative impact.

The model indicates that a 1% increase in domestic credit to the private sector boosts renewable energy consumption by 0.82%. This underscores the role of financial development in promoting renewable energy use in Bangladesh, as the private sector plays a crucial role in advancing clean energy initiatives to meet environmental goals. This finding is consistent with other studies (e.g., Rafindadi & Mika'Ilu, 2019; Lin et al., 2016; Ji and Zhang, 2019), but contrasts with research by Saibu and Omoju (2016) and Ankrah and Lin (2020), who found that financial development hindered renewable energy use.

A 1% increase in CO2 emissions leads to a 1.26% decrease in renewable energy consumption in the long term, highlighting the negative impact of environmental degradation on clean energy adoption. As CO2 emissions rise, the demand for renewable energy declines due to pollution concerns, reinforcing the need for stronger environmental regulations and the promotion of alternative energy sources. This result aligns with previous studies (e.g., Menegaki, 2011; Salim and Rafiq, 2012).

Fixed capital formation, representing infrastructure development based on renewable energy projects, has a significant positive effect on renewable energy usage. A 1% increase in capital formation results in a 0.93% rise in renewable energy consumption, indicating that investment in renewable infrastructure supports both energy transition and job creation in Bangladesh, benefiting the environment.

However, a 1% increase in economic growth leads to a long-term decrease in renewable energy consumption, though this result is statistically insignificant. Similarly, a 1% increase in FDI would slightly increase renewable energy consumption, but this effect is also statistically insignificant. These findings suggest that GDP growth and FDI have limited influence on renewable energy use in Bangladesh. The country's economic development may not be environmentally sustainable, as investments in renewable energy have not kept pace with overall growth.

In conclusion, while FDI positively impacts renewable energy use in Bangladesh, this effect is not statistically significant in the long term, indicating that increased foreign investment alone is insufficient to drive substantial growth in renewable energy consumption.

Table 7: Findings of ARDL in the short-run

ECM Regression				
Variable	**Coefficient**	**Std. error**	**t-statistic**	**Prob.**
Constant	3.734631	0.461528	8.186793	0.0000
Δ LNFDI	-0.004551	0.008546	-1.566382	0.1368
Δ LNDCB	0.034891**	0.044177	2.147951	0.0474
Δ LNDCB (-1)	-0.12534***	0.056240	-2.988873	0.0087
Δ LNCO2	-0.3447680***	0.070712	-8.452312	0.0000
Δ LNGFCF	-0.45644	0.110047	-0.910918	0.3759
ECT (-1)	-0.376479***	0.040432	-8.203454	0.0000

& * indicates the significance level at the 5% and 1% respectively.

Table 7 displays the ECT-ARDL [see equation 4] model's short-run coefficients for the model specification and the ECT (-1), error correction model coefficient. According to the model's parameters, the lagged one-period ECT's negative and statistically significant coefficients show that any short-run disequilibrium is corrected annually at a speed of 33% towards long-run equilibrium. The importance of the lag error term supports the long-term relationship between the variables that we have already established.

The results show that domestic credit provided to the private sector by banks raises REC in the short run favorably and significantly. The results confirm that, in both the short and long periods, domestic credit for financial development is positively and significantly correlated with REC at a 1% level of significance. A 0.09 percent increase in the REC coincides with a 1% increase in financial development in Bangladesh. These results demonstrate that domestic credit employed for financial development has a significant influence on Bangladesh's rate of REC. These findings concur with those of certain studies such as Wang and Zhang, 2021, Anton and Nucu, 2020. But the author Rafindadi & Mika'Ilu,2019 does not support the positive impact of financial development on the demand of renewable energy in the short run.

The higher carbon dioxide emission lowers the demand of renewable energy consumption in both the short run and the long run which is consistent with the studies of Toumi and Toumi, 2019, Lu, 2017, Omri and Nguyen, 2014.

But the influence of foreign direct investment and capital formation is negative and statistically insignificant in the short run. In a related breakthrough, it was discovered that capital reduces renewable energy usage, but this finding was deemed to be insignificant in the short run and it supports the similar result of Rafindadi & Mika'Ilu,2019.

Wald test: Now, we would like to estimate whether there is any short run causality or not between the set of independent variables. For doing this test, this study has used the Wald test (Wald Chi-Squared Test) which is a parametric statistical measure to confirm whether a set of independent variables are collectively ‘significant’ for a model or not. This study has used this test to examine the joint impact of the financial

Copyright © ISRG Publishers. All rights Reserved.
DOI: 10.5281/zenodo.13590319

development (independent variables) on the renewable energy consumption (dependent variable) or there is any causal relationship between the two which is represented in Table 8.

Table 8: Short run causality between financial development and renewable energy consumption

Wald test			
Test Statistic	**Value**	**df**	**Probability**
F-statistic	1.388664	(2, 16)	0.2779
Chi-square	2.777327	2	0.2494

Table 8 shows that there is no short run causal relationship between financial development and renewable energy consumption as chi-square value is more than 5% or probability value, p>0.05.

Diagnostic tests: Since the various test statistics have p-values greater than 0.05, our results are resistant to various diagnostic tests like the Breusch-Godfrey serial correlation LM test, Breusch-Pagan-Godfrey heteroskedasticity test, Jaque-Bera normality test, and the Ramsey RESET test for the model specification error (see Table 9). In the case of the numerous diagnostic tests, for instance, the probability value is higher than 0.05, indicating that the test data are statistically meaningless at the 5% level. Therefore, we were unable to reject the null hypotheses of homoskedasticity, normally distributed residuals, and an error-free model as well as residuals that are not serially correlated and have constant variance.

For serial correlation LM test, H_0: There is no serial correlation.

For heteroscedasticity test, H_0: Homoscedasticity is present.

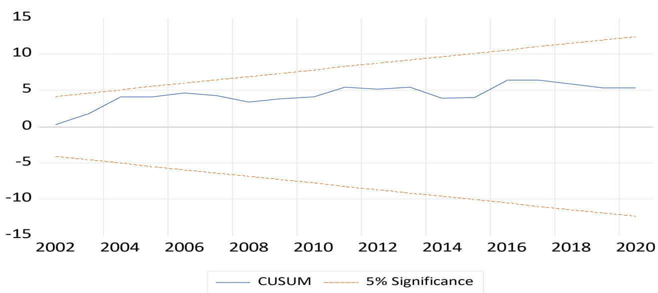
For normality test, H_0: The residuals are normally distributed.

For specification error test, H_0: Model is not mis-specified.

Table 9: Diagnostic tests

Diagnostic tests			
Test type	**Test-statistic**	**Value obtained**	**Prob.**
Serial Correlation LM Test (Breusch-Godfrey)	F-statistic	0.218974	0.8060
Heteroskedasticity Test (Breusch-Pagan-Godfrey)	F-statistic	0.451635	0.9074
Normality Test (Jaque-Bera)	JB-statistic	0.548101	0.760294
Specification Error Test (Ramsey RESET)	F-statistic	1.417729	0.2523

Stability test: As shown in Figure: 1, we further tested the stability of the model using the cumulative sum (CUSUM) and cumulative sum of squares (CUSUMQ). Brown et al., 1975 supported the usage of these two tests by establishing that they give a reliable basis for testing and identifying the positions of any observable gradual changes that may develop within the estimated parameters. The null hypothesis, which suggests that the parameters are valid and consistent, will be accepted if the expected value of the recursive residual is zero in this regard. If this is not the case, the parameters are invalid and inconsistent. The empirical results show that, at a 5 percent level of significance, the plots of both tests are inside the critical region. This attests to the stability of both long-run and short-run characteristics. As a result, the computed ARDL model coefficients are dynamically stable over the time periods.



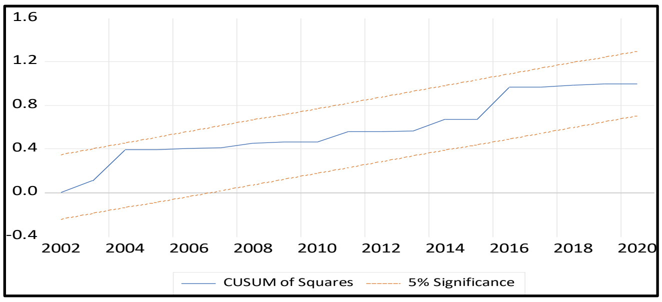


Figure 3: Model Stability Tests- CUSUM and CUSUMQ at 5% significance level.

Conclusion and Policy implications

Based on the discussion, several policy recommendations are proposed. Given that a robust financial sector has a positive impact on Bangladesh's renewable energy development, financial sector policies should prioritize promoting renewable energy growth. This includes supporting new renewable energy businesses, expanding existing projects, and ensuring adequate operational capital by converting liquid assets into readily accessible funds. Collaboration among key stakeholders—government, financial institutions, and energy investors—is crucial for creating a sustainable environment that supports a transition to green banking. The government should adopt a "clean attitude" towards fiscal and environmental policies, while financial institutions can contribute by offering innovative, business-friendly green finance packages and reviving green loans and insurance. Additionally, the Central Bank of Bangladesh should enhance its digital payments initiative to improve credit access, particularly for those interested in green products, and consider offering favorable interest rates to renewable energy investors.Bangladesh requires substantial investment in renewable energy projects to generate sufficient capital. The government should encourage businesses to invest in

Copyright © ISRG Publishers. All rights Reserved.
DOI: 10.5281/zenodo.13590319

small-scale renewable energy production to meet their energy needs and promote policies that strengthen companies' financial capabilities to invest in renewable power plants, rather than imposing unrealistic fossil fuel reduction targets. Collaboration with neighboring countries in renewable energy research is also vital to fostering innovation and investment in environmentally friendly projects, leading to significant capital accumulation and reduced environmental impacts.

The Bangladeshi government should work to reduce its reliance on fossil fuels by phasing out subsidies and gradually introducing environmental or carbon taxes on non-renewable energy use. Collaboration with neighboring nations to develop clean energy technologies and increase public awareness through incentives, subsidies, and tax breaks for renewable energy use is essential.

Strong and stable macroeconomic policies are needed to boost GDP and FDI, which have had limited impact on Bangladesh's renewable energy use. The government can leverage a strong banking sector and improving economic conditions to attract more foreign investment, particularly in renewable energy. Finally, policies should focus on increasing both the share of renewable electricity and the proportion of renewable energy in total consumption. Expanding renewable energy use will enhance sustainability, provide financial benefits, promote economic growth, and reduce environmental harm.

Limitations and future research direction

The study highlights several limitations and suggests directions for future research. Firstly, the findings are specific to Bangladesh, and similar studies could be expanded to other countries using advanced methods like PNARDL. Future research could also explore the role of corporate governance in the financial development-renewable energy relationship in developing nations. Additionally, researchers could investigate the impact of capital accumulation on different types of renewable energy sources, particularly in resource-rich developing countries. Including fossil fuel energy use and other variables such as monetary policy, environmental regulations, R&D spending, and energy innovation strategies could further enhance the current model. Examining the relationship between economic complexity and renewable energy, especially in different global contexts, could also be valuable.

The study notes the increasing importance of sustainable energy in reducing CO2 emissions, which is critical for environmental sustainability. Bangladesh's government recognizes the need to diversify energy sources to combat climate change. Despite various studies on the relationship between energy consumption, financial development, and foreign direct investment, none have specifically addressed these factors in the context of Bangladesh's renewable energy consumption. This study aims to fill that gap by analyzing the effects of financial development, economic growth, CO2 emissions, and capital formation on renewable energy use from 1991 to 2020.

The findings reveal a strong positive relationship between financial development and renewable energy consumption in Bangladesh, suggesting that a robust financial sector supports the transition to clean energy. Conversely, CO2 emissions negatively impact renewable energy use, indicating the need for policies promoting low-carbon lifestyles and reducing reliance on non-renewable energy. The study also finds that long-term capital formation positively affects renewable energy consumption, although short-term effects are minimal due to Bangladesh's economic status. Lastly, GDP growth and foreign direct investment have limited influence on renewable energy use in the country.

References

1. Abdouli, M., & Hammami, S. (2017). Exploring links between FDI inflows, energy consumption, and economic growth: further evidence from MENA countries. *Journal of economic development*, *42*(1), 95.
2. Adom, P. K., Bekoe, W., & Akoena, S. K. K. (2012). Modelling aggregate domestic electricity demand in Ghana: An autoregressive distributed lag bounds cointegration approach. *Energy policy*, *42*, 530-537.
3. Adom, P. K., Bekoe, W., Amuakwa-Mensah, F., Mensah, J. T., & Botchway, E. (2012). Carbon dioxide emissions, economic growth, industrial structure, and technical efficiency: Empirical evidence from Ghana, Senegal, and Morocco on the causal dynamics. *Energy*, *47*(1), 314-325.
4. Ali, H. S., Yusop, Z. B., & Hook, L. S. (2015). Financial development and energy consumption nexus in Nigeria: An application of autoregressive distributed lag bound testing approach. *International Journal of Energy Economics and Policy*, *5*(3), 816-821.
5. Al-Mulali, U. (2014). Investigating the impact of nuclear energy consumption on GDP growth and CO2 emission: A panel data analysis. *Progress in Nuclear Energy*, *73*, 172-178.
6. Al-Mulali, U., & Ozturk, I. (2014). Are energy conservation policies effective without harming economic growth in the Gulf Cooperation Council countries?. *Renewable and Sustainable Energy Reviews*, *38*, 639-650.
7. Al-Mulali, U., & Sab, C. N. B. C. (2012). The impact of energy consumption and CO2 emission on the economic growth and financial development in the Sub Saharan African countries. *Energy*, *39*(1), 180-186.
8. Al-Mulali, U., Fereidouni, H. G., & Lee, J. Y. (2014). Electricity consumption from renewable and non-renewable sources and economic growth: Evidence from Latin American countries. *Renewable and Sustainable Energy Reviews*, *30*, 290-298.
9. Al-Mulali, U., Fereidouni, H. G., Lee, J. Y., & Sab, C. N. B. C. (2013). Examining the bi-directional long run relationship between renewable energy consumption and GDP growth. *Renewable and sustainable energy reviews*, *22*, 209-222.
10. Alsagr, N., & van Hemmen, S. (2021). The impact of financial development and geopolitical risk on renewable energy consumption: evidence from emerging markets. *Environmental Science and Pollution Research*, *28*(20), 25906-25919.
11. Ankrah, I., & Lin, B. (2020). Renewable energy development in Ghana: Beyond potentials and commitment. *Energy*, *198*, 117356.
12. Anton, S. G., & Nucu, A. E. A. (2020). The effect of financial development on renewable energy consumption. A panel data approach. *Renewable Energy*, *147*, 330-338.
13. Anton, S.G., & Nucu, A.E.A. (2019). The effect of financial development on renewable energy consumption: A panel data approach. *Renew. Energy* *147*, 330-338.

Copyright © ISRG Publishers. All rights Reserved.
DOI: 10.5281/zenodo.13590319

14. Antweiler, W., Copeland, B. R., & Taylor, M. S. (2001). Is free trade good for the environment? *American economic review*, *91*(4), 877-908.
15. Apergis, N., & Payne, J. E. (2010a). Renewable energy consumption and economic growth: evidence from a panel of OECD countries. *Energy policy*, *38*(1), 656-660.
16. Apergis, N., & Payne, J. E. (2010b). Renewable energy consumption and growth in Eurasia. *Energy economics*, *32*(6), 1392-1397.
17. Apergis, N., & Payne, J. E. (2012). Renewable and non-renewable energy consumption-growth nexus: Evidence from a panel error correction model. *Energy economics*, *34*(3), 733-738.
18. Asafu-Adjaye, J. (2000). The relationship between energy consumption, energy prices and economic growth: time series evidence from Asian developing countries. *Energy economics*, *22*(6), 615-625.
19. Aslan, A., Apergis, N., & Topcu, M. (2014). Banking development and energy consumption: Evidence from a panel of Middle Eastern countries. *Energy*, *72*, 427-433.
20. Assi, A. F., Isiksal, A. Z., & Tursoy, T. (2021). Renewable energy consumption, financial development, environmental pollution, and innovations in the ASEAN+ 3 group: Evidence from (P-ARDL) model. *Renewable Energy*, *165*, 689-700.
21. Balcilar, M., Ozdemir, Z. A., Ozdemir, H., & Shahbaz, M. (2018). The renewable energy consumption and growth in the G-7 countries: Evidence from historical decomposition method. *Renewable Energy*, *126*, 594-604.
22. Baten, M. Z., Amin, E. M., Sharin, A., Islam, R., & Chowdhury, S. A. (2009, December). Renewable energy scenario of Bangladesh: Physical perspective. In *2009 1st International Conference on the Developements in Renewable Energy Technology (ICDRET)* (pp. 1-5). IEEE.
23. Bhattacharya, M., Paramati, S. R., Ozturk, I., & Bhattacharya, S. (2016). The effect of renewable energy consumption on economic growth: Evidence from top 38 countries. *Applied Energy*, *162*, 733-741.
24. Birol, F. (2017). *"World Energy Outlook".* France. www.iea.org/weo.
25. Bowden, N., & Payne, J. E. (2010). Sectoral analysis of the causal relationship between renewable and non-renewable energy consumption and real output in the US. *Energy Sources, Part B: Economics, Planning, and Policy*, *5*(4), 400-408.
26. Brown, R. L., Durbin, J., & Evans, J. M. (1975). Techniques for testing the constancy of regression relationships over time. *Journal of the Royal Statistical Society: Series B (Methodological)*, *37*(2), 149-163.
27. Brunnschweiler, C. N. (2010). Finance for renewable energy: an empirical analysis of developing and transition economies. *Environment and development economics*, *15*(3), 241-274.
28. Burrett, R., Clini, C., Dixon, R., Eckhart, M., El-Ashry, M., Gupta, D., ... & Ballesteros, A. R. (2009). Renewable energy policy network for the 21st century. *REN21 Global Status Report*.
29. Can, M., & Gozgor, G. (2017). The impact of economic complexity on carbon emissions: evidence from France. *Environmental Science and Pollution Research*, *24*(19), 16364-16370.
30. Chang, S. C. (2015). Effects of financial developments and income on energy consumption. *International Review of Economics & Finance*, *35*, 28-44.
31. Chang, S. C. (2015). Effects of financial developments and income on energy consumption. *International Review of Economics & Finance*, *35*, 28-44.
32. Chishti, M. Z., Ahmad, M., Rehman, A., & Khan, M. K. (2021). Mitigations pathways towards sustainable development: assessing the influence of fiscal and monetary policies on carbon emissions in BRICS economies. *Journal of Cleaner Production*, *292*, 126035.
33. Claessens, S., & Feijen, E. (2007). *Financial sector development and the millennium development goals* (No. 89). World Bank Publications.
34. Çoban, S., & Topcu, M. (2013). The nexus between financial development and energy consumption in the EU: A dynamic panel data analysis. *Energy Economics*, *39*, 81-88.
35. Cole, M. A. (2006). Does trade liberalization increase national energy use?. *Economics Letters*, *92*(1), 108-112.
36. Dimnwobi, S. K., Madichie, C. V., Ekesiobi, C., & Asongu, S. A. (2022). Financial development and renewable energy consumption in Nigeria. *Renewable Energy*, *192*, 668-677.
37. Doğan, B., Balsalobre-Lorente, D., & Nasir, M. A. (2020). European commitment to COP21 and the role of energy consumption, FDI, trade and economic complexity in sustaining economic growth. *Journal of environmental Management*, *273*, 111146.
38. Doytch, N., & Narayan, S. (2016). Does FDI influence renewable energy consumption? An analysis of sectoral FDI impact on renewable and non-renewable industrial energy consumption. *Energy Economics*, *54*, 291-301.
39. Dumrul, Y. (2018). Estimating the impact of the financial development on energy consumption: A co-integration analysis. *International Journal of Energy Economics and Policy*, *8*(5), 294.
40. Eren, B. M., Taspinar, N., & Gokmenoglu, K. K. (2019). The impact of financial development and economic growth on renewable energy consumption: Empirical analysis of India. *Science of the Total Environment*, *663*, 189-197.
41. Eren, B. M., Taspinar, N., & Gokmenoglu, K. K. (2019). The impact of financial development and economic growth on renewable energy consumption: Empirical analysis of India. *Science of the Total Environment*, *663*, 189-197.
42. Farhani, S., & Solarin, S. A. (2017). Financial development and energy demand in the United States: new evidence from combined cointegration and asymmetric causality tests. *Energy*, *134*, 1029-1037.
43. Fatima, T., Mentel, G., Doğan, B., Hashim, Z., & Shahzad, U. (2022). Investigating the role of export product diversification for renewable, and non-renewable energy consumption in GCC (gulf cooperation council) countries: does the Kuznets hypothesis exist? *Environment, Development and Sustainability*, *24*(6), 8397-8417.

Copyright © ISRG Publishers. All rights Reserved.
DOI: 10.5281/zenodo.13590319

44. Fuinhas, J. A., & Marques, A. C. Energy consumption and economic growth nexus in Portugal, Italy, Greece, Spain and Turkey.
45. Ghazouani, T. (2018). *Re-examining the Foreign direct investment, Renewable energy consumption and Economic growth nexus: Evidence from a new Bootstrap ARDL test for Cointegration*. University Library of Munich, Germany.
46. Gozgor, G., Lau, C. K. M., & Lu, Z. (2018). Energy consumption and economic growth: New evidence from the OECD countries. *Energy*, *153*, 27-34.
47. Gozgor, G., Mahalik, M. K., Demir, E., & Padhan, H. (2020). The impact of economic globalization on renewable energy in the OECD countries. *Energy Policy*, *139*, 111365.
48. Hübler, M. (2009). *Energy saving technology diffusion via FDI and trade: a CGE model of China* (No. 1479). Kiel working paper.
49. International Institute for Sustainable Development (IISD) (2019, January 17). Report Outlines How the Energy Transformation Will Reshape the World. *SDG KNOWLEDGE HUB.* https://sdg.iisd.org/news/report-outlines-how-the-energy-transformation-will-reshape-the world/
50. International Renewable Energy Agency (IRENA) (2016, September 6). Unlocking Renewable Energy Investment: The role of risk mitigation and structured finance. https://www.irena.org/events/2016/Sep/Unlocking--Renewable-Energy-Investment-the-Role-of-Risk-Mitigation-and-Structured-Finance
51. Irandoust, M. (2016). The renewable energy-growth nexus with carbon emissions and technological innovation: Evidence from the Nordic countries. *Ecological indicators*, *69*, 118-125.
52. Islam, A. K. M., Islam, M., & Rahman, T. (2006). Effective renewable energy activities in Bangladesh. *Renew Energy*, *31*, 677–88.
53. Islam, A., Chan, E. S., Taufiq-Yap, Y. H., Mondal, M. A. H., Moniruzzaman, M., & Mridha, M. (2014). Energy security in Bangladesh perspective—An assessment and implication. *Renewable and Sustainable Energy Reviews*, *32*, 154-171.
54. Islam, F., Shahbaz, M., Ahmed, A. U., & Alam, M. M. (2013). Financial development and energy consumption nexus in Malaysia: a multivariate time series analysis. *Economic Modelling*, *30*, 435-441.
55. Islam, F., Shahbaz, M., Ahmed, A. U., & Alam, M. M. (2013). Financial development and energy consumption nexus in Malaysia: a multivariate time series analysis. *Economic Modelling*, *30*, 435-441.
56. Jalil, A., & Feridun, M. (2011). The impact of growth, energy and financial development on the environment in China: a cointegration analysis. *Energy economics*, *33*(2), 284-291.
57. Ji, Q., & Zhang, D. (2019). How much does financial development contribute to renewable energy growth and upgrading of energy structure in China? *Energy Policy*, *128*, 114-124.
58. Kariuki, D. (2018, September 25). Barriers to Renewable Energy Technologies Development. *Economics-policy*. https: //www.energytoday.net/economics-policy/barriers-renewable-energy-technologies-development/
59. Kaygusuz, K. (2007). Energy for sustainable development: key issues and challenges. *Energy Sources, Part B: Economics, Planning, and Policy*, *2*(1), 73-83.
60. Khan, Z., Malik, M. Y., Latif, K., & Jiao, Z. (2020). Heterogeneous effect of eco-innovation and human capital on renewable & non-renewable energy consumption: Disaggregate analysis for G-7 countries. *Energy*, *209*, 118405.
61. Khandker, L. L., Amin, S. B., & Khan, F. (2018). Renewable energy consumption and foreign direct investment: Reports from Bangladesh. *Journal of Accounting*, *8*(3).
62. Kilicarslan, Z. (2019). The relationship between foreign direct investment and renewable energy production: Evidence from Brazil, Russia, India, China, South Africa and Turkey. *670216917*.
63. Kim, J., & Park, K. (2016). Financial development and deployment of renewable energy technologies. *Energy Economics*, *59*, 238-250.
64. Koengkan, M., Fuinhas, J. A., & Vieira, I. (2020). Effects of financial openness on renewable energy investments expansion in Latin American countries. *Journal of Sustainable Finance & Investment*, *10*(1), 65-82.
65. Komal, R., & Abbas, F. (2015). Linking financial development, economic growth and energy consumption in Pakistan. *Renewable and sustainable energy reviews*, *44*, 211-220.
66. Kraft, J., & Kraft, A. (1978). On the relationship between energy and GNP. *The Journal of Energy and Development*, 401-403.
67. Lee, J. W. (2013). The contribution of foreign direct investment to clean energy use, carbon emissions and economic growth. *Energy policy*, *55*, 483-489.
68. Li, J., Zhang, X., Ali, S., & Khan, Z. (2020). Eco-innovation and energy productivity: New determinants of renewable energy consumption. *Journal of Environmental Management*, *271*, 111028.
69. Lin, B. (2003). Structural changes, efficiency improvement and electricity demand forecasting. *Economic Research*, *5*, 57-65.
70. Lin, B., & Moubarak, M. (2014). Renewable energy consumption–economic growth nexus for China. *Renewable and Sustainable Energy Reviews*, *40*, 111-117.
71. Lin, B., Omoju, O. E., & Okonkwo, J. U. (2016). Factors influencing renewable electricity consumption in China. *Renewable and Sustainable Energy Reviews*, *55*, 687-696.
72. Lindlein, P., & Mostert, W. (2020, August 20). Financing Renewable Energy. Instruments, Strategies, Practice Approaches. *KfW Discuss. Pap. 2005*. https://www.kfw-entwicklungsbank.de/Download-Center/PDFDokumente-Diskussionsbeitr%C3%A4ge/38_AMD_E.pdf.
73. Lu, W. C. (2017). Renewable energy, carbon emissions, and economic growth in 24 Asian countries: evidence from panel cointegration analysis. *Environmental Science and Pollution Research*, *24*(33), 26006-26015.

Copyright © ISRG Publishers. All rights Reserved.
DOI: 10.5281/zenodo.13590319

74. Lv, Y., Chen, W., & Cheng, J. (2019). Direct and indirect effects of urbanization on energy intensity in Chinese cities: A regional heterogeneity analysis. *Sustainability*, *11*(11), 3167.
75. Mahadevan, R., & Asafu-Adjaye, J. (2005). The productivity–inflation nexus: the case of the Australian mining sector. *Energy economics*, *27*(1), 209-224.
76. Maji, I. K. (2015). Does clean energy contribute to economic growth? Evidence from Nigeria. *Energy Reports*, *1*, 145-150.
77. Marton, C., & Hagert, M. (2017). The effects of FDI on renewable energy consumption.
78. Menegaki, A. N. (2011). Growth and renewable energy in Europe: A random effect model with evidence for neutrality hypothesis. *Energy economics*, *33*(2), 257-263.
79. Mielnik, O., & Goldemberg, J. (2002). Foreign direct investment and decoupling between energy and gross domestic product in developing countries. *Energy policy*, *30*(2), 87-89.
80. Moradpour, O. M., Ebrahimi, M., & Tarkaman, A. M., (2012)."Financial market development and energy demand in Iran", *Quarterly Journal of Energy and Environmental Economics, 5*(2), 187-209.
81. Mudakkar, S. R., Zaman, K., Shakir, H., Arif, M., Naseem, I., & Naz, L. (2013). Determinants of energy consumption function in SAARC countries: Balancing the odds. *Renewable and Sustainable Energy Reviews*, *28*, 566-574.
82. Muhammad, S. (2018). Financial development, investment and energy consumption in Nigeria: ARDL approach. *Acta Universitatis Danubius. Œconomica*, *15*(1).
83. Mukhtarov, S., Mikayilov, J. I., Humbatova, S., & Muradov, V. (2020). Do high oil prices obstruct the transition to renewable energy consumption?. *Sustainability*, *12*(11), 4689.
84. Ocal, O., & Aslan, A. (2013). Renewable energy consumption–economic growth nexus in Turkey. *Renewable and sustainable energy reviews*, *28*, 494-499.
85. Omri, A., & Kahouli, B. (2014). Causal relationships between energy consumption, foreign direct investment and economic growth: Fresh evidence from dynamic simultaneous-equations models. *Energy Policy*, *67*, 913-922.
86. Omri, A., & Nguyen, D. K. (2014). On the determinants of renewable energy consumption: International evidence. *Energy*, *72*, 554-560.
87. Paramati, S. R., Apergis, N., & Ummalla, M. (2017). Financing clean energy projects through domestic and foreign capital: The role of political cooperation among the EU, the G20 and OECD countries. *Energy economics*, *61*, 62-71.
88. Paramati, S. R., Ummalla, M., & Apergis, N. (2016). The effect of foreign direct investment and stock market growth on clean energy use across a panel of emerging market economies. *Energy Economics*, *56*, 29-41.
89. Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of applied econometrics*, *16*(3), 289-326.
90. Qamruzzaman, M., & Jianguo, W. (2020). The asymmetric relationship between financial development, trade openness, foreign capital flows, and renewable energy consumption: fresh evidence from panel NARDL investigation. *Renew. Energy.*
91. Rafindadi, A. A. (2015). Econometric prediction on the effects of financial development and trade openness on the German energy consumption: a startling revelation from the data set. *International Journal of Energy economics and policy*, *5*(1), 182-196.
92. Rafindadi, A. A. (2016). Does the need for economic growth influence energy consumption and CO2 emissions in Nigeria? Evidence from the innovation accounting test. *Renewable and Sustainable Energy Reviews*, *62*, 1209-1225.
93. Rafindadi, A. A. (2016). Revisiting the concept of environmental Kuznets curve in period of energy disaster and deteriorating income: Empirical evidence from Japan. *Energy Policy*, *94*, 274-284.
94. Rafindadi, A. A., & Mika'Ilu, A. S. (2019). Sustainable energy consumption and capital formation: Empirical evidence from the developed financial market of the United Kingdom. *Sustainable Energy Technologies and Assessments*, *35*, 265-277.
95. Rafindadi, A. A., & Ozturk, I. (2016). Effects of financial development, economic growth and trade on electricity consumption: Evidence from post-Fukushima Japan. *Renewable and Sustainable Energy Reviews*, *54*, 1073-1084.
96. Rafindadi, A. A., & Ozturk, I. (2017). Dynamic effects of financial development, trade openness and economic growth on energy consumption: Evidence from South Africa. *International Journal of Energy Economics and Policy*, *7*(3), 74-85.
97. Rafindadi, A. A., & Usman, O. (2019). Globalization, energy use, and environmental degradation in South Africa: startling empirical evidence from the Maki-cointegration test. *Journal of environmental management*, *244*, 265-275.
98. Rafindadi, A. A., & Yusof, Z. (2014). Are the periods of currency collapse an impediment to entrepreneurship and entrepreneurial haven? Evidence from regional comparison. *International Journal of Economics and Financial Issues*, *4*(4), 886-908.
99. Rafique, M. Z., Doğan, B., Husain, S., Huang, S., & Shahzad, U. (2021). Role of economic complexity to induce renewable energy: Contextual evidence from G7 and E7 countries. *International Journal of Green Energy*, *18*(7), 745-754.
100. Rashid, A., & Yousaf, N. (2016). Linkage of Financial development with electricity-growth nexus of India and Pakistan. *EuroEconomica*, *34*(2).
101. Raza, S. A., Shah, N., Qureshi, M. A., Qaiser, S., Ali, R., & Ahmed, F. (2020). Non-linear threshold effect of financial development on renewable energy consumption: evidence from panel smooth transition regression approach. *Environmental Science and Pollution Research*, *27*(25), 32034-32047.
102. Razmi, S. F., Bajgiran, B. R., Behname, M., Salari, T. E., & Razmi, S. M. J. (2020). The relationship of renewable energy consumption to stock market development and

Copyright © ISRG Publishers. All rights Reserved.
DOI: 10.5281/zenodo.13590319

economic growth in Iran. *Renewable Energy*, *145*, 2019-2024.
103. Rezagholizadeh, M., Aghaei, M., & Dehghan, O. (2020). Foreign direct investment, stock market development, and renewable energy consumption: Case study of Iran. *Journal of Renewable Energy and Environment*, *7*(2), 8-18.
104. Rifkin, J. (2011). *The third industrial revolution: how lateral power is transforming energy, the economy, and the world*. Macmillan.
105. Riti, J. S., Shu, Y., Song, D., & Kamah, M. (2017). The contribution of energy use and financial development by source in climate change mitigation process: a global empirical perspective. *Journal of cleaner production*, *148*, 882-894.
106. Sadorsky, P. (2009). Renewable energy consumption and income in emerging economies. *Energy policy*, *37*(10), 4021-4028.
107. Sadorsky, P. (2010). The impact of financial development on energy consumption in emerging economies. *Energy policy*, *38*(5), 2528-2535.
108. Sadorsky, P. (2011). Financial development and energy consumption in Central and Eastern European frontier economies. *Energy policy*, *39*(2), 999-1006.
109. Sadorsky, P. (2011). Trade and energy consumption in the Middle East. *Energy Economics*, *33*(5), 739-749.
110. Sadrosky, P. (2010). The Impact of Financial Development on Energy Consumption in Emerging Economics. *Energy Policy*, *38*, 2528-2535.
111. Saibu, O. M., & Omoju, O. E. (2016). Macroeconomic determinants of renewable electricity technology adoption in Nigeria. *Economic and Environmental Studies (E&ES)*, *16*(1), 65-83.
112. Salim, R. A., & Rafiq, S. (2012). Why do some emerging economies proactively accelerate the adoption of renewable energy? *Energy economics*, *34*(4), 1051-1057.
113. Samour, A., Baskaya, M. M., & Tursoy, T. (2022). The impact of financial development and FDI on renewable energy in the UAE: a path towards sustainable development. *Sustainability*, *14*(3), 1208.
114. Saud, S., Baloch, M. A., & Lodhi, R. N. (2018). The nexus between energy consumption and financial development: estimating the role of globalization in Next-11 countries. *Environmental Science and Pollution Research*, *25*(19), 18651-18661.
115. Sbia, R., Shahbaz, M., & Hamdi, H. (2014). A contribution of foreign direct investment, clean energy, trade openness, carbon emissions and economic growth to energy demand in UAE. *Economic modelling*, *36*, 191-197.
116. Shahbaz, M., & Lean, H. H. (2012). Does financial development increase energy consumption? The role of industrialization and urbanization in Tunisia. *Energy policy*, *40*, 473-479.
117. Shahbaz, M., Chaudhary, A. R., & Ozturk, I. (2017). Does urbanization cause increasing energy demand in Pakistan? Empirical evidence from STIRPAT model. *Energy*, *122*, 83-93.
118. Shahbaz, M., Hye, Q. M. A., Tiwari, A. K., & Leitão, N. C. (2013). Economic growth, energy consumption, financial development, international trade and CO2 emissions in Indonesia. *Renewable and Sustainable Energy Reviews*, *25*, 109-121.
119. Shahbaz, M., Khan, S., & Tahir, M. I. (2013). The dynamic links between energy consumption, economic growth, financial development and trade in China: fresh evidence from multivariate framework analysis. *Energy economics*, *40*, 8-21.
120. Shahbaz, M., Lahiani, A., Abosedra, S., & Hammoudeh, S. (2018b). The role of globalization in energy consumption: a quantile cointegrating regression approach. *Energy Economics*, *71*, 161-170.
121. Shahbaz, M., Mallick, H., Mahalik, M. K., & Sadorsky, P. (2016). The role of globalization on the recent evolution of energy demand in India: Implications for sustainable development. *Energy Economics*, *55*, 52-68.
122. Shahbaz, M., Shahzad, S. J. H., Mahalik, M. K., & Sadorsky, P. (2018a). How strong is the causal relationship between globalization and energy consumption in developed economies? A country-specific time-series and panel analysis. *Applied Economics*, *50*(13), 1479-1494.
123. Shahzad, U., Hussain, M., Qin, F., & Amir, M. (2018). Reinvestigating the Role of Coal Consumption in Indian Economy: An ARDL and Causality Analysis. *European Online Journal of Natural and Social Sciences*, *7*(2), pp-348.
124. Sharmin, M. (2022, July 17). Transition to renewable energy for Bangladesh. *Financial Express*. https://thefinancialexpress.com.bd/views/transition-to-renewable-energy-for-bangladesh-1658073744
125. Shiu, A., & Lam, P. L. (2004). Electricity consumption and economic growth in China. *Energy policy*, *32*(1), 47-54.
126. Simionescu, M., Păuna, C. B., & Diaconescu, T. (2020). Renewable energy and economic performance in the context of the European Green Deal. *Energies*, *13*(23), 6440.
127. Soytas, U., Sari, R., & Ewing, B. T. (2007). Energy consumption, income, and carbon emissions in the United States. *Ecological Economics*, *62*(3-4), 482-489.
128. Tabrizian, S. (2019). Technological innovation to achieve sustainable development—Renewable energy technologies diffusion in developing countries. *Sustainable Development*, *27*(3), 537-544.
129. Tachev, V. (2022, May 12). Renewable Energy in Bangladesh 2022 – Current Trends and Future Opportunities. Energy Tracker Asia. https://energytracker.asia/renewable-energy-in-bangladesh-current-trends-and-future-opportunities/
130. Tamazian, A., & Rao, B. B. (2010). Do economic, financial and institutional developments matter for environmental degradation? Evidence from transitional economies. *Energy economics*, *32*(1), 137-145.
131. Tiwari, A. K. (2011). A structural VAR analysis of renewable energy consumption, real GDP and CO2 emissions: evidence from India. *Economics Bulletin*, *31*(2), 1793-1806.
132. Toumi, S., & Toumi, H. (2019). Asymmetric causality among renewable energy consumption, CO2 emissions, and economic growth in KSA: evidence from a non-linear ARDL model. *Environmental Science and Pollution Research*, *26*(16), 16145-16156.

Copyright © ISRG Publishers. All rights Reserved.
DOI: 10.5281/zenodo.13590319

133. Uddin, M. N., Rahman, M. A., Mofijur, M., Taweekun, J., Techato, K., & Rasul, M. G. (2019). Renewable energy in Bangladesh: Status and prospects. *Energy Procedia*, *160*, 655-661.
134. United Nations (2020, August 10). United Nations Decade of Sustainable Energy for All.2015.https://sustainabledevelopment.un.org/content/documents/8533SG%20Report_UN%20Decade%20of%20Sustainable%20Energy%20for%20All-advance.pdf.
135. United Nations Development Programme (UNDP) (2019). Policy Brief #3: Financing SDG 7. https://sustainabledevelopment.un.org/content/documents/24090pb3_cover.pdf.
136. United Nations Development Programme (UNDP) (2021). Goal 7: Affordable and clean energy: Financing Affordable and Clean Energy. https://www.sdfinance.undp.org/content/sdfinance/en/home/sdg/goal-7--affordable-and clean-energy.html
137. United Nations, 2020. Ensure access to affordable, reliable, sustainable and modern energy. *Sustainable Development Goals.* https://www.un.org/sustainabledevelopment/energy/
138. United Nations. What is renewable energy? https://www.un.org/en/climatechange/what-is-renewable-energy?gclid=CjwKCAjwkaSaBhA4EiwALBgQaGF9llLWu4Q3hSoUC9N5OdMN_onMSh4CdS0pnQh6t9-y6GVZWUEhihoCFmkQAvD_BwE
139. Vadlamannati, K. C., ÃA, T., & Pin, J. (2009). Does higher economic and financial development lead to environmental degradation: evidence from BRIC countries. *Energy Policy*, *37*, 246-253.
140. Wang, J., Zhang, S., & Zhang, Q. (2021). The relationship of renewable energy consumption to financial development and economic growth in China. *Renewable Energy*, *170*, 897-904.
141. Wang, Q., Su, M., & Li, R. (2018). Toward to economic growth without emission growth: The role of urbanization and industrialization in China and India. *Journal of cleaner production*, *205*, 499-511.
142. Wolde-Rufael, Y. (2004). Disaggregated industrial energy consumption and GDP: the case of Shanghai, 1952–1999. *Energy economics*, *26*(1), 69-75.
143. Wolde-Rufael, Y., & Menyah, K. (2010). Nuclear energy consumption and economic growth in nine developed countries. *Energy economics*, *32*(3), 550-556.
144. World Bank (2021, September 11). World Development Indicators. https://databank. worldbank.org/source/world-development-indicators.
145. Wu, L., & Broadstock, D. C. (2015). Does economic, financial and institutional development matter for renewable energy consumption? Evidence from emerging economies. *International Journal of Economic Policy in Emerging Economies*, *8*(1), 20-39.
146. Yahya, F., & Rafiq, M. (2020). Brownfield, greenfield, and renewable energy consumption: Moderating role of effective governance. *Energy & environment*, *31*(3), 405-423.
147. Yilanci, V., Ozgur, O., & Gorus, M. S. (2019). The asymmetric effects of foreign direct investment on clean energy consumption in BRICS countries: A recently introduced hidden cointegration test. *Journal of Cleaner Production*, *237*, 117786.
148. Yildirim, E., Saraç, Ş., & Aslan, A. (2012). Energy consumption and economic growth in the USA: Evidence from renewable energy. *Renewable and Sustainable Energy Reviews*, *16*(9), 6770-6774.
149. Yoo, S. H. (2006). The causal relationship between electricity consumption and economic growth in the ASEAN countries. *Energy policy*, *34*(18), 3573-3582.
150. Yuan, J., Zhao, C., Yu, S., & Hu, Z. (2007). Electricity consumption and economic growth in China: cointegration and co-feature analysis. *Energy economics*, *29*(6), 1179-1191.
151. Zagorchev, A., Vasconcellos, G., & Bae, Y. (2011). Financial development, technology, growth and performance: Evidence from the accession to the EU. *Journal of International Financial Markets, Institutions and Money*, *21*(5), 743-759.
152. Zeren, F., & Mustafa, K. O. C. (2014). The nexus between energy consumption and financial development with asymmetric causality test: new evidence from newly industrialized countries. *International Journal of Energy Economics and Policy*, *4*(1), 83-91.
153. Zhang, M., Zhang, S., Lee, C. C., & Zhou, D. (2021). Effects of trade openness on renewable energy consumption in OECD countries: New insights from panel smooth transition regression modelling. *Energy Economics*, *104*, 105649.
154. Zhang, Y., Shi, S., Huang, K., Chen, X., & Peng, M. (2011). Effect of Cu2+ and Fe3+ for drug delivery: Decreased binding affinity of ilaprazole to bovine serum albumin. *Journal of luminescence*, *131*(9), 1927-1931.

Copyright © ISRG Publishers. All rights Reserved.
DOI: 10.5281/zenodo.13590319