Causal implication of Oil Production on Carbon Emission and Economic Growth in Nigeria

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Abstract: The paper investigated the causality among carbon emission, oil production and economic growth in Nigeria's time series data for the period 1970 to 2013. It estimated an autoregressive distributed lag model and used granger causality mechanism to establish both the effects and causal nexus among the variables. The main finding is that oil production and carbon emission had significant negative effect real per capital growth and a significant causal relationship from crude oil production to carbon emission and economic growth. This finding implied that attempts to quicken real economic growth and enhanced welfare through oil production had led instead to a worsen environment degradation and lower quality of life such that the benefit of oil resources endowment was only seen but not felt by people. Hence, possibly the negative impact of oil resources reported in many previous studies in many oil dependent country might indeed be as a result of induced environmental degradation and health hazard due to higher carbon emission in such countries like Nigeria.

Keywords: Energy Resources, Environmental Quality, Crude oil production

JEL codes: Q56, O55, P48

1. Introduction

Nigeria is Africa's most populated country, with significant oil, and gas reserves. Over 80% of its oil is exported, whilst most of its people are living in abject poverty and penury. More than 3.5 billion standard cubic feet of associated gas was produced in 2000, of which 70 percent and above was burnt off (flared). As oil production increased, Nigeria has become the world's biggest gas

flarer, both proportionally and absolutely, with around 2 billion scf, perhaps 2.5 billion a day being flared. This is equal to about 25 per cent of the UK's gas consumption. The single biggest flarer is the Shell Petroleum Development Company of Nigeria Ltd (SPDC) (friends of the earth 2004).

In economic perspective, flaring and venting in Nigeria, according to a World Bank report, "has contributed more greenhouse gas (GHG) emissions than all other sources in sub-Saharan Africa combined. In 2004, the World Resources Institute's on Climate Analysis Indicators Tool (CAIT) ranked Nigeria the world's 41st largest GHG emitter of carbon dioxide (CO_2) with a figure of 85.1 million tons of CO_2 from fossil fuel and cement manufacture, ahead of Kuwait, Portugal, Libya, Norway and Angola. This figure excludes land use change and Forestry. The GHG emission contributes to global warming, and thus, leading to climatic change with attendant spill-over effect on the environment. Such consequences include desertification leading to reduced crop yield, rise in sea levels giving rise to flooding; and, depletion of Ozone Layer, which manifest itself in increased mean global temperature. In monetary terms, the cost of gas flared from 1970 to 2007 by the oil producing companies in Nigeria would be about $92.5billion if the annual financial loss is estimated at $2.5billion of lost economic value *(NNPC Gas Master Plan Team, 2008)*. The extent of gas flaring from inception to 2006 is presented in figure below which is according to official report from the National Oil Corporation (NNPC). About N169tn has been lost by the country to gas flaring incidences in the last 40 years of exploration. In the same vein, government also noted that N3.5bn worth of agricultural produce is lost annually to gas flaring incidences in addition to the loss of about 3.045tn gas measure recorded.

The bone of contention in this paper is whether crude oil production has positive, negative or neutral impact on economic activities in Nigeria. This issue has been a subject of academic discourse among different economists, scholars and policy analysts. It is on this background that there is need to examine oil production, carbon emission and economic growth in Nigeria.

Olatinwo & Adewunmi (2012) argued that clean, efficient, affordable, sustainable and reliable energy services are indispensable for global prosperity. But for a country like Nigeria with development challenges and dependence on oil, achieving such target require a tradeoff between better economy and cleaner environment. If the exploration of the natural resources has contributed to growth, then it is easier to argue that country can be encourage to explore more and quicken the development process. Therefore the main hypothesis- has oil exploration been beneficial to the Nigerian economy? To achieve this objective the paper will be divided into five sections. Section

2 is devoted to review of some salient studies and section 3 provides the empirical approach adopted while section 4 and 5 deal with the empirical results and summary of findings with policy inferences respectively.

2. Review of Literature

Nigeria's oil wealth has been exploited for more than five decade. But while oil companies including Shell, ExxonMobil and TotalFinaElf, have profited from the resource, local communities in the oil rich but conflict-driven areas live with the daily pollution caused by non-stop gas flaring – where the gas associated with oil extraction is burnt off into the atmosphere. More gas is flared in Nigeria than anywhere else in the world – in Western Europe 99 per cent of associated gas is used or re-injected into the ground. But in Nigeria, despite regulations introduced over the year to ameliorate the situation, most associated gas is flared, causing local pollution and contributing to climate change (friends of the earth 2004). This review looks at oil production and carbon emission from gas flaring and it effect on economic growth.

Oil production and environmental pollution policy is within the realm of macroeconomic policy. The effective formulation and implementation of the policies requires collaborations which is sacrosanct towards achieving sustainable economic growth. Nigeria has recorded series of experience of ineffective policies especially in the power sector, where multinational environment pollution agreements and negotiations were embarked upon towards the reduction of global warming. In the past decades under the structural adjustment programme (SAP) era, the outcome of the implementation of the policies does not meet the economy expectations. Despite the changing policies formulated globally to better support the developing countries; carbon emission has been enormous, which has led to global warming and climate change. Akpan et al (2012) observed that carbon (CO_2) emissions account for more than 75% of greenhouse gas emissions with about 80% of it generated by the energy sector among the several pollutants contributing to climate change. Nevertheless, it is pertinent to precisely establish the exact causality among oil production, economic output and carbon emission within the economy, theoretically and empirically. This forms the major rationale for this study by determining the effects of crude oil production and carbon emission from gas flaring on the growth rate of the Nigerian economy.

Moreover, other motivations for this research study is focused on environmental pollutants and economic growth nexus, which is closely related to testing the validity of the so called Environmental Kuznets Curve (EKC) hypothesis, which postulates an inverted U-shaped relationship between per capita income and environmental degradation in the long run (Akbostanci, Turut-Asik & Tunc, 2009; Diao,Zeng, Taim & Tam, 2009; He & Richard, 2010). Akpan et al (2012) opined that a marriage of the different thoughts of study (Environmental Kuznet Curve hypothesis and Energy-growth nexus) in which the relationship among energy consumption, economic growth and carbon emissions from gas flaring are examined under a multivariate framework has formed a relatively new area of research. Nearly most studies that have focused on this thoughts for both the developed countries (Ang, 2007; Apergis & Payne, 2009; Ozturk & Acaravci, 2010, etc) and developing countries (Jumbe, 2004; Menyah & Wolde-Rufael, 2010) have returned conflicting and mixed results. Empirical evidence from similar studies in Nigeria are at best scanty. Akpan et al (2012) opined that Akinlo's (2009) study suffered from short span of data set (1980-2006) which was based on a bi-variate analysis between electricity consumption and economic growth rather than on an integrated framework within the energy-growth-emission framework. He associated the likely problem from the study as the loss in power associated with the small sample size and the issue of omitted variable bias.

In addition, the National Energy Commission (2003) opined that the insufficient supply of energy affects all aspects of development, more specifically social, economic, environmental, and even quality of life. Improvements in standard of living are manifested in increased agricultural output, increased industrial output, the provision of efficient transportation, adequate shelter, healthcare and other human services and these will holistically require increased in energy consumption. Therefore, energy is considered as an important requirement for economic growth and is potentially an inhibiting factor to economic and social development. Therefore, the relationship between crude oil production and economic growth has been a subject of greater inquiry as crude oil production is considered to be one of the important driving force of economic growth in all economies since production and consumption activities involve energy propelled by oil as an essential factor inputs (Abdulnasser & Manuchehr, 2005). The question as to whether oil production has positive, negative or neutral impact on economic activities motivated the interest of this study, hence, the need to find out the impact and direction of causality between oil production and economic growth (Eddine, 2009).

According to the World Bank, by 2002 flaring in the country had contributed more greenhouse gases to the Earth's atmosphere than all other sources in sub-Saharan Africa combined – and yet this gas is not Local communities living around the gas flares – and many are close to villages and agricultural land - rely on wood for fuel and candles for light. The flares also contain widely-recognised toxins, such as benzene, which pollute the air. Local people complain of respiratory problems such as asthma and bronchitis. According to the US government, the flares contribute to acid rain and villagers complain of the rain corroding their buildings. The particles from the flares fill the air, covering everything with a fine layer of soot. Local people also complain about the roaring noise and the intense heat from the flares. They live and work alongside the flares with no protection. General flaring was made illegal under regulations in 1984, and only allowed in specific circumstances on a field-by-field basis pursuant to a ministerial certificate. None of these certificates have been made public. President Obasanjo has agreed to put back the 2004 "flares-out" deadline to 2008 (friends of the earth 2004).

Policy and research interests have grown on the link between crude oil production, economic and carbon emission and there is general contention on causal relationship among crude oil production, carbon emission and a country's output growth. However, energy-growth-environmental pollution nexus has continued to receive serious attention in the contemporary energy economics research and literature. The first impetus of this study was concern over energy price rises, the finite nature of key energy resources and the presumed importance of providing energy to facilitate the development process. The second momentum considers the environmental consequences of energy use testing the causality between energy use and income making references to the widespread concern about climate change i.e. the relationship between carbon emission and income is now seemingly of greater important (Jumbe, 2004; Mahedi, 2012 and Olatinwo & Adewunmi, 2012). On this basis, this study will not only analyse the casual raltionship between crude oil production, economic growth and carbon emission but also the impact of crude oil production and carbon emission on the growth rate in the Nigerian economy.

3. Empirical Methodology

Two different but not mutual exclusive approaches have been adopted in tracing the nexus between crude oil production and economic growth. First, regression approach, where there is little attention

to direction of causality and second, causality approach (Odhiambo, 2009; Bowden & Payne, 2009; Yuan et al. 2008), where there is high stress on the direction of causality. This paper combines the two approaches, which are netted within the Autoregressive Distributed Lag (ARDL) bounds testing framework and Granger causality test. The central issue in the causal relationship between economic growth and crude oil production has been whether economic growth stimulates crude oil production or is crude oil production itself is a stimulus for economic growth via indirect channels of effective aggregate demand, improved overall efficiency and technological progress (Ghosh and Basu, 2006).

There are two related hypotheses on the nexus between crude oil production and economic growth: energy - led- growth hypothesis and growth- led- energy hypothesis. The investigation of these two hypotheses is well established in the development literature, yet the outcomes remain inconsistent and controversial. Pradhan had attributed the controversy over the results from the existing studies to various structural frameworks and policies followed by different countries under different conditions and time periods, Apergis and Payne (2009), Balat (2008), Chiou-Wei et al., (2008), Lee and Chang (2007,2008). In order to capture the causal relationship between oil price, crude oil production, investment and real economic growth and to account for possible feedback effects from the short run fluctuations to the long run steady state of the relationship between the key variables, the model is expressed in the form that allows for the testing of both unit root and cointegration. Therefore, the granger causality test is done using the models below:

$$RGDP = f(OLP, CEGF, OLC, INV\ EST) \qquad\qquad 1$$

Mathematically, it can be logarithmical expressed in three models in order to follow the hypothesis formulated above as thus:

$$InRGDP_t = \alpha_0 + \beta_4 OLP_t + \mu_t \qquad\qquad 2$$

$$InRGDP_t = \alpha_0 + \beta_1 InCEGF_t + \mu_t \qquad\qquad 3$$

$$InRGDP_t = \alpha_0 + \beta_1 InOLP_t + \beta_2 InCEGF_t + \beta_3 InOLC_t + \beta_4 InINVEST_t + \mu_t \qquad\qquad 4$$

Where:
RGDP = Real gross domestic product;
OLP = Oil production;

CEGF = Carbon emission from gas flaring;
OLC = Oil consumption;
INVEST = Investment;
$\propto_0$ = *Intercept;*
β_{1-4} = *Slope or regression parameters;*
and μ = Stochastic term.

Data Description and Analytical Technique

Data and methodological description for the econometric analysis of the relationship among crude oil production, carbon emission and growth rate in Nigeria between 1970 and 2013 are adopted. The time frame for the analysis is chosen based on availability of data from various sources. The data sourced for the analysis of this study are presented and employed to estimate the multiple regression model specified in the previous section.

To examine the empirical relationship between carbon emission, crude oil production and economic growth in Nigeria, the model designed for this research is the multiple regression equation. The model predicts the relationship between the dependent variable (RGDP) and independent variables ("OLP", "CEGF", "OLC" and "INVEST"). This study made a narrative attempt to adopt a dynamic methodology of the form of Granger causality and dynamic regression model to examine the dynamic effect of oil production, and carbon emission from gas flaring on economic growth in Nigeria and further employ the Autoregressive Distributed Lag (ARDL) bounds testing framework to establish the economic growth response of carbon emission which serves as the methodological rationale for the study. The model is estimated using data from the Central Bank of Nigeria Statistical Bulletin, Volume 22, 2011; World Development Index, 2012 and International Energy Agency (IEA) publications for the period of 43 years (1970 – 2013).

4. Empirical Results and Discussion

4.1. Unit Root Tests

The first and prime step of the nexus between crude oil production, carbon emission and economic growth requires that all the variables should be integrated of same order, specifically, I(I). The ADF unit-root test is deployed for investigating the same. The estimated results of these variables are reported in Table 1.

Table 1. ADF Unit Root Test Results

Variable	ADF Tau Statistics		Order of Integration
	Intercept	Linear Trend	
Δrg	-7.7438*(1) [-3.6156]	-7.6760*(1) [-4.2191]	0
$\Delta olpg$	-5.7002*(3) [-3.6268]	-5.6156*(3) [-4.2350]	0
$\Delta olcg$	-5.1342*(4) [-5.1342]	-4.9951*(4) [-4.2436]	0
$\Delta C02g$	-8.6359*(0) [-3.6105]	-8.5399*(0) [-4.2119]	0
$\Delta invtg$	-9.7901*(0) [-3.6145]	-9.6422*(0) [-4.2119]	0

*Note: * significant at 1%; Mackinnon critical values and are shown in parenthesis. The lagged numbers shown in brackets are selected using the minimum Schwarz and Akaike Information criteria.*
Source: Authors' own elaboration.

The estimated error term $(ect_t = \hat{u}_t)$ extracted from the ARDL model reject the null hypothesis "no stationary", which implies the null hypothesis "no cointegration" is rejected for intercept and linear deterministic models at 1% McKinnon critical value as shown in Table 4.3. This implies that there is long-run relationship among change of real gross domestic product growth rate (Δrg), change of crude oil production growth rate ($\Delta olpg$), change of crude oil consumption ($\Delta olcg$), change in growth rate of Carbon Monoxide Emission from Gas Flaring ($\Delta C02g$), and change in investment growth rate ($\Delta invtg$) in Nigeria between 1970 and 2013.

4.2. Granger-Causality Test Results

The third step involves the estimation of the Granger-Causality test. The causality between economic growth and crude oil production proxies from 1970 and 2013 are shown in Table 2. The results indicated that the null hypotheses "change in investment growth rate ($\Delta invtg$) does not granger cause change of real gross domestic product growth rate (Δrg)"; and "change in investment growth rate ($\Delta invtg$) does not granger cause change of crude oil consumption ($\Delta olcg$)" at 10% significant level. This indicates that change in investment growth rate ($\Delta invtg$) granger cause changes in real GDP growth rate (Δrg) and investment growth rate ($\Delta invtg$).

Table 2. Granger causality Results

Null Hypothesis:	Obs	F-Statistic	Prob.
DOLPG does not Granger Cause DRG	39	0.58844	0.448
DRG does not Granger Cause DOLPG		0.03927	0.844
DOLCG does not Granger Cause DRG	39	0.75605	0.3903
DRG does not Granger Cause DOLCG		0.21198	0.648
DCO2G does not Granger Cause DRG	39	0.03897	0.8446
DRG does not Granger Cause DCO2G		0.24377	0.6245
DINVTG does not Granger Cause DRG	39	3.55365	0.0675
DRG does not Granger Cause DINVTG		1.76833	0.192
DOLCG does not Granger Cause DOLPG	39	2.57916	0.117
DOLPG does not Granger Cause DOLCG		0.06500	0.8002
DCO2G does not Granger Cause DOLPG	39	3.11579	0.086
DOLPG does not Granger Cause DCO2G		6.50360	0.0152
DINVTG does not Granger Cause DOLPG	39	0.20215	0.6557
DOLPG does not Granger Cause DINVTG		0.03696	0.8486
DCO2G does not Granger Cause DOLCG	39	0.91850	0.3443
DOLCG does not Granger Cause DCO2G		0.01032	0.9197
DINVTG does not Granger Cause DOLCG	39	3.29949	0.0776
DOLCG does not Granger Cause DINVTG		0.79254	0.3792
DINVTG does not Granger Cause DCO2G	39	0.75206	0.3916
DCO2G does not Granger Cause DINVTG		1.39954	0.2446

Source: Authors Computation, 2013.

Also, the null hypotheses "change in growth rate of Carbon Monoxide Emission from Gas Flaring ($\Delta C02g$) does not granger cause change of crude oil production growth rate ($\Delta olpg$)"; and "change of crude oil production growth rate ($\Delta olpg$) does not granger cause change in growth rate of Carbon Monoxide Emission from Gas Flaring ($\Delta C02g$)" at 10% and 5% significant level respectively. This indicated that there is bi-causal relationship between change in growth rate of Carbon Monoxide Emission from Gas Flaring ($\Delta C02g$) and change of crude oil production growth rate ($\Delta olpg$).

5. Conclusion and Recommendations

The main finding of the paper is that crude oil production and consumption, carbon monoxide emission from gas flaring and investment significantly affected economic growth in Nigeria.

Therefore, the paper also established that there is a significant causal relationship between oil production, carbon emission and economic growth in Nigeria. This finding is consistent with other studies in other countries (such as Kummel, Kroeger & Eichhorn, 2001; Ayres, Ayres & Warr, 2002; Ayres, 2004 and Ayres & Warr, 2010). It also supported the assertion that the high tendencies to rely on oil resource as sources of economic growth had led to high environmental degradation and lower quality of welfare and wellbeing of the people. Consequently this might be account for insignificant and possibly negative impact of oil resources in many oil dependent countries like Nigeria. Thus the influence of oil production is only seen but not yet felt by many citizens in the case of Nigeria as the results shown.

Considering the observed nature of the effect of oil production and carbon emission from gas flaring on the growth rate of the national output in Nigeria, the following policy options are proffered as follows: There is need to fully explore the potential gas has to offer by increasing sales and market penetration in the domestic, regional and international markets. The government intends to protect supply to the domestic market, through the introduction of the Domestic Gas Supply Obligation regulation, which mandates that a certain portion of gas production be set aside for the domestic market *(This can generate employment indirectly)*. Competitively position Nigeria in terms of cost competiveness and scalability of capacity. By improving Nigerian gas industry's competitiveness by implementing an integrated infrastructure strategy to support domestic, regional and export markets; and attracting new players; and ensuring the commercial viability of investments.There is need to have a single energy regulator, hence the need to re-align, harmonise existing structures-organisation, management and policies on Energy. The policy on energy supply and demand planning should be drawn based on a long term view of the direction of a country over a minimum period of 100 years;

The ultimate goal is to supply adequate energy to support growth and development of the economy from viable sources and to have a one-stop shop that assesses what infrastructure is necessary for such to happen that can lead to industrial development. Thus, there is a need to have central coordination for planning of sources of energy supply and for managing demand in Nigeria, from the current dispersed supervisory authorities; The country do not need to sacrifice economic growth to decrease their emission levels, as they may achieve CO_2 emissions reduction via energy conservation without negative long-run effects on economic growth; and The government should integrate emissions regulation with economic development policies. Another important policy

issue to be addressed if the level of emission is to be reduced and the benefit of oil production realised is the adoption of renewable energy. As stated by Saibu and Omoju 92016) renewable energy id well managed and made at a more cost effective scale could lead to a greater reduction in carbon emission and also a greener environment.

Literature

Acaravci, A.; Ozturk, I. (2010). On the relationship between energy consumption, CO 2 emissions and economic growth in Europe. *Energy* 35(12): 5412-5420.

Akinlo, A. E. (2009). Electricity consumption and economic growth in Nigeria: evidence from cointegration and co-feature analysis. *Journal of Policy Modeling* 31(5): 681-693.

Akbostancı, E.; Türüt-Aşık, S.; Tunç, G. İ. (2009). The relationship between income and environment in Turkey: Is there an environmental Kuznets curve? *Energy Policy* 37(3): 861-867.

Akpan, G. E.; Akpan, U. F. (2012). Electricity consumption, carbon emissions and economic growth in Nigeria. *International Journal of Energy Economics and Policy*, 2(4): 292.

Ang, J. B. (2007). CO 2 emissions, energy consumption, and output in France. *Energy Policy* 35(10): 4772-4778.

Apergis, N.; Payne, J. E. (2009). CO2 emissions, energy usage, and output in Central America. *Energy Policy* 37(8): 3282-3286.

Apergis, N.; Payne, J. E. (2009). Energy consumption and economic growth: evidence from the Commonwealth of Independent States. *Energy Economics* 31(5): 641-647.

Apergis, N.; Payne, J. E. (2009). Energy consumption and economic growth in Central America: evidence from a panel cointegration and error correction model. *Energy Economics* 31(2): 211-216.

Apergis, N.; Payne, J. E. (2010). Renewable energy consumption and economic growth: evidence from a panel of OECD countries. *Energy policy* 38(1): 656-660.

Balat, M. (2008). Energy consumption and economic growth in Turkey during the past two decades. *Energy Policy* 36(1): 118-127.

Balat, M. (2008). Global trends on the processing of bio-fuels. *International Journal of Green Energy* 5(3): 212-238.

Chiou-Wei, S. Z., Chen, C. F.; Zhu, Z. (2008). Economic growth and energy consumption revisited—evidence from linear and nonlinear Granger causality. *Energy Economics* 30(6): 3063-3076.

Ghosh, S.; Basu, S. (2006). Coal and gas consumption with economic growth: co-integration and causality evidences from India. *Journal of Resources, Energy and Development* 3(1): 13-20.

Hatemi, A.; Irandoust, M. (2005). Energy consumption and economic growth in Sweden: a leveraged bootstrap approach, 1965–2000. *International Journal of Applied Econometrics and Quantitative Studies* 2(4): 87-98.

Jumbe, C. B. (2004). Cointegration and causality between electricity consumption and GDP: empirical evidence from Malawi. *Energy economics* 26(1): 61-68.

Lee, C. C.; Chang, C. P. (2008). Energy consumption and economic growth in Asian economies: a more comprehensive analysis using panel data. *Resource and energy Economics* 30(1): 50-65.

Menyah, K.; Wolde-Rufael, Y. (2010). Energy consumption, pollutant emissions and economic growth in South Africa. *Energy Economics* 32(6): 1374-1382.

Odhiambo, N. M. (2009). Electricity consumption and economic growth in South Africa: A trivariate causality test. *Energy Economics* 31(5): 635-640.

Odhiambo, N. M. (2009). Energy consumption and economic growth nexus in Tanzania: An ARDL bounds testing approach. *Energy Policy* 37(2): 617-622.

Olatinwo, K. B.; Adewumi, M. O. (2012). Energy Consumption of Rural Farming Households in Kwara State, Nigeria. *Journal of Sustainable Development in Africa* 14(2): 67-70.

Ozturk, I.; Acaravci, A. (2010). CO 2 emissions, energy consumption and economic growth in Turkey. *Renewable and Sustainable Energy Reviews* 14(9): 3220-3225.

Saibu M.O.; Omoju E.O. (2016). Macroeconomic Determinants of Renewable Electricity Technology Adoption in Nigeria. *Economic and Environment Studies* 16(1): 65-83.

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Wieliczko, B. (2012). Zmiany WPR na lata 2014-2020 a modernizacja polskiej wsi i rolnictwa (Changes in the CAP 2014-2020 vs. Modernisation of the Polish Agriculture and Rural Areas). *Journal of Agribusiness and Rural Development* 3(25): 291-298.

Konsekwencje produkcji ropy naftowej w kontekście emisji dwutlenku węgla i wzrostu gospodarczego w Nigerii

Streszczenie

Niniejszy artykuł bada związku przyczynowo – skutkowe pomiędzy emisją dwutlenku węgla, produkcją ropy naftowej i wzrostem ekonomicznym w Nigerii na podstawie danych z zakresu czasowego 1970-2013. Oszacowano model z autoregresyjnymi rozkładami opóźnień oraz test przyczynowości Grangera, aby ustalić zarówno efekty, jak i związek przyczynowy pomiędzy zmiennymi. Podstawowe wyniki wskazują, że produkcja ropy i emisja dwutlenku węgla mają znaczący negatywny efekt na wzrost per capita i znaczącą relację przyczynową od produkcji ropy poprzez emisję dwutlenku węgla i wzrost gospodarczy. Wyniki te dowodzą, że próby przyspieszenia rzeczywistego wzrostu gospodarczego i poprawy dobrobytu poprzez produkcję ropy doprowadziły do pogorszenia stanu środowiska i niższej jakości życia, w związku z czym korzyści z wydobycia ropy były tylko widziane, lecz nie odczuwane przez mieszkańców. Z tego powodu możliwy negatywny wpływ zasobów ropy zaobserwowany we wcześniejszych badaniach dotyczących wielu krajów uzależnionych od wydobycia ropy, może także wystąpić w Nigerii w postaci degradacji środowiska i problemów zdrowowtnych wskutek wyższej emisji dwutlenku węgla.

Słowa kluczowe: zasoby energetyczne, jakość środowiska, produkcja ropy naftowej

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