

The Impact of Green Accounting on Economic Development of Nigeria

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Abstract

This paper analysed the present and future likelihood trend of green accounting in terms of gas flaring on the economic development of Nigeria. Trend and correlation analysis of time series data was employed for the yearly data collected from the World Bank database. Two functional models were fitted to the collected data and forecasts were made based on these models with the use of MINITAB for the period 1980 – 2030. The findings of the study revealed that the impact of green accounting on economic development caused the gross domestic product (GDP) of Nigeria to produce a negative downward shift within 1980 - 2009, thereby reducing the GDP figures of Nigerian the short run. It further revealed that apart from the years where negative growth rates were experienced, the effect of green accounting in terms of gas flaring also crowded out all possible benefits that could be derived from such growth in 14 of the 29 year period studied in the short run. Furthermore, it also showed that green GDP proved to be a better welfare indicator than the traditional GDP in the long run. The paper however recommends that there is a need for proper awareness of the harms of gas flaring on the economy and consequently the introduction of sanctions, measures and fines that can help reduce the amount of gas flared in Nigeria. In addition, there is also the need for the introduction of green accounting indicators that can help capture the damaging effects of gas flaring in Nigeria. Furthermore, the Nigerian government should adopt green national accounts, especially since green GDP is an all-inclusive and better welfare indicator in the long run.

Keywords: *Green Accounting, Economic Development, Gas Flaring, Green Gross Domestic Product, Growth Rate.*

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Background to the Study

National accounts of a country serve as a scorekeeping purpose which provides indicators on how well the nation is doing, and a management purpose which provides detailed statistics and information in order to make proper national decisions. According to Asheim and Weitzman (2001), for any economy leaving aside environmental considerations the proper measure of economic performance is the net domestic product (NDP) which is gross domestic product (GDP) less the depreciation of reproducible capital. But GDP is more widely used than NDP largely because of the difficulty in measuring reproducible capital. Hence, in standard national accounting, GDP is measured as the market value of all goods and services produced by a country within a specified time period (Asheim, 2000). It has been used over decades to determine the welfare of an economy in terms of economic development. Growth GDP on the other hand indicates whether the economy is growing, but not whether this growth is all inclusive and sustainable. Waves (2013), posits that GDP only assess gross output and does not have a mechanism for identifying the wealth and assets that underlie output. This in turn shows that GDP does not account for the permanent depletion and pollution occurring in an economy. Also Richard (1984) suggested that the 3 pillars on which an analysis of society ought to rest are studies of economic, socio-demographic and environmental phenomenon. In Nigeria nevertheless, growth or decline in GDP is usually as a consequence of environmental pollution by means of gas flared in the exploration process of oil and gas especially since it represents the main stay of the Nigerian economy. Hence, the use or misuse of natural capital is not taken into account in the current GDP figures of Nigeria. Therefore, Green accounting as postulated by Van and Mark (2004), attempts to widen the scope of national accounting by taking into consideration in various ways the environmental repercussions of production and consumption.

Green accounting essentially comprises of a type of accounting that attempts to factor environmental costs into the financial results of operations thereby systematically supplementing the national accounts with indicators covering a wide range of welfare aspects (Sjak, 2008). Hence, green accounting thereby extends national accounts to include the value of the damage and depletion of the natural assets that underpin production and human well-being especially in Nigeria where the depletion of oil and minerals has been offsetting savings by the public and private sectors, displaying a worrisome trend (World Bank, 2012). Consequently, *the end result of infusing green accounting on an economy produces an all-inclusive welfare indicator termed green GDP which in turn results in green growth*. Current development in green accounting has led to the expectation that an economy can by way of inclusive green growth foster sustainable development (World Bank 2012). Green growth is a means to foster economic growth and development while ensuring that natural assets continue to provide the resources and environmental services on which our well-being relies (OECD, 2011). Therefore, green accounting by way of green growth aims to operationalize sustainable development by reconciling developing countries' urgent need for rapid growth and poverty alleviation with the need to avoid irreversible and costly environmental damage. According to Kyte (2012), rapid growth is necessary to meet the urgent development needs of the world's poor. But growth will be unsustainable in the long run unless it is both socially inclusive and green. Interest is growing in modifying national income accounting systems to promote understanding of the links between economy and

environment. Hence, the field of green accounting has made great strides in the past two decades, moving from a rather arcane endeavor to one tested in dozens of countries and well established in a few (Rajib and Suman, 2012).

Objectives of the Study

The main objective of this study is to examine the impact of green accounting on economic development of Nigeria. To achieve these, the following specific objectives are formulated:

1. To study the present and future likelihood trend pattern of GDP, growth GDP and gas flared in Nigeria.
2. To ascertain the present trend correlation of the value of gas flared on the value of growth in Nigeria.
3. To ascertain the present and future likelihood trend correlation between GDP and Real Green GDP of Nigeria.

Statement of the Problem

In Nigeria, the measure of economic performance is the GDP and growth GDP which are welfare indicators that reflect the level of economic growth of the economy. However, economic growth or decline in GDP is usually as a consequence of environmental pollution by means of gas flared in the exploration process of oil, gas and cement production which the current GDP does not take cognizance of. Hence, the impact that gas flaring has on the current and future productive capacity of Nigeria is unaccounted for in the GDP estimates. In view of this, in order to ascertain a better economic wellbeing, it becomes incumbent to indoctrinate the environment into the economy by manner of adopting green accounting in order to accounting for the damages mete out upon the environment through the production process. As a result, there exists the need to calculate a new GDP indicator called the green GDP which will be all comprehensive in capturing the whole economy. The rationale for green growth by way of calculating a green GDP figure originated vividly from the limitations inherent in the economic GDP. Hence, this study is posed to answer these troubling questions; how do the values of the environmental damages of gas flared compare to GDP and growth of Nigeria? And is it significant enough to cause a stir? Basically, is Nigeria really growing and developing at all?

Literature Review

According to Hong, Hai, Trinh, Hoa, Phong, and Hung (2012), Green National Accounting (Green GDP Accounting for short) refers to an accounting system deducting natural resources depletion costs and environmental degradation costs, so as to assess the quality of sustainable development in a real sense. The rationale for introducing this concept is because the traditional GDP accounting system does not reflect sufficiently and precisely the nature of the economic growth since it neglects the environmental costs and resource depletion resulting from economic activities. Economic activities in Nigeria such as the production of oil related products like fuels, gas and cement production result in environmental pollution in terms of greenhouse gases (such as carbon dioxide) that are emitted into the earth's atmosphere as a result of gas been flared during the production process. These greenhouse gases that are emitted constitute an economic, social and environmental waste of valuable natural resources which would have otherwise generate more revenue.

Gas flaring according to World Bank (2012) is a process in which excess gas from drilling associated with natural gas or oil is burned off, releasing carbon dioxide into the atmosphere. In other words, the burning of gas by flaring leads to the emission of carbon dioxide (CO₂), the main greenhouse gas. Raupach (2007) stated that the seven sources of CO₂ from fossil fuel combustion are Liquid fuels e.g., gasoline, fuel oil, Solid fuels e.g., coal, Gaseous fuels e.g., natural gas, Cement production, Flaring gas industrially and at wells, Non-fuel hydrocarbons. For the purpose of this study gas flaring will constitute emissions stemming from the burning of fossil fuel and the manufacture of cement. According to Friends of the Earth (2004), 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 more than 20 years ago to outlaw the practice, most associated gas is flared, causing local pollution and contributing to climate change. On the other hand, Essien (2011) studied the Relationship between Economic Growth and CO₂ Emissions and the Effects of Energy Consumption on CO₂ emissions Patterns in the Nigerian Economy. The study used the Standard Version of Granger and the Restricted VAR Model (VECM). The analysis showed that for the Nigerian economy the carbon emissions patterns have greater effects on the levels of economic growth in the short run but a neutral hypothesis holds in long run.

Methodology

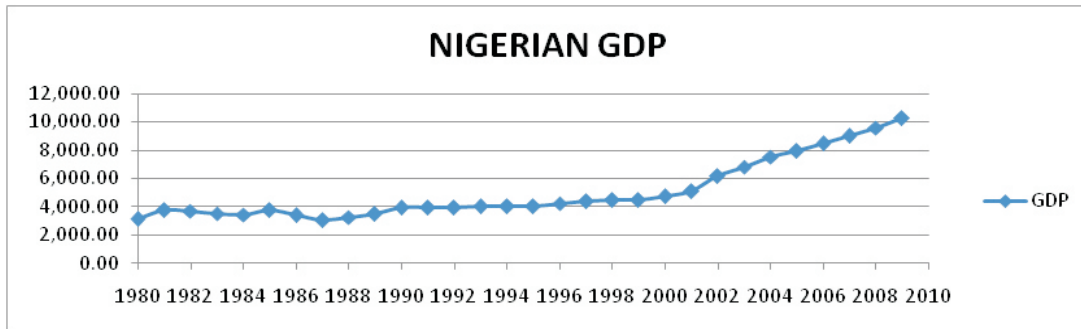
This study is limited to secondary data on gas flaring and GDP in the study area. The analysis and interpretation of the data for this study is limited to Nigeria for a period of 50 years i.e. 1980 - 2030. This study employed trend and correlation analysis as its methodological backbone. The research method comprised of desktop study. Secondary data for this study were derived from the World Bank database. The data contained the yearly values on Carbon Dioxide (CO₂) emissions per metric ton (gas flaring) and GDP figures from the study area. For the purpose of proper analysis, CO₂ which represents the amount of gas flared in petroleum and cement production is the only proxy for green accounting while, GDP will be used to proxy economic development. Hence, a global social cost of carbon (SCC) value of \$37 per ton of CO₂ was used. The preliminary steps of editing, coding and tabulating of the data were done.

To analyze the data, two statistical tools namely: time series analysis and correlation analysis were used. The results of these analyses were obtained using a statistical software package MINITAB for windows for accuracy and consistency. The method of least squares was used to fit linear trend models to the data as well as make forecasts. For the time series data, unit root test was performed to test for stationarity. Augmented Dickey- Fuller test and KPSS test were run on the data to determine whether it contains unit root or not. Thereafter, the Autocorrelation function (ACF) and the partial Autocorrelation function (PACF) were also obtained.

Therefore in the Analysis,

$$GDP_{green} = GDP_{traditional} - \text{Cost value of Gas Flared}$$

Results and Discussion



Source: World Bank Data (2016).

Figure 1: Nigerian GDP (1980 - 2009)

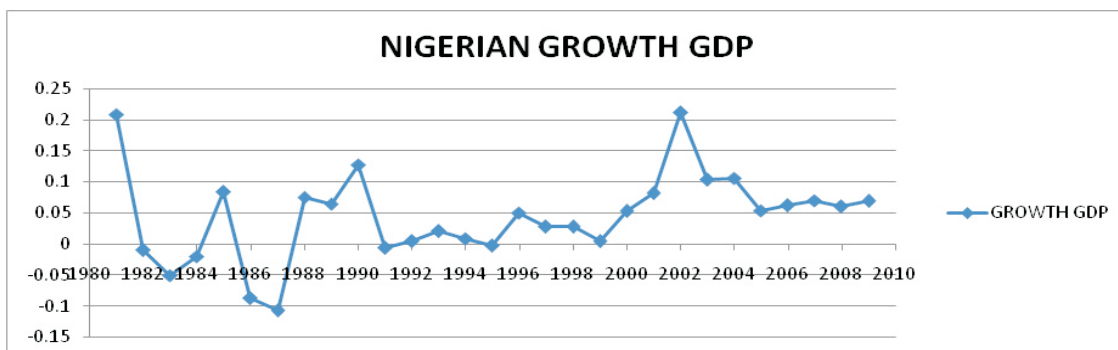
The graph of figure 1 above shows GDP figures for Nigeria for the year 1980 – 2009. The trend shows a consistent increase since 1987, with a further higher increase in recent years (2001-2009)



Source: Author's Calculated forecast Based on World Bank Data (2016).

Figure 2: Nigerian GDP (2010 - 2030)

The graph of figure 2 above shows GDP figures for Nigeria for the year 2010 – 2030. The trend shows a consistent positive increase from 2011 up until 2030.



Source: World Bank Data (2016).

Figure3: Nigeria Growth GDP (1980 - 2009)

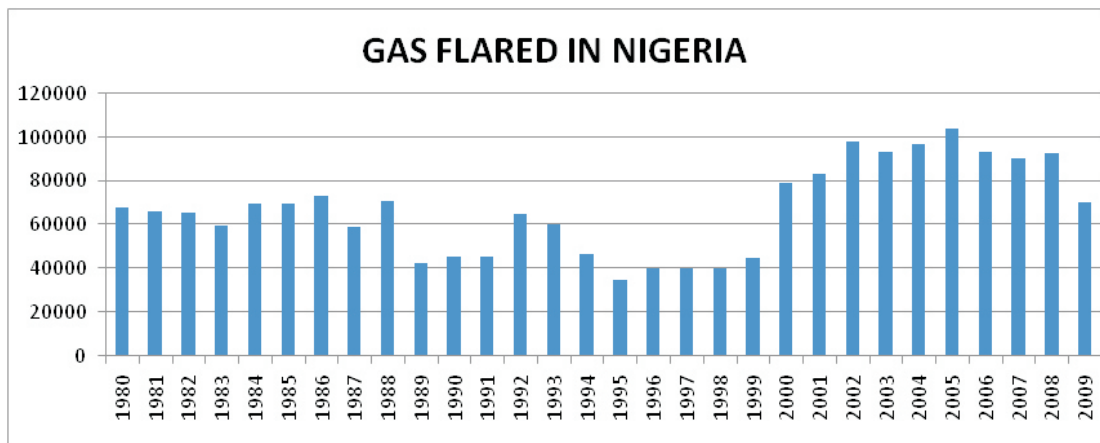
From figure 3 above, Nigeria has been experiencing significant growth rates. The trend shows a fluctuating rate, with negative growth during the years 1982 – 1984 and 1986 – 1987. However, the years 1985, 1990 and 2002 - 2004 experienced very significant growth rates.



Source: Author's Calculated forecast Based on World Bank Data (2016).

Figure 4: Nigerian Growth GDP (2010 - 2030)

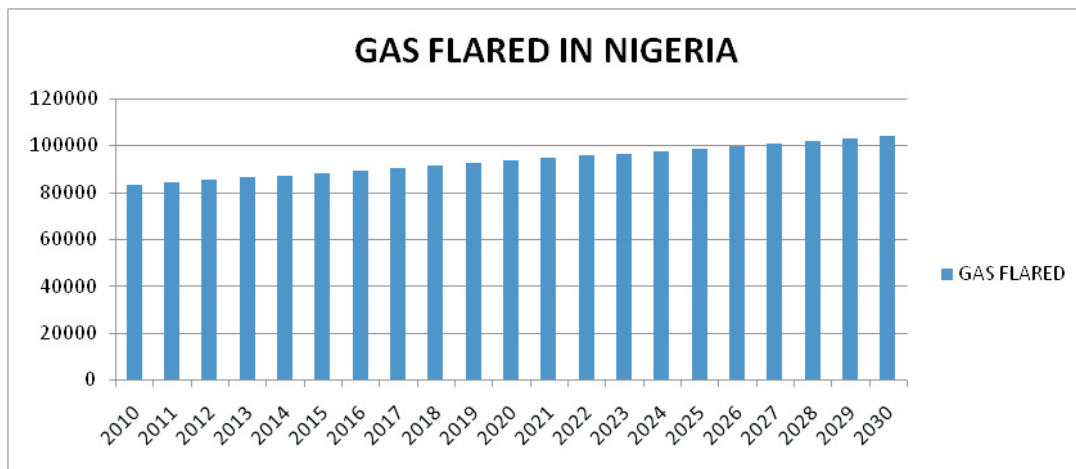
From the graph above, Nigeria will be experiencing significant growth rates. The trend however, also shows a fluctuating rate with forecast of negative growth during the years 2013, 2017, 2019 and 2023 – 2025. However, the years 2014, 2018 and 2022 are set to experience very significant growth rates.



Source: World Bank Database (2016).

Figure 5: Gas Flared in Nigeria (1980 – 2009)

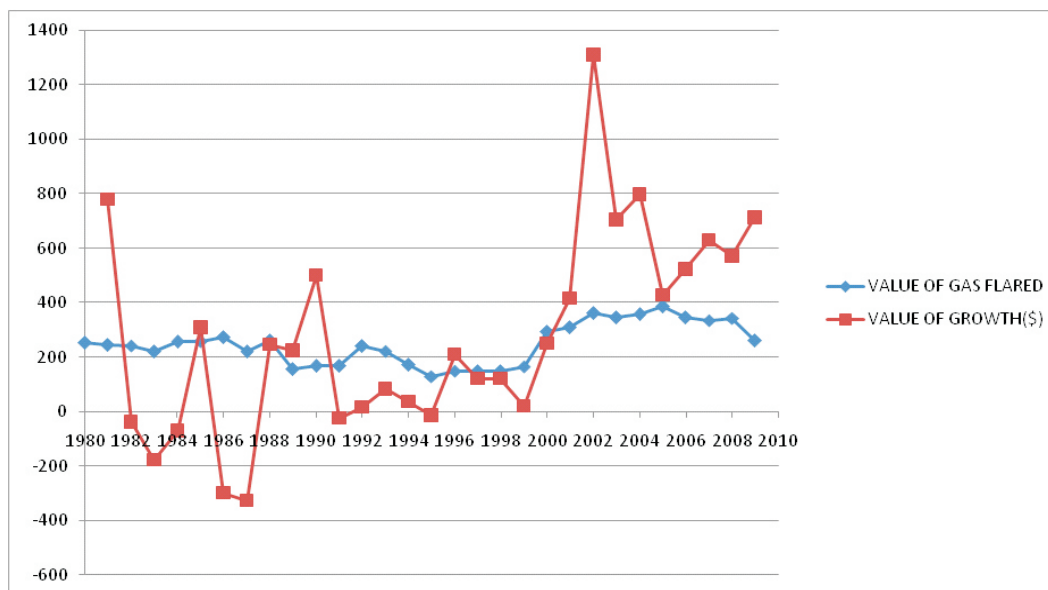
From figure 5 above, it is glaring that the level of gas flared in Nigeria is high and rising. The chart shows the years (2002, 2004 – 2006 and 2008) with the highest levels of gas flared while, 1995 recorded the lowest level of gas flared within the study period. It further revealed a drastic increase in gas flared from the year 2000.



Source: Author's Calculated forecast Based on World Bank Data (2016).

Figure 6: Gas Flared in Nigeria (2010 - 2030)

From figure 6, it is glaring that the level of gas flare in Nigeria will continue to rise and considerable so. This forms the basis on which the emphasis on the need to capture these costs in the valuation of the economy's productive capacity, thus arriving at a green GDP figure.



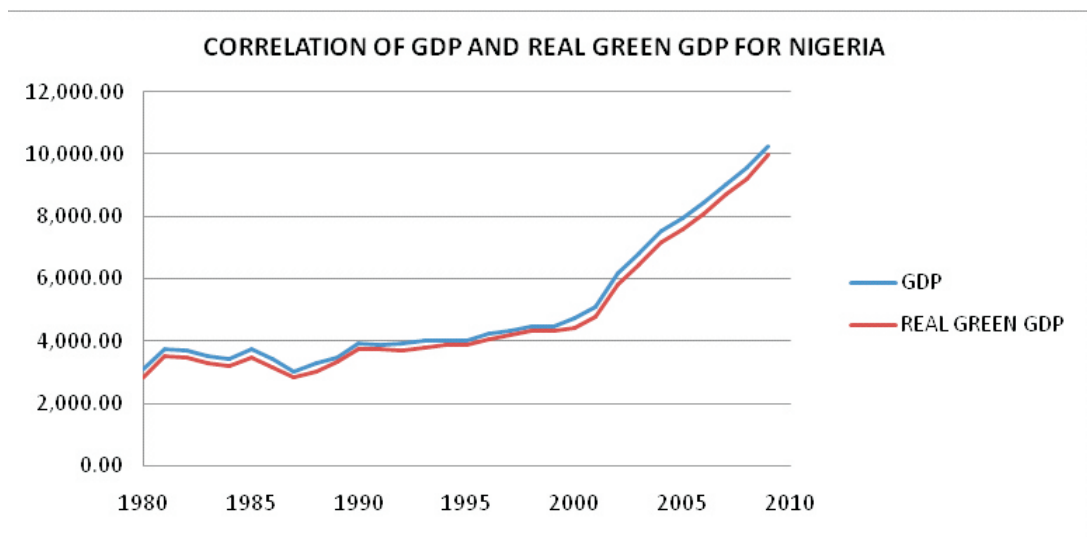
Source: World Bank Database (2016).

Figure 7: Correlation of Value of Gas Flared and Value of Growth for Nigeria (1980 - 2009)

Figure 7 above shows the correlation between the value of gas flared and the value of growth in Nigeria. The graph reveals that there exist years (1981, 1985, 1989 - 1990, 1996 and 2001 - 2009) where the monetary value of growth exceeded the value of gas flared into the Nigerian economy. Furthermore, it also showed that the economy had been experiencing positive

growth except in the years (1982-1984 and 1986-1987) where it experienced negative growth. However, during these years of negative growth, it always and consistently experienced positive gas flaring figures. In addition, apart from the years where negative growth rates were experienced, gas flaring also crowded out all possible benefits that could be derived from such growth during the years, 1991-1995 and 1997-2000. This consequently makes up to 14 of the 29 years under analyses. Hence, it is such years that make a case for the inclusion of green accounting by way of Green GDP. Statistically, Nigeria recorded negative and positive growth rates during these periods. However, when the damaging effects of the production process that led to such growths is considered, it can be concluded that there was no real growth during these periods due to the loss attributed to environmental degradation and pollution in the form of gas flaring. Nonetheless, this growth does not give the whole picture of the Nigerian economy. Even though persistent high growth rates are prevalent, the processes that bring about such growths (oil exploration activities, cement production) will also damage the Nigerian environment. Therefore, there is a need to adjust the GDP figures as well as growth figures of Nigeria to accommodate these costs of degradation and pollution from greenhouse gases (GHG) to the environment.

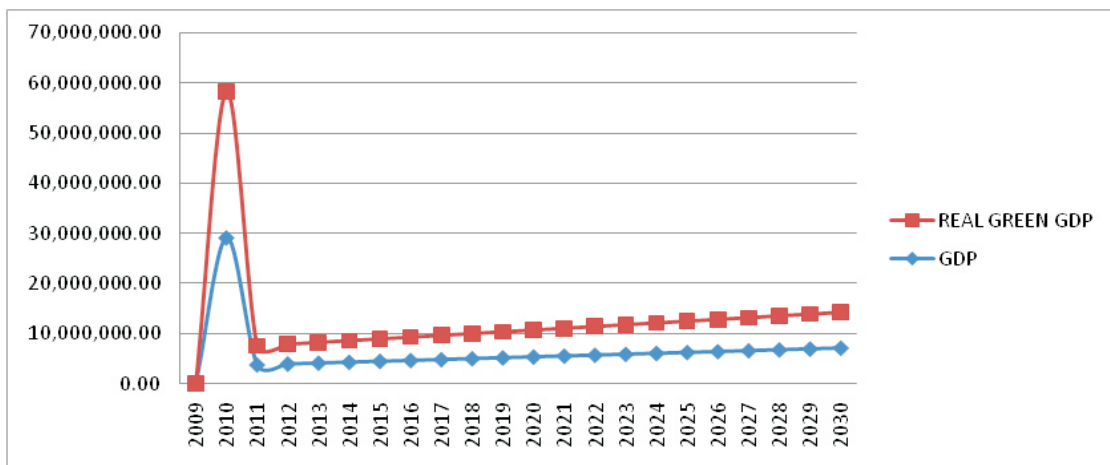
Having arrived at these green GDP figures, it is imperative that some form of comparative analysis be conducted to show its relevance and implication on the GDP of the Nigerian economy. The paper does this, by comparing the green GDP figures computed for Nigeria to the GDP of the country. The intuition here is does the loss attributed to environmental degradation and pollution equal or crowd out the benefits derived from such activities? If the benefits of performing such activities consistently outweigh the loss, then there is ample evidence against the need for green accounting. If on the other hand, the loss does outweigh the benefits, then we can make a case for green accounting.



Source: World Bank Data (2016).

Figure 8: Correlation of GDP and Real Green GDP for Nigeria (1980 - 2009)

Figure 8 above shows both GDP and green GDP figures. Clearly, the effects and implications of environmental pollution in terms of gas flaring on the Nigerian economy can be seen. The implications of green accounting on the GDP of Nigeria shows that it reduces the GDP by accounting for loss of social benefits that would have been derived if the environment was not endangered. The inclusion of green accounting in terms of gas flaring produces a negative downward shift on the GDP of Nigeria which in turn affects the growth rate of the Nigerian economy. This goes to show that in the short run; even thou the GDP give a slightly better position, the real green GDP on the other hand give an overall position of the Nigerian economy. This finding is in line with Essien (2011) which showed that for the Nigerian economy the carbon emissions patterns have greater effects on the levels of economic growth in the short run.



Source: Author's Calculated forecasts Based on World Bank Data (2016).

Figure 9: Correlation of GDP and Real Green GDP for Nigeria (2010 - 2030)

From the graph of figure 9, there is enough evidence to suggest the implication of the inclusion and importance of green accounting on the GDP of Nigeria. The implications of green accounting on the GDP of Nigeria shows that it increases the GDP and accounts for loss of social benefits that would have been derived if the environment was not endangered. The inclusion of green accounting in terms of gas flaring produces a positive upward shift on the GDP of Nigeria which in turn will impact on the growth rate of the Nigerian economy. Hence, in the long run, green GDP will be a better economic welfare indicator than the traditional GDP.

Conclusion

Following the conceptualization of green accounting and analysis of the implication of green accounting to the GDP of Nigeria, the paper concludes that:

1. For the present and future likelihood trends of GDP of Nigeria showed a consistent increase since 1987 with an anticipated further higher increase in future years. Also, the present and future likelihood trends of growth GDP of Nigeria showed a fluctuating rate with negative growth during the 80's, a consistent increase since

1987 and an anticipated further higher increase in the future years. Furthermore, the present and future likelihood trends of gas flared of Nigeria showed a consistent increase since 2000 and an anticipated further higher increase in future years. Hence, gas flaring in Nigeria is high and rising.

2. For the present trend correlation of the value of gas flared on the value of growth, the cost of gas flaring outweighed all benefits or loss derived from the growth process during the years, 1982-1984, 1986 - 1987 , 1991-1995 and 1997-2000 which represented 14 years out of the 29 year that was analyzed in the short run.Hence, the need for calculating green GDP.
3. For the present and future likelihood trends correlation between GDP and green GDP, green accounting reduced the GDP by accounting for loss of social benefits that would have been derived if the environment was not endangered in the short run, but in the long run, green GDP was a better economic welfare indicator than the traditional GDP.

Recommendation

In line with the conclusions, the paper however recommends that:

1. There is a need for proper awareness of the harms of gas flaring on the economy and consequently the introduction of sanctions, measures and fines that can help reduce the amount of gas flared from the production process of oil, gas and cement in Nigeria.
2. There is also the need for the introduction of green accounting indicators that can help capture the damaging effects of gas flaring arising from the production process of oil, gas and cement in Nigeria.
3. There is a need for the Nigerian government to adopt green national accounts, thereby capturing the damaging effects of gas flaring arising from the production process of oil, gas and cement on the Nigerian economy especially since green GDP is an all-inclusive and better welfare indicator in the long run.

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Appendix

Appendix 1: Forecasted Trend Analysis for Gas flaring

Data: CO₂ QUANTITY
Length: 30
NMissing: 0

Fitted Trend Equation (Model)

$$Y_t = 50909 + 1038*t$$

Accuracy Measures

MAPE: 28
MAD: 15887
MSD: 323608270

Appendix 2: Forecasted Trend Analysis for GDP

Data: GDP
Length: 30
N Missing: 0

Fitted Trend Equation (Model)

$$Y_t = -1881884 + 176805*t$$

Accuracy Measures

MAPE: 2.63347E+04
MAD: 2.24101E+06
MSD: 2.41178E+13