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Article

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Energy Consumption and Environmental Pollution in Nigeria

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Abstract

This study examines the relationships between energy consumption, financial development, GDP, urbanization and environmental pollution in Nigeria from the period 1980- 2011 by applying autoregressive distributed lag (ARDL) method. The finding shows that in the short-run energy use is positively related with environmental pollution, while financial development and GDP reduce environmental pollution. The long-run analysis shows that energy consumption is positive and significant in influencing environmental pollution. The results suggest that Nigerian policymakers should formulate efficient policies, such as adoption of low emissions technology in Nigeria to achieve a clean environment.

Key words

Environmental pollution, energy consumption, environmental sustainability, GDP, ARDL

JEL Codes: 013, Q4

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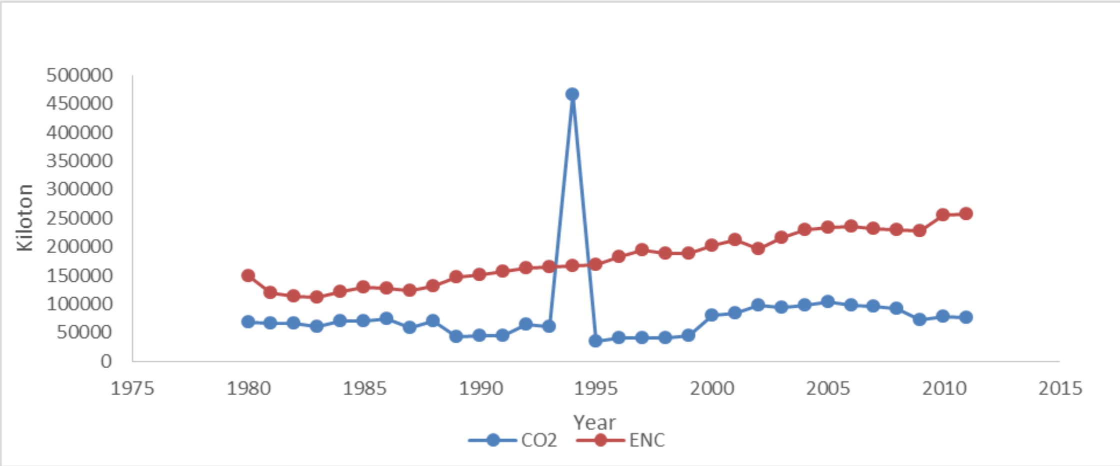
1. Introduction

Environmental sustainability has become a global concern in recent years due to increased environmental degradation and pollution (Begum *et al.*, 2015). The world population growth, technological innovation and the struggle to attain higher economic progress in both industrialized and emerging nations have led to the high concentration of pollution in the atmosphere (Danlami *et al.*, 2018). This phenomenon has increased global warming and climate change that affect human society and the economy in general (Danlami *et al.*, 2018). It is argued that control measures have to be put in place to reduce the CO_2 emissions, otherwise greenhouse gases would increase twice more than its pre-industrial level as predicted (Tiwari, 2011). As a result, the international community has advocated for the mitigation of the environmental pollution in both industrialized and emerging economies. The analysis of environmental study is built on the environmental Kuznets curve (EKC) hypothesis and urban environmental transition theory. EKC hypothesis is best known theory that explains the link connecting economic growth and environmental pollutions as well as the other factors that influence environmental degradation (Dinda, 2004). According to Kuznets (1955), environmental pollution rises at the early stage of economic development until it reaches a certain level, then environmental degradation declines. Moreover, EKC relationship is influenced by scale effect, composition effect and technical effect. Heerink *et al.*, (2001) argue that increase in the scale of production influences high consumption of energy and consequently environmental pollution. Similarly, changes in the composition of structure of an economy such as financial reform induce more economic growth and eventually cause environmental pollution (Bilgili *et al.,* 2016).

In addition, urban environmental transition theory stresses that urban environmental problems usually go with the level of economic progress of society. It is further argued that increase in income level is accompanied by rise in manufacturing activities that cause environmental degradation. Consumption pattern and lifestyle of developed societies are capital intensive than the less developed societies, and result into high demand for infrastructure and transportation that influence energy use and CO_2 emissions (Bai and Imura, 2000). The growth of CO_2 emissions is predominant in developing counties, like Nigeria (Hassan and Kouhy, 2013). It is claimed that Nigeria is the major contributor to CO_2 emissions in Africa. For example, in 2014 Nigeria contributed about 0.3 percent of CO_2 emissions in the world, which was enough to alter the weather conditions of Nigeria (World Bank, 2017). Recently, Nigeria is ranked 38th in the world in relations to the discharged of CO_2 emissions. According to organization of the petroleum exporting countries (OPEC), Nigeria is categorized as the world 5th major gas flaring country contributing about 8 percent to the total amount flared globally in 2014. Presently, Nigeria is the leading oil producer in African continent and was the world 4th main exporter of gas in 2015 (EIA, 2016). CO_2 emissions and energy use in Nigeria over the years have been increasing. For instance, Figure 1 indicates an improvement in energy consumption in Nigeria from 1980 to 2011. CO_2 emissions also increased by 24,466.23kt from 1980 to 2011, which indicates a substantial increase in the CO_2 emissions. If the trends continue in this direction, the situation may be devastating and cause major problems such as excessive heat, diseases outbreak, flooding and drought. Therefore, it is essential to reduce the CO_2 emissions in Nigeria for a better healthy environment and sustainable development.



Source: World development indicator (WDI)

Figure 1. CO_2 emissions and energy consumption in Nigeria 1980 – 2015

To do this, one may need to examine the motivating factors accountable for the increase in CO_2 emissions in Nigeria. Although several studies have indicated the contribution of factors such as energy use, financial development, GDP and urbanization, among others, to CO_2 emission in other countries, however, only few studies have been conducted for Nigeria. Since energy consumption has been on increase in Nigeria and the level of CO_2 emissions is alarming, knowing the responsible factors will enable the concerned authorities to adopt appropriate policies to lessen its adverse effect to achieve sustainable development in the country. Thus, the present study examines the influence of energy use, GDP, urbanization and financial development on environmental pollution in Nigeria.

2. Literature review

The influences of energy use, urbanization, financial development and economic progress on CO_2 emissions have been analyzed in the environmental literature. Some of these studies have tested the presence of EKC hypothesis while some have investigated the influence of energy use and financial sector progress on CO_2 emissions. Others look into the impact of economic progress and urbanization on CO_2 dioxide emissions. On the studies of EKC hypothesis in both developed and developing countries, some studies have provided proof for the occurrence of EKC hypothesis while others have found no evidence in their studies. For example, Lau *et al.,* (2014) examine the connection between GDP and CO_2 emissions in Malaysia and find that EKC hypothesis is not valid. Apergis and Ozturk (2015) employ panel data analysis to study the link connecting GDP and CO_2 emissions with the primary objective of investigating the presence of EKC hypothesis in 14 Asian countries. The study confirms the applicability of EKC hypothesis in the study area.

Cho *et al.* (2014) explore the influence of energy use, GDP on CO_2 emissions in 22 OECD countries. Their study confirms the applicability of EKC hypothesis and that energy use increases CO_2 emissions in OECD countries. However, study by Ben *et al.,* (2015) does not find the existence of EKC hypothesis in South Africa. Rafindadi (2016) notes that despite the natural calamities and downfall of economic activities in Japan, there is presence of EKC hypothesis in the country, and the energy use contributes positively to carbon dioxide emissions. In contrast, study by Li *et al.,* (2016) analyzes the influence of economic progress, energy use, urbanization, trade on CO_2 emissions in China. The study finds that energy use and GDP are positively related to CO_2 emissions and the EKC hypothesis is not valid in China. Dogan and Turkekul (2016) argue that EKC hypothesis occur in USA. Recently, Adeel-farooq *et al.* (2018) investigate the effects of energy use, urbanization and GDP on the environmental performance in developing Asian countries. They find evidence in support of environment Kuznets curve in those countries.

Other category of the studies on Carbon dioxide emissions (Dogan and Turkekul, 2015; Farhani and Ozturk, 2015; Muhammad and Fatima, 2013; Omri, 2013; Saimanul and Abdul-Rahim, 2017; Salahuddin and Gow, 2014; Shahbaz *et al.*, 2013) focused on the impact of energy use, progress in financial sector on CO_2 emissions. For example, Dogan and Turkekul (2015) study the effect of energy use, financial growth, GDP, trade, urbanization on CO_2 emissions in USA. The study finds that energy use influences carbon dioxide emissions positively while financial development does not affect it.

Farhani and Ozturk (2015) employ ARDL approach to investigate the causal link among energy use, development of financial sector, GDP, trade, urbanization and carbon dioxide emissions in Tunisia. Their finding shows that financial sector development increases CO_2 emissions and energy use causes carbon dioxide emissions. Similarly, findings by Muhammad and Fatima (2013) suggest that energy use and financial progress rise CO_2 emissions in Pakistan. Saimanul and Abdul-Rahim (2017) examine the impact of energy use, GDP on environmental pollution in Malaysia. The study reveals that energy use influences environmental pollution positively. Salahuddin and Gow (2014) documents that energy use influences Carbon dioxide emissions positively in GCC countries. On the contrary, a study by Bölük and Mert (2015) confirms that energy use reduces CO_2 emissions in Turkey. Moreover, some studies have focused on the relationship of GDP and urbanization with carbon dioxide emissions (Adusah-poku, 2016; Al-Mulali *et al.*, 2015; Farhani and Ozturk, 2015; Kasman and Duman, 2015; Shahbaz *et al.*, 2014). For instance, Adusah-poku (2016) uses the dynamic panel to analyze the impact of urbanization on Carbon dioxide emissions in 45 SSA countries. The study finds that urbanization has positive effect on environmental pollution. Al-Mulali *et al.*, (2015) analyze the association of renewable energy production, GDP, urbanization, and financial progress with CO_2 emissions in 23 European states. The study finds that GDP and urbanization increase carbon dioxide emissions.

Farhani and Ozturk (2015) reveal a strong relationship of GDP and urbanization with carbon dioxide emissions. Similarly, Kasman and Duman (2015) analyze the causal link between GDP, urbanization, trade and CO_2 emissions. The finding reveals GDP and urbanization cause CO_2 emissions. Shahbaz *et al*. (2014) report that GDP rises the level of CO_2 emissions while urbanization reduces it in UAE. In contrast, Salahuddin and Gow (2014) employ panel analysis to investigate the link connecting energy use, GDP and CO_2 emissions in GCC countries. The study concludes that GDP does not explain CO_2 emissions. Various studies have analyzed the connection among consumption of energy, financial progress, GDP, urbanization and CO_2 emission in developed countries. However, very few studies have considered energy consumption in less developed countries like Nigeria. Thus, this study examines the influence of energy consumption among other elements that add to the level of environmental pollution in Nigeria. The consideration of energy consumption for examination is due to the role it plays in influencing carbon dioxide emission in Nigeria. Given the assertion by EIA (2016), Nigeria is placed as the major oil and gas producer in Africa and it is the 4^{th} largest supplier of liquefied gas in 2015 globally. Therefore, examining the effect of energy use on environmental pollution may offer useful information for making proper policies in respect of the concentration of carbon dioxide emissions.

3. Methodology of research

3.1 Data description

Time series data are used in this study over the period 1980 –2011. World development indicator is the source of data used in this study. The variables considered are carbon dioxide emissions in kiloton (environmental pollution), financial development (private sector credit/GDP), energy use (kg of oil equivalent), GDP per capita (current USD) and urban population growth (annual %). The data are transformed to their natural log values for easy interpretation in elasticity form. The descriptive statistic is shown in Tables 1. It indicates the minimum, maximum, mean values and standard deviation of the dependent and four independent variables. The descriptive statistics show that the value of mean for energy consumption is the highest compared to other variables while the GDP has the highest standard deviation.

Table 1. Descriptive statistics

Variables	Min	Max	Mean	SD
LCO2	10.46	13.1	11.6	0.47
LEC	11.62	12.5	12.1	0.26
LFD	2.2	3.6	2.7	0.33
LGDP	5.03	7.8	6.14	0.71
LUBR	1.4	1.8	1.56	0.12

3.2. Model specification

3.2.1. Unit root

This study uses Augmented Dickey Fuller (ADF) and Phillip Perron (PP) tests to find the order of intergradation and stationarity level of the variables. ADF test use the following equation:

$$\Delta Z_t = \beta + \theta_{yt-1} + \beta T + \sum_{j-1}^{k} \vartheta_j \Delta Z_{t-j-1} + \varepsilon_t \qquad (1)$$

Where Z represent the series at period t, β indicates coefficient, k represent the lags and ε_t is error term. Therefore, the rule for rejecting the null hypothesis is that when the value of ADF is below the critical value, and the conclusion here is that there is presence of unit root in the series. While, the rule for not rejecting null hypothesis is when ADF test value is above the critical value. This indicates that there is absence of unit root in the series.

The Phillip Perron (PP) test adopted the Kemel Newey-West statistics that possess an advantage of correcting higher order autocorrelation and likely problem of heteroscedasticity in the series. The PP test is express on the equation below:

$$\delta^2 = T^{-1}\sum_1^T \bar{e}_r^2 + 2T^{-1}\sum_{t-1}^{l} w(t,l) \sum_{r=t+1}^{l} \bar{e}_t \bar{e}_{t-1} \quad (2)$$

Where w(r, l) = 1[t/ (1+l)] and l is lags. If the computed PP value is lower the critical value, the decision is that null hypothesis cannot be rejected and it is concluded that there is presence of unit root in the series. In the case PP value is above the critical value the null hypothesis is rejected and the conclusion is that there is absence of unit root in the series.

3.2.2. Autoregressive distributed lag (ARDL) model

The study uses a modified version of the model from Dogan and Turkekul (2015) for the association between CO_2 emissions and other independent variables as expressed in equation (3).

$$CO_2 = f\,(CO_2, EC, FD, GDP, UBR) \quad (3)$$

The variables CO_2, EC, FD, GDP, and UBR represent carbon emissions, energy use, financial development, and urbanization, respectively. The study uses Autoregressive Distributed Lag (ARDL) to determine the long-run relationship between these variables. ARDL bounds testing method was offered by Pesaran *et al.* (2001) and it has number of advantages over other traditional techniques. The technique can be applied in the case variables are I(0), I(1) or are in mixed and therefore, it is appropriate for this study. The models can be expressed as:

$$\Delta LCO_{2t} = \beta_0 + \sum_{j=1}^{n} \beta_1 \Delta LCO_{2t-j} + \sum_{j=0}^{n} \beta_2 \Delta LEC_{t-j} + \sum_{j=0}^{n} \beta_3 \Delta LFD_{t-j} + \sum_{j=0}^{n} \beta_4 \Delta LGDP_{t-j} + \sum_{j=0}^{n} \beta_5 \Delta LUBR_{t-j} + \alpha_1 LCO_{2t-1} + \alpha_2 LEC_{t-1} + \alpha_3 LFD_{t-1} + \alpha_4 LGDP_{t-1} + \alpha_5 LUBR_{t-1} + \varepsilon_t \quad (4)$$

In equation (4), ε represents the error term, t denotes the time trend and Δ indicates the first difference operator. Lag selection is built on the Akaike information criteria (AIC). Moreover, the decision concerning the long run depends on F-statistic. The null hypothesis that no cointegration among the variables is indicated by H_0: $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$ while the alternative hypothesis is that the variables have long run relationship, specified as H_1: $\beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq 0$. Pesaran *et al.* (2001) formulated two critical values; the lower critical bound value (LCB) and the upper critical bound value (UCB). Therefore, a higher value of F statistic than the UBC implies rejection of the null hypothesis and it is concluded that cointegration exist between the variables. However, a lower value of F statistics than the LCB suggests that null hypothesis cannot be rejected and it is concluded that cointegration does not exist between the variables. Moreover, the estimated dynamic error correction model determines the short run and long run associations between the variables. The significant negative value of the error correction term (ECT) further endorses the presence of long- run relationship.

4. Results

This section discusses the findings of the study. For good econometric estimation there is need to check stationarity of the data. Therefore, unit root test was conducted using PP test in addition to ADF tests. The estimation of the ADF is built on Schwarz Information Criterion (SIC) and the PP estimate is built on Kemel Newey West bound selection. Table 2 depicts the unit root tests result in for both ADF and PP test. The results suggest that some of the variables are stationary at I(0) while others are found to be stationary at I(1). No variable among them are found to be stationary at I(2), hence, the ARDL bound testing method is appropriate as technique to analyze these variables.

Table 2. Results of Unit Root test

Variable	ADF LEVEL		PP LEVEL		ADF First Diff		PP First Diff	
LCO2	-4.793161*	(0.0005)	-4.793161*	(0.0005)	-	-	-	-
LEC	-6.193425*	(0.0001)	0.154731	(0.9649)	-	-	-12.74912*	(0.0000)
LFD	-2.462427	(0.1341)	-2.345486	(0.1649)	-4.931001*	(0.0004)	-7.691048*	(0.0000)
LGDP	-1.414574	(0.8365)	-1.543909	(0.7917)	-7.012676*	(0.0000)	16.67529*	(0.0000)
LUBR	-1.437033	(0.5541)	-1.751552	(0.5126)	-5.995694*	(0.0000)	-5.977986*	(0.0000)

Notes: * represents statistically significance at 1 percent level. Figures in parenthesis represent probability.

Table 3 present the findings of bound test for the existence of cointegration. The bound test result endorses the presence of long-run association since the value of F-statistic is above the upper bound critical values at 1% significance level.

Table 3. ARDL Bound test result

F-statistics	1% I(0)	I(1)	5% I(0)	I(1)
7.97	3.74	5.06	2.86	4.01

Table 4 shows the results of the study estimation. The short-run result indicates that the L*EC*, *LFD,* and *LGDP* coefficients are significant in explaining the carbon dioxide emissions in Nigeria. For example, an increase in energy consumption by 1 percent results in 2.4 percent increase in environmental pollution, while an increase in financial development by 1 percent causes to 1.5 per cent decrease in environmental pollution. In addition, a 1 per cent rise in LGDP leads to 1.8 per cent decrease in environmental pollution. However, the short run result indicates that LUBR is not significant in explaining environmental pollution in Nigeria.

Furthermore, the result shows that it takes 72.38 percent to adjust to long-run equilibrium, with the coefficient of adjustment term negatively significant at 1 percent. The long run results indicate that only LEC is positive and significant in influencing environmental pollution in Nigeria. The result indicates that an increase in energy consumption by 1 percent results to about 3.4 percent increase in environmental pollution. This implies that higher energy consumption is associated with the 3.4 percent increase in environmental pollution. It is not surprise to see the relation of energy consumption with environmental pollution to be positively significant in this study as the recent diversification policy takes more effect on manufacturing sector in Nigeria. The diversification policy in Nigeria has encouraged firms to enhance production in order to generate more profit and revenue to the government. Consequently, more CO_2 emissions are released to the environment due to high-energy consumption. This finding is consistence with the result obtained by previous studies (Al-mulali and Ozturk, 2015; Heidari *et al.*, 2015; Jebli *et al*., 2017).

Table 4. Short Run and Long Run Results

ARDL estimation	Coefficients	SD Errors	t-Statistics	Prob
Short run estimates				
∆LEC	2.440855*	0.752363	3.244250	0.0048
∆LFD	-1.484847*	0.408317	-3.636506	0.0020
∆LGDP	-1.830118	0.427574	-4.280234	0.0005
∆LUBN	-0.259677	1.317385	-0.197116	0.8461
ECT(-1)	-0.723840	0.161743	-4.475251	0.0003
Long run estimates				
LEC	3.372094**	1.285498	2.623182	0.0178
LFD	0.066781	0.844719	0.079057	0.9379
LGDP	-0.353295	0.368904	-0.957690	0.3516
LUBR	2.244602	1.446998	1.551213	0.1393
C	-31.07696	15.77334	-1.970220	0.0653

Source: Authors' 2018;

Notes: * and ** represents statistically significant at 1 and 5 percent levels.

Table 5 presents the post-estimation diagnostic checks. The estimated model shows that there is no problem Heteroskedasticity, serial correlation and the errors are normally distributed. Furthermore, the study applies CUSUM and CUSUM square to know the stability of the model. Figure 2 and 3 present the CUSUM and CUSUM square, the figures show that the model is stable as CUSUM and CUSUM square lines are not outside the 5 percent critical line.

Table 5. Post Estimation Diagnostic Checks

Test Type	F-statistics	Probability	Result
Breusch-Pagan Test.	1.235454	0.3367	No Heteroskedasticity
Breusch-Godfrey Test	0.570058	0.5773	No Serial Correlation
Jarque-Bera	1.354824	0.5079	Normally Distributed

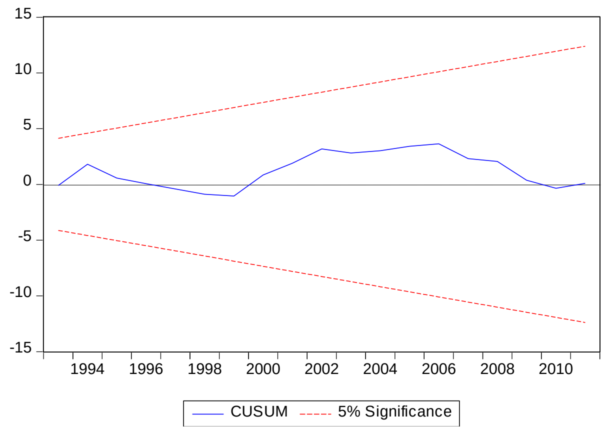


Figure 2. CUSUM statistics stability test

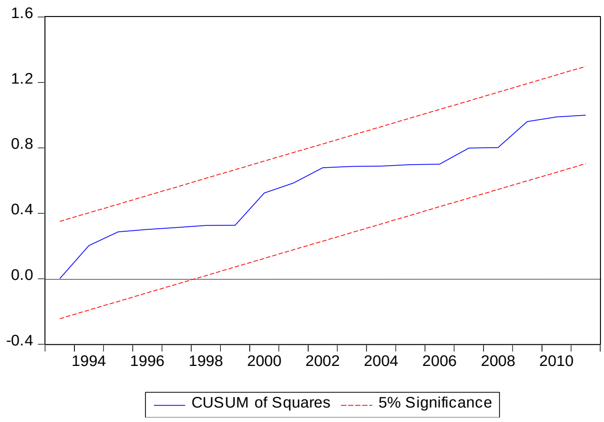


Figure 3. CUSUM square statistics stability test

5. Conclusions

This study investigated the influence of energy use, financial development, GDP, and urbanization on environmental pollution by employing ARDL bound testing method. The results of the bound test indicate that there exists a co-integration between the variables. The short-run estimates show that energy use is positively related with environmental pollution, while financial development and GDP reduce environmental pollution. The long-run analysis also indicates that a rise in energy consumption is related with higher environmental pollution. The implication of the results obtained in this study is that since energy consumption is linked to concentration of CO_2 emissions in Nigeria, especially the fossil fuel energy consumption, the policymakers should consider low emissions technology in order to lessen (CO_2 emissions) damaging effect. The result also signifies the need for using other forms of energy such as wind and solar energy to realize a clean and better environment. The positive association found between energy use and CO_2 emissions is consistent with the conclusion of previous studies (Omri, 2014; Salahuddin and Gow, 2014). Finally, there is a need for future studies to consider other factors that may influence environmental quality.

References

Adeel-farooq, R. M., Abu Bakar, N. A., Raji. J.O. (2018). Green Field Investment and Environmental Performance : A Case of Selected Nine Developing Countries of Asia. *Environmental Progress and Sustainable Energy*, *37*(3), 1085–1092.

Adusah-poku, F. (2016). Carbon Dioxide Emissions, Urbanization and Population : Empirical Evidence in Sub Saharan Africa. *Energy Economics Letters*, *3*(1), 1–16. https://doi.org/10.18488/journal.82/2016.3.1/82.1.1.16

Al-mulali, U., Ozturk, I. (2015). The Effect of Energy Consumption, Urbanization, Trade Openness, Industrial output, and The Political Stability on the Environmental degradation in the MENA (Middle East and North African) Region. *Energy*, *84*, 382–389. https://doi.org/10.1016/j.energy.2015.03.004

Al-Mulali, U., Ozturk, I., Lean, H. H. (2015). The Influence of Economic growth, Urbanization, Trade Openness, Financial development, and Renewable Energy on Pollution in Europe. *Natural Hazards*, *79*(1), 621–644. https://doi.org/10.1007/s11069-015-1865-9

Apergis, N., Ozturk, I. (2015). Testing environmental Kuznets curve hypothesis in Asian countries. *Ecological Indicators*, *52*, 16–22. https://doi.org/10.1016/j.ecolind.2014.11.026

Bai, X., Imura, H. (2000). A Comparative Study of Urban Environment in East Asia : Stage Model of Urban. *International Review for Environmental Strategies*, *1*(1), 135–158.

Begum, R. A., Sohag, K., Abullah, S. S. M., Jaafar, M. (2015). CO 2 Emissions, Energy Consumption, Economic and Population growth in Malaysia. *Renewable and Sustainable Energy Reviews*, *41*, 594–601. https://doi.org/10.1016/j.rser.2014.07.205

Ben Nasr, A., Gupta, R., Sato, J. R. (2015). Is there an Environmental Kuznets Curve for South Africa? A co-summability approach using a century of data. *Energy Economics*, *52*, 136–141. https://doi.org/10.1016/j.eneco.2015.10.005

Bilgili, F., Koçak, E., Bulut, Ü. (2016). The Dynamic Impact of Renewable Energy Consumption on CO2 Emissions : A revisited Environmental Kuznets Curve Approach. *Renewable and Sustainable Energy Reviews*, *54*, 838–845. https://doi.org/10.1016/j.rser.2015.10.080

Bölük, G., Mert, M. (2015). The renewable energy, growth and environmental Kuznets curve in Turkey: An ARDL approach. *Renewable and Sustainable Energy Reviews*, *52*, 587–595. https://doi.org/10.1016/j.rser.2015.07.138

Cho, C. H., Chu, Y. P., Yang, H. Y. (2014). An Environment Kuznets Curve for GHG Emissions: A Panel Cointegration Analysis. *Energy Sources Part B-Economics Planning and Policy*, *9*(2), 120–129. https://doi.org/Doi 10.1080/15567241003773192

Danlami, A. H., Applanaidu, S.-D., Islam, R. (2018). Movement towards a low Carbon Emitted Environment: A test of some factors in Malaysia. *Environment, Development and Sustainability*, *20*(3), 1085–1102. https://doi.org/10.1007/s10668-017-9927-7
Dinda, S. (2004). Environmental Kuznets Curve Hypothesis : A Survey. *Ecological Economics*, *49*(4), 431–455. https://doi.org/10.1016/j.ecolecon.2004.02.011
Dogan, E., Turkekul, B. (2015). CO2 Emissions, Real output, Energy Consumption, Trade, Urbanization and Financial Development : Testing The EKC Hypothesis For The USA. *Environmental Science and Pollution Research*, *23*(2), 1203–1213. https://doi.org/10.1007/s11356-015-5323-8
Dogan, E., Turkekul, B. (2016). CO2 emissions, real output, energy consumption, trade, urbanization and financial development: testing the EKC hypothesis for the USA. *Environmental Science and Pollution Research*, *23*(2), 1203–1213. https://doi.org/10.1007/s11356-015-5323-8
EIA. (2016). *Country Analysis Brief: Nigeria*. *Energy Information Administration*.
Farhani, S., Ozturk, I. (2015). Causal Relationship Between CO 2 Emissions, Real GDP, Energy Consumption, Financial development, Trade openness, and Urbanization in Tunisia. *Environmental Science and Pollution Research*, *22*(20), 15663–15676. https://doi.org/10.1007/s11356-015-4767-1
Hassan, A., Kouhy, R. (2013). Gas Flaring in Nigeria : Analysis of Changes in its Consequent Carbon Emission and Reporting. *Accounting Forum*, *37*(2), 124–134. https://doi.org/10.1016/j.accfor.2013.04.004
Heerink, N., Mulatu, A., Bulte, E. (2001). Income Inequality and The Environment : Aggregation bias In Environmental Kuznets curves. *Ecological Economics*, *38*, 359–367.
Heidari, H., Turan Katircioğlu, S., Saeidpour, L. (2015). Economic growth, CO2 emissions, and energy consumption in the five ASEAN countries. *International Journal of Electrical Power & Energy Systems*, *64*(April 2017), 785–791. https://doi.org/10.1016/j.ijepes.2014.07.081
Javid, M., Sharif, F. (2016). Environmental Kuznets curve and financial development in Pakistan. *Renewable and Sustainable Energy Reviews*, *54*, 406–414. https://doi.org/10.1016/j.rser.2015.10.019
Jebli, M. Ben, Youssef, S. Ben, Ozturk, I. (2017). Testing Environmental Kuznets curve hypothesis : The Role of Renewable and Non-renewable Energy Consumption and Trade in OECD Countries. *Ecological Indicators*, *60*, 824–831. https://doi.org/10.1016/j.ecolind.2015.08.031
Kasman, A., Duman, Y. S. (2015). CO2 emissions, economic growth, energy consumption, trade and urbanization in new EU member and candidate countries: A panel data analysis. *Economic Modelling*, *44*, 97–103. https://doi.org/10.1016/j.econmod.2014.10.022
Kuznets, S. (1955). Economic Growth and Income Inequality. *The American Economic Review*, *45*(1), 1–28.
Lau, L. S., Choong, C. K., Eng, Y. K. (2014). Investigation of the environmental Kuznets curve for carbon emissions in Malaysia: DO foreign direct investment and trade matter? *Energy Policy*, *68*, 490–497. https://doi.org/10.1016/j.enpol.2014.01.002
Li, T., Wang, Y., Zhao, D. (2016). Environmental Kuznets Curve in China: New Evidence from Dynamic Panel Analysis. *Energy Policy*, *91*, 138–147. https://doi.org/10.1016/j.enpol.2016.01.002
Muhammad, J., Ghulam Fatima, S. (2013). Energy Consuption, Financial Development and CO2 Emissions in Pakistan. *MPRA*, (48287).
Omri, A. (2013). CO2 emissions, energy consumption and economic growth nexus in MENA countries: Evidence from simultaneous equations models. *Energy Economics*, *40*(November 2013), 657–664. https://doi.org/10.1016/j.eneco.2013.09.003
Omri, A. (2014). The nexus between foreign investment, domestic capital and economic growth : Empirical evidence from the MENA region. *Research in Economics*, *68*(3), 257–263. https://doi.org/10.1016/j.rie.2013.11.001
Ozturk, I., Al-mulali, U. (2015). Investigating the validity of the environmental Kuznets curve hypothesis in Cambodia. *Ecological Indicators*, *57*, 324–330. https://doi.org/10.1016/j.ecolind.2015.05.018
Pesaran, M. H., Shin, Y., Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, *16*(3), 289–326. https://doi.org/10.1002/jae.616
Rafindadi, A. A. (2016). Revisiting the concept of environmental Kuznets curve in period of energy disaster and deteriorating income: Empirical evidence from Japan. *Energy Policy*, *94*, 274–284. https://doi.org/10.1016/j.enpol.2016.03.040
Saimanul, C., Abdul-Rahim, A. S. (2017). The Relationship between CO2 Emission, Energy Consumption and Economic growth in Malaysia : A Three-way Linkage Approach. *Environmental Science and Pollution Research*, *24*(32), 25204–25220. https://doi.org/10.1007/s11356-017-0092-1
Salahuddin, M., Gow, J. (2014). Economic growth, energy consumption and CO 2 emissions in Gulf Cooperation Council countries. *Energy*, *73*, 44–58. https://doi.org/10.1016/j.energy.2014.05.054
Shahbaz, M., Sbia, R., Hamdi, H., Ozturk, I. (2014a). Economic growth, electricity consumption, urbanization and environmental degradation relationship in United Arab Emirates. *Ecological Indicators*, *45*, 622–631. https://doi.org/10.1016/j.ecolind.2014.05.022
Shahbaz, M., Sbia, R., Hamdi, H., Ozturk, I. (2014b). Economic Growth , Electricity Consumption , Urbanization and Environmental Degradation Relationship in United Arab Emirates. *Ecological Indicators*, *45*, 622–631. https://doi.org/10.1016/j.ecolind.2014.05.022
Shahbaz, M., Solarin, S. A., Mahmood, H., Arouri, M. (2013). Does financial development reduce CO2 emissions in Malaysian economy? A time series analysis. *Economic Modelling*, *35*, 145–152. https://doi.org/10.1016/j.econmod.2013.06.037
Tiwari, A. K. (2011). A Structural VAR Analysis of Renewable Energy Consumption, Real GDP and CO2 Emissions: Evidence from India. *Economics Bulletin*, *31*(2), 1793–1806.
World Bank Group. (2017). *Global Economic Prospects, June 2017: A Fragile Recovery*.