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CARBON EMISSION TAX AS TOOL FOR REDUCING EMISSION IN NIGERIA: A LITERATURE REVIEW

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ABSTRACT

This paper through literature review and meta-analysis investigates carbon emission tax as a tool for emission reduction in Nigeria's economy. To obtain robust findings, other countries experience as regards to carbon emission tax policy implementation were reviewed. Findings from the meta-analysis show thatcarbon emission tax would significantly reduce carbon emissions and energy consumption from fossil fuels. Therefore, Nigeria should strive to promote clean and friendly environment, which is essential to reducing carbon emission.Furthermore, implementing a carbon emission tax would improve the use of clean energy, which would be an effective means of reducing carbon emissions. Therefore, the Nigeria government should formulate the regulations for and pass a carbon emission tax as early as possible to achieve its carbon emission reduction target and further contribute to mitigating climate change.

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INTRODUCTION

There had been a growing concern among environmentalists and economists as regards to the relationship between economic growth and the environment. This concern has resulted to more scrutiny being placed on growth policies in order to assess the long-run negative effect of further economic growth and development on the sustainability of the environment (Bullard &Herendeen, 1975). Therefore, Due to growth in the economy and population, Nigeria has become one of the largest emitter of carbon in Africa. Oni and Oyewo (2016) further emphasized that the discovery of oil in Nigeria and exploration activities by oil companies contributed to the issues of carbon emission facing the country. They advocated through their study for the use of a tax that will help control the individual's and company's activities, hence, revenue can be generated and invested back to encourage clean and safe environment. This Suggests that taxation through carbon tax policy together with other regulatory instrument such as green growth declaration as suggested by Richard and William, (1994) can be used as a tool for regulating human and corporate behavior as regard to carbon emission. A Green Growth Declaration was signed in June 2009 by Ministers from 34 countries at the Organisation for Economic Co-operation and Development (OECD) Meeting of the Council at Ministerial level. A directive was signed by these countries for the OECD to put in place a green growth strategy which connects economic growth objectives with social and environmental aspects (OECD, 2015). The said carbon emission, is not only a global issue but it's a major point of concern in Africa, as her countries are in the category of a developing economies and carbon emission is positively correlated to a developing economy (WHO, 2018). This assertion of WHO is validated by the quest for growth in the African countries' economy, therefore production and business activities will be on the increase to achieve economic growth without any measure in place to check the environmental impact of such activities. Odinkonigbo (2012) stated that the global warming as a result of carbon emission released in the atmosphere has become a serious challenge to the planet earth. Developed and developing economies are surprisingly major contributors to the global warming as a result of their activities. He also opined that carbon emission in Nigeria is one of the factors causing negative externalities, environmental deterioration and economic hardship in the country. International Energy Agency (IEA) in its World Energy Balances (2018), affirmed in its report that carbon emission at global level had been increasing persistently over two decades ago, and this is what accounted for changes in the earth's radiation balance due to the anthropogenic accumulation in the atmosphere of radioactively active greenhouse gases.

In fact a National Research Council Report in 2016, reported that the global average temperature during the past few decades was much more than the temperature in any comparative period in the last 500 years. Damage from consumption of the toxic emissions from carbon emission by the surrounding vegetation can affect the quality and esthetic value of plants and reduce their economic value (Westenbarger & Frisvold, 2015). International Energy Agency, (2018) recorded that the global carbon emission of 1990, 1995, 2000, 2005, 2010, 2015 and 2016 was 20518.23, 21379.59, 27069.7, 30489.89, 32276.04 and 32316.22 per metric tons respectively. The carbon emission report of Nigeria had also been on the increase for the past two decades. Literature confirmed that when this carbon emission is in the atmosphere the resulting water (in form of rain) can become harmful to vegetation (Cape, 2013) and aquatic life (Havens, Yan, & Keller, 2012). In respect of health implications, the acidic reactions mix and travel with the air and can lead to leukemia (that is cancer of the body's blood-forming tissues, including the bone marrow and the lymphatic system). Carbon emission worsens the living conditions for many who are already vulnerable, particularly in developing countries because of the lack of assets and adequate insurance coverage.

The use of carbon emission tax as an instrument to reduce global emissions and climate change has been the subject of scholarly discuss for a long time (Pearce, 2018; Metcalf, 2019). While excessive carbon emissions have been identified as an important cause of global warming (Meinshausen, Meinshausen, Hare, Raper, FrielerKnutti, Frame & Allen, 2018), the use of carbon tax as an economic instrument to reduce carbon emissions by industries has been widely accepted by countries around the world as appropriate. But 'global warming and climate change' are long term issues that require substantial mitigation effort involving complex interactions among environmental, economic, social, technological and political processes (Sathre and Gustavsson, 2017). They also stated that, there are numerous potential options for reducing carbon emissions, national policies to encourage climate change mitigation can comprise a portfolio of market-based instruments, regulatory instruments and voluntary instruments. Among a variety of instruments to control carbon emissions, a growing number of governments worldwide has opted for carbon tax as the most effective economic measures because of its relatively straight forward implementation and low transaction cost; its dynamic efficiency giving a permanent incentive to reduce emissions, and the ability to recycle tax revenues back into the economy (Terkla, 2018). Zhengquan and Xingping, (2014) stated that levying a carbon tax may have negative effects on economic growth in the short-run, extensive studies have applied different alternative approaches to discuss this issue and formulate effective environmentally friendly economic policies.

In fact a National Research Council Report in 2016, reported that the global average temperature during the past few decades was much more than the temperature in any comparative period in the last 500 years. The toxic chemicals released into the air (as shown in figure 4) settles into the plants and water sources, animals eat the contaminated plants and drink the poisoned water, then travel through the food chair to us human being. Toxic air shortens life by 20 months on average, this is according to Health Effect Institute in its latest report called the state of global air. The institute reiterated that the 20 months is for those that are not affected or death by the other side effects of the emission. Air pollution through emission is now a bigger killer than malaria and road accident (WHO, 2016; Earth File, 2017). In several studies, intoxication leading to unconsciousness was evident in ≤ 30 in-patients inhaling 30% CO_2 (Carbon dioxide) in 70% O_2. Some patients exhibited seizures that were characterized as de-cerebrate i.e. no cerebral functioning (Pollock, Stein, &Gyarfs, 1949). Moreover, Nigeria is currently exploring all options to accelerate the process of industrialization and urbanization to a better growth within the economy, and therefore, substantial energy input is needed. Hence, it is imperative for Nigeria to adopt effective measures (carbon emission tax) to reduce carbon emissions and fossil fuel consumption to achieve its emission reduction goal. Earth File (2017), reported that about 18.9Billion cubit metre gas are flared per year in Nigeria which translate to about 45Million tons of Carbon dioxide equivalent, making Nigeria one of the highest emitters. The carbon dioxide level of Kuje was reported as being worrisome because it was above the ASHRAE (a global society advancing human well-being through sustainable technology for the built environment) and OSHA (Occupational Safety and Health Association) standards (Okobia, Hassan &Adekayi, 2017), what will then be said of Nigeria as a whole?

The absent of effective environmental policies which most often results to environmental pollution is now a solemn problem in many developing countries particularly in Nigeria (Earth File, 2017). The present study therefore seeks to examine through literature review the effect of carbon emission tax on emission level in Nigeria. The remainder of the paper is structured as follows. The second section reviews the related literature. The third section contains the metal analysis of prior studies. The fourth section discussion of findings, the fifth section provides conclusions and recommendations.

Review of extant literature

The Nigerian tax system is made up of tax policy, tax laws and tax administration (Somorin, 2015). A major function of taxation, apart from the provision of public goods and services and financing government expenditures, is a fair redistribution of income tax revenue (Pantya, Kovacs, Kogler&Kirchler, 2016). In other words, besides being a major source of revenue for governments to provide public and merit goods and services needed by the citizens, taxation systems can stimulate economic growth and job creation through its impact on savings, investment and capital formation. In the words of Somorin (2012), tax system is viewed as a legal system of assessing and collecting taxes which she referred to as a tripartite position, namely the tax policy, the tax laws and tax administration. In the development of an emission tax, several questions have to be answered. The first of which is the fact that what is to be taxed? How will the tax be administered and monitored? And how will the revenue therefrom be used? It is good to note that the development of a tax depends on several factors and requires so many details. The term tax is used to denote all mandatory charge or levy on a recipient (taxpayer), defined by public law and does not include any rights to any service in return. For the design of such a tax as this, some relevant market elements must be taken into consideration such as price elasticity, availability of alternatives, potential for technological innovation, the competitive situation of the market, and the market/economy structure of the country

(Meng, Siriwardana, & McNeill, 2013). Lee, Wang, and Sun, (2019) stated that in determining the rate at which the proposed tax will be imposed, it may be necessary to consider a rate capable of inducing the desired change. Very often, it may be difficult to state, without equivocation, the exact rate at which penalties could be set to deter the doing of prohibited act(s). Psychologists and other social scientists have propounded theories and hypothesis pointing to what could be done to encourage compliance. The economic theory of compliance is one of the earliest theories imported into the field of taxation. Alligham and Sandmo (2018) argue that punishment must be set at a level that culprit will feel the pain and see that there is no benefit to disobedience or non-compliance to set a tax rate that will be effective, it must be remembered that the main essence of the proposed tax is to influence a behavioural change on the part of oil companies whose activities contribute immensely to polluting the environment and contributing to the problems of global warming.

Green, (2016) define carbon tax as taxes imposed on the carbon content of the fuel whereas energy taxes are defined as taxes imposed on the production of fossil fuels and carbon energy sources according to their energy content. Carbon dioxide taxation forces domestic emitters to pay a tax for their release of carbon dioxide. The aim of this tax is to promote a reduction in emissions through an increase in prices but without increasing the living costs of community members. If there are less expensive measures than paying the tax, for example by using less polluting cars or through using public transport, then there is the possibility of an emission reduction. Carbon emission taxes might likely result in negative impacts on a company's competitiveness where a company is trade-exposed. Trade-intensive industries may be defined as those industries in which exports and imports combined are more than 40% of their domestic output, although other studies suggest 60% as the threshold (Jooste, Winkler, Van Seventer, & Truong, 2009; National Treasury, 2013). An approach to address trade exposure is through border carbon adjustments (BCAs) or border tax adjustments (BTAs). BCAs are adjustments to the prices of traded goods based on some measure of the greenhouse gases embodied in the good. They can be applied to imports (as a tariff) or to exports (as a rebate). Based on the newly signed Free Trade Agreement by the President, border carbon adjustments might not be applicable for Nigeria in the nearest future. Hashmat, Konstantinos, Knittel, and Maya (2019), in their study on Carbon emissions and business cycles, used Dynamic stochastic general equilibrium model and Structural vector auto-regressions (SVARs). Using the SVARs, they also rank the shocks in terms of explaining the emissions' forecast error variation. It was found that emissions tend to rise gradually after most shocks, consistent with their theoretical counterparts; the impulse responses are not statistically significant. Unanticipated technology shocks account for less than 10 percent of the variation in emissions.

Stefan, Birgit, Pablo, Michaela, and Johanna (2019), in their study on National Policies for Global Emission Reductions: Effectiveness of Carbon Emission Reductions in International Supply Chains. Using the combination of Computable General Equilibrium with a Multi-Regional Input-Output model as methodology, found that a carbon added tax is highly effective in reducing consumption-based emissions which on the long run reduces the National emission level. Silvia, Alvarez, Loboguerrero, Arango, Calvin, Kober, Daenzer, and Karen (2016), the paper investigated CO_2 emission scenarios for Colombia and the effects of implementing carbon taxes and abatement targets on the energy system. They found that as at 2016, the carbon intensity of the energy system in Colombia is low compared to other countries in Latin America. The electric power sector plays an important role in achieving CO_2 emission reductions in Colombia. Chuanyi, Qing, and Xuemei (2010) investigated the impacts of carbon tax and complementary policies on Chinese economy. The THCGE-DR model, a dynamic recursive computable general equilibrium model, developed by TsingHua University was used. The simulation results show that carbon tax is an effective policy tool because it can reduce carbon emissions. Appiah (2018) Investigate the multivariate Granger causality between energy consumption, economic growth and CO_2 emissions in Ghana. The Johansen and Johansen-Juselius co-integration approach and the Autoregressive Distributed Lag bounds-test approach are employed to test for co-integration relationship. The results show that the variables are co-integrated. The causality tests reveal that there is feedback Granger causality between energy consumption and CO_2 emissions. Any energy conservation-oriented policy not derived from energy efficiency and technological progress may hurt the Ghanaian economy.

Annegrete, and Bodil (2004), studied Greenhouse gas emissions in Norway: do carbon taxes work? An applied general equilibrium simulation was used to look into the specific effect of carbon taxes. They found a significant reduction in emissions per unit of GDP over the period due to reduced energy intensity, changes in the energy mix and reduced process emissions. Despite considerable taxes and price increases for some fuel-types, the carbon tax effect has been modest. The carbon tax contributed to only 2 percent reduction. Mohammed, and Maríadel (2016) also studied Carbon dioxide emission and economic growth in Algeria, Autoregressive Distributed Lag model extended to introduce the break points was used. Result shows that an increase in energy use and electricity consumption increase carbon emissions, and that exports and imports affect them negatively and positive, respectively. Therefore, it is necessary promote renewable energies and energy efficiency policies

MATERIALS AND METHODS

The study adopted meta-analysis by reviewing the experience of different countries.

Carbon Emission Tax Experience from other Countries: The carbon emission tax design of countries were reviewed, these countries includes; Australia, Mexico, Chile, Japan, Portugal, France, United Kingdom, Ireland, Iceland, Finland, Norway, Sweden, Denmark, Slovenia, Switzerland and British Columbia. These are countries that currently imposed carbon emission tax explicitly, except Australia which had repealed her carbon emission tax since 2014. It has been included in the study's review as one of the most suitable example of an unsuccessful carbon emission tax implementation.

Finland: Finland was the first country in the world to introduce a carbon emission tax. In 1990 Finland introduced a tax on a carbon content of fossil fuels, at the time when the country contributes only 0,3% to the world's emissions. The first tax rate was €1.12 (US$1.25) covering only electricity

generation and heat. Most important reforms in the carbon taxation in Finland happened in 1997 and 2011 when tax rates were increased and changed to an energy-carbon tax, respectively. At the moment carbon emission tax already covers transportation as well but it is clear that tax is not working at its full potential as electricity industry was always favored. Current tax amounts in range from US$48 to US$64 per ton of carbon monoxide (World Bank &Ecofys, 2015). Finland is being revenue neutral, so all money earned through a carbon tax is used to reduce other taxes, in particular income tax. The main reason for the adoption of this policy was majorly for economic growth, as at 2016 it was said that the annual revenue amounted to US$900 Million with the fact that carbon emission itself has reduced drastically.

Norway: Norway in 1991 introduced its first carbon emission tax, Oil and gas industries are responsible for the largest portion of Norway's carbon emissions, about 30% of all emissions. Thus, these were the main covered sectors. Land based industries and some energy intensive, trade exposed industries are exempt from the tax. Norway has agreed to mitigate greenhouse gas emissions at least 40% below 1990 levels by 2030. Current tax rates are in range from US$3 to US$52 per ton of carbon monoxide, depending on the sector (World Bank &Ecofys, 2015). Sectors which are using petroleum have higher rates, while sectors using mineral oils have lower tax rates. Revenues gained through the tax are mainly used to fund general budget of the Government (IETA, 2015). The main reason for the adoption of this policy was majorly for economic growth, as at 2016 it was said that the annual revenue amounted to US$1,580 billion with the fact that carbon emission itself has reduced drastically.

Denmark: Denmark implemented carbon emission tax policy in 1992, and all energy users are covered with the tax, while some industrial companies have different taxes due to different energy use and whether or not they agreed to apply energy efficiency programs. Companies which sign an agreement on energy efficiency with the Ministry of Transportation and Energy are entitled to 25% deduction of the carbon tax. Highest tax rate is imposed on households and their consumption of electricity which led to 10% lover energy consumption in the country (Karaczun, 2012). Revenue collected from the tax is redistributed back by the Government. The main reason for the adoption of this policy was majorly for economic growth, the annual revenue amounted to about US$1,400 billion with the fact that carbon emission itself has reduced drastically.

Slovenia: Slovenia was the first country in Central and Eastern Europe to introduce this tax. In 1996 Slovenia implemented the tax on carbon monoxide emissions deriving from fossil fuel combustion. Companies covered with European Emissions trading scheme are excluded from the tax. Only in 2012 transportation sector and land use sectors are included under the taxation. Initial tax rate was approximately €5,5 (US$6,13) per tCO2 and today is US$19 per ton of carbon monoxide. Primary objective of the tax, as many in Slovenia claim, is increasing the Government's budget. The main reason for the adoption of this policy was majorly for economic growth, the annual revenue amounted to about US$35 million with the fact that carbon emission itself has reduced (Ilic & Odlund, 2018).

Switzerland: Switzerland has put a price on carbon in 2008, combining emissions trading system and carbon tax. The country ambitiously committed to 50% reduction in emissions by 2030, comparing to 1990 levels. Tax base are thermal fuels with the tax rate of US$87 per ton of carbon monoxide emission equivalent since January 2016. About 2/3 of tax revenues are redistributed to the society and businesses while 1/3 goes to funding climate friendly building renovations. In addition, one small part also goes to funding low carbon technologies. Citizens are benefiting from lower payments for health insurance while businesses through social security contributions (World Bank &Ecofys, 2015). The main reason for the adoption of this policy was majorly for sustainable environmental development, the annual revenue amounted to about US$830 million with the fact that carbon emission itself has reduced.

British Columbia: Canadian province British Columbia has introduced a carbon tax in 2008. The tax base is emissions from fossil fuel combustion, covering around 70% of total greenhouse gas emissions in the province. (Vivid Economics, 2012) Revenue recycling is determined by law, and all revenue from carbon taxation needs to be recycled through cuts in other taxes. Such taxes are income taxes, corporate and personal, as well as specific tax credits. The interesting fact is that the tax is "revenue-negative" since the beginning of implementation, meaning that revenue recycling amounts more than revenue received from tax. Current tax rate is US$23 per mt of carbon emitted the same rate since 2012. The fact that tax increases were set in advance and therefore removing uncertainty for businesses is probably the reason its successfulness. The Government committed to change the tax only in case of inconsistency with targeted emission mitigation. It was estimated that presence of the tax will cut emissions by 3 million Mt per annum by 2020 (Sumner, Bird, & Smith, 2009). The main reason for the adoption of this policy was majorly for sustainable environmental development, the annual revenue amounted to about US$1,100 billion with the fact that carbon emission itself has reduced.

Sweden: Sweden was also one of the countries in the world to introduce a carbon tax which was in 1991. Carbon emission tax came along with the energy tax system reform happening at the time in Sweden. The first applied tax covered coal, oil and natural gas and petrol. One of the main objectives was to shift from labor affecting taxes and to discourage oil use for heating. Sweden is a country which proves that carbon emission tax works. They have not only significantly reduced their greenhouse gas emissions, but they also managed to keep on going with the economic growth. The first tax rate was US$133 per ton of carbon monoxide and as at 2015 it was US$130 (World Bank &Ecofys, 2015). Currently, sectors such as forestry, industry, agriculture and fisheries pay only 21% of this tax rate, while energy sector, transportation sector and consumers are paying the most. Carbon emissions have decreased a lot since the introduction of the tax. Namely, Swedish Ministry of the environment reported that greenhouse gas emissions have decrease by more than 40% from 1970 to 2018 with estimated annual revenue of US$3,665 billion.

Iceland: Iceland was committed to reduce its emissions for 40% by 2030 in comparison with levels in 1990. In 2008 Iceland joined the European emissions trading system, despite being outside of EU. Later, in January 2010, the country introduced a carbon emission tax. Now, both mechanisms together cover more than 90% of Iceland's emissions. When introduced, carbon emission tax supposed to exist only until

2012, but it was indefinitely extended. Tax rates are designed to recreate a price equivalent to 75% of market price in emissions trading system. The tax base is carbon content of liquid and gaseous fuels such as gas, diesel oil, gasoline, petroleum gas, fuel oil, etc. which are not included under emissions trading system. Its tax rates are in general lower than in other Nordic countries and its tax base could be expanded to more fuels so the tax can be more cost-effective and mitigation-efficient. Current tax rate amounts to only US$8 per ton of carbon emission. Annual Revenues (US$30 million) collected through the tax are used to reduce national deficit created after financial crisis in 2008, as this was the main reason to introduce the tax in the first place. It is estimated that this tax will result in emission mitigation of 50 to 100 kilo tons of carbon emission by 2020 (Carl &Fedor, 2016).

Ireland: In 2010 Ireland, one of the highest European greenhouse gas per capita producers adopted a carbon emission tax on oil and gas. The primary objective behind the tax was to hinder further increase in income tax and cover national deficit, at the same time, working towards achieving their legal obligations to reduce greenhouse gas emissions within European Union. The revenues from this tax are going mostly to the Government's budget and part of it goes to energy efficiency programs. The introduction of this carbon tax led to rise in natural gas, oil and kerosene prices. Today this tax covers almost all fossil fuels and amounts US$22 per ton of carbon emission (World Bank &Ecofys, 2015). The revenue it brings to the Government is approximately US$520 million per annum. In addition, Ireland has a set of other environmental taxes imposed on vehicle emissions and waste. This set of environmental taxes, with the carbon tax in front row, has brought satisfying results from both, economic and environmental aspects. Namely, since introduction of carbon tax, emissions decreased for 7% by the end of 2014. Agriculture is the leading polluter, followed by energy and transportation sectors.

United Kingdom: UK's road towards carbon tax started already in 1993, when tax was introduced on retail petroleum products in order to cut emissions in transportation sector. Later in 2001, UK introduced a "Climate Change Levy", imposed on electricity sector, solid fuels and natural gas. Some people considered this levy as carbon tax, but the fact that levy rate was not really based on carbon content says the opposite. The aim was to facilitate energy efficiency and reduce greenhouse gas emissions. Besides this, European emission trading scheme is in place as well. Finally, in 2013 UK introduced a carbon price floor, a form of a carbon tax covering fossil fuels used in electricity production. This decision is made to create stability in the electricity market, as they were not satisfied with functioning of European emissions trading scheme. In 2014, UK accounted for 1/5 of total carbon tax revenues in the world (World Bank &Ecofys, 2015). In that year tax rate was around US$16 per ton of carbon monoxide. Current tax rate is US$29 per ton of carbon monoxide. Revenues gained through the tax of US$2,700 billion annually are mostly used in funding the Government's budget with small percentages used for cuts in other taxes and subsidies to energy-intensive industries. How serious UK is about the Green Growth says the fact that it promulgated regulation which requires all new built homes to have zero emissions in lighting, heating and hot water from 2016.

France: Just recently, in 2014, France has introduced a carbon tax as an additional instrument next to European emissions trading system. This was not France's first attempt to introduce a carbon tax, namely a carbon tax proposal was rejected in 2009. Tax is covering sectors and fossil fuels which are not included in the emissions trading system, such as coal, oil and natural gas. When introduced in April 2014, tax rate amounted US$8 per ton of carbon emission equivalent. It is planned that tax reaches US$100 per ton of carbon monoxide equivalent in 2030. Revenues in the first year were used to fund green energy projects and it has been estimated that the annual revenue will be around US$452 million. In following year percentage of revenue going towards green energy was lower, probably around 45%. For this year it is planned to devote around 35% of revenue for this purposes. Remaining revenue is to be used to cut other, distortionary taxes. France is also on its way toward Green Growth, after formal adoption of "Law on the Energy Transition to Green Growth". This Law also defines French commitment to reduce greenhouse gas emissions by 40% until 2030, comparing to 1990 levels (Zhou, Poh & Ang, 2017).

Portugal: In November 2014, Portugal adopted carbon taxation for fuels not covered with European emissions trading scheme, in fulfillment of her pledge to mitigate its carbon monoxide emissions by 40% until 2030, the need for new policies supporting this commitment was the adoption of carbon taxation in 2014. According to Sun, Tariq, Chen and Zhu (2018) this novelty was part of the broader tax reform in the country. Tax covers around 1/4 of emissions in the country. First tax rate amounted around US$6 per ton of carbon monoxide equivalent and was implemented since 2015. It annual revenue from the tax amounts' to not less than US$104 million, it is the aim of the country to be revenue neutral and redistribute the tax back to citizens through reduction in income taxes.

Japan: Japan introduced a carbon tax in 2012, imposed on fossil fuels in all sectors except agriculture, railways, national aviation and fishing. These immunities are not indefinite, but excepted to last until 2017. The aim of the tax is to remove the burden from specific sectors and transfer it to emissions. Besides the tax, emissions trading schemes are operating in Tokyo and Saitama regions. The initial tax rate is approximately US$2 per ton of carbon monoxide equivalent and is expected to increase by US$2,7 every next year. This tax is only an addition to already existing energy taxes in the country. Japanese Government has estimated that the burden tax is creating on households will amount only around US$0,95 per month. Tax revenues of US$3 billion annually from carbon tax are reserved to fund energy efficiency projects, low-carbon technology projects and promotion of renewable energy on local levels. The spending of the revenue was criticized in recent years. Namely, the Government is criticized to have a lack of transparency in actual level of a carbon tax revenue and revenue spending. The line between a carbon tax and other energy taxes is blurred. Moreover, they are accused to take money to fund its own budget instead of placing it into promised funding (Carl &Fedor, 2016).

Chile: Chile is the first country in South American continent which adopted a carbon tax. This tax is just part of broader tax reform. Even though the tax was adopted years ago, in September 2014, the implementation was in 2017. The tax rate amounts only US$5 per ton of carbon monoxide emitted and it

designed to cover around 55% of emissions in the country. Many experts claim that 5 dollars is too low to achieve any expected results. The primary sector in the tax base is electricity sector and its capacities above 50 MW. Although this sector has opposed to the carbon tax initiative, this controversy didn't manage to get more attention as everyone was occupied by simultaneous Government's decision to raise corporate taxes. Revenue recycling is still not clear, but there are assumptions that annual revenues made of US$250 million will be used to fund education system (Lee, Wang and Sun, 2019).

Mexico: Mexico adopted a carbon tax in January 2014. The tax is imposed only on the consumption of fossil fuels. The tax is designed in a way to put higher rates on coal and oil use, while natural gas is exempt. The tax is coexisting with country's global carbon trading platform where big emitters of greenhouse gas can purchase "Certified Emissions Reductions Credits". This offset scheme and the carbon tax are proof of great Mexico's efforts to reduce their emissions, as they committed to 30% reduction under business as usual by 2020. Current tax rate is in range from US$1 to US$3 per ton of carbon dioxide but the use of the annual revenues of about US$1 billion is not clarified. The major reason for the adoption of this tax policy was also for economic growth.

South Africa: Burck, Marten, and Bals (2014) identify South Africa to be ranked in the worst 20 countries in terms of total emissions of carbon monoxide. Literature shows that South Africa produces about 1% of global carbon emission. Her greenhouse gas emissions as at 2005 were 9 tonnes per capita which is twice as high as those other developing African countries. Latete, Guma and Marquard (2008) also opined that the country's per capita emissions is approximately 10 tons per annum which is within the per annum emissions of many developed economies. The rationale behind the carbon tax policy, proposed by South Africa National Treasury (National Treasury, 2013), is to internalize part of the external costs of climate change through a price mechanism and to build incentives for behavioral changes, by producers and consumers, towards low carbon, green investments and purchases. The carbon emission tax introduced in year 2016 seeks to provide the space for economic development of affected sectors by providing a basic tax free allowance of 60% for all sectors coupled with additional allowances for process emissions, trade-exposed industries, possible performance based allowances for firms that perform better than the benchmark and the use of offsets by entities to reduce their carbon emission tax liability. After consultation with the Department of Environmental Affairs, it was agreed that the carbon emission tax and carbon budgets would be included and aligned during the first phase (2016 to 2020), based on an additional tax free allowance of 5% for the carbon budgets. Subsequent to the first phase, the relative (percentage based) tax free allowances could be replaced with an absolute tax free threshold which could be based on carbon budgets. National Treasury, (2013) reported that based on the oligopolistic nature of some sectors in South Africa, most especially the energy sector, a carbon emission tax is more appropriate than any other instrument or approach in the short to medium term to reduce carbon emissions from electricity industry in particular to 0.6kg per kilowatt-hour from 0.9kg per kilowatt-hour. In October 2015 a Draft Carbon Emission Tax Bill was introduced in the National Assembly (National Assembly, 2015).

FINDINGS AND CONCLUSION

Evidence from literature shows that,carbon emission tax has been of benefit to all the economy that had implemented the policy. Specifically it was found that carbon emission tax implementation had help achieve reduction in the carbon emission level of all the counties examined. Our findings from the Nigeria economy is in line with the work of Stefan, Birgit, Pablo, Michaela, and Johanna (2019), in their study on National Policies for Global Emission Reductions: Effectiveness of Carbon Emission Reductions in International Supply Chains. Found that a carbon added tax is highly effective in reducing consumption-based emissions which on the long run reduces the National emission level. Also the work of Silvia, Alvarez, Loboguerrero, Arango, Calvin, Kober, Daenzer, and Karen (2016), is in agreement with our findings. They found that as at 2016, the carbon intensity of the energy system in Colombia is low compared to other countries in Latin America because of the implementation of carbon tax. Guowei, Hainan, Qingyu and Xiaodong, (2019) in there study on a two-period carbon tax regulation for manufacturing and remanufacturing production planning. They model a manufacturer who produces new products in the first period and makes new and remanufactured products in the second period under carbon tax regulation where the tax price differs over the two periods. It is shown that improving the first period tax price always decreases the total emission, while improving the second period tax price may enlarge the overall emission. With the decrease of the remanufacturing emission intensity, the overall emission could either increase or decrease, this is consistent with our findings on the Nigeria economy. The study therefore concluded that, implementing carbon emission tax is one of the veritable tools for reducing carbon emission in Nigeria, based on findings from other economy.

Recommendations

The success or failure of carbon emission reduction strong lies in the attitude and commitments of the government at addressing the issues. There are several policies that the government can adopt but because of the Nigeria revenue that is been threatened due to decline in oil price this has given the government the options of generating revenue. This calls for the policy decision such as carbon emission tax. Based on the outcome of this study the government should encourage productive firms in the economy to adopt carbon saving technology. This can be through the use of wind or solar sources of power as an alternative to fossil fuels, since it has no form of serious harmful emission. This is because it is more economical to operate and it is not affected by commodity prices in the same way as fossil fuels. The government should introduce palliatives measures to improve household's welfare. This can be achieved through provision of subsidies and incentives to any economic agent opting out for renewable energy sources of energy. So as to encourage others to follow suit and to also make it obvious to the public that the government is out to promote green environment (promoting wellbeing) and just imposing tax for revenue.

REFERENCES

Annegrete, B., & Bodil, M. 2004. Greenhouse Gas Emissions in Norway: Do Carbon Taxes Work? *Energy Policy, 32*, 493-505.

Appiah, M. 2018. Investigating the Multivariate Granger Causalty Between Energy Consumption, Economic Growth and Carbon Dioxide Emmisions in Ghana. *Energy Policy, 112*, 198-208.

Bullard, C., & Herendeen, R. 1975. The Energy cost of goods and services. *Energy Policy, 3*, 268-278.

Cape. 2013, May 4. *State of Energy Report for Cape Town: Integrated Strategic Communications, Branding and Marketing Department*. Retrieved April 17, 2019, from Cape town State of Energy Report: www.capetown.gov.za/en/environmentalresourcemanagement

Carl, J., & Fedor, D. 2016. *Tracking Global Carbon Revenues: A Survey of Carbon Taxes Versus Cap-and-trade in the Real World.* New York: Elsevier.

Chuanyi, L. Q. 2010. The Impacts of Carbon Tax and Complementary Policies on Chinese Economy. *Energy Policy, 38*(1), 7278-7286.

Guowei, D., Hainan, G., Qingyu, Z., & Xiaodong, L. 2019. A Two-period Carbon Tax Regulation for Manufacturing and Remanufacturing Production Planning. *Computers & Industrial Engineering, 128*, 502-513.

Hashmat, K. K. 2019. Carbon Emission and Business Cycles. *Journal of Macroeconomics, 60*(1), 1-10.

Haven, K., Yan, N., & Keller, W. 2012. Lake Acidification: Effects on Crustacean Zooplankton Populations. *Environmental Science and Technology, 27*, 1621-164.

Iiic, D., & Odlund, L. 2019. Method for Allocation of Carbon Dioxide Emissions from Waste Incineration which Includes Energy Recovery. *Energy Procedia, 149*, 400-409.

International Energy Agency. 2018. *Key World Energy Statistics.* Paris.

Karaczum, Z. 2012. *Poland 2050-At a Carbon Crossroads.* Poland & Belgium: Institute for Structural Research, European Climate Foundation & Institute of Sustainable Development.

Lee, C., Wang, K., & Sun, W. 2019. Allocation of emissions permit for China's iron and steel industry in an imperfectly competitive market: A Nash Equilibrium DEA Method. *IEEE Trans. Eng. Managment*, doi.org/10.1109/TEM.2019.2904985.

Meinshausen, M. M. 2018. Greenhouse Gas Emission Targets for Limiting Global Warming. *Nature, 458*(7242), 1158-1162.

Meng, S., Siriwardana, M., & McNeill, J. 2013. The Environmental and Economic Impact of the Carbon Tax in Australia. *Environmental Resource Economics, 53*(3), 313-332.

Metcalf, G. 2019. Designing a Carbon Tax to Reduce US Greenhouse Gas Emissions. *Review of Environmental Economics and Policy, 3*(1), 63-83.

Mohammed, B. &. 2016. Carbon Dioxide Emission and Economic Growth in Algeria. *Energy Policy, 96*(1), 93-104.

National Treasury. 2013. *Draft Policy Paper: A Framework for Considering Market-Based Instruments to Support Environmental Fiscal Reform in South Africa.* Prestoria, South Africa: Government Printer.

Odinkonigbo, J. 2012. Carbon Taxation as a Policy Instrument for Environmental Management and Control in Nigeria. *Nigerian Juridical Review, 10*, 96-111.

OECD. 2015. *OECD Economic Surveys.* SOuth Africa: OECD.

Okobia, L. H., & Adakayi, P. 2017. Increase in Outdoor Carbon Dioxide and its Effects on the Environment and Human Health in Kuje FCT Abuja. *Environmental Health Review, 60*(4), 104-112.

Pantya, J., Kovacs, J., Kogler, C., & Kirchler, E. 2016. Work Performance of tax Compliance in Flat and Progressive Tax Systems. *Journal of Economic and Psychology*, 1-30.

Pearce, D. 2018. The Role of Carbon Taxes in Adjusting to Global Warming. *The Economic Journal, 101*(407), 938-948.

Richard, L., & William , B. M. 1994. The Case for State Pollution Taxes. *Pace Environmental Law Review, 12*(1), 110-111.

Sathre, R. &Gustavsson. 2017. Effects of Energy and Carbon Taxes on Building Material Competitveness. *Energy and Building*, 488-494.

Silvia, C. A. 2016. Achieving Carbon Dioxide reductions in Colombia: Effects of Carbon Taxes and Abatement Targets. *Energy Economics, 56*(1), 575-586.

Somorin, O. 2012. *Teju Tax Reference Book: Nigerian tax system general accounting and taxation terms.* Lagos, Nigeria: Malthouse Press.

Somorin, O. 2015. *Taxes around the globe: A coincise review of different tax types.* Lagos: Chartered Institute of Taxation of Nigeria.

Sun, H., Tariq, G., Chen, H., & Zhu, J. 2018. Allocation of Carbon Emission Quotas to Chinese Power Enterprises. *Energy Procedia, 152*, 115-124.

Terkla, D. 2019. The Efficiency Value of Effluent Tax Revenue. *Journal of Environmental Economics and Management, 11*(2), 107-123.

Westenbarger, D., & Frisvold, G. 2015. Agricultural Exposure to Ozone and Acid Precipitation. *Atmodheric Environment, 28*, 2895-2907.

World Bank., & Ecofys. 2015. State and Trends of CarbonPricing . *The World Bank*.

Zhengquan, G., & Xingping, Z. 2014. Exploring the Impacts of a Carbon Tax on the Chinese Economy Using CGE Model with a Detailed Disaggregation of Energy Sectors. *Energy Economics, 45*, 455-462.

Zhou, P., Poh, K., & Ang, B. 2017. A non-radial DEA approach to measuring environmental performance. *European Journal of Operation Research, 178*(1), 21-32.

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