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Impact of Green Energy on Commodity Producing Sector in Developing Countries

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Abstract
This study investigates the impact of green energy on commodity producing sector in developing countries using the panel data from 2000 to 2022. Industry construction was taken as an outcome variable whereas Renewable energy was taken as the main focused explanatory variable along with control variables labor force, Gross capital formation, General government expenditure, GDP per capita and Co2 emission. For data analysis, panel unit root tests, panel ARDL model and causality tests were applied on a data. The ARDL model long run results showed that the main focused variable, Renewable energy positively impacted industry construction followed by Gross fixed capital formation whereas, General government expenditure, Labore force, Co2 emission, GDP per capita, were positively affected the industry construction in developing countries. It was proved that the Renewable energy impedes industry construction so these countries need special considerations.
Keywords: Renewable energy consumption, industrial output, Panel ARDL, Developing Countries.

Introduction

The executive summary of green energy offers green growth and real opportunities in developing economies. In our study, we have explored the implementation of green energy. In contrast to wealthy nations, the advantageous strategy of green energy must make various and very difficult political decisions. Positive changes are brought about by green energy in the social, environmental, and economic spheres. It has a huge impact on sustainable development as well as economic policy. The key imperative of green energy is the improvement of environmental management needed to tackle climate change. This is specifically true for developing regions, The industrial structure is

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permeated by the high share of self-employed, and of micro- and small firms in the informal economy. An industry is simply any grouping of businesses that share of common method of generating profits like steel, automobile or the food industry.Natural resources are often converted into primary goods in the dominant industry. This is especially true for emerging regions, where a sizable portion of self-employed individuals and micro- and small companies in the informal sector penetrate the industrial system. An industry is essentially any association of companies that use a similar strategy to make money, such as the steel, car, or food sectors. The majority of this sector's products are used as raw materials by other sectors. Manufacturing and construction are two economic sectors that are responsible for the creation of final, usable goods. The industry is frequently split into heavy industry and light industry. Small and medium-sized businesses (SMEs) are acknowledged as one of Pakistan's main industries. The industry contribution is as, Fabricate employment, Rising income level, Increasing exports, Improving the economies of scale and Alleviating poverty

Katsarou et al. (2018) the continuous shifting of energy sources from conventional to non-conventional has been taken place. The negative influence of conventional energy and forms of production and usage. The need for renewable energy sources usage is becoming urgent. According to research global context about 19% of total energy usage to cover its needs with Renewable energy source till 2020. The attain strategy will show their usage by 50% until 2050.This study also tested the positive correlation recorded between Renewable energy, Labor force, Gross fixed capital formation.

Pirvu et al. (2020) was establish forecasted on the production sector by taken data from 2010-2020 using Markove method. According to them hydro power was the most and latest clean energy producer in Romania. The subordination of is 50.266% of the total amount of the renewable energy till 2025. Energy concerns are not limited for only European, countries. Kayani (2017) was also examined that 90% of energy dependence in the form of natural gas. The research strategy of 2017 in UAE was based on the section of energy used. The percentage of energies divided into 4 components Renewable energy (44%), Natural gas (38%), Clean coal with carbon dioxide (12%) and nuclear energy (6%). According to statistics from the National Energy Administration supplied by Xu et al. (2019), China adopted a percentage of renewable energy that was 39.5% with a power output of 794 million KW. In spite of government assistance, solar photovoltaic, wind energy, and other renewable energy sources, there are still stumbling block in the way of their development growth. The impact of green energy on the commodity producing sectors of developing economies is not something easily avoidable. The continuous use of technology and generation of electricity for meeting the rising demand puts an enormous pressure over the energy infrastructure of developing economies. The energy consumption increases with the increase in living standards and population. Therefore, it is vital to bring a change in the consumption pattern. It also emphasizes on investment pattern about market regarding the renewable energy. Developing economies are certainly the keys to achieve global green growth. Although most of the economies are contributing only minor share until now. However, it can be increased if they follow the path of developed economies which relies on the efficient use of Green Energy. They are becoming the source of global economic

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growth along with growing emissions and intensive use of resources. They also enable the great opportunities for capitalizing economic and environmental sustainability. Indeed, green energy is a chance for developing and emerging economies to leapfrog the consumption ways. It is the key factors that influences the economy and promotes sustainable growth of developing economies. The concept of green energy growth helps to remodel the conventional growth approach and re-assess several investment decisions in meeting energy, water and other resources of economic growth. According to the facts, developing economies usually holds 80% of the world's population. However, they deviously 30% of global commercial energy. Renewable energy usually refers to both biomass and modern technologies. It plays its role efficiently in every way.

Research Question

This section shows that what is the linkage between green energy and commodity producing sector in developing countries?

Objectives of the Study

The objective of the study is to scrutinize the effective level of green energy on commodity producing sector. Moreover, the study objectives are to explore the impacts of GDP per capita, Gross fixed capital, Total labor force, General Government and Renewable energy, Co2 emission on Industry sector of 58 developing economies.

Literature Review

Qureshi & shah. (2003) were highlighted the impacts of changing energy policies on ground water and development management in Pakistan. The published paper highlighted the growth policies of the government on ground water irrigation. There were no practical means for the organized management of ground water authority. The struggle behind to make energy feasible with the help of power supply and pricing policy took lit for the growth water and energy use. This publication was also providing a deep analysis of the tube well owners flat tariff and the Flat cum-Metered tariff policies.

Lee and Chiang. (2007) were range over on the new panel stationary data to reinvestigate the interactions of energy consumption and real GDP per capita. Carrion -i-Silvestre (2005) were used first time on the developed and developing countries data. Break in the series were convinced to account that the presence of stationarity for both (LEC) and (LRY). The variables were positively significant. In developing countries impacts were grater and persistent. We should work for important steps that could emerged.

Rufael. (2009) prescribed the study to reconceive the causal connection of energy consumption and economic growth for seventeen African countries, the variance of decomposition due to the Pesaran and Shin including T statical inference. The independent variable was energy consumption with the coordination of explained variable like labor and capital proved that in eleven out of seventeen countries energy participation not more than contributed factor. But the results of labor and capital output growth amazed them. The part of energy consumption was statically minor in the economic growth of African countries.

Paresh & Popp. (2012) tried to found the combined relationship between energy

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consumption and real GDP for G6 countries. Cluster of data was taken from 93 countries, negative causality of G6 countries urged to work for such implications that beneficial for reducing carbon emission. Basically, regional panel was all about western Europe/Asia, Latin America, Middle East and the last one globe panel. Kao (1999) residual model used for based test to check the error in the panel causality. Eagle and Granger (1987) were applied empirically. There was no cointegration, organized panel data resulted for Asia nine out of 17 countries have been negatively impact. In case of Latin America unit root test revealed that results were non stationary and cointegrated. Essence of this discussion was ended on this particular point that G6 countries should adopt energy conversation policies lead for the friendly carbon dioxide pollution,

Campo and Sarmiento (2013) specifically estimated the long run relationship between energy consumption and GDP for 10 countries of Latin America. Their data have been ranged from descriptive time series (1971-2007). Pedro's panel cointegration test used to determine the existence of long run relationship. These findings were proved the empirical guidance for policies to promote energy efficiency. Results were positive and stationary in both directions. This paper was forced on the implementation of energy conversation policies in the economy.

Ashraf et al. (2013) primarily investigated the long run relation between real GDP per capita and electricity consumption in Pakistan from (1971-2008). The suggested results were on the positive side. The unidirectional causality presents the implication of policies the scenario was different for developing countries rather than developed. We think to work for planned investment infrastructure development for electricity demand

Reheel et al. (2014) concentrated to discovered the causal link between renewable energy and, environmental degradation, economic growth for SAARC countries. The main motive of the study was to check the short and long run relation for renewable energy. Data have been taken from SAARC countries. A review of more than 20 years of SAARC countries resulted that quite different for Nepal and Pakistan as compared to Bangladesh, Sri Lanka, India, (FMOLS) fully modified ordinary least square shown that, GDP and poverty positively affected while, carbon dioxide emission have been negatively impact on energy production. There was a solid assumption that increase in energy production leads to decrease carbon emission. But on the other hand, natural depletion strongly increased carbon emission in SAARC countries. Ultimately, it proved that level of energy production leads to increase GDP which further increased carbon dioxide emission.

Bozkurt & Akan (2014) highlighted such factors and focused on global warming threads in this publication. They took data annually from 1960-2010. They tested the relation of economic growth, Co2 emissions and energy consumption in Turkey by cointegration test. But obtained results were negative (Khan, Zafar, & Ayaz, 2022) .

Ahmad and Zeeshan (2015) wrote the article about the decomposition of energy consumption energy intensity and structure changes over the period. The agriculture sector was progressed with the passage of time. The changes in gas, electricity adjustments affected the farmers' income badly. The dependence of agriculture on energy consumption has been robustly increased. While on the other side power generation have not kept up with demand. On the behalf of

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energy provision that effected production livelihoods positively with the advancement of mechanization in agriculture.

Kasperowicz & Streimikience (2016) used the Panel approach to evaluate the energy consumption and economic growth for v4 and 14 EU old states from (1995-2012). The case of pro-growth variable that provoke to create increased in economic growth. Energy consumption relatively more attracted for v4 countries as compare old EU countries. That point where the individual growth rate practically not captured for GDP model.

Chief of economist link din (2017) about to said that green skills were strongly created jobs in green economy with the cooperation of international organization approximately 24 million jobs till 2030.A case study data have been taken form 2015 year. Green jobs have a wide range of industries itself like finance, fashion, technologies and transport. This research was mainly focused on green skills and forced for the adoption of friendly environmental policies. Performed study showed that as far as greener rules grow, employs, were concentrated on skilled rather than a good degree. Linkedin research explored that the hype of green jobs in other sectors like ecosystem management, sustainable procurement highly specialized in the field of environmental scientist, as a sat ability mangers and also wildlife biologist. This particular discussion indulged a list of those jobs that were not considered in the past as green like fashion designer and vehicle maintenance green skills were all about how people of different sector done their jobs for the sake of green economy.

Ardakni et al. (2019) portrayed that the relation of energy consumption, economic growth and carbon dioxide in the light of Kuznets curve. The research focused on the practices seven oil rich countries. The data used over the period from (1995-2014). A quadratic model was applied to check the reliability of energy consumption and economic growth. This article was demonstrated how to employ Multivariate regression analysis. They also suggested that a cubic formulation for environmental quality or for better goodness of fit and meaningful interpretations (Batool, Khan, Arshad, & Bashir, 2024).

Vasilyeva et al. (2019) conducted the study to justify the relation of economic, social and environmental direction of stable development. The theoretical evidence based on the concept of the environmental Kuznets curve about the non – linear relation of economic growth and environmental population from (2000-2016) Eurostat data base. The results were interpreted increasing renewable energy% decreasing greenhouse gas, and 1%increasing in control corruption led to decreases of greenhouse gas about 0.88%. It concluded that Ukraine needs to increase GDP per capita, any pay heed on clean production technologies.

Nawaz et al. (2020) discovered the relation of green finance and climate change by using (DID) difference in difference approach from (1975-2015) to resolve the problems of 30 OECD countries. The auto regressive model was also used for the verification of energy consumption and economic growth level. The Pinpoints of green finance not just counted for climate change but, it also included environmental activities like sanitation system industrial pollution and biodiversity protection. It showed positive results. The performed study and the phenomena of 20 developed and 24 developing countries proved that there is reduction in emission level and the government should adopt such policies to green their stock portfolios. FDI was the robust way to enhance economic

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growth (Minghai, Khan, Khalil, Khan, & Marwat, 2024).
Khan et al. (2020) was published nexus of energy consumption and economic growth to checked the reliability of hypothesis for (unit root test, structural break test, long run cointegration, short run cointegration, diagnostic test availability of shocks was proved causality. Symmetric and asymmetric causality was positive and present. The targeted variable was used as an ecological footprint. (Environmental quality). In case of supported variables that was supposed to GDP and gross fixed capital distributed lags were legally expressed the causality link. Neutrality have been shown mixture of shocks in Pakistani economy. Results were on the behalf of energy consumption. But policy makers have been faced a situation for a sustained economic growth for future generation.
Abbasi et al. (2020) discussed about the massive growth of electricity in the economy. They also studied the vital role of industrial sector as overall energy demand closely related to economy. The used data were periodically (1970-2018). Two methods of model were applied to assure the contribution of electricity in Pakistan. Vector Error Correction model VECM and Dynamic Variance Decomposition technique to attest the overall impact of unexpected shocks on each variable. Indicated results were co-integrated. Existence of long run relationship between electricity consumption, Price and real GDP in the industrial sector. However, we could say that electricity needs to demand at low price can boost the local industry confidence also attracts foreign investors, and the strong governance should be extended for public sector to ensure the priorities from energy to business for extension. Khan and Kong. (2020) took a look at the survey of world top polluted countries, and examined the GDP, process of electricity, inspected the changes in factors like biomass, coal, natural gas, hydroelectricity, or GDP with per capita. The data have been taken from (1968-2017) by GLM model. The level of economic expansion in BRICS countries showed that the largest producers and sources of co2 emissions. The reconnoiter showcased unidirectional relation among energy consumption and economic development, but bidirectional causality exists in energy indicators. We need to find the unilateral casualty between energy consumption and economic growth. So, we tried to lemmatized the resources of these countries. Yu et al. (2020) purposed research in the urban spatial development in China with the mixture of under developed economies ,but rich in ecological capital from 2000-2010.The basic foundation of this research to attain sustainable system with the construction of green coordination, green development, green sustainability for urban spatial development .The effectiveness of positivity proved that this paper was not provided reference for only underdeveloped urban development planning but also distributed theoretical frame for the management control policy to sustain urban development. Justas & Mahyar (2021) defined the role of (DEA) data envelopment analysis in the field of agriculture for undesirable output. A systematic review of 20 years' study (2000- 2020) illustrated that how can be measured of output efficiency through (DEA) approach. The clear contribute of China have showed as relatively for agriculture pollution, there were four types of DEA approached that were discussed models name are, CCR, BCC, SBM, and RAM. Charnas et al (1978) first model implication was occurred to measure the technical efficiency of DMUS. (RAM) model were applied for agriculture productivity. (BCC) model always worked in the presence of CRR

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model. BCC model has been played a role just for pure technical efficiency. (DEA) model have been authority to significantly compiled productivity in the presence of undesirable output. Rosicky et al. (2021) the basic aim was to present the situation and further changes in agriculture sector of European union. The research period covered the year from (2005-2018). Some methods were used to analyze for Lorenz curve coefficient of variation like Kendall tau correlation cofficent and spears man s rank correlation cofficent. The dependent variable was energy consumption highly concentrated.EU countries were mainly concerned about liquid fuels. Because, stable and gaseous fuels were abounded in the favored of electricity for renewable source. There was a hype of energy consumption that were closely related to the economy parameter. Therefore, analyst urged to prove economic factors have been smaller impact rather than energy consumption. Wang et al. (2021) was study to verifies the ultra-role in the energy sector of total factor productivity. The purpose of research was to check the effectiveness of total productivity for a complete sample by region. Data used from (2005-2018) was taken. Empirically results revealed that the level of economic development has positive influence as the threshold variable worked. The biggest role in the innovation of industrial upgrading with the passage of time. The total factor productivity existed between different region of China. But, significantly only in western region of China. Tawiah et al. (2021) was forecasted the influence of green growth. The fixed effect estimation technique empirically applied on a large panel data proved that economic development was significantly related with green growth. But there was negative association between institutional quality and green growth, and trade openness also impacts negatively. Data were sourced by OECD statically. Countries at a progress level will be required kinds of strategies to own sustainable development goals in 2030.

Liu & Dong (2021) were classified the link between technological innovation and green economic efficiency for emerging economies. These techniques were like data envelopment analysis, game cross efficiency model from (2003-2007) to measure the GEE Green economic efficiency had positive correlation. Due to urban development, there were large differences among technological innovation and GEE. The eastern government of China should take steps for upgrading level. This research was mainly participated not for only government to guide researcher. But also, were of interested urban planners in emerging economies. Wu et al. (2021) traversed the long run dynamics of cleaner environment, green financing climate change for e7countries and G7 countries. The recent study intended the climate mitigation with GDP from (2010-2018). The second-generation panel were applied to draw the long run inference, inclusion of ADF (augmented Dickey Fuller), PPT (Philips Peron test). Indicated results were positive. So, the researcher made assumption about 1%increase in green financing ultimately index enhance environmental quality by 0.375%. According to cleaner perspective it would be 0.3920%environment in E7 countries. The policies were appealed for energy source towards alternatives. Furthermore, pollution reduction could be achieved strongly. Feng et al. (2022) deled with the dual difficulties of climate change and economic crises. The research wants to pay attention green belt and road initiate (BRI) for green transition. This method used panel data of selected BRIC countries from (2008-2018) and data

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envelopment analysis, GMM techniques were applied to found the association of government expenditure and the green economic performance. However, the elasticity of index was fluctuated due to the lack of serious government policies. Furthermore, application of econometric model was significant. So, the usage of labor and advance development practices played a complete role of green economic performance.

Research gap

The research gap of given study explained as the data ranged used from 2000-2022.The data is taken from World Development Indicator. The model of dependent and independent variable as quite different form previously regression model. In this research we are using Dependent variable is (industry construction) and Independent (Gross Fixed capital, General Government, GDP per capita, Renewable energy, Labor force, Co2 Emission). The data is consisting on 58 developing countries. The relationship of dependent and independent variable is positive and significant. The technique is using by panel ARDL.

Data Description

The data description examined the short- and long-term effects of gross fixed capital, general government, labor, consumption of renewable energy, and CO2 emissions on the building of industries in 58 emerging nations as a worldwide sample. This categorization part will show how each variable directly affects the way an industry is built. 2000 through 2022 is the time frame. The information was obtained from the world development indicator. Gross fixed capital formation, general government spending, and GDP per capita are all measured in US dollars. The other variables, such as renewable energy consumption, CO2 emission measurements in kilograms, and labor force in numerical units, are measured in several ways. The name of 58 countries are as follows. Algeria, El Salvador ,Nepal Angola, Eswatini ,Nicaragua ,Argentina, Gabon Nigeria Bangladesh ,Ghana, North Macedonia ,Belize ,Guatemala Bhutan, Haiti ,Pakistan ,Bolivia ,Honduras ,Peru Bosnia and Herzegovina ,India, Benin, Indonesia ,Philippines, Brazil Iran, Islamic, Rep ,Russian Federation, Combodia,Cameron ,Jordan Rwanda , China ,Kenya ,Senegal,Colombia,Lebanon,Congo, Dem, RepMalysia, South Africa, Congo Rep ,Mexico Sri Lanka ,Costa Rica Moldova,Sudan,Dominicia Republic ,Morocco ,Tanzania ,Ecudan, Mozambique ,Thailaand,Egypt, Arab, Rep Namibia ,Togo, Tunisia.

Methodology

This empirical approach's major goal is to identify the order of inclusion in the data. In order to compute an ARDL model, it is crucial to ensure that the panel series IPS, LLC group has been tested for unit root. Both Im, Pesran Shin (2003) and Levin, Lin & Chu suggested include these tests as part of the fundamental framework of any model. The IPS and LLC tests are also regarded as first-generation unit root tests since connections, unexplained residual independence, and unobserved common variables are not encountered. to look at the short- and long-term effects of industrial building on the usage of renewable energy. There are three estimating techniques used in the panel ARDL short run long run model: PMG (pooled mean group), MG (mean group). Shin and Pesaran (1996)

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As defined, the ARDL (p, q) model is (Yousaf Khan & Khan, 2020):

$$y_{it} = \sum_{j=1}^{p} \varphi i,jy_{i,t-j} + \sum_{j=0}^{q} \delta i,jX_{i,t-_j} + \vartheta_i + \varepsilon_{it}$$

$$y_{it} = \sum_{j=1}^{p} \varphi i,jy_{i,t-j} + \sum_{j=0}^{q} \delta i,jX_{i,t-_j} + \vartheta_i + \varepsilon_{it} \quad (1)$$

N is the total number of nations. t=1..... T is referred to as time, j is the number of lags, $X_{i,ti}$ is the vector of related variables of I is the particular fixed impact of 58 developing nations, and ti is the vector of relating variables. The short run and long run adjusted coefficients are as follows:

$$\Delta y_{it} = \emptyset_i(y_{i,t_{-1}} - \theta_{iX_{i,t}}) + \sum_{j=1}^{p\_1} \varphi i,j\Delta y_{i,t-j} + \sum_{j=0}^{q\_1} \delta i,j\Delta X_{i,t-_j} + \vartheta_i + \varepsilon_{it}$$

This signal denotes a modification of the long-term dynamics. I is the definition of the long-term equilibrium connection between yit, Xit, and i, j, i, j.It illustrates the relationship between the dependent and independent variables. The data are not restricted in any way by the mean group. For both the short- and long-term models, it enables simultaneous variation of all variables (Mumtaz, Ahmad, & Khan, 2021). The fundamental need for the consistency and validity of time series data is a bigger dimension. The slope coefficient and error variance for all selected nations are likewise restricted for the final group, which uses a dynamic fixed effect estimator. The intercepts and error variance offered by this panel estimate allow the developing nations group's PMG to differ freely and make outlier detection less sensitive.

Model Specification

The model specification elaborated as the real object of this research to check the impact of green energy on commodity producing sector in developing countries. The theoretical way of model specification is the representation of the Solow growth model of macroeconomics. Solow model is an exogenous model of economic growth that analyzes the changes in the population growth rate, saving rate and the rate of technological progress. The beneficial pinpoint of Solow growth model that it gives frame work to understand how capital and technology progress depend on the determination of growth rate. The applicability of this model in emerging nations and its notion of catch-up development when a poorer country is catching up to a richer country is an intriguing characteristic of this model, according to the subject. Because faster expanding economies were made possible by the greater marginal rate of return on invested capital. The model's functional form is set up as follows:

$$Industry(F) = \begin{Bmatrix} Gross\ fixed\ capital \\ General\ Government\ expenditure \\ Labor\ Force \\ Renewable\ Energy\ Consumption \\ GDP\ per\ capita \\ Co2\ emission \end{Bmatrix}$$

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It explained the supposed relation between industry and other explanatory variable. The transformation of functional form to econometric form;

$$In\ I_{it} = \alpha + \alpha_1 InGFC_{it} + \alpha_2 InGG_{it} + \alpha_3 InLF_{it} + \alpha_4 InREC_{it} + a_5 InGDP_{it} + a_6 Inco2_{it}$$

$$In\ I_{it} = \alpha + \alpha_1 InGFC_{it} + \alpha_2 InGG_{it} + \alpha_3 InLF_{it} + \alpha_4 InREC_{it} + a_5 InGDP_{it} + a_6 Inco2_{it}$$

Industry building is a dependent variable in equation I above, whereas GFC (gross fixed capital) is an independent variable. General government (GG)REC (Renewable energy consumption) stands for work force. GDP (Emission of CO2) Equation 2 is expected to employ the time series autoregressive distributed lag model (ARDL) in Im- Pesran & Shin's (1998).

Table 1: Description of variable

Variables	***Units of Measurement***	***Data Sources***	***Expected Relationships***
Industry	Value added	Word development Indicator	
Gross Fixed Capital Formation	Current US$	World development Indicator	Positive
General Government Final Expenditure	Current US$	World development indicator	Positive
Renewable Energy Consumption	Kilo tones	World development indicator	Positive
Labor Force	Numbers	World development indicator	Positive
Co2 Emission	Kilo Tones	World development indicator	Positive
GDP per Capita	Current US$	World development indicator	Positive

Table 2: Descriptive analysis

Variables	Industry Sector Output (Billion)	Gross Fixed Capital Formation (Million)	General Government Consumption Expenditure (Billion)	GDP per capita	Renewable energy consumption	Labor force (Million)	Co2 Emission (Million)
Mean	20.604	99100,00	47.20	3395	41.70	37.78	17.17
Median	0.00	7,760.00	4.30	2495	37.36	8.35	0.02
Maximum	27500	6490,000	2760	15974	98.34	800.00	7780.00
Minimum	0.00	47.35	-22.80	153	0.06	0.08	0.00
Std Dev	752	515000	206	2935	28.71	116.00	35600
Skewness	0.00	0.00	0.00	1.42	0.29	0.00	0.00
Kurtosis	0.00	0.00	0.00	4.80	1.82	0.00	0.00

The mean value is 20.60 and the given median is 0.00. The minimum and maximum values (27500.00), (0.00), the standard deviation is 7.52. The skewness value is 0.00 that is right distribution and kurtosis is perfectly

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leptokurtic. The mean value of gross fixed capital formation is 991,00.00 median is 7760. The maximum value limit is 6490,000.00 and the minimum is rely as 47.35. The standard deviation is 515000.00 The skewness is rightward 0.00and kurtosis is leptokurtik0.00. The suggested value of mean and median for general government is 47.20. The maximum and minimum range is between 2760.00, -22.80 minimum range is negative and beyond the positive range. The standard deviation is 206.00. The skewness and kurtosis value are 0.00 rightward normally distributed and kurtosis is leptokurtick,0.00. The descriptive value for GDP per capita for means and median is (3395.74), (2495.01). The minimum and maximum range among (15974.64), (153.59). standard deviation value is 2935.93. The given value of Skewness (1.42) right ward skewness and the kurtosis (4.80) positive and leptokurtic. The renewable energy consumption mean value is 41.70, and the median value is 37.36. The maximum and minimum value is relatively between (98.34), (0.06). The standard deviation is 28.71. The skewness and kurtosis value are 0.29 the skewness is light tailed distributed, kurtosis 1.82, leptokurtic. The labor force total variable means and median value is represented 37.78 and median is 8.35. The maximum value is 800.00 and minimum value is 0.08. The standard deviation value is 116.00. The Skewness is 0.00 tailed distributed and the kurtosis is 0.00 positive and leptokurtic. The mean and median resulted values of descriptive analysis are 17.17. The maximum and minimum values are 7780.00 and 0.00.the standard deviation is 35600. The value of skewness is 0.00high relative to normal distributed and kurtosis 0.00, that is greater than criteria leptokurtic.

Interpretation of correlation

The matrix of correlation shows the degree of association between two variables. The value 1.00 have been shown strong association of Co2 emission and, the value of Co2 Emission is strongly positive.

The GDP per capita have moderate correlation between Co2 emission. The given value 0.64 rely relatively between weak and strong. the value of fore. There is no association between GDP deflator and GDP per capita. The matrix of correlation proposed that there is positive and strong coordination between broad money and General Government. The co2 emission were highly correlated. On the other the association is weakly but, significant with GDP per capita.

The table value given significant and strong correlation for Co2 emission. The value of energy use. Gross fixed capital has been zero association with GDP Deflator. But, positively Weak with GDP per capita.

The values of industry including construction were strongly positive correlated with co2 emission. but scenario was different for GDP per capita because GDP per capita have weakly correlated variable.

The value of factor 0.79 of CO2 emission were weakly correlated with Labor force .and GDP per capita has been insignificant with labor force. General Government, Gross fixed, and industry these are strongly significant.

The given values of correlation table of renewable energy consumption have shown that there were negative and no correlation, between, Co2 emission, GDP per capita, General Government, Gross fixed capital, Industry and Labor force. But, the degree of association between Renewable energy positively weak.

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Table 3: Correlation Analysis

	CO2 Emission	GDP per capita	General government Consumption Expenditure	Gross fixed capital	Industrial Sector Output	Labor Force	Renewable energy consumption
Co_2 Emissions	1.00						

GDP per capita	0.39	1.00					
	0.00	-----					
General government	0.90	0.53	1.00				
	0.00	0.00	-----				
Gross Fixed capital	0.89	0.45	0.97	1.00			
	0.00	0.00	0.00	-----			
Industrial sector output	0.90	0.47	0.97	0.98	1.00		
	0.00	0.00	0.00	0.00	-----		
Labor force	0.79	-0.02	0.81	0.86	0.86	1.00	
	0.00	0.44	0.00	0.00	0.00	-----	
Renewable energy consumption	-0.24	-0.13	-0.14	-0.14	-0.13	-0.03	1.00
	0.00	0.00	0.00	0.00	0.00	0.24	-----

Causality Analysis Interpretation

The GDP per capita does not cause co2 emission variable and the same scenario in case of Co2 emission that does not cause GDP per capita. we are rejecting the null hypothesis. There is Bi-directional causality. The general government variable not cause equally co2 emission as co2 emission does not cause general government. But we are rejecting this hypothesis statement, there is Bi-directional causality.The Gross fixed capita not cause co2 emission and co2 emission does not cause Gross fixed capita as per resulted causality. The p-value is less than decision criteria of causality. There is Bi-directional causality. The industry Including construction variable does not effective co2 emission and co2 emission does not homogeneously cause industry. Because, the p value is less than 0.10. There is Bi- directional causality. The labore force does not cause co2 emission and co2 emission does not cause labor force equally. The p value is less than calculated value we are rejecting null hypothesis. There is uni-causality.

The renewable energy does not cause co2 emission and co2 emission does not cause renewable energy according to given statement. the p value is less than 0.10. There is bi- directional causality. We are rejected the null hypothesis. The general government does not effectively GDP per capita and GDP per capita does not cause at the same time. There is bi - directional causality. The gross fixed capital does not cause GDP per capita and GDP per capita also caused gross fixed capital so we are rejecting null hypothesis. There is bi- directional causality.

The industry including construction homogeneously cause GDP per capita and GDP per capita does not caused industry including construction. The p value is less than 0.10. There is bi-directional causality. The renewable energy not caused homogenously GDP per capita and GDP per capita does not cause Renewable energy. The p value is less than actual value. There is uni-directional causality between renewable energy and GDP per capita. The gross fixed capita does not equally influence general government and general government also not influenced Gross fixed capita. we are rejecting this null hypothesis. The p value is 0.00<0.10. There is bidirectional causality.

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The labor force does not cause General government and General government also does not cause labor force. The p value is less than 0.10. There is bi-directional causality. so, we are rejecting this null hypothesis. The renewable energy does not homogeneously cause general government and general government does not caused renewable energy. The p value is 0.24. There is uni-directional causality between variables. The industry including construction not caused gross fixed capital also gross fixed capital also not caused industry variable simultaneously. The p value is greater than actual criteria. There is uni- directional causality.
The renewable energy consumption does not cause Gross fixed capital and gross fixed capital not caused renewable energy. The p value is 0.18,0.00. There is uni-directional causality. The labor force does not influence gross fixed capital and gross fixed capita at the same time not caused, the p value is 0.00. we are rejecting this hypothesis. There is bi-directional causality. The renewable energy not caused industry construction and the industry variable also not caused renewable energy the p value is 0.83 and 0.00 we are rejecting this null hypothesis. There is uni-directional causality.

Table 4: Causality analysis

Hypothesis	w-stat	z-stat	Prob.
GDP per capita does not cause co2 emission	4.84	7.36	0.00
Co2 does not cause GDP per capita	3.79	4.33	0.00
General government does not cause co2 emission	5.03	7.90	0.00
Co2 emission does not cause general government	5.64	9.67	0.00
Gross fixed capital does not cause co2 emission	4.38	6.05	0.00
Co2 emission does not cause gross fixed capital	4.39	6.07	0.00
Industry construction does not cause co2 emission	5.31	8.53	0.00
Co2 emission does not cause industry construction	3.24	2.96	0.00
Renewable energy consumption does not co2 emission	2.95	1.93	0.05
Co2 emission does not cause co2 emission	4.30	5.82	0.00
General government does not cause GDP per capita	3.38	3.08	0.00
GDP per capita does not cause General government	7.49	15.02	0.00
Gross fixed capital does not cause GDP per capita	3.03	2.16	0.03
GDP per capita does not cause gross fixed capital	3.52	3.56	0.00
Industry construction does not cause GDP per capita	3.39	3.18	0.00
GDP per capita does not cause Industry construction	3.01	2.08	0.04
Gross fixed capital does not cause General government	4.35	5.96	0.00
General government does not cause gross fixed capital	3.97	4.87	0.00
Labor force does not cause General government	4.20	5.53	0.00
General government does not cause labor force	4.37	6.02	0.00
Labor force does not cause gross fixed capital	4.15	5.37	0.00
Gross fixed capital does not cause labor force	3.75	4.21	0.00
Renewable energy does not cause gross fixed capital	2.75	1.35	0.18
Gross fixed capital does not cause renewable energy	5.34	8.83	0.00
Labor force does not cause industry construction	3.60	3.80	0.00
Industry construction does not labor force	3.99	4.90	0.00

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Table 5: Unit root table

Variable	Test for unit root	Include in test equation	t-Stat.	p-value	Remarks
Co2 Emission	Level	Intercept	2.22	0.98	I(1)
GDP per capita	Level	Intercept	3.00	0.99	I(1)
	Level	Trend and Intercept	5.74	1.00	
General Government Expenditure	Level	Intercept	-3.37	0.00	I(1)
	Level	Trend and Intercept	5.11	1.00	
Gross Fixed Capital Formation	Level	Intercept	-0.38	0.35	I(1)
	Level	Trend and Intercept	5.93	1.00	
Industrial Value Addition	Level	Intercept	-0.417	0.33	I(1)
	Level	Trend and Intercept	4.77	1.00	
Labor Force	Level	Intercept	1.71	0.95	I(1)
Renewable Energy Consumption	Level	Intercept	7.03	1.00	I(1)
	Level	Trend and Intercept	5.52	1.00	

Interpretation of unit root test: The Co2 emission shows stationarity at 1st difference. The p value is 0.98 at intercept and 0.98 at trend. The data is stationary. The Co2 emission have same stationarity at 1st difference the p value is less than 5% that is 0.00. so, we are rejecting null hypothesis rejecting null hypothesis. The broad money has also stationary at 1st level difference intercept and trend because of p calculated value 0.00. The GDP per capita variable is stationary at level. The suggested p value of intercept is 0.00 and trend value is 1.00 that is less than 0.01. we are rejecting null hypothesis, because of stationarity level.

The general government variable is stationary at level. The suggested p value of intercept is 0.00 and trend value 1.00, that is less than 0.05 but trend value is equal to one. so, we are rejecting null hypothesis. The data is stationary. The Labor force variable is stationary at 1st difference. The p value of intercept is 0.95 and trend value is 0.99 that is less than 0.01. According to this value we are rejecting the null hypothesis. There is stationarity in unit root test. The showcased value is 0.00 that is less 0.05 criteria.The renewable energy consumption has shown stationarity at 1st difference. The p value of intercept and trend is equal to one that is 1.00. that urged to rejecting the null hypothesis. The intercept and trend value is 0.00that shows stationarity at 5% also.

Model (1) of 58 developing countries

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
Long Run Equation				
Gross fixed capital formation	0.2410	0.029049	8.2968	0.0000
General Government expenditure	0.0317	0.0326	0.9719	0.3313
GDP Per Capita	0.7835	0.0472	16.5859	0.0000
Renewable Energy consumption	0.0566	0.0163	3.4701	0.0005
Labor Force	0.5775	0.0555	10.3992	0.0000
CO2 emission	0.1392	0.0333	4.1810	0.0000
Short Run Equation				
COINTEQ01	0.1941	0.0263	7.3555	0.0000

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Gross fixed capital	0.0698	0.0341	2.0474	0.0409
General government	-0.1100	0.0401	-2.7433	0.0062
GDP per capita	1.0332	0.0716	14.4131	0.0000
Renewable energy	0.1206	0.0642	1.8781	0.0607
Labor force	0.0367	0.4675	0.0785	0.9374
Co2 emission	-0.0034	0.0454	-0.0752	0.9400
Constant	0.0509	0.0263	1.9320	0.0537
Mean dependent var	0.0686	S.D. dependent var		0.1533
S.E. of regression	0.0552	Akaike info criterion		-3.0855
Sum squared	2.6381	Schwarz criterion		-1.2537
Log likelihood	2526.518	Hannan –Quinn.		-2.3991

Interpretation

The Gross fixed capital is positively related with industrial sector. Because, the coefficient value is positive 0.24. The positive and significant result shows if the gross capital increases, then industrial sector level grows. The fixed capital helps in expansion, diversification and automation of industrial sector. It also played role in capital requirements of industrial sector. The p value is significant the calculated value is 0.00. Stupnikova & Sukhadolets (2019) determined also have same results as our regressed model relation of Gross fixed capital and industry construction the positive and significant. The have also examined the same approach ARDL. Raduteanu et al (2020) showcased that gross fixed capital is positively related as coefficient of our given gross fixed capital value. Gross capital formation was validated by Granger causality. The used model is also positive and significant.

The General government variable impact positively with industrial construction sector. If general government increases for industry construction. It provides the social and legal framework within which the economy functions, upholds competition in the market, and offers public goods and services. It permits the transfer of money, co-reacts to externalities, and takes specific steps to stabilize the economic situation. The p value is 0.33 that is insignificant. Mohammed &Ibrahim (2019) suggested the relationship between General government and GDP per capita as interpreted by given model. The general government variable secondary data should ensure to inject more funds into the economy for the blockage of all leakages or loopholes. A. RAMEY, J. WAYATT, Otchia, these were also supposed to give the same results.

The GDP per capita also have same and positive result as Gross fixed capital the positive cofficent and significant result proved that they are positively correlate with industry construction. The connectivity of GDP per capita with industry construction as Construction spending goes, so goes the GDP. That's because, it tracks so closely to the most important economic indicators of them all gross domestic product. The p value is significant that is 0.00. According to Jiang Qifa (2013) the relationship between GDP and industry value added is positive and significant as our resulted cofficent model. They also used correlation test that shows the tested value is less than 0.05. which indicates linear relation between GDP and construction value added. Raduteanu et al (2020) analyzed the same relation of GDP per capita, Labor force, Gross fixed capital as our cofficent results determined. The application of Granger causality test has shown the similar results. That were positive and significant. Mohamad & Ibrahim (2019) was giving sustained indication of positive relation of GDP per capita and

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General government.
The renewable energy consumption is significantly positive and relatively related with industry construction. Renewable energy has the potential to reduce emissions by shifting subsidies away from fossil fuels. More equality, especially for the world's poorest and most vulnerable communities, greater public health, and job creation are other benefits of sustainable economic growth. The P value of Renewable energy is significant, its less than 0.10. Zuoyi, Monroy et al 2013 was regressed same results.
The Labor force influenced positively industry construction. The terms of trade move against Industrial Value Addition, the industrial wage rate goes up to accommodate the higher cost of agriculture product in terms of industrial output. The complete model of data variable analysis gives positive and significant results and all variables are correlated positively with one another. The p value is significant Because, its less than0.05. Begum Sertyesilsik and Hamdi Tekin, Raduateanu et al (2020) regress the same dimension of labor force, Gross fixed capital and GDP per capita. They have same positive and significant valid results.
The Co2 emission is also positively related with industry construction building-related CO2 emissions were reduced by actively procuring materials and minimizing the carbon footprint of the building process. increasing the effectiveness of machinery planning throughout the project and portfolio. acquiring machinery and equipment that runs on renewable energy and biofuels, which are carbon neutral. The p value is 0.00 that is less than actual value. Zainordin&Zahra (2020) have same positive relation of industry construction and carbon emitter. Musa et al 2022 Long Li and Yingting Li also suggested the similar result.

Model of high income countries

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
	Long Run Equation			
Gross Fixed Capital Formation	0.0453	0.0112	4.0287	0.0001
General Government Consumption Expenditure	0.1850	0.0449	4.1200	0.0000
GDP per capita	0.8871	0.0701	12.6423	0.0000
Co2 Emission	0.1926	0.0513	3.7531	0.0002
Renewable Energy Consumption	0.6128	0.0592	10.3500	0.0000
Labor force	0.4309	0.0722	5.9636	0.0000
	Short Run Equation			
COINTEQ01	0.1591	0.0449	3.5403	0.0004
General government	-0.1248	0.0515	-2.4217	0.0158
GDP per capita	1.0883	0.0951	11.4421	0.0000
Co2 emission	-0.0067	0.0627	-0.1071	0.9147
Renewable energy consumption	0.1417	0.0844	1.6780	0.0940
Labor force total	0.5183	0.5550	0.9338	0.3509
Constant	0.5603	0.1581	3.5430	0.0004
Mean dependent var	0.0725	S.D. dependent var		0.1501
S.E. of regression	0.0546	Akaike info criterion		-3.1078
Sum squared	1.3676	Schwarz criterion		-1.4782
Log likelihood	1360.404	Hannan-Quinn .		-2.4784

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Model Result of High-income developing countries

The data analysis of high-income countries shows relatively positive relation between industry and rest of variables. The cofficent values of Gross fixed capital is positively related with industrial sector. Because, Gross fixed capital level increases also increased automation in industrial sector. In high income countries the general government expenditure also has positive impact on industrial sector. When government invest more in industrial sector the economic condition would better. The GDP Per capita also have positively impacted industry construction in the high-income countries. The p value of GDP per capita is positive and significant. Rest of the variables like Co2 emission renewable energy consumption and Co2 emission also have positively influenced industrial sector. The cofficent of these variables have been with industry including construction variable. The calculated probability shows p value is less than actual p value criteria that is 0.10.

Conclusion and Policy Recommendation

In conclusion, the reviewed literature offers valuable insights into the impact of green energy on developing nation industries. As these nations strive to strike a balance between economic expansion and environmental preservation, the shift toward environmentally friendly and sustainable industrial practices is becoming increasingly important. Several important themes and findings are highlighted in the examined studies. To begin, it is abundantly clear that the adoption of green energy in developing nations has the potential to significantly contribute to the mitigation of environmental degradation caused by industrial activities. The use of renewable energy sources like solar, wind, and biomass can help fight climate change by reducing emissions of greenhouse gases and reliance on fossil fuels.Second, the literature emphasizes the possibility of increasing energy security and decreasing dependence on imported fossil fuels through the use of green energy technologies. Green energy solutions can help developing nations become more energy independent while also diversifying their energy mix, both of which are issues that developing nations frequently face in terms of energy access and affordability. In addition, the reviewed studies consistently demonstrate the beneficial economic effects of adopting green energy. Renewable energy investments have the potential to boost local economies, create employment opportunities, and attract direct foreign investment. Additionally, as consumers and investors place an increasing emphasis on environmentally responsible production, the shift toward sustainable practices may increase industries' global market competitiveness. However, it is essential to acknowledge the persistent obstacles to the widespread use of green energy in developing nations. Policy frameworks, technological capabilities, and limited financial resources all present obstacles that must be resolved. According to the literature, specific support mechanisms, such as policy reforms, capacity-building programs, and financial incentives, are essential for facilitating the transition to green energy in these nations. The literature review concludes by emphasizing the significant potential of green energy to transform developing nation industries. These nations have the potential to achieve a triple bottom line by adopting sustainable practices: preservation of the environment, expansion of the economy, and social progress. For the future viability and prosperity of

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industries in developing nations, it will be crucial to address the challenges posed by the adoption of green energy and take advantage of the opportunities. Further examination and interdisciplinary joint efforts are expected to acquire a more profound comprehension of the particular settings and procedures that can expand the positive effect of efficient power energy on these economies. So, if we divert our industry gradually from fossil fuel to renewable energy consumption the level of carbon emission is low. The commodity producing sector grows in the presence of friendly environment due to green energy. We should focus on the implementation of green energy.

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