Assessing Long-run Dynamics of Financial Hedging, A New Determinants of Green Financing in E7 and G7 Countries

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Abstract

The study estimates the long-run dynamics of a cleaner environment in promoting the gross domestic product of E7 and G7 countries. The recent study intends to estimate the climate change mitigation factor for a cleaner environment with the GDP of E7 countries and G7 countries from 2010 to 2018. For long-run estimation, second-generation panel data techniques including Augmented Dickey-Fuller (ADF), Phillip-Peron technique and fully modified ordinary least square (FMOLS) techniques are applied to draw the long-run inference. The results of study are robust with VECM technique. The outcomes of study revealed that climate change mitigation indicators affect more to the GDP of G7 countries than E7 countries. The GDP of both E7 and G7 countries is found depleting due to less clean environment. However, green financing techniques may clean the environment and reinforce the confidence of policymakers on the elevation of green economic growth in G7 and E7 countries. Furthermore, results show that a 1% rise in green financing index improves the environmental quality by 0.375% in G-7 countries, while it purifies 0.3920% environment in E7 countries. There is a need to reduce environmental pollution, shift energy generation sources towards alternative, innovative and green sources.

Keywords: Cleaner environment, Green financing, Climate change, E7 countries, G7 countries.

1. Introduction

Climate change and global warming due to greenhouse pollution are regarded as the greatest challenge of the 21st century (Iqbal et al., 2020). In 2015, 196 countries joined the Climate Change Agreement in Paris to hold the annual temperature increase well below 2°C to mitigate the extreme effects of global warming (Asbahi et al., 2019). The performance of the Paris Agreement and other associated environmental emission policies largely depends on the administrative efficiency of the government (Yumei et al., 2021). Institutions establish and regulate carbon-reduction environmental programs. These structures come in several directions, such as politics, government, the social, etc. and are affected by multiple factors (Abbas et al., 2020).
The cleaner environment notion is still emerging and it is much valuable in current policies and agendas. The rising trends of global warming has gained much attention of policy makers to clean the environment using climate change mitigation strategies and it seems to be the part of broad consensus. However, social, geographic and regional impacts of climate change take on another dimension particularly following the mission to the clean the environment of densely populated regions and projects. All these initiatives to clean the environment for climate change mitigation are inclined towards energy development and consumption sources, led a significant improvement in energy sector of different regions and projects. E7 and G7 regions are one of the important projects, expected to face multiple environmental and climate change orientated threats. Thus, it is prerequisite to clean the environment using climate change mitigation strategies for effectiveness of Belt and road initiative (BRI) project and smooth economic growth of E7 and G7 region. However, there is need for safe and less polluted climate but also to the need to develop and implement green financing strategies in different forms so “clean” that is to say without harm to the climate and especially without affecting economic growth of E7 and G7 region. Hence, endorsing the importance of BRI and E7 and G7 regions, recent study intends to estimate the antecedents of cleaner environment by using green financing techniques on long-run basis, and, provide the way forwards for policy makers to mitigate the climate change.

The destruction of the environment and climate change are growing quickly as the demand for innovative and viable solutions is rising. The green economy is one of the most effective strategies for resolving these issues and promoting recycling of economic capital, economic development and environmental protection (Zandalinas et al., 2021). The social welfare mechanism thus preserving environmental destruction to a minimum may be considered a green economy (Tvaronavičienė, 2021). The important impact of the green economy on sustainable
growth is one of the issues highlighted at the United Nations Conference on Rio+20 (Dineva, 2021). The main variables involved in the development of a green economy must be given equal priority. This study focuses on public procurement as one of the key influences of the green economy (Richards et al., 2021). A basic alteration of public expenditure, given the previous literature, would appear to have a major effect on economic and environmental depletion. The specific nature of the connection between public expenditure and green economic development has not yet been analyzed in depth (Ossebaard & Lachman, 2021). A comprehensive analysis of fiscal expenditure will help define its connection to green economic development.

The essence of this partnership can be identified by environmental studies like (Abhimanyu Kumar, 2019). For example, a sequence of effects called the 'size impact' reflects how economic activity rises with a rise in government spending. However, this mechanism causes numerous environmental threats, with green economic development gradually dropping (Miedaner & Juroszek, 2021). In the other side, a major transition in the "composition effect" of capital-based industry into human capital-based industries with a rise in public education expenditures may be observed. As a consequence of the compositional impact, a new model of economic growth is viable as pollution is reduced (Ossebaard & Lachman, 2021). Nations can be motivated to use more cleaner technology and renewable energy with a large allocation of science and innovation capital (Zhao et al., 2020). The usage of these innovations will ensure improved resource productivity and healthier production (Marvin Herndon & Alberto Pérez Bartolomé, 2018). A minimum pollution/output ratio may be observed utilizing a method known as the "scientific effect." An approximate $2 trillion is needed to help the planet recover sustainably from COVID-19's global retrogression. This money will be used to invest in green schemes such as renewables to complete the COVID-19, 2021-20123 period (Anjum, 2020).
Only these structural investments, such as private investments, renewable bonds, and committed financing, will ensure a complete and long-term recovery (Agrawala et al., n.d.). The G-7 and E-7 countries will comfortably achieve a W-shaped or a V-shaped green recovery outlook. COVID-19 has resulted in a lower CO2 level (Kumar & Ayedee, 2021). However, it has had a negative impact on global development due to economic challenges and human misery. The BRI project helps member countries to build and promote broad markets whilst still promoting mutual understanding. The activities of emerging countries creating considerable dependence on energy supplies, while growing their manufacturing productivity by an advanced development mechanism, indicate a relatively secure economic condition. Another major issue addressed is global warming, which can be addressed by strong collaboration among member countries. In developing countries, there is a lot of study on different environmental concerns. In the developed countries, however, there is a lack of study. In terms of industrial and non-renewable resources, the economy has seen substantial expansion. In general, dependence on the manufacturing sector and nonrenewable energy services has boosted economic development by a fraction, although the prospect of green economic growth has risen dramatically at the same time due to significant environmental deterioration (Letcher, 2018).

This study's valuable insights can contribute to the literature significantly while explaining how the green economy is affected by public spending. However, studies have not been able to identify the specifics of how government spending affects market mechanisms. A positive relationship between fiscal spending and green economic growth can be seen in this study (Khan et al., 2019) and (Isaksen & Trippl, 2017). This study assesses how G-7 and E-7 countries are stimulating green finance and carrying out strategies to reduce climate change. Green finance can be replaced by renewable energy consumption while making use of the FOMS and VECM
approach on the G-7 and E7 countries. Few studies have analyzed the G-7 and E-7 countries (Erdoğan et al., 2020; No & Padhan, 2018; Sinha et al., 2020; Yildirim et al., 2014) while using the econometric method. This study's significant difference lies in using the FOMS and VECM approaches to assess long-run dynamics of cleaner environment with economic growth indicators, in the context of E7 and G7 countries.

The rest of the paper is organizing as follows: section 2 represents how G7 and E7 countries are affected by green and climate change mitigation. Section 2 represents the methodology used in the study. Section 3 states the result and discussion for the study, while section 4 states the conclusion and policy implications.

2. Literature Review and Background

Despite reductions in fossil-fuel consumption and CO2 emissions, the electricity industry remains the world's most significant and largest producer of these emissions. Human-induced and CO2-emissions from the electricity industry make up two-thirds of both human-driven and CO2-based emissions, which have increased sharply over the century. Many nations plan to reduce their dependence on fossil fuels and get down to 75% of total global resources by that year. Consequently, ambitious energy policy is vital to solving the climate change problem. While few studies have concentrated on the connection between clean energy consumption, CO2 emissions, and economic growth, several previous studies have highlighted the correlation between nuclear energy consumption, renewable energy consumption, CO2 emissions, and economic growth, which may help us better understand the relationship between clean energy consumption and other variables.

Development and enhancement of agricultural production capacity, together with the usage of renewable energy, are vital for developed countries to achieve sustainable growth. Between
2016 and 2050, according to a PWC survey (2017), the global economy is predicted to expand at a real annual pace of about 2.5 percent. The E7 countries – China, India, Brazil, Russia, Mexico, Indonesia, and Turkey are expected to develop at an annual average pace of about 3.5 percent over the next 34 years, opposed to just about 1.6 percent for the advanced G7 nations. According to the Bloomberg New Energy Finance Report (2016), in terms of overall new clean energy spending, emerging countries overtook industrialized countries for the first time in 2015.

More so, in 2015, green energy expenditure grew by 16 percent in China, India, and Brazil, the top three E7 nations, to $120.2 billion, while investment in ‘other emerging’ countries increased by 30% to $36.1 billion. The presence of a significant renewable energy resource is at the core of the E7 countries’ challenges in achieving balanced agricultural growth and increasing domestic demand. The option to encourage sustainable energy sources, according to (Khattak et al., 2020), would not only contribute to more modernization of the energy market, but would also help various countries economic growth and sustainability goals.

The influence of NER and RER sources on greenhouse gas emissions is also demonstrated by geographic variability in the literature (Kutan et al., 2018; MacNaughton et al., 2018). However, little research has been done on the effect of environmental protection strategies on greenhouse gas emissions. The position of environmental protection policies, the usage of renewable and nonrenewable energy supplies, and per capita GDP growth on greenhouse gas emissions in emerging Asian economies is highlighted in this report, which adds to the current literature.

Table 1. Renewable, Nonrenewable and energy and Economic Growth

<table>
<thead>
<tr>
<th>Time Duration</th>
<th>Region</th>
<th>Method</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990-2014</td>
<td>15 Renewable Consuming</td>
<td>Granger causality test</td>
<td>Growth</td>
</tr>
<tr>
<td>1980-2015</td>
<td>ASEAN-5</td>
<td>Causality</td>
<td>Neutrality</td>
</tr>
</tbody>
</table>
As seen in the discussion above, there is enough research on the relationship between energy and development. (Khan et al., 2020) all agree with the literature review in Table 1. However, there is a scarcity of evidence on the impact of energy demand on economic development in emerging Asian economies in general. There is also no proper conclusion or findings in this data. As a result, there is a pressing need to put the energy-growth nexus discussions to rest (Tang et al., 2018). Furthermore, there is yet to be released a report that explores the impact of renewables on economic development incorporating both renewable and nonrenewable energy. As a consequence, this research is important in bolstering the third strand of literature, which seeks to fill this void in the literature for emerging Asian economies.
3. Data and Methodology

3.1 Study Measures and Data

To estimate the long-run modeling of study constructs we used growth functions. The unit of measurements used for levels of carbon dioxide emission is in kilotons (kt) serving as a proxy measure of cleaner environment, GDP in US dollars (Vasylieva et al., 2019), the population in % and technical operation grants in US dollars. Whereas the foreign direct investment (FDI) is measured in USD, human development index in %, renewable consumption as a proxy for green finance in kilotons (kt), inflation in %, GDP in USD 2017 purchasing power parity (PPP), domestic investment private participation in the energy sector in USD while the local credit in dollars, specific for the private sector. The data for G-7 and E-7 countries was taken from different databases, such as, databank.worldbank.org, fred.stlouisfed.org and data.worldbank.org, for the years of 2010-2018 to execute empirical analysis. In E7 countries, China, India, Brazil, Mexico, Russia, Indonesia and Turkey were taken. While, united states, United Kingdom, Germany, Japan, France, Italy and Canada were taken in G7 countries. In total, 14 countries were taken which are major countries facing issues in terms of environmental pollution and reduction in economic growth. Subsequently, this is to assess the log-run dynamics of cleaner environment on economic indicators. The cleaner environment is also assessed by using the green performance index data of E7 countries and G7 countries. Table 1 of the study shows the green performance index scores of E7 and G7 countries. Notably, the empirical statistics revealed that G7 countries are more attentive to clean the environment for climate change mitigation, concerned to gain environmental sustainability and this matters them most than E7 countries.
3.2. Econometric modeling

In this study, we examine the impact of climate change on macroeconomic indicators of BRI project and G7 AND E7 region. To acquire the study objectives, we consider two models (Y: growth function and CE: environmental function), which are specified as follows:

\[ Y_{it} = f(X_{it}; Pre_{it}; Post_{it}) \]  

(1)

In equation (1), \( Y_{it} \) is the dependent variable of the study, \( X_{it} \) is the composite function including GDP, FDI, population, R & D expenditures, CO\(_2\) emission, human development index score, inflation, grants, DCP and investment in power plants. \( Pre_{it} \) is pre-test exposure of the countries to the climate change and green financing. While, \( Post_{it} \) is the examined function showing the exposure of the countries to the climate change and green financing (e.g. under treated). The panel form of equation (1) is developed in equation (2), as below;

\[ \ln Y_{it} = \beta_0 + \beta_1 X_{it} + \beta_2 Pre_{it} + \beta_3 Post_{it} + \epsilon_{it} \]  

(2)

where \( i \) designates countries; \( t \) represents the period; \( \alpha_0 \) represents the fixed country effect, and \( \epsilon \) is the white noise. Ln is the natural logarithms of all variables. Moreover, the logarithmic form of equation (3) is developed as,

\[ \ln Y_{it} = \beta_0 + \beta_1 \ln(X)_{it} + \beta_2 \ln(Pre)_{it} + \beta_3 \ln(Post)_{it} + \epsilon_{it} \]  

(3)

where, the country, \( t \) is the period, and \( \epsilon_{it} \) is the error term. The parameters, such as, \( \beta_1, \beta_2, \) and \( \beta_3 \) represent the long-run elasticity estimates of \( Y, X, \) Pre-test exposure, and post-test exposure of the countries, in G7 and E7 region, respectively.

3.3. Strategy for Econometric Estimation

A panel stationary test is applied to test to assess the order of variable integration. For this, Augmented Dickey-Fuller (ADF) technique (1979) and Phillips and Perron (1988) are used to determine unit root among variables. The study used the hybrid strategy for the estimation of study
constructs to infer the findings, in two ways. First, study applied FMOLS approach to show the
evidences on climate change mitigation and economic growth. This approach shown constructs-
wise and country-wise differences interpreting the pre and post consequences of climate change
on economic performance of G7 and E7 region. Secondly, we used panel cointegration and panel
long-run elasticity’s functions to robust the findings of FMOLS approach. This approached
supported the operationalization part of study findings by proposing the estimated residuals to give
the findings in terms of long-run (Adedoyin et al., 2020). However, hypothesized form of equation
(4) for long-run regression technique is as follows;
\[
Y_{it} = \lambda_1 + \theta_i t + \sum_{j=1}^{n} \lambda_j t X_{jt} + \varepsilon_{it} t = 1 \ldots T; \ i = 1 \ldots \ldots \ldots \ (4)
\]
Extending to it, fully modified OLS method is used to estimate the nature of heterogeneity
among the variables to measure the intensity of relationship. According to Pedroni, (2000) this
method allows to operationalize and rectify the expounding variable’s endogeneity with different
vibrant data sheets. The use of FMOLS presupposes that the variables have a cointegration
connection. As a result, we begin with unit root tests on each of the data set.

3.4. Robustness: Vector Error Correction Modeling (VECM)

The cointegration of variables estimation supported to develop the casualty among variables.
For this and long-run inference of results we applied VECM methods by using two-step process.

Table 2 Probit and Logit estimates for economic efficiency

<table>
<thead>
<tr>
<th>Countries</th>
<th>Constructs</th>
<th>Eaccess</th>
<th>Enimp</th>
<th>FDI</th>
<th>GDP</th>
<th>Foss</th>
<th>Taxes</th>
<th>QPI</th>
<th>LPI</th>
<th>Eneemis</th>
</tr>
</thead>
<tbody>
<tr>
<td>E7</td>
<td>Probit</td>
<td>-0.016</td>
<td>-0.043</td>
<td>0.059</td>
<td>0.033</td>
<td>0.098</td>
<td>0.003</td>
<td>0.073</td>
<td>0</td>
<td>0.001</td>
</tr>
<tr>
<td>Logit</td>
<td>-0.027</td>
<td>-0.086</td>
<td>0.114</td>
<td>0.054</td>
<td>0.196</td>
<td>0.002</td>
<td>0.129</td>
<td>0</td>
<td>0</td>
<td>0.001</td>
</tr>
<tr>
<td>G7</td>
<td>Probit</td>
<td>-0.028</td>
<td>-0.056</td>
<td>0.71</td>
<td>0.088</td>
<td>0.097</td>
<td>0.000</td>
<td>0.029</td>
<td>0</td>
<td>0.000</td>
</tr>
<tr>
<td>Logit</td>
<td>-0.017</td>
<td>-0.099</td>
<td>0.25</td>
<td>0.041</td>
<td>0.234</td>
<td>0.059</td>
<td>0.011</td>
<td>0</td>
<td>0</td>
<td>0.000</td>
</tr>
</tbody>
</table>
Table 2 shows the probit and logit figures of E7 and G7's economic performance. Eaccess and Enimp are unlikely to affect the energy performance of the countries studied in this report. The EE on BRI countries in SSA, on the other hand, is likely to be influenced by FDI, as predicted. This is shown by an increase in Chinese investments in Africa and SSA. The oil and transportation industries are the two most important sectors for China's investments in BRI ventures. The GDP would have an effect on the energy production of E7 and G7 nations, as well as fossil fuels, taxes, QPI, LPI, and ENEEMIS. The coefficients of the probit model demonstrate this. As seen in Table 2, the countries under review with energy access have a probable effect on energy efficiency of [39.5646 percent]. Energy imports, on the other side, have little effect on the countries under review, with a negative mean [-45.13979 percent], showing that energy imports have little effect on EE in the E7 and G7 nations. All of the covariates show that the BRI project countries in E7 and G7 countries with means have an effect on energy quality. To measure the long-run relationship between the structures, the VECM procedure is used. The F-statistics in the VECM may indicate short-run causality, whereas the error correction word ECT (1) may indicate long-run causality. Therefore, the equation of the VECM for economic growth (Y) is written as follows:

\[
\begin{bmatrix}
\Delta \text{Clim} \\
\Delta \text{Eco} \\
\Delta \text{Soc}
\end{bmatrix} = \begin{bmatrix}
\lambda_1 \\
\lambda_2 \\
\lambda_3
\end{bmatrix} + \sum_{m=1}^{n} \begin{bmatrix}
\delta_{11} & \delta_{12} & \delta_{13} \\
\delta_{21} & \delta_{22} & \delta_{23} \\
\delta_{31} & \delta_{32} & \delta_{33}
\end{bmatrix} \times \begin{bmatrix}
\Delta \text{LnClim} it - m \\
\Delta \text{LnEco} it - m \\
\Delta \text{LnSoc} it - m
\end{bmatrix} + \begin{bmatrix}
\vartheta_1 \\
\vartheta_2 \\
\vartheta_3
\end{bmatrix} \text{ECT}_{t-1} + \begin{bmatrix}
\varepsilon_1 \\
\varepsilon_2 \\
\varepsilon_3
\end{bmatrix}
\]

In above equation (5), three main dimensions were taken, such as, environmental, social and economic to assess the cleaner environment, climate change and economic growth prospects in BRI project and G7 and E7 regions.
The vector error (VECM) form of study model is written and sub-divided into proxies as follows, where $\Delta$, $\delta_{it}$, $\gamma_{it}$, $i$, $t$, and $\mu_{it}$ represent the first difference operator, the constant term, the parameters, the period and the error term, respectively. ECT is the lagged error correction term. Using above econometric models, we used long run growth prospecting econometric function (see equation 5 & 6) of G7 and E7 regions. For growth regression, an index of economic indicators was developed including GDP, FDI, INF, R & D and IPP, Index of social indicators was also developed including GRT, HDI and PoP. While, environmental factors were assessed using CO2 emission index, as a measure of climate change mitigation. The functions are graphically reported as below;
Graph 4 (a) Modeling causality relationship of growth regression

Graph 4 (b) Modeling causality relationship of growth regression
Results and Discussion

Empirical Analysis

The results indicate that decreased fossil fuel usage and increased renewable energy consumption caused development in the E7 and G7 regions. Backs up this point by citing Indonesia's goal of producing 5% of its electricity from geothermal, 5% from wind, biomass, hydro, and solar, and 5% from biofuel by 2025. In order to improve and achieve a low-carbon economy, Indonesia initiated the Low Carbon Growth Initiative (LCDI). This aim also promotes the creation of a policy suite and modular transformation programs that can be used in various economic sectors. These revolutionary processes could result in economic growth of 5.6 percent by 2020 and 6.0 percent by 2045.

In the best-case scenario, 15.3 million good green workers will be introduced by 2045, resulting in a $5.4 trillion GDP boost. Poverty is projected to fall from 9.8% of the population in 2018 to 4.2 percent in 2019. About the same way, better air quality is projected to save 40,000 lives (Zeng et al., 2017). During the period 2005-2015, the Philippines expected to raise its renewable energy by 100%. In the last six years, the Philippines' economy has expanded at a steady pace of 6.6 percent. By 2030, it intends to build 2.35 GW of wind power. However, the theoretical capacity is 76 GW (Baloch et al., 2020). With steady GDP growth of 6% over the last decade, Vietnam can be called another booming economy. Its clean energy goals are 5% in 2020 and 11% in 2050, respectively (Ma et al., 2019). The nation currently has 228 MW of installed wind power and expects to build 800 MW by the end of 2020. The G-7 AND E-7 countries have a large energy intensity ratio, which should be ample incentive for them to engage in energy production and conservation.

Table 3 ADF and PP results
<table>
<thead>
<tr>
<th>Constructs</th>
<th>Level</th>
<th>1st Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Intercept</td>
</tr>
<tr>
<td>Ln (Y)</td>
<td>18.75 (0.8723)</td>
<td>13.07 (0.2217)</td>
</tr>
<tr>
<td>Ln (λ1)</td>
<td>0.26 (0.3467)</td>
<td>0.11 (0.000)</td>
</tr>
<tr>
<td>Ln (λ2)</td>
<td>11.37 (0.2865)</td>
<td>9.49 (0.2371)*</td>
</tr>
<tr>
<td>Ln (λ3)</td>
<td>10.68 (0.7777)</td>
<td>6.66 (0.000)*</td>
</tr>
<tr>
<td>Ln (λ4)</td>
<td>16.27 (0.3461)</td>
<td>10.01 (0.5728)</td>
</tr>
<tr>
<td>Ln (λ5)</td>
<td>6.028 (0.3544)</td>
<td>0.89 (0.3410)*</td>
</tr>
<tr>
<td>Ln (λ6)</td>
<td>9.734 (0.2971)</td>
<td>3.13 (0.000)*</td>
</tr>
<tr>
<td>Ln (λ7)</td>
<td>6.001 (0.3064)</td>
<td>0.10 (0.7321)</td>
</tr>
<tr>
<td>Ln (λ8)</td>
<td>7.237 (0.8275)</td>
<td>2.15 (0.0016)*</td>
</tr>
<tr>
<td>Ln (λ9)</td>
<td>8.666 (0.5601)</td>
<td>4.80 (0.5388)</td>
</tr>
</tbody>
</table>

Panel II: PP Fisher Chi-Square

| Ln (Y)     | 27.61 (0.8831) | 31.14 (0.8813) | 10.38 (0.2020) | 7.004 (0.1476) |
| Ln (λ1)    | 32.45 (0.0200) | 11.81 (0.4934)* | 15.67 (0.7142)* | 14.75 (0.1789) |
| Ln (λ2)    | 11.99 (0.7684) | 6.07 (0.4672) | 16.79 (0.1421)* | 11.23 (0.6216)* |
| Ln (λ3)    | 4.525 (0.3308) | 0.05 (0.0000)* | 28.19 (0.2489)* | 18.88 (0.3604) |
| Ln (λ4)    | 7.067 (0.4006) | 2.17 (0.3419)* | 17.71 (0.2676)* | 20.71 (0.2013)* |
| Ln (λ5)    | 13.01 (0.4250) | 7.19 (0.1111)* | 19.56 (0.1431)* | 12.57 (0.0365)* |
| Ln (λ6)    | 21.01 (0.3111) | 8.35 (0.0007) | 21.17 (0.0006)* | 0.019 (0.000)* |
| Ln (λ7)    | 37.92 (0.0000) | 4.07 (0.1489)* | 35.10 (0.7893) | 9.47 (0.1827)* |
| Ln (λ8)    | 12.55 (0.6803) | 0.14 (0.5617)* | 32.13 (0.5637)* | 5.08 (0.6802)* |
| Ln (λ9)    | 19.29 (0.5557) | 0.56 (0.3418)* | 14.07 (0.4190) | 0.05 (0.9992)* |

The ADF and PP unit root results are tabulated in table 3 presenting that study results are stationary at level and some of the measures, such as, CO₂ emission, REC and per capita GDP are stationary at level. The results indicated that null hypothesis is accepted and the variables are...
stationary at first difference, highlighting that variables are cointegrated in a singular order. Extending to it, con-integration test is applied to build more econometric clarity in study results. These results are tabulated in table 4 by applying Pedroni panel co-integration test with seven diverse statistics, in which, three are between and four are within magnitudes. Table 4 shown that there is a significant cointegration among the variables therefore H1 is accepted.

We used the FMOLS methodology to calculate the long-term association between variables. For the estimates in Table 5, see this article. It validates the growth theory, which maintains that economic growth is generated by energy usage. As an economy grows, the energy use is often dependent on labor and resources, as well as other factors such as population, place, and technology. Are you a masochist? These findings indicate that green energy use has a favorable effect on the 1% of the national economy, that a rise in renewable energy demand of 22% would result in 1% in the growth of the overall economy. According to the G7 formula, a 1% GDP percentage-point raises the carbon emissions of 1% of a country's population by 4.55%. There is an ever-increasing volume of data supporting the argument that development in the Gross Domestic Product (GDP) and population leads in a rise in carbon dioxide emissions, according to several analyses (Solaymani, 2019). Even countries with a high GDP, such as the United States, China, Japan, and Germany are, as well as is shown in Graph 5, still very populated.

An insignificant 2% risk that energy-related pollution would affect the atmosphere the other change in the variable could result in a small change in the percentage Energy efficiency decreases by about eight percent as the percentage of energy access varies. Although between 4% and 6% of the participants of the G7 have a strong impact on their Gross Domestic Product (GDP), foreign direct investment (FDI) has a high mean influence on overall direct investment (QPI). Table 6 predicts that the respective mean and standard deviation for the logit and probit models lie between
The formula would not limit the range of probabilities to 0-1 for the Logit model, which means they will take on every possible logit value. An equivalent or even higher mean value for $E_i$, an equal mean for G-7 and E-7 countries with respect to energy production. as said above, the sensitivity and specificity models were accurate in their predictions. See Figure 19, where the model has a sensitivity of 89.33 and a reported value of 92.42, but a negative accuracy of 58.93. The findings of this analysis indicate was considered to be right to be at 84.21% Although 84% of the model has been estimated to be right, the majority of the assumptions are in error. It is shown in Table 3. The inverse association between national GDP and pollution reduction (e.g., decreasing $\text{CO}_2$) is, however, not universal.

![Graph 5 Synthesis of climate change – GDP relationship](image)

**Table 4 Cointegration results**

<table>
<thead>
<tr>
<th></th>
<th>Y model (economic growth function in E7 countries)</th>
<th>CE model (environmental function in E7 countries)</th>
<th>Y model (economic growth function in E7 countries)</th>
<th>CE model (environmental function in E7 countries)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Statistics</td>
<td>Significance</td>
<td>Statistics</td>
<td>Significance</td>
<td>Statistics</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The renewable energy score is shown in Graph 3. A 0.057 and 0.126 value can be seen for the coefficients of per capita education spending (PCEDU). Whereas, coefficients of per capita for research and development (PCRD) are recorded at 0.022 and 0.073, respectively. An evident heterogeneous effect can also be observed. The low GDP per capita countries represented here tend to have a reasonable estimate regarding composition and technical effects. The coefficient of low GDP per capita countries for education expenditure is recorded at 0.215. This value is
significant at a level of 1%. However, the value of the coefficient for high GDP per capita countries is recorded at 0.049. This value is significant at 5% level. A GDP per capita based split analysis on the whole sample is explained in this section. The two sub-divisions of the sample include the countries with low GDP per capita and a high GDP per capita. The three non-parametric tests applied include the rank-sum equality, equality of distribution and rank comparison.

Table 5 Split outcomes of G7 and E7 countries on the basis of GDP.

<table>
<thead>
<tr>
<th></th>
<th>GDP per capita G7 Countries</th>
<th>GDP per capita E7 Countries</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>L.GEGI</td>
<td>-0.075*</td>
<td>0.057***</td>
</tr>
<tr>
<td></td>
<td>(0.039)</td>
<td>-0.037</td>
</tr>
<tr>
<td>PCRD</td>
<td>0.063***</td>
<td>0.025</td>
</tr>
<tr>
<td></td>
<td>(0.025)</td>
<td></td>
</tr>
<tr>
<td>PCEDU</td>
<td></td>
<td>0.215***</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.036)</td>
</tr>
<tr>
<td>INDUS</td>
<td>-0.298***</td>
<td>-0.208**</td>
</tr>
<tr>
<td></td>
<td>(0.99)</td>
<td>(0.96)</td>
</tr>
<tr>
<td>Green</td>
<td>0.013</td>
<td>-0.021</td>
</tr>
<tr>
<td></td>
<td>(0.064)</td>
<td>(0.062)</td>
</tr>
<tr>
<td>GDPPL</td>
<td>-0.000</td>
<td>0.009</td>
</tr>
<tr>
<td></td>
<td>(0.018)</td>
<td>(0.019)</td>
</tr>
<tr>
<td>Openness</td>
<td>-0.027*</td>
<td>-0.010</td>
</tr>
<tr>
<td></td>
<td>(0.021)</td>
<td>(0.018)</td>
</tr>
<tr>
<td>Constant</td>
<td>3.612***</td>
<td>3.789***</td>
</tr>
<tr>
<td></td>
<td>(0.574)</td>
<td>(0.578)</td>
</tr>
<tr>
<td>Observations</td>
<td>108</td>
<td>108</td>
</tr>
<tr>
<td>Arellano-bond AR (1)</td>
<td>-5.037</td>
<td>-5.046</td>
</tr>
<tr>
<td></td>
<td>[0.000]</td>
<td>[0.000]</td>
</tr>
<tr>
<td>Arellano-bond AR (2)</td>
<td>0.719</td>
<td>0.809</td>
</tr>
<tr>
<td></td>
<td>[0.507]</td>
<td>[0.438]</td>
</tr>
<tr>
<td>Sargan test</td>
<td>144.737</td>
<td>146.655</td>
</tr>
<tr>
<td></td>
<td>[0.780]</td>
<td>[0.756]</td>
</tr>
</tbody>
</table>
Table 5 suggests that climate change can have substantial impacts on normal market practices. A large rise in electricity consumption has been induced by the population as well. estimated another input parameter estimated in the model, this time, the G-7 countries gave a response of 99.37% (Table 5), demonstrating the broad variety of economic data forecasts correlated with climate change mitigation. As a result, CO2 emission measurements from the same nation have a high degree of homogeneity over time, implying that heterogeneity within countries accounts for over 99 percent of CO2 emissions over time. This implies that countries' CO2 pollution policies should not shift with time. That is, CO2 emissions from the previous year represent CO2 emissions in the subsequent year for the same region. (McDonough et al., 2018) observed that CO2 emissions at time t-1 are the key drivers of the shift in CO2 emissions at time t. Contrary to common opinion, the E7 countries are seeing fewer volatility in GDP (overall) as a consequence of climate change.

**Long-run Dynamics**

To estimate the long-run association among the study constructs, we applied FMOLS technique. Our findings reported the growth function in the table 6. It seemed that cleaner environment or in other words climate change mitigation in terms of CO2 emission reduction has positive impacts on economic growth of BRI project and G7 and E7 region countries. Importantly, renewable energy sources have significantly moderated in this relationship and inclined the role towards positive extent. However, role of green financing in terms of renewable energy sources usage has commendable role. All the countries of E7 and G7 region reported the relationship between variables, as significant. This commends a significant role of green financing techniques through renewable energy sources for environmental cleaning and greening. Such results validated the growth hypothesis, suggesting a unidirectional causality relationship between environmental
cleaning and economic growth of G7 and E7 region and BRI project. This suggest more that using innovative energy solutions for the energy consumption holds a vital role in regional economic growth and climate change mitigation, directly and indirectly (Assadi et al., 2020).

Table 6 Long run estimates of the growth function

<table>
<thead>
<tr>
<th>Countries</th>
<th>Growth function</th>
<th>Durbin-Watson</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LnClim</td>
<td>LnEco</td>
</tr>
<tr>
<td>Brazil</td>
<td>0.024 (0.000)</td>
<td>0.016 (0.000)</td>
</tr>
<tr>
<td>Mexico</td>
<td>0.029 (0.000)</td>
<td>0.022 (0.000)</td>
</tr>
<tr>
<td>Russia</td>
<td>0.020 (0.000)</td>
<td>0.044 (0.000)</td>
</tr>
<tr>
<td>China</td>
<td>0.041 (0.000)</td>
<td>0.027 (0.000)</td>
</tr>
<tr>
<td>Turkey</td>
<td>0.039 (0.000)</td>
<td>0.059 (0.000)</td>
</tr>
<tr>
<td>India</td>
<td>0.019 (0.000)</td>
<td>0.028 (0.000)</td>
</tr>
<tr>
<td>Indonesia</td>
<td>0.033 (0.000)</td>
<td>0.047 (0.000)</td>
</tr>
<tr>
<td>USA</td>
<td>0.018 (0.000)</td>
<td>0.036 (0.000)</td>
</tr>
<tr>
<td>UK</td>
<td>0.009 (0.000)</td>
<td>0.014 (0.000)</td>
</tr>
<tr>
<td>Japan</td>
<td>0.002 (0.000)</td>
<td>0.010 (0.000)</td>
</tr>
<tr>
<td>Italy</td>
<td>0.034 (0.000)</td>
<td>0.048 (0.000)</td>
</tr>
<tr>
<td>Germany</td>
<td>0.017 (0.000)</td>
<td>0.031 (0.000)</td>
</tr>
<tr>
<td>France</td>
<td>0.030 (0.000)</td>
<td>0.058 (0.000)</td>
</tr>
<tr>
<td>Canada</td>
<td>0.017 (0.000)</td>
<td>0.044 (0.000)</td>
</tr>
</tbody>
</table>

*shows level of significance at 5 percent level of confidence interval

Table 7 Robustness of results using Panel VECM results for the growth function

<table>
<thead>
<tr>
<th>Dependent Variables</th>
<th>F – Statistics</th>
<th>T - statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>λ1</td>
<td>λ2</td>
</tr>
<tr>
<td></td>
<td>(-1)</td>
<td></td>
</tr>
</tbody>
</table>
As a consequence, the panel findings remained relevant in two ways: first, construct-wise, and second, country-wise. Since the residual errors are usually distributed, we can trust the findings recorded by the models, which are 1% for the lower percentiles and 99% for the higher percentiles. Floods endanger 48% of the world's property, more than half of the world's people, and 46% of global properties. In 68% of coastal regions, tidal and storms will cause flooding, while the remaining 32% is at risk from a regional increase in sea level, according to his report. The study
also reveals the flow of green finance in G-7 and E-7 nations. The developing countries are host
to the bulk of the world's population. In 2018, the total and nominal GDP of the world's population
was projected to be about $6.5 trillion, with about 1.5 billion people. While having a population
that is larger than China, their GDP is comparable to China's. This level of magnitude revealed
that 0.34 represents a 1% increase in economic growth due to green energy demand, resulting in a
0.11 increase in economic growth from where it is now. As a consequence, our results are
compatible with previous research on E7 and G7 regional initiatives in multiple contexts,
highlighting the role of a cleaner environment in economic development by green finance on
regional scales such as the G7 and E7. We have used the effects of the environmental feature with
the growth function, as seen in table 7, utilizing the FMOLS technique. These findings indicate
that CO$_2$ levels are elastic as green energy is used in combination with G7 economic development.

4.3 Green Performance Index

Interestingly, there is slight difference of graphs between E7 and G7 countries but comparatively
G7 countries are more inclined to take initiatives for climate change mitigation. As Brazil holds
lower score ranging from 46% to 54% which is lowest score in E7 countries, as well as in G7
countries. Mexico has good index in terms of green performance which is greater than 75%. China
is setting a benchmark in green performance index achieving more than 93% score to perform
green. Indonesia is sluggish to perform as green countries holding score less than 60%, which is
quite alarming and indicating to take quick actions for a secure environmental future, nation-wide.
While, in G7 countries only France is less efficient to perform green and having score less than
60%. Conclusively, G7 has one country (e.g France) and E7 has two countries (e.g. Brazil and
Indonesia).

Table 1 Green performance index of E7 and G7 countries
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>E7</td>
<td>Brazil</td>
<td>0.47</td>
<td>0.46</td>
<td>0.45</td>
<td>0.46</td>
<td>0.45</td>
<td>0.47</td>
<td>0.51</td>
<td>0.52</td>
<td>0.54</td>
</tr>
<tr>
<td></td>
<td>Mexico</td>
<td>0.76</td>
<td>0.76</td>
<td>0.75</td>
<td>0.73</td>
<td>0.73</td>
<td>0.79</td>
<td>0.83</td>
<td>0.81</td>
<td>0.83</td>
</tr>
<tr>
<td></td>
<td>Russia</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0.97</td>
<td>0.98</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>China</td>
<td>0.93</td>
<td>0.93</td>
<td>0.95</td>
<td>0.98</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Turkey</td>
<td>0.62</td>
<td>0.74</td>
<td>0.5</td>
<td>0.65</td>
<td>0.75</td>
<td>0.71</td>
<td>0.90</td>
<td>0.78</td>
<td>0.84</td>
</tr>
<tr>
<td></td>
<td>India</td>
<td>0.67</td>
<td>0.71</td>
<td>0.69</td>
<td>0.79</td>
<td>0.79</td>
<td>0.84</td>
<td>0.73</td>
<td>0.77</td>
<td>0.76</td>
</tr>
<tr>
<td></td>
<td>Indonesia</td>
<td>0.58</td>
<td>0.73</td>
<td>0.72</td>
<td>0.62</td>
<td>0.58</td>
<td>0.58</td>
<td>0.58</td>
<td>0.58</td>
<td>0.58</td>
</tr>
<tr>
<td>G7</td>
<td>USA</td>
<td>0.66</td>
<td>0.65</td>
<td>0.65</td>
<td>0.67</td>
<td>0.66</td>
<td>0.65</td>
<td>0.66</td>
<td>0.67</td>
<td>0.69</td>
</tr>
<tr>
<td></td>
<td>UK</td>
<td>0.95</td>
<td>0.95</td>
<td>0.95</td>
<td>0.85</td>
<td>0.78</td>
<td>0.78</td>
<td>0.8</td>
<td>0.77</td>
<td>0.65</td>
</tr>
<tr>
<td></td>
<td>Japan</td>
<td>0.87</td>
<td>0.88</td>
<td>0.87</td>
<td>0.88</td>
<td>0.88</td>
<td>0.85</td>
<td>0.84</td>
<td>0.84</td>
<td>0.85</td>
</tr>
<tr>
<td></td>
<td>Italy</td>
<td>0.76</td>
<td>0.75</td>
<td>0.73</td>
<td>0.75</td>
<td>0.67</td>
<td>0.68</td>
<td>0.68</td>
<td>0.67</td>
<td>0.65</td>
</tr>
<tr>
<td></td>
<td>Germany</td>
<td>0.95</td>
<td>0.86</td>
<td>0.84</td>
<td>0.80</td>
<td>0.85</td>
<td>0.87</td>
<td>0.95</td>
<td>0.95</td>
<td>0.95</td>
</tr>
<tr>
<td></td>
<td>France</td>
<td>0.46</td>
<td>0.50</td>
<td>0.49</td>
<td>0.49</td>
<td>0.48</td>
<td>0.5</td>
<td>0.53</td>
<td>0.52</td>
<td>0.55</td>
</tr>
<tr>
<td></td>
<td>Canada</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

The G-7 and E-7 countries must strive to emphasize the value of natural resources' effect on global growth and financial development. A 7% growth in export leads to a 45 percent rise in financial deepening, according to his calculations. Despite the fact that it is mostly based on fossil fuels, this research may be particularly useful for the E7 and G7 countries in terms of consuming renewables and developing their financial sectors. Between 2011 and 2018, the six MDBs donated a total of 237 billion dollars to developed countries in the battle against climate change. Multilateral Development Banks (MDBs) have recorded a 61 percent growth in climate financing from 18 percent to 29 percent since 2013. In 2018, the MDBs pledged $165 million to mitigate climate change.
change, totaling US$ 21,439 million, with 71 percent of it heading to construction loans and the
remaining 7% going to policy-based funding, totaling US$ 2,195 million. (Yuan and Gallagher, 2018) stressed the importance of filling the $110 billion annual deficit left by MDBs, concentrating on green finance in Latin America and the Caribbean. According to the report, an extra $7 billion in green funds and $4.4 billion from MDBs can be spent next year. (Yuan and Gallagher, 2018) found that MDBs favoured countries with higher civil rights and pro-socialist governments in terms of support.

Graph 2 Climate Change Mitigation Performance of E7 Countries
Discussion

The aim of this analysis was to look at the impact of climate change mitigation on GDP in the E7 and G7 nations, as well as other determinants including environmental taxation, human resources, GDP, green energy use, and environmentally sustainable technical innovation. For a variety of factors, we decided to analyses a sample of G-7 and E-7 nations. The strategy, strategies, and activities of these seven great powers, which control nearly half of global GDP, are critical in achieving low CO₂ levels. G7 countries' attempts to curb CO₂ pollution are commendable, given that their exposure to greenhouse gas emissions was 70% in the early twentieth century and just 24% in 2015. Despite the fact that its absolute contribution to greenhouse gas emissions is high, the G7's contribution is just half that of China as of early 2010. Canada has the largest greenhouse gas emissions and electricity use per capita in the E7 nations.

As long as it proceeds to subsidies the use and output of fossil fuels, Canada's success in climate change mitigation policy is rated as average. Furthermore, the United Kingdom, Indonesia,
and Germany have excellent results in terms of greenhouse gas emissions and oil usage, while the United States and Japan have poor efficiency. By examining the non-homogeneous features of regional nations, such as E7 vs. G7, the study seems appealing. The results of this analysis can be used to advise relevant strategies for a balanced world by the great powers. The research constructs are bidirectional between climate change mitigation (e.g. CO2 emissions) and economic growth in the G7 and E7 areas, according to the long-run calculation parameters. These results back up the study's hypothesis that there is a beneficial connection between a cleaner atmosphere (e.g., climate change mitigation) and economic development, and that green finance strategies will help to improve the G7 and E7 region's natural, economic, and social well-being.

**Graph 6 Proposed policy frameworks**

Thus, study hypothesis is accepted and through these estimates our study findings are robust in long run. The results of recent study are aligned with the findings of Abbas, (2020) and Wu et al, (2020) for regional dynamics and in long-run context. Note: * mean significance at the 5% stage. We concluded the empirical outputs of study with growth function by using VECM approach shown in table (10) and (table (11), indicating bidirectional causality among the cleaner environment and green financing potential, in long-run, endorsing. Our results are in line with the conclusions of (Bocco et al., 2020). Contradicting to it, the findings of study are comparatively consistent with different other studies (Wahab et al., 2020), supporting the unidirectional findings of recent study, missing the link to predict the long-run future of any BRI project in a region that is covered by recent study. By this, current investigation sufficiently fills the gap on theoretical, empirical and practical grounds by providing key policies suggestion for policy makers.

In this sense, the International Institute for Applied Systems Analysis (IIASA) predicts that Southeastern, Central, and Western Asia will become major economic drivers (i.e., the BRI
countries will account for 50% of global GDP from 2015 to 2030). It has a worldwide market share of 11%. These figures demonstrate the G-7 and E-7 countries' expenditure and demand capacity. A analysis by shows a long-term equilibrium association between population, technical change, and sustainable use for G7 vs. E-7 countries (Wahab et al., 2020). As facility access is a necessity in the introduction of the BRI, a growth in per capita GDP would result in a major increase in electricity demand and carbon emissions (Safi et al., 2021).

**Conclusion and Policy Implications**

This research suggested an examination of various approaches to changing green finance and environment conditions in G-7 and E-7 countries from 2010 to 2018. Two classes of countries have been created (i.e., treated group and control group). To contend with the unobserved time-variation, which may trigger weakness in the inference, pre-treatment observables have been used by matching approaches (i.e., the kernel, radius matching, and nearest neighbour approach). This strategy may help to offset the time gaps between classes. The E-7 countries are the 21st century's fastest-growing economies. China has the world's largest clean energy assets, including hydropower, solar PV, and wind. With a 15 percent renewable energy goal for 2020, China has been investing in renewable energy for a long time. By 2018, it had reached 14.3 percent, with a total expenditure in renewables of 33 percent (Chain et al., 2019). Furthermore, low-carbon solutions are expected to meet about 40% of the country's renewable energy expenditure requirements, including transportation. Whereas, wastewater, land remediation, waste management and sewerage will get the remaining 60% from 2014-2020 (Shahzad et al., 2021). The G-7 and E-7 countries account for 7.94% of world GDP and produce around 11.2% of global CO₂ emissions (Chain et al., 2019) and (Sinha et al., 2018). The burden-sharing issue requires that the developed and the developing world take equal constructive measures to prevent practices that
would increase global temperatures above 1.5 Celsius as foreseen by the Paris Accord (Sinha et al., 2020).

This research highlighted the importance of G-7 and E-7 countries developing policies capable of addressing systemic risks associated with climate change, as well as the necessary funding to mitigate these risks and impacts. Based on the methodology used, the analysis yielded mixed results, as there is no correlation between the G-7 and E-7 countries' green finance and climate risk profiles. For Emerging and Developing Economies (EMDEs), in particular, sustainability is a critical concern. Overall, the following indicators have a major influence on SSA BRI countries: the continent's EE condition, foreign direct investment, GDP, oil imports, energy-related pollution, fossil-fuel use, port infrastructure efficiency, logistic output index, and taxes. However, various models showed that certain factors had different effects on the BRI countries' Energy EE. Furthermore, projections of the marginal impact suggest that oil imports are unlikely to disrupt the G7 and E7 countries' energy EE.

1. The existing assessment techniques for energy, pollution and economy need to be replaced with completer and more low-cost (in terms of time) indicators for better assessment of real-time data and enforcement of local and international energy laws.

2. Authorities need to redistribute public funds towards the public good. Although public funds, R&D and education for clean energy have been raised lately, they are not comparable to developed countries. Governments should allocate additional funding to green energy education and R&D in the light of the findings of this study, which will proliferate human resource mobilization and technology innovation, critical to green economic success.
3. This work highlights country-wide variation in the effects of public funds on green economic growth. Therefore, BRI economies are recommended to formulate country-specific strategies for better benefit.

Policy Implications

The following are the policy recommendations in this article:

To begin, increase the severity of environmental regulations as required. The environmental regulation has had the anticipated "back-forced reduction" impact at this stage. As a result, improving environmental policies would aid in the reduction of carbon emissions.

Second, the government should set the level of environmental regulation based on regional economic growth and carbon intensity heterogeneity. It is recommended that the eastern developed provinces adopt a higher degree of environmental regulation severity, taking into account the growing demand for environmental quality and green goods.

Third, technical innovation should have a positive impact on carbon emissions reduction. The empirical findings indicate that technological progress has not substantially decreased carbon emissions under the constraints of environmental regulation. As a result, the government should build an external climate conducive to corporate environmental protection technology innovation, as well as direct the transition of innovation inputs to environmental protection technologies, based on local conditions. Enterprises should aggressively adopt environmental management technologies that are compatible with their own productivity levels and technical absorption capability, undertake reverse learning and secondary growth, fully exploit the advantages of late development, and realise the dynamic evolution from technology import to technology imitation to independent innovation.

Ethical Approval and Consent to Participate
The authors declare that they have no Known competing financial interests or personal relationships that seem to affect the work reported in this article. We declare that we have no human participants, human data or human tissues.

Consent for Publication

We do not have any individual person’s data in any form.

Author Contribution

Wu Xueying: Conceptualization, Writing - original draft; Muhammad Sadiq: Writing - original draft. Feng Sheng Chien: Data curation, Methodology; Data curation; Thanh Quang Ngo: Data curation, Visualization, review & editing. Anh-Tuan, Nguyen: Writing - review & editing and software. The-Truyen, Trinh: Visualization, supervision, editing and software.

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Competing interest statement

We declare that there is no conflict of interest.

Availability of data and materials

The data that support the findings of this study are openly available on request.

Reference


Vasylieva, Lyulyov, Bilan, & Streimikiene. (2019). Sustainable Economic Development and...


Figures

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Figure 1

Graph 1

Climate Change Mitigation Performance of E7 Countries
Figure 3

Climate Change Mitigation Performance of G7 Countries
Figure 4

(a) Modeling causality relationship of growth regression (b) Modeling causality relationship of growth regression
**Figure 5**

Synthesis of climate change – GDP relationship

![CC-GDP](image)

**Image not available with this version**

**Figure 6**

Proposed policy frameworks