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The Effect of Renewable and Nonrenewable Energy Use on Sustainable Development in South East Asia

Sheeza Ramzan [a], Noreen Safdar [b], Malka Liaquat [c]

[a] Research Scholar, Department of Economics, The Woman University Multan, Pakistan
Email: shezaramzaneco@gmail.com
[b] Assistant Professor, Department of Economics, The Woman University Multan, Pakistan
Email: noreen.safdar@wum.edu.pk
[c] Assistant Professor, Institute of Management Science, The Women University Multan, Pakistan
Email: malka.liaquat@wum.edu.pk

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ABSTRACT

This research focuses on observing the effects of renewable and fossil fuel energy usage on the environment and economic growth in Southeast Asian countries. The study utilized the annual data of southeast Asian countries from 1990 to 2020 This study used gross fixed capital formation, foreign direct investment, renewable energy, population, non-renewable energy, and Labor force on fundaments of economic growth concerning sustainability. Fixed Effect, Radom Effect, and a two-step GMM methodology were used to estimate the link among the variables. The consequences of the study demonstrate that renewable energy intake has a destructive and statistically significant influence the dependent variable: CO2 emission whereas fossil energy has a noteworthy and positive influence on CO2 emissions. Foreign direct investment and population have a significantly positive influence on CO2 emission. While non-renewable and Renewable-energy intake has a momentous optimistic bearing on the economic progress of nominated ASEAN states along through labor force and capital formation. The universal energy needs depend on finite nonrenewable energy sources in the form of natural gas, oil, and coal which are exhaustible and hazardous to the environment. So, the need for hours is that the governments should escalate the use of renewable energy in their energy mix to increase the economy's growth and environmental sustainability.

Corresponding author's email address: noreen.safdar@wum.edu.pk

1. Introduction

Sustainable development is one of the key objectives of economies around the globe. Economic growth is used as a sign to represent the sustainable development of a country and the continuous increase in the productive capability of an economy. Generally, to measure the economic progress of any country economists used the GDP as an indicator of economic growth. To achieve economic development and to break the circle of poverty, it is necessary to sustain it. **(Desmond *et al.,* 2012)**. There are different advantages of economic growth as it helps to reduce the poverty and to achieve the natural rate of employment. As the productive capacity of the economy increase after the economic growth at the same time, it leads to full utilization of the given resources. It is also fundamentally important for the welfare of an individual.

Southeast Asia is situated south of China and east of the Indian subcontinent. Southeast Asia is divided into the countries of Laos, Myanmar, Singapore, Brunei, Cambodia, Thailand, Vietnam, Malaysia, Indonesia, and the Philippines. As the discussion on energy use, environment, and sustainable development are mounting, with mounting fears about climate modification, there is a stress for the countries to consume a greater amount of renewable energy. Along with this, the countries must ensure long-term economic growth. $CO2$ emissions have risen over time as the global demand for fossil fuel energy has expanded. It has serious ramifications for the ecosystem and global warming. Combating environmental change while stimulating sustainable development has become a major worldwide agenda item in production along with consumption planning of energy. If an economy uses a mix of renewable and nonrenewable energy resources, it may be able to transition to a more sustainable route (Dogan, 2016). To do so, officials must understand the influences of renewable and fossil energy on the economy.

Energy is influential in the economic growth of a state. Both production and consumption processes require energy. Energy, like Adam Smith's land, labor, and capital, is now considered an element of production. Energy use also contributes significantly to economic growth. Energy has come to be a chief cause of economic progress since the 1973 oil shock (Noor & Siddiqui, 2010).

Uninterrupted energy supply is thought to be an important tool for the economic progress of developed as well as under-developed countries (Saudi *et al.,* 2019). It seems difficult to produce goods and services in contemporary times without the use of energy and also to maintain the continuous production procedure and the supply of goods and services (Esen & Bayrak, 2017). Besides the accessibility of natural assets and location of that state which are signs of advancement and economic strength of a country; energy also dramas a critical role in the economic empowerment of a country because we need energy like oil to extract those resources through the use of machinery. (Sasana & Ghazali, 2017).

In the present study, we are going to discuss two sorts of energy, which are renewable in addition to non-renewable energy. deplete able or Non-renewable resources of electricity generation cannot be restored and replenished and depleted after one-time use, and cannot be recovered like nonrenewable fuels including coal, oil, plus gas.

There are numerous arguments for this study. To begin, this research will provide a foundation for understanding energy use in the context of long-term economic development. Second, this paper will explain which energy is accountable for environmental degradation as well as the mechanisms by which the environment gets polluted. Finally, this research will show how energy is a key driver of economic growth, particularly long-term economic growth. Fourth, because this study covers all significant explanatory factors, it lowers omitted variable bias. Fifthly, this increases country-wise time series analysis along with cross-country panel data analysis.

This increases our understanding of the country-level issue as well as regional issues relating to sustainable development such as energy mix, and economic growth in addition to climate change. Lastly, this study will highlight the variation of energy mix over the last few decades along with underlying causes of these.

2. Literature Review

Using Panel Co-integration and homogenous interconnection tests to examine the long-run cross-sectional dependency and causal link of consumption of energies, environmental deterioration, as well as macroeconomic performance, as measured by GDP and employment, in 50 developing economies from 1990 to 2016, Safdar (2020) confirms the positive long period link of environmental worry, energy consumption, along with macroeconomic performance, as measured by GDP and employment, in 50 developing nations between 1990 to 2016.

Furthermore, Narayan and Doytch (2017) inspected the positive influence of reusable and fossil energy use on growth of economy in a panel of eighty-nine poor, middle, and high-income nations from 1970 to 2011.

Ito (2017) employs a panel of 42 developing nations and the generalized method of moment and pooled mean group to show that renewable energy has become added important in growth of economy, while Fossil energy has an adverse bearing on the economic well-being of developing nations. Similarly, using OLS, FE, and GMM, Atems, and Hoteling (2018) exposed that fossil fuel and renewable energy had an encouraging and substantial influence on growth of economy.

Renewable energy bears a favorable and substantial stimulus for the economic well-being of five Mercosur nations, according to Koengkan and Fuinhas (2020), but fossil fuels have adverse relation to economic growth. Adedoyin (2020) exposed that renewable and fossil fuel energy had a favorable and significant impact on economic well-being of European countries by utilizing a panel of 16 European countries. The study by Zafar et al. (2019) confirms the positive influence of renewable and fossil fuel energy use on Asia-Pacific economic cooperation's economic well-being. Venkatraja, B. (2020) investigates the importance of renewable energy consumption in the growth of economy in the BRICS states from 1990 to 2015. The study's findings, based on OLS and Fixed effects, show that the use of renewable energy dampens the growth of economy because cost of transitioning from one source to another is higher than the rate of economic growth.

Fadilah et al. (2020) indicated that employment of renewable and Fossil energy has a favorable, substantial impact on GDP growth in the ASEAN region. Lotz (2016) confirms renewable energy use has a favorable and statistically substantial bearing on OECD's economic well-being.

Ivanovski (2020) validates the favorable influence of renewable and fossil fuel energy consumption on economic well-being of Non-OECD nations using local linear dummy variable estimates.

In a panel of 102 countries, Le et al. (2020) used GMM to document the beneficial and statistically noteworthy influence of renewable energies and fossil fuel energy consumption upon these countries' economic well-being. Chen et al. (2020) depicted renewable energies are having a significant and positive link in non-OECD economic growth, but hurt growth of developed and developing countries, under specific threshold levels, using the 9,5058 to 9,5926 threshold level employing the threshold regression model.

Another study by Tsaurai and Ngcobo (2019) confirms that renewable energy utilization has a detrimental influence on growth in the BRICS states. This is owing to education's negligible impact. As a result, increasing education spending in the BRICS region can help renewable energy play a greater part in growth of economy. Prettner (2014) confirms negative effecct of population expansion on economic growth employing a sample of industrialized countries. The detrimental impact on the population outweighs the benefits of well-developed education systems.

Charfeddine and Kahia's (2019) study has confirmed the influences of utilizing renewable energy on growth of economy. According to PVAR, renewable energy usage helps in improving growth of economy in MENA area. Similarly, Wang and Wang (2020) found that renewable resource consumption has an encouraging and significant bearing on growth of economy utilizing threshold regression and urbanization level, technical progress, and per capita income.

Dogan and Seker (2016) use panel estimating techniques in their EKC model for Eurozone to explore impacts of trade openness, renewable, nonrenewable energy, and real income on carbon dioxide emissions over period 1980-2012. Carbon dioxide emissions, GDP, renewable and nonrenewable energy, GDP2, and commerce are all linked in the long run. The EKC hypothesis is supported by a dynamic OLS estimator, which shows that trade and renewable energy reduce carbon emissions whereas fossil fuel energy enhances them.

Using an autoregressive distributes lag model, Zaidi, Hou, and Mirza (2018) studied causal link among CO2 emissions, GDP, renewable, and exhaustible energy consumption at a disaggregated level in case Pakistan dating 1970 to 2016. The findings display that non-renewable energy has considerable bearing on carbon dioxide emissions. In renewable energy model, economic growth helps to reduce CO2 emissions, but not according to non-renewable energy model. Natural gas consumption, followed by coal and oil usage, is a key source of energy making and largest reason of CO2 emissions at disaggregated level.

Ali, Anwar, and Nasreen (2017) studied the causal relationship between renewable, environmental quality and fossil fuel energy sources, per capita production, and population density for Bangladesh, Sri Lanka, India, and Pakistan from 1980 to 2013. Johanson co-integration, Larsson panel co-integration, and the DH causality technique were all used. The findings support the co-integration of variables. Financial development, per capita output, population density, and non-renewable energy sources all have a large and beneficial influence on CO2 emissions; renewable energy sources, on other hand, reduce CO2 emissions. They also show the presence of bi-directional causality amongst CO_2 and RE sources and from population density to CO_2.

Mohiuddin, Asumadu-Sarkodie, and Obaidullah (2016) inspected connection among GDP, energy consumption (EC), carbon dioxide emissions, and power production for oil, coal, as well as natural gas in Pakistan using data from 1971 up to 2013. It was decided to use the vector error correction model. A linkage was discovered between all variables and carbon dioxide emissions using long-run equilibrium. CO2 levels will rise as the level of oil-based energy supplied rises. EC, EPG, and GDP all contribute positively to CO2 emissions in Pakistan, according to a generalized impulse-response analysis; however, EPL and EPC hurt EC, which hurts CO2 emissions.

According to Adams et al. (2018), usage of renewable and fossil fuel energy has substantial, positive influence on the economic maturity in a panel containing 30 Sub-Sahara African nations from 1980 to 2012, however non-renewable energy has a bigger proportionate influence than renewable energy. Similarly, Khobai and Roux (2017) found that embracing renewable energy increases South Africa's economic well-being using autoregressive distributed lag (ARDL) in research done in South Africa.

3. Data and Methodology

The panel data from 1990 to 2018 is taken from World Bank's Development Indicator and U.S Energy Information Management. Southeast Asian countries are included in the analysis.

Model 1

GDP growth = ʃ (REC, NREC, CO_2, L, K,) $_{it}$……… (2)

The subscription to represent the types of data which is panel here i is used to represent the country-specific effect is used to represent the time fixed effect. As usage of renewable energy upsurges, it causes to increase the economic growth similarly usage of fossil fuels indicates the results.

CO_2 = Carbon dioxide emission
REC= Renewable Energy Consumption
NREC= Non-renewable Energy
GDP= Economic Growth
K= stock of capita
L= Total labor force

Model 2

CO2= ʃ REC, NRE, OP, FDI) $_{it}$…… (2)

POP=Population
FDI=Foreign Direct Investment

Here is representing GDP per capita, L issued o represent the logarithms, here represents the error term β_0 here used as intercept the model.

$$= \ +\beta_1 REC_{it} + \beta_2 NEC_{it} + \beta_4 LF_{it} + \ \varepsilon_{it} \quad (3)$$

$$Y_{it} = \ \beta_0 \ + LREC_{it} + \quad {}_2 LNRC_{it} + \beta \ \ CO2_{it} + \beta_4 F_{it} + \beta_5 K_{it} + \ \varepsilon_{it} \quad (4)$$

The empirical models of this study are written as

$$CO2_{it} = \ \beta_0 \ + \beta_1 REC_{it} + \beta_2 NREC_{it} + \beta_3 FDI_{it} + \beta_4 POP_{it} + \ \varepsilon_{it} \ (5)$$

Equation of empirical model rewrite after taking the natural logarithmic in this form as follows for the better result:$LCO2_{it} = \ \beta_0 \ + \beta_1 LREC_{it} + \beta_2 LNREC_{it} + \beta_3 LFDI_{it} + \beta_4 LPOP_{it} + \ \varepsilon_{it}$

4. Empirical Findings and Discussion

4.1 Unit Root Estimation

Variable	Result
LCO2	I(0)
LNREC	I(0)
LREC	I(0)
LPOP	I(0)
LGDP	I(0)
LFDI	I(0)
LK	I(1)
LF	I(0)

Fixed Effect Model 1:

Variables	Fixed effect	
Renewable energy consumption	-1.007399	{0.000}
	.1316839	
Non-renewable energy	.1660884	{.032}
	(0.1179395)	{0.000}
Population	1.033552	{0.000}
	(0.2058268)	
Foreign Direct investment	.1065709	{0.000}
	(0.0270483)	
Constant	-6.539225	{0.056}
	(3.390442)	
p-value	0.0000	
Observations	174	
F-test	105.20	
R-square	0.7258	

At 1% level, the coefficient of renewable energy consumption is shown to be adverse and statistically substantial. This means every 1% increase in renewable energy consumption consequences in a 1.0073 percent decrease in carbon dioxide emissions. Shafiei and Salim (2014), Dogan and Seker (2016), Ali, Anwar, and Naseem (2017), Wang, Chen, Zou (2005), Viswanathan and Hassan(2018), Jebli, Yousaf, and Ozturk (2016) have all reported that the renewable energy usage has an adverse and significant bearing upon carbon dioxide emissions. As a result, it is calculated that aggregate usage of renewable energy has no adverse effect on environment and decreases the CO_2 emissions.

The nonrenewable energy coefficient in the table is optimistic and statistically significant at 5% level. This depicts that every 1% rise in non-renewable energy usage consequences in a.166 percent increase in carbon dioxide emissions. Non-renewable energy use has optimistic and large influence on carbon emissions, according to Ali, Anwar, and Naseem (2017), Shafiei and Salim (2014), Dogan and Seker (2016) and Jebli, Yousaf, and Ozturk (2016).

At the 1% level, the population coefficient in the table is positive plus statistically significant. This means that for every 1% increase in population, carbon dioxide emissions increase by 1.3355 percent. Dogan and Seker (2016), Ali, Anwar, and Nasreen (2017).

The coefficient of FDI in the table is positive as well as statistically significant at 1% level. This shows that 1% percent increase in FDI usage consequences in a.1065709 percent rise in carbon dioxide emissions. FDI has a favorable and considerable impact on carbon dioxide emissions, according to Jebli, Yousaf, and Ozturk (2016)

Random Effect Model 1:

	Random effect
Dependent variable: CO_2 emission)	
Renewable energy consumption	-.8006764 {.000}
	(.120747)
Fossil fuels	0.151227 {.0411}
	(0.117521)
Foreign Direct investment	0.1047521 {0.000}
	(0.026077)
Population	1.155879 {0.000]
	(0.1634149)
Constant	-9.22615 [0.000}
	(2.4622)
p-value	0.000
Observations	174
Wald test	351.59
R-square	0.7188

The coefficient at 1% level of renewable energy consumption shows it is adverse and statistically significant. This indicates that a 1% rise in renewable energy usage decreases carbon dioxide emissions by 0.8006764%. Renewable energy use has undesirable and considerable influence on carbon dioxide emissions, according to Shafiei and Salim (2014), Dogan and Seker (2016).

The Fossils energy consumption coefficient in the table is positive and also statistically significant at 5% level. This depicts that every 1% rise in renewable energy usage consequences in a.1512 percent rise in carbon dioxide emissions. Fossil fuel energy use has a optimistic and large bearing on carbon emissions, according to Ali, Anwar, and Naseem (2017), and Shafiei and Salim (2014).

The population coefficient in the table is positive as well as statistically significant at 1% level. It elaborates that a 1% rise in population usage consequences in a 1.1558 percent increase in carbon dioxide emissions. Population has a positive and large impact on CO2 emissions, according to Dogan and Seker (2016).

The coefficient of FDI in the table is positive as well as significant at the 1% level. This means that a 1% rise in FDI consequences in a.104752% rise in CO_2 emissions. FDI has a favorable and considerable influence on carbon dioxide emissions, according to Jebli, Yousaf, and Ozturk (2016).

Hausman Test Model 1:

The Hausman test is used to identify best model among fixed effect as well as random effect models. The null hypothesis Ho states that random effect model is applicable.

H1 Alternative Hypothesis: A model showing fixed effect is appropriate.
Null hypothesis is rejected so alternative hypothesis is accepted since Hausman test's probability value is 0. 0000. In this scenario, the fixed effect technique is used.

Two-Step System GMM Model 1:

Dependent Variable: $CO2$	
Variables	Two-step system GMM
$CO2_{t-1}$	0.908***
	(0.0132)
Renewable energy consumption	-0.847315***
	(0.143099)
Fossil Fuels	0.083421**
	(0.1388)
FDI	0.095389***
	(0.02314)
Population	0.87153
	(.13883)
Inflation	-0.0000164
	(0.0000153)
Constant	0.337***
	(0.0796)
Observation	174
Groups	6
Instruments	12
AR (1) PR>z	0.000
AR (2) PR>z	0.052
Hansen test	0.215
Standard errors in parentheses	** $p < 0.05$, *** $p < 0.01$

This directs that one percent increment in use of renewable energy causes 0. 0.8473% decrease in carbon dioxide emissions. This is consonant with results of the study of Shafiei and Salim (2014).

The Table reveals that use of Fossil energy has increasing influence on CO2 emission. This directs that a 1% rise in use of fossil energy causes 0. 0. 08342% increase in CO2 emission. This is consonant with the findings of the study by the Ali, Anwar, and Naseem (2017),

The coefficient of FDI in the table is positive as well as statistically significant at the 1% level. It means that a 1% rise in FDI usage consequences in a 0.0953% rise in carbon dioxide emissions.

Whereas population increase has a positive nonetheless insignificant bearing on CO2 as p-value is higher than the threshold.

Fixed Effect Model 2:

Variables	Fixed effect
Dependent variable: GDP per capita	
Renewable energy consumption	0.1500245* {0.005}
	(.0523612)
Non-renewable energy	.1807149 * {0.000}
	(.0425631)
Gross fixed capital formation	0.1950712* {0.000}
	(0.0313262)
Labor Force	0.6442139 * {0.000}
	(0.0668993)
Carbon dioxide	0.2363233* {0.000}
	(0.0283722)
Constant	-11.26525 {0.000}
	(.7351673)
p-value	0.0000
Observations	174
F-test	130.86
R-square	0.9357
Standard errors in parentheses * p < 0.01	

This translates to a 0. 1500245 percent boost in economic growth for every 1% increment in the renewable energy consumption. Renewable energy usage has a direct and substantial influence, according to Koaak and aarkgünei (2017).

The fossil fuel energy consumption coefficient in the table is statistically and +tively significant at 1percentage level. This depicts that for every one percent rise in nonrenewable energy use, economic growth increases by.18071 percent. Fossil fuel energy consumption has positive as well as significant influence upon growth of economy, conferring to Kahia et al. (2016).

At 1% level in table, the labor force coefficient is optimistic and statistically significant. This amounts to a 0.6442 percent rise in the economic growth for every 1% increase in labor force participation. The labor force effect upon growth of economy was studied by A. Wijaya, J. Kasuma, T. Tasenţe, and Darma, D. C. (2021).

Similarly, at a 1% level of significance, gross fixed capital formation is positive and substantial. This demonstrates that a 1% rise in physical capital results in a 0.195 percent rise in growth of economy.

Whereas carbon dioxide has also a positive as well as significant bearing on economic growth. This shows that 1% rise in carbon dioxide translates into an upsurge in economic growth by .2363%.

Random Effect Model 2:

	Random effect	
Dependent variable: GDP per capita		
Renewable energy consumption	-.2840825*	{0.000}
	(0.0395005)	
Fossil fuels	-.2297237*	{0.000}
	(0.0479458)	
Gross fixed capital formation	0.633782*	{0.000}
	(0.038207)	
Labor Force	-0.7119633*	{0.000}
	(0.0488268)	
Carbon dioxide	0.1955217*	{0.000}
	(0.0427865)	
Constant	4.237126*	{0.000}
	(0.5381828)	
p-value	0.000	
Observations	174	
Wald test	8339	
R-square	0.7301	
Adjusted R-Square		
Standard errors in parentheses * $p < 0.1$,		

Hausman Test Model 2:

When the probability value of the Hausman test is significant, we reject null hypothesis and accept alternative hypothesis. As a consequence, fixed-effect model appears to be adequate. Two hypotheses exist in the case of the present study.

H_0: Random effect model is suitable.

H_1: Fixed effect seems applicable

So, the alternative hypothesis is accepted

Two-Step System GMM Model 2:

Dependent Variable: GDP per capita	
Variables	Two-step system GMM
GDP per capita $_{t-1}$	0.762***
	(0.0215)
Renewable energy consumption	0.19281*
	(0.06169)
Fossil Fuels	0.2100687*
	(0.0453)
Gross fixed capital formation	0.2638*
	(0.02516)
Labor Force	0.735419*
	.04387
Carbon dioxide	.15738
	0.3429
Constant	0-9.2678***
	(0.6294)
Observation	174
Groups	6
AR (1) PR>z	0.034
AR (2) PR>z	0.057
Hansen test	0.223
Standard errors in parentheses * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$	

The renewable energy consumption coefficient as depicted in the table is positive as well as statistically significant at 1% level. It means that every 1% rise in the renewable energy usage consequences in a 0. 19281 percent rise in the growth of economy.

The Capital Formation coefficient has a statistically significant, positive influence on the growth of economy. This means that a one percent rise in capital formation translates to a rise in the economic growth of 0.2638 percent.

Labor force expansion has a positive and highly substantial influence upon economic growth. According to this formula, a one percent increment in population causes a 0.735419 percent rise in the growth of economy.

At 1% level, non-Fossil energy coefficient in the table is positive along with statistically significant. This suggests that for every 1% rise in use of non-renewable, the economic growth increases by 0.19281 percent.

We apply the system GMM model to tackle autocorrelation problems and verify the validity of instrumental variables. Because AR (2) = 0.057 is insignificant, there is no issue of autocorrelation, and Hansen= 0.223 indicates that instrumental variables are valid when the null hypothesis is accepted, and there is no issue of endogeneity.

5. Conclusion and Recommendations

Nonrenewable energy has a good impact on environmental degradation but a detrimental impact on long-term development. As a result, significant efforts must be taken to promote renewable energy while discouraging nonrenewable energy use. The government's role in energy-saving and production is difficult to overlook. They should put money into smart, modern technology that maximizes the usage of nonrenewable energy. Energy conversion technologies, which come in a variety of shapes and sizes, are highly developed and developed technologies that are beneficial in converting energy to boost efficacy.

The study's empirical findings imply that adoption of the renewable energy bears a significant as well as statistically significant impact on global growth of economy. And Fossil fuel energy use has a considerable effect on the growth of economy. Because, according to a British petroleum report, oil consumes 193.03 exajoules, natural gas consumes 157.86 exajoules, and coal consumes 157.86 exajoules of total primary energy. However, only 28.98 exajoules out of total primary energy use are accounted for by renewable energy.

The study's next step will be to check impact of renewable energy usage on growth of economy at a disaggregated level. As a consequence of the outcomes of this study, the governments of the selected countries under study should implement policies to encourage the use of renewable energy, which has optimistic effect on environment and economic growth, along with renewable energy having no negative affect on the environment or human health.

References

Adedoyin, F. F., Bekun, F. V., & Alola, A. A. (2020). Growth impact of transition from non-renewable to renewable energy in the EU: the role of research and development expenditure. Renewable Energy, 159, 1139-1145.

Ali, S., Anwar, S., & Nasreen, S. (2017). Renewable and Non-Renewable Energy and its Impact on Environmental Quality in South Asian Countries. Forman Journal of Economic Studies, 13, 177-194.

Atems, B., & Hotaling, C. (2018). The effect of renewable and nonrenewable electricity generation on economic growth. Energy Policy, 112, 111-118.

Chen, C., Pinar, M., & Stengos, T. (2020). Renewable energy consumption and economic growth nexus: Evidence from a threshold model. Energy Policy, 139, 111295.

Dogan, E., & Seker, F. (2016). Determinants of CO2 emissions in the European Union: The role of renewable and non-renewable energy. Renewable Energy, 94, 429-439.

Energy Consumption and Economic Growth: Empirical Evidence from Pakistan", Pakistan Journal of Social Sciences (PJSS), Vol. 32, No. 02, 2012

Fadilah, S., Lestari, R., Sahdan, M. H., & Khalid, A. Z. A. (2020). The Impact of Renewable Energy Consumption on the Economic Growth of the ASEAN Countries. International Journal of Energy Economics and Policy, 10(6), 602.

Inglesi-Lotz, R. (2016). The impact of renewable energy consumption to economic growth: A panel data application. Energy economics, 53, 58-63.

Ito, K. (2017). CO2 emissions, renewable and non-renewable energy consumption, and economic growth: Evidence from panel data for developing countries. International Economics, 151, 1-6.

Kahia, M., Aïssa, M. S. B., & Charfeddine, L. (2016). Impact of renewable and non-renewable energy consumption on economic growth: New evidence from the MENA Net Oil Exporting

Countries (NOECs). Energy, 116, 102-115.
Koengkan, M., & Fuinhas, J. A. (2020). Exploring the effect of the renewable energy transition on CO2 emissions of Latin American & Caribbean countries. International Journal of Sustainable Energy, 39(6), 515-538.
Le, T. H., Chang, Y., & Park, D. (2020). Renewable and nonrenewable energy consumption, economic growth, and emissions: International evidence. The Energy Journal, 41(2).
Mohiuddin, O., Asumadu-Sarkodie, S., & Obaidullah, M. (2016). The relationship between carbon dioxide emissions, energy consumption, and GDP: A recent evidence from Pakistan. Cogent Engineering, 3(1), 1210491.
Narayan, S., & Doytch, N. (2017). An investigation of renewable and non-renewable energy consumption and economic growth nexus using industrial and residential energy consumption. Energy Economics, 68, 160-176.
Prettner, K. (2014). The non-monotonous impact of population growth on economic prosperity. Economics Letters, 124(1), 93-95.
Safdar, N. (2020). How do Energy Consumption, Environmental Degradation and Macroeconomic Performance Cause in Developing Countries? An Analysis. Journal of Business and Social Review in Emerging Economies, 6(3), 1189-1197.
Safdar, N., Chaudhry, I. S., & Chaudhry, M. O. (2019). Energy Consumption, Environmental Degradation and Economic Growth in Developing Countries. Pakistan Journal of Social Sciences (PJSS), 39(2).
Safdar, N., Ghaffar, H., Farooq, F., & Liaquat, M. (2020). Trade Liberalization, Economic Growth, and Environmental Quality Nexus: An Empirical Evidence from Pakistan. Journal of Accounting and Finance in Emerging Economies, 6(4), 1077-1087.
Tsaurai, K., & Ngcobo, L. (2020). Renewable energy consumption, education and economic growth in Brazil, Russia, India, China, South Africa. International Journal of Energy Economics and Policy, 10(2), 26.
Venkatraja, B. (2020). Does renewable energy affect economic growth? Evidence from panel data estimation of BRIC countries. International Journal of Sustainable Development and World Ecology, 27(2), 107-113.
Wang, Q., & Wang, L. (2020). Renewable energy consumption and economic growth in OECD countries: A nonlinear panel data analysis. Energy, 207, 118200.
Zafar, M. W., Shahbaz, M., Hou, F., & Sinha, A. (2019). From nonrenewable to renewable energy and its impact on economic growth: the role of research & development expenditures in Asia-Pacific Economic Cooperation countries. Journal of cleaner production, 212, 1166-1178.
Zaidi, S. A. H., Hou, F., & Mirza, F. M. (2018). The role of renewable and non-renewable energy consumption in CO 2 emissions: a disaggregate analysis of Pakistan. Environmental Science and Pollution Research, 25(31), 31616-31629.