EFFECT OF EXCHANGE RATE VOLATILITY ON MATERIAL PRICE MANAGEMENT OF SELECTED BUILDING CONSTRUCTION MATERIALS IN NORTH CENTRAL NIGERIA PROJECTS

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ABSTRACT

Exchange rate volatility is one of the macroeconomic variables that affect construction material prices in the country especially in the last 10 years. This study examined the trend of exchange rate volatility on the construction materials prices between 2011 – 2020 in the north central geo-political zone with quantitative data on exchange rate obtained from the Central Bank of Nigeria Statistical Bulletins (CBN) whereas cement, block, tile and reinforcement prices were obtained via market survey. Data analysis using the Ordinary Least Square (OLS) technique revealed p-values of <2.2e-16, <2.2e-16, <2e-16 and <2.2e-16 for cement, block, tile and reinforcement respectively, these implies that exchange rate volatility was statistically significant in forecasting the trend of the selected construction material prices. The construction materials used for this study were sourced off-shore. The study recommends that formulation and implementation of necessary fiscal policies by diversification of the revenue base will go a long way in stabilizing Nigeria's balance of payment position and lessen her dependence on foreign building materials.
Keywords: exchange rate, volatility, building, materials, fluctuation

INTRODUCTION

The volatility experienced in exchange rate today has led to rigid balance of payment position of Nigeria, with attendant hike in construction materials. Darlington (2014) posits that exchange rate is the price of domestic currency in terms of other countries currency and plays an important role in allowing traders to directly compare the different price systems in different countries. Oladipo & Oni (2012), states that building materials prices escalation forms a critical restrain to Nigeria's construction procurement improvement. Issues of non-commissioning of valuable projects, delay in work progress and construction output volume reduction, reduced rate of construction workers, use of low-quality local materials which lead to poor workmanship and hold up innovation in material research and construction method are typified. Studies conducted by Windapo, et al., (2004); Idoro & Jolaiya (2010). Oladipo & Oni (2012); Akanni, et al., (2014) showed that Nigerian Naira exchange rate is the highest ranked factor militating against the reduction of building materials costs in Nigeria. Bala &

Asemota (2013), stated that exchange rate volatility is the major variable militating against Nigeria's economic activities. Ogundipe & Ogundipe (2013), opined that swings in the volatility level in the Naira exchange rate over a time period against major international currencies has shown an unprecedented level of Naira volatility against other major international currencies. The building materials industry is an important contributor to any nation's national economy as its output governs both the rate and the quality of construction. Researches by Adedeji (2002); Arayela (2005) & Ogunsemi (2010) have revealed that materials account for as much as 50 - 60% of building construction; hence serious attention should be given to it, specifically in view of policies or factors that may make their prices to increase, thereby slowing down the building construction sector growth. The cost of construction projects are to be well estimated in order for the deliverable to be of benefit to stakeholders (Ward & Chapman 2008). Project Managers have a duty of ensuring that projects under all variety of economic conditions are sustainable (Ramos 2014). From the foregoing, this study therefore examines the effect of exchange rate volatility on material price management of selected building construction materials in North-Central Nigeria projects.

LITERATURE REVIEW

Construction and exchange rate volatility

The construction industry has in many countries of the world been impacted by exchange rate and other macroeconomic variables. Derakhshanalavijeh & Teixeira, (2017) views foreign exchange rate as a main factor that brings about changes in the prices of building materials in developing nations. Anosike (2009) posited that an increase in the prices of building materials is a serious threat to the construction industry culminating into construction cost discrepancies and eventual project abandonment. Kim et al., (2011) posited that exchange rate, liquidity ratio, Consumer Price Index (CPI), gross national income, index liquidity, interest rate are the variables that has affected the performance of Korea's construction sector. In Canada, the housing price determinant as suggested by Padilla (2005) includes exchange rate, interest rate and oil prices. Economic factors are seen to be critical to Iranian contractors in delivering of public and private projects (Tadayon *et al.,* 2012). Goh *et al.,* (2013) opines that the Malaysian construction sector is majorly affected by the effect of the macroeconomic variables. Persistent exchange rate fluctuation, budget shortages and high inflation are considered as the major factors that contributes to increment in the prices of

building materials in UAE (UAE Ministry of Infrastructure Development, 2017). Similarly, exchange rate policies, producer price index (PPI), inflation, foreign direct investment and CPI are the major contributing factors to the rise in building materials cost of Vietnamese construction firms (Le-Hoai *et. al.,* 2008). Exchange rate, net import, GDP, consumption, net savings, public finance, inflation, external reserve, balance of payment, forex rate and public debt as factors are the major influencers of building materials cost (Kembe & Onoja, 2017). Tender prices are subjective to the economic factors of GDP, currency exchange rate, PPI, composite CPI, and interest rates and posited the need for examining the degree of economic impact on the pricing of building contracts (Kissi et al., 2017).

The Moroccan construction industry suffered challenges that limit its performance on construction project delivery, and the increase in the prices of building materials occasioned by the inconsistent macroeconomic factors was listed as causative factor (Khalfaoui & Zenasni, 2014. Musyoki *et. al.,* (2012) study in Kenya, revealed the exchange rate volatility of the country and showed an appreciating trend in foreign currency. In South Africa, the Construction Industry Development Board and the Public Works Department (2017) listed exchange rate volatility, global commodities, crude oil prices and inflation as the major drivers of the cost experienced by the construction sector. Amoah-Mensah (2016), views exchange rate and crude oil as the main factors in local price currency adjustment of the West African building industry. Mensah *et. al.,* (1996), posited that exchange rate, lending rate, inflation, employment and government expenditure as the factors affecting the performance of the construction industry. Bediako, *et. al.*, (2016), established exchange rate, inflation rate and monetary policy rate as the indicator that influences the prices of cement in the Ghanaian construction industry. Also, Adobor (2014) considered exchange rate inflation in terms of CPI and crude oil prices in his development framework for Ghanaian construction cost.

In Nigeria, Adegbembo & Adeniyi (2015) in examining the effect of exchange rate, interest and inflation rate on the prices of building materials, concluded that reduction in the real figures of these economic indicators are needed to reduce construction material escalation. Amoateng & Osei (2017), postulated that exchange rate and the general condition of the economy as the exogenous factors influencing public tendering.

Building Materials Price Fluctuation

Building materials are materials used in construction work starting from the foundation to the finishing (Mansur *et al.,* 2016). Building materials are basic construction

products such as cement, bricks, concrete, and aggregates, i.e. sand, rock, reinforcement and gravel (Nadramia 2013). Building materials price increase has become a common global trend, and even the developed countries are not left out. A number of developed countries are in recent times experiencing the problem of price increase of thier building materials. According to Jonsson (2017), building materials' cost rose in Sweden by 3.1%; the largest increase in the building material group was in reinforcement steel with price increase of 5.8%, concrete products price rose at 2.7%, and other building material groups also increased. Slowey (2017), noted that the numbers from the Bureau of Labour Statistics US revealed a 4.8% rise in building material prices between February 2016 and February 2017. According to Reyes (2017), prices of building materials in the US increased in 2016 by 13.8% for oriented strand board (OSB), a type of particle board commonly used in home construction, 8.7% for softwood lumber, commonly used in home construction, 5.0% for gypsum products, such as plaster and plasterboard; and 3.5% for ready-mix concrete, used for projects like foundations and drive-ways. Building materials cost fluctuate on a daily basis, but the overall trend in recent time has been up (Reyes 2017). Huan & Jianhua (2013) analysed the factors that cause the price change of building materials in China, whereas Rajaprabha, et al., (2017) studied the factors affecting the cost of building material in construction projects in India.

The situation in developing countries is not different, where building materials prices keep increasing. A study by Windapo *et al.,* (2017) showed that the price of building materials in South Africa among others have an effect on the cost of the building. The cost of building new houses in Namibia increased considerably between 2008 and 2009 because of a hike in the prices of building materials, like cement (Mosha, 2011). According to Pashardesa & Savva (2009) increase in house prices during the period 1988-2008 in Cyprus points to increase in the cost of building materials. Wagura (2013), noted that building materials are expensive in Kenya due to the transport and importation costs. Oladipo & Oni (2012) study reviewed selected macroeconomic factors impacting building material prices in Nigeria.

The supply of houses is affected by the increase in the costs of building materials (Sunde & Muzindutsi, 2017). The growth of the construction sector brings with it, the growth in the manufacturing industry for the building materials such as cement and steel (Wagura, 2013). Cost overruns among other factors are often caused by the increasing prices of resources such as building materials (Danso, 2013). The cost of building a house has rapidly increased with the increase in the cost of construction materials such as cement, steel, sand,

and piling materials since 2008 (Glindro et al., 2008). Oladipo & Oni (2012) established that inflation, exchange rate, import, interest rate, money supply and demand for money have a significant effect on the prices of building materials in Nigeria. Another study conducted in Nigeria by Akanni *et al.*, (2014) found that the three most rated factors responsible for the rising cost of building materials are the exchange rate of the Nigeria Naira, cost of fuel and power supply, and changes in government policies and legislation, while fluctuations in construction cost, reduced volume of construction output, and risk of project abandonment were the most significant implications. Huan & Jianhua (2013) study identified the value of building materials, supply-demand relationship, national macro policy, the value of money, notes circulation and the influence of the international market as the factors that cause the price change of building materials in China.

In South Africa, a study by Windapo & Cattell (2012) examined the trends in building material prices and the factors contributing to the increase in prices of building materials. The study found transport costs, crude oil prices, labour costs and energy costs as the factors that affect building material prices. Rajaprabha, *et al.,* (2016) found design issues and market condition issues as the major significant factors that cause building materials' prices increase in India. According to Nadramia (2013), building materials companies that are able to defend and increase market share are likely to adjust their strategies to evolving market conditions, be innovative, have some pricing advantage, and maintain sales growth and profitability, even during adverse economic conditions. A study by Tupenaite, *et al.,* (2016) revealed that prices movements in Lithuania's housing sector were largely explained by economic fundamentals and housing market indicators. The housing supply lag in urban sectors has been worsened by the high cost of building materials among others which make decent housing unaffordable to the urban poor who in turn result to makeshift houses (Wagura 2013).

Sources of Building Materials in Nigeria

1. Local Sources

The building materials that are locally sourced mainly thrive on indigenous raw materials, styles, technology and the building process pertaining to a community is related to with environmental condition, cultural values and socio-economy of Nigeria (Oluyode, 1988). The use of local law raw material in roofing sheets construction Nigeria was first advocated by the Directorate for Food, Roads and Rural Infrastructural (DFRRI) (Oladapo &

Oni, 2012). The exploitable and available local resources available in Nigeria encompasses the developing products and residues, small scale raw materials, industrial wastes, renewable and low cost of energy sources and available technologies applicable to reduced production cost of materials (Oladapo & Oni, 2012). Okereke (2003), categorized the raw material sources into three, which local building materials depends on. These include the developing products and residues, naturally occurring raw materials deposit and manufacturing process products. Oladapo & Oni (2012), deduced some key factors that constrained the realization of domestic materials full potentials in Nigeria, these are non-compliance to standards which results into product poor quality. A host of other identified reasons are life span and durability issues, reduced aesthetic worth, poor commercial status, poor finishing and lack of general standard (Sanusi, 1993).

2. Imported Sources

These are building materials that are either produced or manufactured overseas or have its raw materials sources from abroad and brought in for the purpose of construction (Atolagbe, 2009). Importation is an important sector of international trade and the capital goods imported including building materials are an important factor in a nation's economic growth. Investment is affected directly by imported capital goods which is an important constituent of economic expansion (Sa'ada & Hassan, 2008). Ayeni (1997) stated that imported building materials in Nigeria account for at least 48% of the overall materials. Olowo-okere (1998), posited that there is up to 78% degree of dependence on foreign material sources in Nigeria.

Qalitheia (2010) deduced that raw materials amount to over 70%, while Owoye (2003), stated that raw materials constitute 60% of imports in the Nigerian construction industry. Raw materials importations have since the nation's independence in 1960 grown considerably as the nominal value of imported materials sprang from N130 million in 1960 to over N60 billion in 2009 (Egwaikhide, 1999), and the National Bureau of Statistics (NBS), (2012). International trade and globalization which are construction accelerators are induced by importation as it allows for building materials varieties, encourage specialization and global scale comparative advantages (Mbamali & Okotie, 2012). The uncontrolled desire for foreign materials especially for developing nation like Nigeria has reduced the growth rate of her construction sector owing to presence of intrinsic problems including the lack of

managerial know-how, technical inadequacies, insufficient materials, equipment and capital base (Oluwakiyesi, 2011).

METHODOLOGY

Data analysis using the Ordinary Least Square (OLS) method was employed in analysing the trend of exchange rate volatility against each of the considered construction materials price. Regression technique posited by Bronson (1986) is considered appropriate because of its capability in predicting values of dependent variables from independent variables and for enabling inferences to be drawn between relationships.

DATA ANALYSIS AND RESULT

Quantitative data was obtained from the Central Bank of Nigeria (CBN, 2021) and market survey, 2021. A purposive 10 year data sample base on quarterly period was employed in this study specifically from 2011 to 2020. This is the period where the country twice experienced recession rising from the fall in the oil revenue and causing problems to the macroeconomic structure of the country. The considered construction materials are (Vitrified ceramic 25x40mm wall tiles per m^2, 12 mm reinforcement per 40ft. length, block per 9 inches hollow sandcrete, and Dangote Cement per 50kg bag).

Figures 4.1 & 4.2 present the descriptive analysis of the parameters: exchange rate and the selected building materials (Cements, Block, Tile & Reinforcement) prices

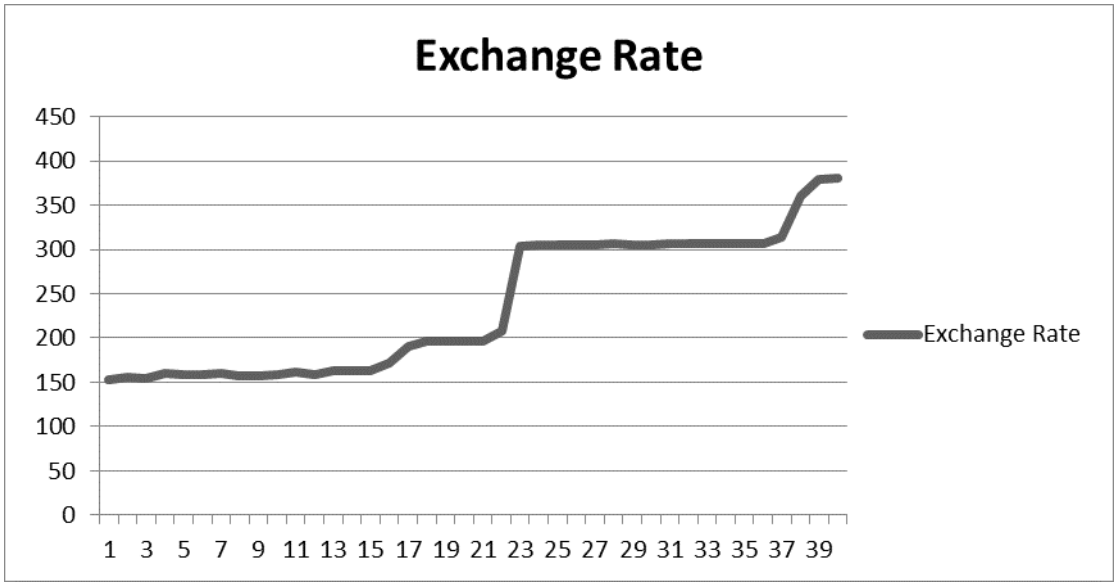

Figure 4.1: Exchange rate values between the period of 2011Q1 and 2020Q4
Source: Author's Survey (2021

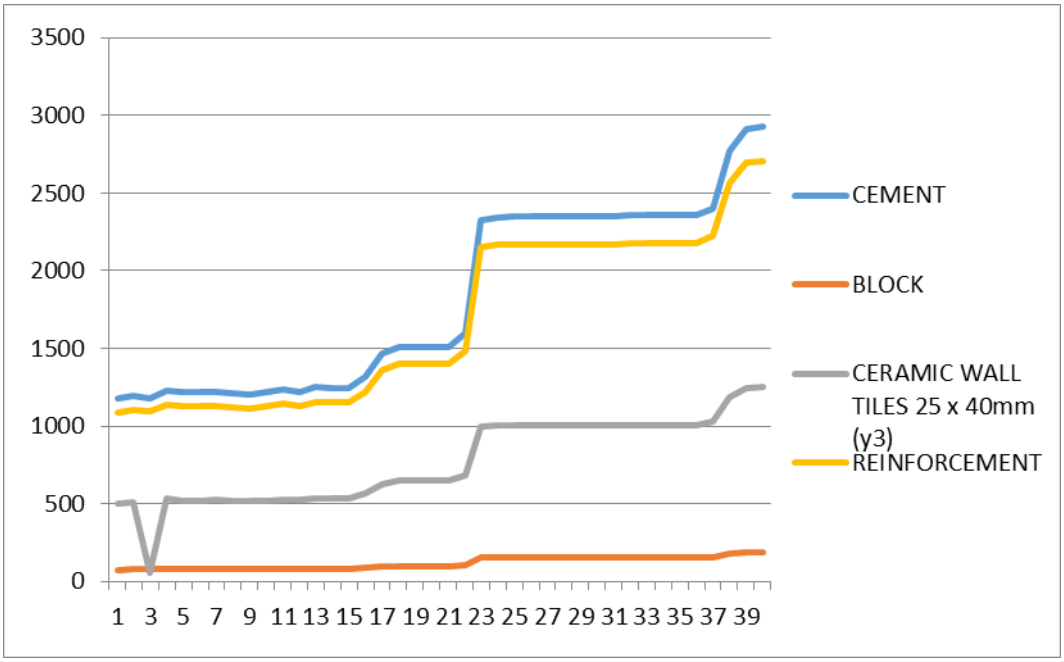

Figure 4.2: The trend of the mean values of the selected construction materials aggregate prices from 2010Q1 to 2020Q1
Source: Author's Survey (2021)

Table 4.1: Regressing ERV against Cement Price trend

Call: Lm (formula = Cement ~ERV, data = data)				
Residuals				
Min	**1Q**	**Median**	**3Q**	**Max**
-4.3756	0.2017	0.2205	0.2312	0.2752
Coefficients				
	Estimate	**Std. Error**	**t-value**	**Pr (ltl)**
(Intercept)	-0.266054	0.501936	-0.53	0.599
ERS	7.677372	0.002019	3802.45	<2e-16***
Significance Codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1				
Residual Standard error: 0.9771 at 38 degrees of freedom				
Multiple R-Squared: 1			**Adjusted R-Squared:** 1	
F-Statistics: 1.446e+07 at 1 and 38df			**p-value:** <2.2e-16	
The confidence interval of the model coefficient				
	2.5%		**97.5%**	
(Intercept)	-1.282170		0.7500609	
ERV	7.673285		7.6814598	
Sigma of the model: 0.0005381766				

Source: Author's Computation (R-Programming), (2021).

The table 4.1 above, depicts the trend of exchange rate volatility and the prices of cement. The model shows that for every 7.677 increase in the rate of exchange, there is a corresponding 0.266 reduction in the total value that will give you the predicted value of

cement prices at the rate. This model was made for the last 10 years where the country twice experienced recession and there was an unprecedented increment in the rate of naira exchange per US Dollar. The linear model can be mathematically expressed as: **y = -0.266054 + 7.677372x**. The 'y' is the predicted value of cement prices and 'x' is the rate of exchange per USD for that given period, hence, depicting the linear relationship between the dependent and the independent variables.

Table 4.2: Regressing ERV against Block Price trend

Call: Lm (formula = Block ~ERV, data = data)				
Residuals				
Min	**1Q**	**Median**	**3Q**	**Max**
-0.285135	-0.001335	0.010400	0.015315	0.022204
Coefficients				
	Estimate	**Std. Error**	**t-value**	**Pr (ltl)**
(Intercept)	-3.579e-02	2.446e-02	-1.463	0.152
ERS	4.988e-01	9.841e-05	5068.678	<2e-16***
Significance Codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1				
Residual Standard error: 0.04763 at 38 degrees of freedom				
Multiple R-Squared: 1			**Adjusted R-Squared:** 1	
F-Statistics: 2.569e+07 at 1 and 38df			**p-value:** <2.2e-16	
The confidence interval of the model coefficient				
	2.5%		**97.5%**	
(Intercept)	-0.08531987		0.01373056	
ERV	0.49860186		0.49900029	
Sigma of the model: 0.0004037956				

Source: Author's Computation (R-Programming), (2021).

Table 4.2 depicts the trend of exchange rate volatility and the prices of block. The model indicates a -3.579e-02 reduction in the total value with every 4.988e-01 rise in exchange rate, which will give the predicted value of block prices for that rate within that period. And with a p-value of <2.2e-16, we conclude that the model is statistically significant. The linear model can be mathematically expressed as: **y = -3.579e-02 + 4.988e-01x.** The 'y' is the predicted value of block prices and 'x' is the rate of exchange per USD for that given period, which is the linear relationship between the variables.

Table 4.3: Regressing ERV against the Tile Prices

Call: Lm (formula = Tile~ERV, data = data)				
Residuals				
Min	**1Q**	**Median**	**3Q**	**Max**
-426.04	0.17	16.32	22.68	32.96
Coefficients				
	Estimate	**Std. Error**	**t-value**	**Pr (ltl)**

(Intercept)	-47.9903	36.5137	-1.314	0.197
ERS	3.4370	0.1469	23.400	<2e-16***
Significance Codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1				
Residual Standard error: 71.08 at 38 degrees of freedom				
Multiple R-Squared: 0.9351			**Adjusted R-Squared:** 0.9334	
F-Statistics: 547.6 at 1 and 38df			**p-value:** <2.2e-16	
The confidence interval of the model coefficient				
	2.5%		**97.5%**	
(Intercept)	-121.908279		25.927768	
ERV	3.139678		3.734356	
Sigma of the model: 0.09292331				

Source: Author's Computation (R-Programming), (2021).

Table 4.3 shows the trend of exchange rate volatility and the prices of tile. The model is considered to be statistically significant with a t-value of -1.314 which is considerably less than the 2.5% level of significance. The linear model can be mathematically expressed as: **y = -47.9903+ 3.4370x.** The 'y' is the predicted value of tile prices and 'x' is the rate of exchange per USD for that given period which shows the linear relationship between the variables.

Table 4.4: Regressing ERV against Reinforcement Prices

Call: Lm (formula = Reinforcement ~ERV, data = data)				
Residuals				
Min	**1Q**	**Median**	**3Q**	**Max**
-4.0340	-0.0002	0.1511	0.2134	0.2249
Coefficients				
	Estimate	**Std. Error**	**t-value**	**Pr (ltl)**
(Intercept)	-0.455115	0.345267	-1.318	0.195
ERS	7.098599	0.001389	5111.128	<2e-16***
Significance Codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1				
Residual Standard error: 0.6721 at 38 degrees of freedom				
Multiple R-Squared: 1			**Adjusted R-Squared:** 1	
F-Statistics: 2.612e+07 at 1 and 38df			**p-value:** <2.2e-16	
The confidence interval of the model coefficient				
	2.5%		**97.5%**	
(Intercept)	-1.154071		0.2438403	
ERV	7.095788		7.1014111	
Sigma of the model: 0.0004004289				

Source: Author's Computation (R-Programming), (2021).

Table 4.4 shows the trend of exchange rate volatility and the prices of reinforcement. The model is considered to be statistically significant as such we conclude that the model is statistically significant at the Adjusted R-Squared (James *et. al.,* 2014), and t-value of -1.318 which is considerably less than the 2.5% level of significance. Also, the linear model can be

mathematically expressed as: **y = -0.455115+ 7.098599x.** The 'y' is the predicted value of reinforcement prices and 'x' is the rate of exchange per USD for that given period displaying the linear relationship between the variables.

CONCLUSION

The study concludes that exchange rate volatility is an important macroeconomic factor that has increasingly affected the construction sector leading to escalation in prices of construction materials throughout the nation for the period under review because of the nation's overdependence on foreign building materials. The study also revealed that the period of reduction in the oil prices culminated into poor balance of payment position and inducing a stress on the nation's macroeconomic structure and leading to the reduction in sales' value of Nigeria's Naira against the currency of her foreign counterparts.

RECOMMENDATION

The study recommends the provision of adequate fiscal policies that can better the balance of payment positions of the country. This can be done through diversification of the revenue base of the country from oil base to solid minerals. Revitalization of the Ajaokuta Steel and Itakpe Iron-Ore Mining companies would significantly reduce the overdependence on foreign building materials, and would further stabilize the balance of payment position of the country and significantly reduce the nation's debt-to-revenue ratio.

The local capacity can be improved through the encouragement of private sector investment by providing secure and enabling environment, lowering interest rates, public private partnership (PPP), and provision of healthy competition between investors. These will significantly boost the local production of cement, tiles, reinforcement and blocks.

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REVIEW OF END USERS' SATISFACTION WITH PUBLIC HOUSING ESTATES IN NIGERIA

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ABSTRACT
The population explosion experienced in most Nigerian cities, and rising rate of urbanisation which are incommensurate with the provision of adequate housing infrastructure is of major concern. Public housing schemes have generally been condemned for failing to deliver quality, affordable and adequate housing units to the end users in most developing countries. The objective of this study is to assess through literature review, the level of satisfaction of residents in public housing estates in Nigeria. Findings revealed that there exists low satisfaction level to a large extent across the Nigerian states. In addition, residents are mostly dissatisfies with illumination, safety, service quality, housing/dwelling quality, and physical environment quality. Thus, the study recommends active participation of end users in the design and development of public housing estates, effective total quality management practices, quality control and quality assurance mechanisms.

Keywords: End users, Housing estates, Nigeria, Public, Quality management.