Rural Infrastructure and Sustainable Development in Nigeria

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ABSTRACT

This study examined rural infrastructure and sustainable development in Nigeria. Specifically, the study ascertained the extent to which poverty alleviation, basic education, rural electrification, corruption, primary healthcare, and road networking have influenced sustainable development of the rural areas in Nigeria using an econometric regression model of the ordinary least square after conducting some preliminary tests like the stationarity of the variables using the ADF Statistic and Johansen Cointegration Test. From the result of the OLS, the study revealed that poverty alleviation, basic education, rural electrification, primary healthcare, and road network have a positive impact on sustainable development in Nigeria. With the exception of road networking that was not statistically insignificant, all the other variables of the study were statistically significant in explaining sustainable development in Nigeria. The study recommends that: The federal government should increase its monetary budget on education for the purpose of procuring educational materials, equipments, conducive environment for both staffs and students and also provide skill acquisition equipment for human capital development which will also lead to self employment. The government at all levels should formulate policies that aims at eliminating those negative externalities that are responsible for natural resource depletion and environmental degradation which undermines sustainable development in Nigeria. Government should also step-up a well supervised expenditure on basic infrastructures, poverty alleviation, basic education, rural electrification, fight against corruption, primary healthcare, and road networking. This is because they have been found to influence productivity of the rural dwellers and also affect sustainable development.

KEYWORDS: *Rural Infrastructure, Sustainable Development, Poverty Alleviation, Basic Education, Rural Electrification, Corruption, Primary Healthcare, Road Networking*

1. INTRODUCTION

From time immemorial, infrastructure has been a very important indicator in the process of development in both developed and developing economy. In Nigeria, rural infrastructure has long been factored in as a strategy for national development. This is because of the important role the area plays in terms of supplying the needed raw materials for industrialization and food for survival. Research has shown that despite the important role played by rural areas in the process of development, rural areas in Nigeria are still characterized by rural poverty, rural-urban migration, low productivity, illiteracy and maternal mortality among others (Raheem & Bako, 2014). This finding is also corroborated by Ogungbemi, Bubou and Okorhi (2014) who posit that lack of critical infrastructure like energy, transportation, Processing technologies, Information communications technology (ICT), roads communication network, irrigation, storage facilities, market facilities, research and extension institutions, schools and universities are some of the infrastructure development challenges that affects rural growth and sustainable development in Nigeria. Yet, successive governments in Nigeria have been making frantic efforts by building rural infrastructures and also initiating a number of rural development programmes aimed at developing the rural areas.

As cited by Okoli (2015) some of the government programmes aimed at developing the rural areas in Nigeria include: Agricultural Development Projects (ADP), River Basin Development Authority, Operation Feed the Nation (OFN), Green Revolution (GR), Family Economic Advancement Programme (FEAP), Family Support Programme (FSP), National Poverty Eradication Programme (NAPEP), National Economic Empowerment and Development Strategy (NEEDS). Then came Millennium Development Goals (MDGs) and presently Sustainable Development Goals (MDGs) - The MDGs and SDGs are global partnership to tackle poverty. However, despite these efforts, sustainable development in the rural areas is still far from reality in the eyes of the populace because of the persistent rise in the poverty levels and other attendant human miseries in the rural areas.

Sustainable development is important. This is because it creates intergenerational equity by ensuring maximization of human well being for today's generation which does not lead to declines in future well being. According to Okonkwo (2013) "attaining this path requires eliminating those negative externalities that are responsible for natural resource depletion and environmental degradation. All

human activities and developmental projects are associated with environmental degradation in one form or the other with the attendant generation of wastes. As a result of these, environmental problems of various types and intensities have emerged to threaten man's well-being and the natural environment which serves as his life support system". Apart from building physical infrastructures that protect the natural environment, the social infrastructure is also imperative. It will help to reduce poverty, inequality, malnutrition, youth unemployment which Ojo and Oluwatayo (2016) observed to be predominant and the highest in Africa. This study is therefore an attempt to examine rural infrastructure and sustainable development in Nigeria by modeling some selected macroeconomic variables like poverty alleviation, basic education, rural electrification, corruption, primary healthcare, and road networking to ascertain the extent to which they have influenced sustainable development of the rural areas in Nigeria.

Objectives of the Study
The main objective of the study is to examine rural infrastructure and sustainable development in Nigeria. Specifically, the study intends to ascertain to which poverty alleviation, basic education, rural electrification, corruption, primary healthcare, and road networking have influenced sustainable development of the rural areas in Nigeria.

2. RELATED LITERATURE
Related literature on rural infrastructure and sustainable development are rife. Extant literature is replete with studies asserting the need and importance of rural infrastructure for sustainable development in every economy. Manggat, Zain and Jamaluddin (2018) examined the impact of infrastructure development on rural communities: a literature review relying on extant literature. Findings revealed that community social workers play an important role in assisting and developing the rural communities while maintaining good collaboration with the development planner for the community. The community social worker understands the world view of rural communities much better as they are closer to the community and they are working with the community to achieve the objectives that have been set. Edeh, wakamma and Ugbala (2017) carried out a study on re-engineering sustainable rural economy through socio-infrastructural facilities in Nigeria. The study relied on review of extant literature and content analysis. Findings revealed that poor condition of education, health care facilities, provision of clean source of drinking water, housing, poverty reduction, human capital development affect sustainable rural economy. Ojo and Oluwatayo (2016) investigated drivers and challenges of sustainable development in Africa using content analysis technique. The study revealed that poverty, inequality, malnutrition, youth unemployment are the highest in Africa. It further posit that Africa's sustainable development is constrained by corruption, infrastructure deficits, insecurity and reliance on primary products.

Emokaro and Oyoboh (2016) examined the impact of rural infrastructure on the livelihood of smallholders in agrarian communities in Edo state, Nigeria using descriptive and quantitative techniques such as frequency tables, means, standard deviation, percentages, comparative cost ratios and Difference-in-Differences (DD). Results of the socioeconomic characteristics of respondents showed that they were mainly

smallholder farmers with mean farm size and annual income of 0.23ha and N 133,500, respectively. Their average age and household size were 45 years and eight persons respectively. Over 60% of the respondents were men and about 40% of them had formal education up to secondary school level. Results of the economic analysis indicated that the cost of all the Micro Projects embarked upon by Edo State CSDP averaged about N4,867,704.11. The estimated comparative cost ratio showed that the cost of CSDP Micro Projects were, at the least, about a third of the average alternative cost of similar projects embarked upon by the State Government, Local Government Areas (LGAs) and the Niger Delta Development Commission (NDDC). The highest comparative cost ratio of 4.55, was recorded in the skills acquisition project. The lowest ratio of 1.6 was however recorded in the town hall (civic center) project. Results of the causality between CSDP Micro Projects (MPs) and outcomes in the six sectors considered showed that the education sector had a reduction of 29.72 minutes in the average time taken by students to get to school and 0.69 kilometers in average distance to school due to Edo State CSDP intervention in the construction and rehabilitation of schools. In the water sector, a DD of 425 persons fetching water for domestic purpose was recorded, a 47% reduction in the cost of buying water with 65% of the community members now having access to portable water as a result of CSDP intervention in the provision of motorized boreholes. Average distance to water source equally reduced by 5.82 kilometers, while average time spent in fetching water reduced by 10. 56 minutes. The result also showed a 61% reduction in reported cases of water borne diseases, with 70% of the respondents opining that there is a change in personal hygiene after the provision of water facilities by Edo State CSDP. Raheem and Bako (2014) examined sustainable rural development programmes in Nigeria: issues and challenges. This study relied on secondary data by making use of past literature in order to examine the successes and shortcomings of the programmes. Findings revealed that rural poverty, rural-urban migration, low productivity, illiteracy and maternal mortality among others as the predominant problems faced by the rural dwellers. Ogungbemi, Bubou and Okorhi (2014) carried out a study on revitalizing infrastructure for rural growth and sustainable development. The study relied on extensive literature review of extant literature. Findings revealed that lack of critical infrastructure like energy, transportation, Processing technologies, Information communications technology (ICT), roads communication network, irrigation, storage facilities, market facilities, research and extension institutions, schools and universities as infrastructure development challenges that affects rural growth and sustainable development in Nigeria.

Adejumo and Adejumo (2014) investigated the prospects for achieving sustainable development through the millennium development goals in Nigeria using content analysis of previous literature. The study posits that poor economic and social development are the main challenges of achieving sustainable development through the millennium development goals in Nigeria. Kamar, Lawal, Babangida and Jahun (2014) examined rural development in Nigeria: problems and prospects for sustainable development using content analysis technique. Findings revealed failure of previous administrations in the development of rural areas in Nigeria due to poor and no coordinated governance as a

major problem stagnating the rural development in Nigeria Awojobi (2014) investigated sustainable rural development in Nigeria within the context of the Millennium Development Goals using content analysis. Findings revealed MDG will be unable to meet up with the challenge of increasing poverty, infrastructure deficiencies and a high level of an illiteracy rate before the termination of the project in 2015. Adenipekun (2013) examined sustainable rural infrastructural development in Nigeria within the context of Vision 20:2020. The study relied on extensive literature review and content analysis. The study revealed the inadequacy of basic infrastructure in Atakunmosa West Local Government Area (AWLGA) of Osun State.

Ikurekong and Atser (2013) carried out a study on community-environment relations and development of rural communities in Uyo, Nigeria using factor analysis and Step wise multiple regression analyses. Results showed strong and positive levels of relationships between community-environment relations and development of rural communities in Uyo. The study also highlighted major factors that significantly influence rural development in the study area which include very poor Health sector in Uyo rural communities, sand, gravels and laterite in some of these communities are extracted with little or no regards to its adverse effects on the environment. Streams, the main source of water supply in these communities, are polluted. Village roads are seriously damaged by heavy duty tippers which carry the sand and gravels. Also communities' forests are fast disappearing due to uncontrolled logging and firewood exploitation, Infrastructural development is generally poor in all the communities studied except for Nung Asang and Ifa Ikot Akpan that have some significant advantage, most rural dwellers can rarely get rich as their incomes in many cases are not commensurate with the tasks involved in production and extractive processes, farm labour is scarce and expensive and young and educated rural dwellers are not attracted to this form of employment given the relatively low status and prestige attached to farming occupation. Okonkwo (2013) examined sustainable development in a developing economy: challenges and prospects using descriptive statistics and content analysis of extant literature. The study revealed that Household wastes, industrial wastes, offices and small scale business centers account for challenges for sustainable development in Nigeria while Governmental sectoral policies, Public education, Non-governmental organizations (NGOs), Effective town planning, Enforcement of existing environmental Regulations and Waste minimization and recycling waste were identified as prospects for sustainable development in Nigeria.

In the final analysis, it is evident that a number of studies have been carried out in this subject area with robust insightful findings but there is little or no indefinable study that has statistical and empirical analysis on previous trends and current issues and facts surrounding issues on rural infrastructure and sustainable development particularly in Nigeria thus creating a critical literature and knowledge gap that informed this study. This study therefore examined rural infrastructure and sustainable development in Nigeria by modeling a number of aggregated, macroeconomic, physical and social infrastructure to ascertain the extent they have influenced sustainable development in rural areas.

3. METHODOLOGY
Model Specification
To examine rural infrastructure and sustainable development in Nigeria, this study have incorporated variables like sustainable development, poverty alleviation, basic education, rural electrification, corruption, primary healthcare, and road networking. Poverty alleviation, basic education, rural electrification, corruption, primary healthcare, and road networking are the explanatory variables, while sustainable development is used as the explained variable. Thus, the model for the study is specified as:

The structural form of the model is:
$$SUD = (POV, BED, REL, COR, PHC, RON) \quad \dots \quad \dots \ (1)$$

The mathematical form of the model is:
$$SUD = \beta_0 + \beta_1 POV + \beta_2 BED + \beta_3 REL + \beta_4 COR + \beta_5 PHC + \beta_6 RON \quad \dots (2)$$

The econometric form of the model is:
$$SUD = \beta_0 + \beta_1 POV + \beta_2 BED + \beta_3 REL + \beta_4 COR + \beta_5 PHC + \beta_6 RON + \mu_i \quad \dots (3)$$

Where;
SUD = Sustainable development proxied by human capital development index
POV = Poverty Alleviation proxied by domestic government expenditure on poverty reduction at the constant price
BED = Basic education proxied by domestic government expenditure on basic education at the constant price
REL = Rural electrification proxied by domestic government expenditure on rural electrification at the constant price
COR = Corruption proxied by Corruption perception index
PHC = Primary healthcare proxied by domestic government expenditure on primary healthcare at the constant price
RON = Road networking proxied by domestic government expenditure on road construction and maintenance at the constant price
β_0 = Constant term
$\beta_1 - \beta_6$ = Coefficient of parameters
μ_i = Stochastic error term

Method of Data Analysis
The economic technique employed in the study is the ordinary least square (OLS). This is because (i) the OLS estimators are expressed solely in terms of the observable (i.e. sample) quantities. Therefore, they can be easily computed. (ii) They are point estimators; that is, given the sample, each estimator will provide only a single value of the relevant population parameter. (iii) The mechanism of the OLS is simple to comprehend and interpret. (iv) Once the OLS estimates are obtained from the same data, the sample regression line can be easily obtained. All data used in this research are secondary time series data which are sourced from the Central Bank of Nigeria (CBN) annual statistical bulletin and World Bank Databank.

4. PRESENTATION OF RESULT
Dependent Variable: SUD
Method: Least Squares
Sample: 1991 2018
Included observations: 28

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.329077	0.047516	6.925528	0.0000
POV	1.397855	0.000643	4.021588	0.0011
BED	7.692318	2.590643	7.969886	0.0000
REL	6.415882	2.272117	3.268443	0.0082
COR	-0.025825	0.032044	-4.805932	0.0093
PHC	1.800766	1.354425	5.767985	0.0008
RON	0.344098	0.450201	1.503627	0.1212
R-squared	0.625116	F-statistic		23.83623
Adjusted R-squared	0.518007	Prob(F-statistic)		0.000046
S.E. of regression	0.040390	Durbin-Watson stat		1.881683

Source: Researcher computation

Evaluation of Findings
Evaluation Based on Economic A Priori Criteria

This subsection is concerned with evaluating the regression results based on a priori (i.e., theoretical) expectations. The sign and magnitude of each variable coefficient is evaluated against theoretical expectations. From table 1, it is observed that the regression line have a positive intercept as presented by the constant (c) = 0.329077. This means that if all the variables are held constant or fixed (zero), sustainable development will be valued at 0.3291. Thus, the a-priori expectation is that the intercept could be positive or negative, so it conforms to the theoretical expectation. It is observed in table 1 that poverty alleviation, basic education, rural electrification, primary healthcare, and road network have a positive impact on sustainable development in Nigeria. This means that if domestic government expenditure increases on poverty alleviation, basic education, rural electrification, primary healthcare and road network, it will improve and increase sustainable development in Nigeria. On the other hands, corruption has shown to exhibit a negative impact on sustainable development in Nigeria. Thus, increase in corruption will decrease sustainable development in Nigeria and vice versa.

From the regression analysis, it is observed that all the variables conform to the a priori expectation of the study. Thus, Table 2 summarises the a priori test of this study.

Table 2: Summary of Economic A Priori Test

Parameters	Variables Regressand	Variables Regressor	Expected Relationships	Observed Relationships	Conclusion
β_0	SUD	Intercept	+/-	+	Conform
β_1	SUD	POV	+	+	Conform
β_2	SUD	BED	+	+	Conform
β_3	SUD	REL	+	+	Conform
β_4	SUD	COR	-	-	Conform
β_5	SUD	PHC	+	+	Conform
β_6	SUD	RON	+	+	Conform

Source: Researcher's compilation

Evaluation Based on Statistical Criteria

This subsection applies the R^2, adjusted R^2 and the F–test to determine the statistical reliability of the estimated parameters. These tests are performed as follows: From the study regression result, Table 4.3 indicated that the coefficient of determination (R^2) is given as 0.625116, which shows that the explanatory power of the variables is high and moderately strong. This implies that 63% of the variations in the sustainable development are being accounted for or explained by the variations in poverty alleviation, basic education, rural electrification, corporation, primary healthcare, and road networking in Nigeria. While other determinants of sustainable development not captured in the model explain about 37% of the variation in sustainable development in Nigeria.

The adjusted R^2 in Table 4.3 supports the claim of the R^2 with a value of 0.518007 indicating that 52% of the total variation in the dependent variable (sustainable development) is explained by the independent variables (the regressors)). Thus, this supports the statement that the explanatory power of the variables is slightly high and strong. The F-statistic: The F-test is applied to check the overall significance of the model. The F-statistic is instrumental in verifying the overall significance of an estimated model. The hypothesis tested is:

H_0: The model has no goodness of fit
H_1: The model has a goodness of fit

Decision rule: Reject H_0 if $F_{cal} > F_\alpha$ (k-1, n-k) at α = 5%, accept if otherwise.

Where
V_1 / V_2 Degree of freedom (d.f)
V_1 = n-k, V_2 = k-1:
Where; n (number of observation); k (number of parameters)

Where k-1 = 7-1= 6
Thus, n-k = 28-7 = 21

Therefore: $F_{0.05(6,21)} = 2.57$ (From F-table) ... ... F-table

F-statistic = 23.83623 (From Regression Result) ... F-calculated

Therefore, since the F-calculated > F-table in table 4.3, the study reject H_0 and accept H_1 that the model has goodness of fit and is statistically different from zero. In other words, there is significant impact between the dependent and independent variables in the study.

Table 3: Summary of t-statistic

Variable	t-calculated (t_{cal})	t-tabulated ($t_{\alpha/2}$)	Conclusion
Constant	6.925528	±2.080	Statistically Significance
POV	4.021588	±2.080	Statistically Significance
BED	7.969886	±2.080	Statistically Significance
REL	3.268443	±2.080	Statistically Significance
COR	-4.805932	±2.080	Statistically Significance
PHC	5.767985	±2.080	Statistically Significance
RON	1.503627	±2.080	Statistically Insignificance

Source: Researchers computation

The study begins by bringing the working hypothesis to focus in considering the individual hypothesis.

For POV, $t_{cal} > t_{\alpha/2}$, therefore the study reject the null hypothesis and accept the alternative hypothesis. This means that government domestic expenditure on poverty alleviation has a significant impact on sustainable development in Nigeria.

For BED, $t_{cal} > t_{\alpha/2}$, therefore the study reject the null hypothesis and accept the alternative hypothesis. This means that government domestic expenditure on basic education has a significant impact on sustainable development in Nigeria.

For REL, $t_{cal} > t_{\alpha/2}$, therefore the study reject the null hypothesis and accept the alternative hypothesis. This means that government domestic expenditure on rural electrification has a significant impact on sustainable development in Nigeria.

For COR, $t_{cal} > t_{\alpha/2}$, therefore the study reject the null hypothesis and accept the alternative hypothesis. This means that corruption has a significant impact on sustainable development in Nigeria.

For PHC, $t_{cal} > t_{\alpha/2}$, therefore the study reject the null hypothesis and accept the alternative hypothesis. This means that government domestic expenditure on primary healthcare has a significant impact on sustainable development in Nigeria.

For RON, $t_{cal} < t_{\alpha/2}$, therefore the study accept the null hypothesis and reject the alternative hypothesis. This means that road networking has no significant impact on sustainable development in Nigeria.

4. CONCLUSION AND RECOMMENDATIONS
Conclusion
This study attempted to explain rural infrastructure and sustainable development in Nigeria from 1991-2018 using Ordinary Least Square (OLS) technique method. In executing the study, the OLS techniques was applied after conducting some preliminary tests like the stationarity of the variables using the ADF Statistic and Johansen Cointegration Test. From the result of the OLS, the study revealed that poverty alleviation, basic education, rural electrification, primary healthcare, and road network have a positive impact on sustainable development in Nigeria. This means that if domestic government increases on poverty alleviation, basic education, rural electrification, primary healthcare and road network, it will improve and increase sustainable development in Nigeria. On the other hands, corruption has shown to exhibit a negative impact on sustainable development in Nigeria. Thus, increase in corruption will decrease sustainable development in Nigeria and vice versa.

From the regression analysis, it is observed that all the variables conform to the a priori expectation of the study and the variables of the study are statistically significant in explaining sustainable development in Nigeria except road networking that was statistically insignificant. The F-test conducted in the study shows that the model has a goodness of fit and is statistically different from zero. In other words, there is a significant impact between the dependent and independent variables in the model. Finally, both R^2 and adjusted R^2 show that the explanatory power of the variables is slightly high and/or strong in explaining sustainable development in Nigeria. Although, government has achieved some level of progress at the aggregate level, within the limits of available resources, large proportion of Nigerians still lack access to the most basic human needs and rural infrastructure. Based on the findings of this research, the study draws the following conclusions that government domestic expenditure in Nigeria is inconsistent and unreliable and there is gross misplacement of government domestic expenditure pattern in Nigeria for sustainable development for rural dwellers.

Recommendations
In light of the findings of the study, the study recommends that: The federal government should increase its monetary budget on education for the purpose of procuring

educational materials, equipments, conducive environment for both staffs and students to enhance skill acquisition equipment for human capital development which will also lead to self employment. The government at all levels should formulate policies that aims at eliminating those negative externalities that are responsible for natural resource depletion and environmental degradation which undermines sustainable development in Nigeria. Government should also step-up a well supervised expenditure on basic infrastructures poverty alleviation, basic education, rural electrification, for against corruption, primary healthcare, and road networking. This is because they have been found to influence productivity of the rural dwellers and also affect sustainable development.

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