

## ACCESS TO CLEAN WATER AND ELECTRICITY: THE EFFECT ON GOVERNMENT CAPITAL SPENDING IN NIGERIA

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### ABSTRACT

Access to clean drinkable water and electricity is a fundamental requirement for the population of a nation. Knowing that accessibility is inevitably tied to financial capacity, this paper ventures to ascertain the effect of clean water and electricity accessibility on government capital spending in order to enhance their nexus. Secondary data were obtained from Central Bank of Nigeria Statistical Bulletin, 2021, Statistical Bulletin- Public Finance and Real Sector; World Development Indicators of the World Bank Group, 2023. Using descriptive statistics to analyse trends and ordinary least squares (OLS) via the SPSS statistical package to analyze a ten year period data for relationship, it was revealed that the trend of access to clean water progressively rises over the years as against access to electricity that is erratic and undulating. Government capital spending trend is likewise ups and down over the years. There was no statistical significant relationship between access to clean water/electricity and government capital spending. Government capital spending is thus, not influenced by accessibility to clean water and electricity. Recommendation was made to alert government on the need to align their capital allocations towards positive, significant impact on public utility accessibility thereby inducing positive demands in the populace towards higher accessibility to the public utilities of clean water and electricity.

**Key Words:** Access to Clean Water, Access to Electricity, Government, Capital Spending, Nigeria.

### 1. INTRODUCTION

A long standing historical fact suggests that food, water and shelter are the principal needs of man on earth. Coming from the primitive times to date there is still so much meaning to this fact. However, the demands of modern day living standard requires that energy (electricity and gas), telecommunication and sanitation be regarded as one of the principal factors that make the home (shelter) a functional and comfortable place to live in. On a general note, these four variables of water, electricity, cooking gas supply and telecommunication are termed public utilities which serve the household. Among these, water and electricity seems to be the most dependable. A household that has appreciable access to clean water and electricity is fulfilled. Such access is invariably dependent on availability by government (directly or indirectly) and affordability (financial ability) of the user. In a cosmopolitan society of the modern age, government has the onus to make capital spending on public utilities for accessibility of the people. In some nations of the world, particularly the developed ones, government is considerably alert and taken action to provide adequate public utility services; but for others of the developing nation cadre the experience is poor and worrisome. In 2018 for instance, with approximately 60 million Nigerians lacking access to basic drinking water, Nigeria's water, sanitation and hygiene sector was declared by the Federal government to be in a state of emergency (The World Bank, 2021). Although the government took immediate action by launching the National Action Plan (NAP) for the effective revitalization of Nigeria's Water supply, sanitation, and hygiene services by 2030, the gains of that is yet to be effectively seen in the last five years. Electricity consumption has a significant impact on sustainable development (Matthew et.al, 2019). In Nigeria, the complain of inadequate electricity supply to satisfy industrial activities are a daily issue and this corresponds to what obtains in most developing nations of Africa and part of Asia. The unreliability of power supply in these nations results in high disruption costs, thus competitiveness and production efficiency affected (Emodi and Yusuf, 2015). In the case of drinking water, Nigeria has a poor quality status that justifies an increased attention on efforts, not just on accessing water but ensuring that water services that meet quality standards are in position (FMWR, 2020). Nigeria's rising population and expanding settlements of people, agricultural and industrial growth is likely to increase the effect of poor quality water supply that is quite health risking and life-threatening. Cheap and safe drinking water accessibility is inevitable to eradicate hunger and malnutrition (Shehu and Nazim, 2022; WHO, 2017). The basic necessity for sustaining human life calls for a safe drinking water free from toxicity and various infections. Access to drinking water mostly demands that the water is colourless, odourless, tasteless, physically clean, not hard, and free from contaminating microbes. Sadly most of the water supply systems provided by the colonial authorities and merely sustained by early administrations of the Nigerian government are grossly dilapidated, non functional or nonexistent. Corruption of politicians that interfere with judicious water supply contracting is another notable hindrance to the efficient improvement of water supply system in the country. Relating power supply and water supply, Egbinola (2017) opines that water supply efforts can be quite marred by epileptic power supply within the country.

In all of these, the basic question that arises is how Nigeria's aggregate capital spending is influenced by access to clean water and electricity supply. Is the demand on these public utilities relating positively with government total capital allocation or not? The empirical answers will clearly define the public utilities and government capital spending nexus, based on which proper recommendation can be made to enhance their relationship. Three basic objectives were pursued in this study:

- To examine the spatial trend of access to clean water and electricity in Nigeria.
- To ascertain the spatial trend of government capital spending in Nigeria.
- To determine the statistical relationship between access to clean water/electricity and government capital spending.

The basic hypothesis is thus:

H1: There is no significant relationship between access to clean water/electricity and government capital spending.

## 2. LITERATURE REVIEW

**Access to Reliable Electricity-**Economic transformation of a nation like Nigeria depends on one ground, tackling strongly the electricity issue. Two main facets of this issue are dependable electricity supply and affordability. The problem can be lack of reliable electricity supply or of limited affordability or even both. Blimpo and Cosgrove-Davies (2019) took a broader look at the electricity issue and reported that the problem in Africa is not power but poverty. In other words, power can be available but not affordable because of the high rate of poverty in the community. On the other hand there is power availability but it is not reliable – unsteady supply, voltage fluctuations, regular blackouts and maintenance/repair delays. Added to such uncomfortable situation is yet the problem of high electricity tariffs that weigh on the users and corrupt sharp practices by some staff of supply authorities. With such burden on the people they quickly lose the desire for connection to power supply. This is a notable problem in most parts of Africa and evidently in Nigeria. To supply dependable electricity, government's capital allocation must sufficiently overwhelm electricity generation, transmission and distribution infrastructures together with an effective maintenance provision. Investments on electricity infrastructure enhance adaptation of climate change, reduce dependency on household fossil fuel use, strengthen agricultural and food processing ventures (Rud 2012; Eberhard and Dyson, 2020). Concerning electricity supply in Nigeria (in both the national grid and the numerous power stations), the background reasons for its negative development is evident: investment in national power sector by the early 1990's had diminished seriously and maintenance budgets reduced greatly with no addition of new capacity (INTEC, 2015).

**Access to Clean Water-**Clean water, potable water or drinking water is a resource from natural means that is very fundamental to human living and health. Clean drinkable water is mainly of improved water sources such as rainwater water, water supplies into dwellings, estates or plot through pipes, boreholes or tube wells, public stand posts, protected springs and wells, delivered water through tanker trucks and packaged water like bottled water and sachet water (Venkatasubramanian, Selvam and Jain, 2021). In defining clean or safe drinking water, WHO (2006) states that it is "water that does not represent any significant risk to health over a lifetime of consumption, including different sensitivities that may occur between life stages." Water is safe for consumption when it is devoid of contaminants that are biological/microbial (of Pathogens such as viruses, bacteria and protozoa), physical, radiological or chemical in nature (MDGs 2012). Sharma & Bhattacharya (2017) opines that Water contaminants can be of inorganic, organic, biological and radiological forms leading to health challenges such as typhoid, cholera, hepatitis A and E, diarrhea, dysentery and poliomyelitis. There is surplus water in Nigeria but not enough clean drinkable water. For water to be drinkable it must meet some standards. In Nigeria, water quality standard is provided by the authorities as follows: pH, 6.5-8.5; Turbidity (NTU), 5.0; Conductivity ( $\mu\text{S}/\text{cm}$ ), 1000; TDS (mg/L), 500; Temperature ( $^{\circ}\text{C}$ ), Ambient; Total Hardness (mg/L), 150; Chloride (mg/L), 100; Fluoride (mg/L), 1.0; Nitrate (mg/L), 10; Sulphate (mg/L), 100; Manganese (mg/L), 0.1; Iron (mg/L), 0.3; Zinc (mg/L), 5.0; Copper (mg/L), 1.0; Lead (mg/L), 0.01; Chromium (mg/L), 0.01; Arsenic (mg/L), 0.01; Potassium (mg/L), 1.0; Nickel (mg/L), 0.01 (NSDWQ and NIS, 2017).

**Empirical Literature-** In applying the Bayer Hanck co-integration system and the Auto-Regressive Distributed Lag (ARDL) bound test, Dimnwobi et.al. (2023) found out that public capital spending in Nigeria has a positive but insignificant effect on rural electrification. Eberhard and Dyson (2020) carried out a review encompassing econometric or statistical and mixed methods analyses and found strong evidence that investing in electricity infrastructure results in positive benefits for the people and society. It further points out the need to investment more on both off-grid and grid networks being essential segments of value chain necessary to provide access, improve efficiency of grid and stability. Evidence from some studies by Walle et al. (2017) and Arnaiz et al. (2018), suggests that household incomes are affected significantly by electrification prominently in the long run, and at times, at a village level, with spill-over effects. A study conducted by Parikh et al. (2015) reveal that in Indian slums, increased

land value and households upgrade are influenced by the provision of electricity and other infrastructure services. Onyekwena, Ishaku and Akanonu (2017) concludes from a study that Nigeria’s Electricity Supply Industry is plagued by several challenges such as constraints of finance, energy source base that is undiversified, infrastructural deficits worsened by vandalism, operating under market governance structure that is inefficient, aggregate technical, commercial and collection losses that is substantially great. Egbinola (2017) took a general look at domestic water in Nigeria in the areas of availability, supply and funding and found a decline in capital allocation for the supply of water, decline in access to the supply of public water and increased dependence on sources of groundwater for domestic use both in rural and urban areas. Iduseri et.al (2021) investigated the sources of water supply and the challenges inhabitants faced in accessing the sources of water in each of three urban and rural districts of Zaria, Nigeria. The results were compared using descriptive statistics and average mean score (AMS) technique and found that to access water (which varied with the season), the urban dwellers travel longer distances compared to the rural dwellers. Grazing through the literature review it is observed that quite few cases address relationship studies between access to clean water/electricity and government capital spending. This paper is poised to enrich the few previous empirical studies in ascertaining the statistical bond between concerned public utilities and government capital spending.

### 3. METHODOLOGY

Quantitative research method is used in this study with the adoption of descriptive, hypotheses testing and determining relationship research design. Publication of World Development Indicators of the World Bank Group provided the source of secondary data used in this research. Further, Statistical Bulletin 2021 (Public Finance and Real sector) published by Central Bank of Nigeria was also used. The span period for the study was 10 years (2011-2020). The methods of data analysis are: descriptive statistical analysis for spatial trend analysis and statistical relationship by means of simple linear regression (OLS) through the use of SPSS software. The linear regression equation is as follows:  $Z = a_0 + a_1X_1 + a_2X_2 + \dots + a_nX_n$ , where:  $Z$  = expected or predicted value of the dependent variable;  $X_1$  to  $X_n$  =  $n$  distinct independent or predictor variables;  $a_0$  = value of  $Z$  when the independent variables  $X_1$  is equal to zero;  $a_1$  through  $a_n$  = the regression coefficients estimates. The variables are government capital expenditure as dependent variable, access to clean water and electricity independent variables.

### 4. DATA ANALYSIS, FINDINGS AND DISCUSSION

Table 1 shows the data of access to clean water and access to electricity in percentage of population and government capital spending per capita for 10 years. Objective 1 of this research is to examine the spatial trend of access to clean water and electricity in Nigeria. Observing table 1 and figure 1 together the trend of clean water is seen as gently and progressively rising over the years. The progress in access to clean water within the years considered is evident. The reason, from literature studies may be due to corresponding rise of government capital spending per capita. This is likely not true as the trend of capital spending shown in table 1 and figure 2 is conspicuously unsteady compared to that of access to clean water. Another suggestible reason may be due to increased demand and affordability of the population to access clean water. Increased demand of water is inevitable, given a growing population and developmental activities.

**Table 1.** Access to Clean Water/Electricity and Government Capital Spending per Capita

Year	Access to Clean Water (% of Population)	Access to Electricity (% of Population)	Govt. Capital Spending (Naira) per Capita
2011	18.3	55.9	5,551.1
2012	18.7	53.2	5,143.0
2013	19.1	55.6	6,343.6
2014	19.5	54.0	4,365.6
2015	19.9	52.5	4,447.9
2016	20.2	59.3	3,464.3
2017	20.6	54.4	6,420.3
2018	21.0	56.4	8,478.9
2019	21.3	55.4	11,259.0
2020	21.7	55.4	7,751.7

**Source:** Central bank of Nigeria Statistical Bulletin, 2021 Statistical Bulletin- Public Finance and Real Sector; World Development Indicators, The World Bank Group, 2023. Capital spending per capita values calculated by author. On access to electricity, figure 1 reveals an erratic, undulating trend that suggests the erratic nature of government's supply of electricity in Nigeria. The posture of government in the area of reliable power supply may possibly influence the electricity accessing trend of the people. Table 1 is quite explicit on the percentage of population accessing clean water in comparison to that of electricity. Greater population are accessible to electricity than clean water over the years and this finding is quite worrisome though expected. The average percentage of people that have access to clean water is 20.03% and for electricity 55.21% as seen in table 1. The truthful saying that "water is life" makes demand for water and access to water a more necessary utility. However, various sources of water are available for consumption and indeed accessed by the population, but accessing clean (drinkable) water which is the emphasis in this study is found to be at a limited level. Moreover, percentage of population accessing electricity being more is understandably because of the technical role electricity plays, even in the production of clean water. In fulfilling objective 2, being to ascertain the spatial trend of government capital spending in Nigeria, the Nigerian government's focus on capital spending over the years was found to be unsteady. Figure 2 reveals that there are capital expenditure drops from 2011-2012, 2013-2014, 2015-2016 and 2019-2020, while rises are seen from 2012-2013, 2014-2015, and 2016-2019 (the best capital spending growth period).

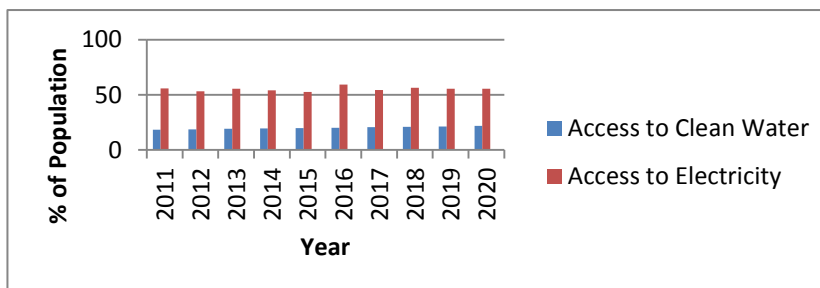


Figure 1. Trend of Access to Clean Water and Electricity

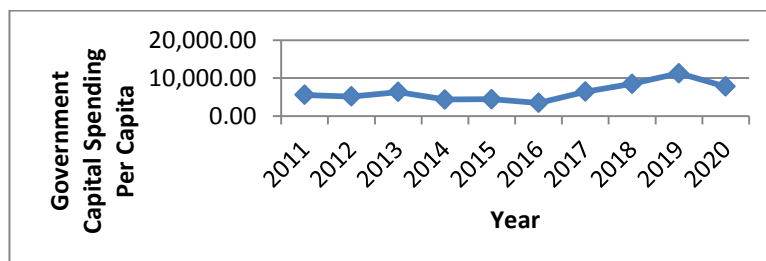


Figure 2. Trend of Government Capital Spending Per Capita

**4.1. Test of Hypotheses** -By objective 3 of this study the statistical relationship between access to clean water/electricity and government capital spending per capita should be determined. Through linear regression statistics the hypothesis was tested. The null hypothesis stipulates that there is no significant relationship between government capital spending per capita and access to clean water/electricity in Nigeria. In tables 2 the SPSS analysis shows the adjusted R square as 0.204 which implies that only 20.4% of the government capital spending variance can be explained by access to clean water and electricity, the independent variable. By the R square value obtained the relationship between the dependent and independent variables is considerably weak. The F-statistics value is 2.154 and p-value of  $0.187 > 0.05$ . This proves that access to clean water and electricity as a whole is not significantly related with government capital spending in Nigeria. Thus the null hypothesis is accepted. On individual basis, the coefficients table 3 suggests that access to clean water is not significantly related with government capital spending ( $p = 0.077 > 0.05$ ), the insignificant relationship is positive though (with t-value = 2.073). Access to electricity is also not significantly related with government capital spending (t-statistics value is -0.326 and p-value  $0.754 > 0.05$ ). The insignificant relationship is even negative given the negative sign of the t value.

Table 2. Regression Summary of government capital spending per capita Vs access to clean water/electricity

**Model Summary<sup>b</sup>**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.617 <sup>a</sup>	.381	.204	2072.5189	.381	2.154	2	7	.187

- a. Predictors: (Constant), Access to Electricity , Access to Clean Water  
b. Dependent Variable: Government Capital Spending

**Table 3.** Regression Coefficients of government capital spending per capita Vs access to clean water/electricity Coefficients<sup>a</sup>

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	
	B	Std. Error	Beta			
1	(Constant)	-12786.145	21715.429		-.589	.574
	Access to Clean Water	1288.583	621.725	.630	2.073	.077
	Access to Electricity	-121.384	372.640	-.099	-.326	.754

a. Dependent Variable: Government Capital Spending

From literature, Dimnwobi et.al. (2023) and others of similar findings, point to the fact that access to electricity is not significantly related with government capital spending. This postulation is confirmed again in the Nigerian case as found in this study. The same goes for access to clean water. Sensibly, access to clean water and electricity should impact government capital spending; but the case is the opposite as revealed in the study.

## 5. CONCLUSION AND RECOMMEN DATION

In the spatial trend analysis of access to clean water using descriptive statistics, this study concludes that over the years there is a progressive growth rate of access to clean water. However, the progressive rise is unreasonably gentle. The reason for such is not determined in this study but can be a cause for concern in future research. In the case of the spatial trend of access to electricity, this study concludes that over the given years, the trend is erratic, undulating and non progressive. This is a worrisome pattern to observe. The same irregular pattern is observed in the trend of government capital spending. The average percentage of people that have access to water is 20.03% and for electricity 55.21% as found in the study. Thus, it is worth concluding that progressive and meaningful attention is not given to capital spending that should impact access to public utilities and infrastructure development by the Nigerian government. Observably however, the populace is more accessible to electricity than clean water, not minding the erratic nature of access to electricity over the years. It is not a surprise then that access to clean water has a negative insignificant relationship with government capital spending. The relationship between capital spending and the public utilities variables of access to clean water and electricity is not significant holistically or with individual variables. This study therefore concludes that access to clean water and electricity does not influence government capital spending in Nigeria.

### This study recommends the following:

- Notable emphasis should be placed on capital spending by the Nigerian government to enhance infrastructure development as a means of positively impacting access to public utilities and generally strengthening the nation's economic growth.
- The government of Nigeria should create the enabling environment and condition to support the people's easy affordability of clean water and electricity. This means government must consciously carry out programs to alleviate poverty of the people.
- Government interest in clean water supply and thus influencing consumption is weaker (access to clean water being negatively and insignificantly related with government capital spending) and needs to be strengthened by government.

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