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Assessment of Rising Cost of Selected Building Materials on Housing Development in Akure, Nigeria

Sumanu S.O.[1], Akharia O.O.[2], Olatunde M.B.[3], Izah N.L.[3] and Daodu, S.A.[2]

[1]Department of Quantity Surveying, Auchi Polytechnic, Auchi, Edo State, Nigeria
[2]Department of Architectural Technology, Auchi Polytechnic, Auchi, Nigeria
[3]Department of Surveying and Geoinformatics, Auchi Polytechnic, Auchi, Nigeria

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ABSTRACT

The increasing cost of building and construction materials (BCM) has been the major challenge facing affordable housing development in Akure. The study evaluates the effects of BCM on housing construction and delivery in Akure from the government and private individuals. A hindcast analysis using a sequential model was applied to extract the relevant dataset from building professionals (civil engineers, quantity survivors, building materials suppliers and others). Conversely, a survey for constructing a room-self-contained, two-bedroom, and three-bedroom using the three most crucial building materials (Dangote cement, steel diameters, 9 inches & 6inches block) from ten (10) building materials retailers. The generated datasets were analyzed using statistical metrics as a descriptive measure, correlation, and lead significance difference (LSD). The findings show that the cost of building materials has increased steadily from 2012 at an annual average of between 5%-30%. However, the increases in the cost of building materials have insignificant effects on the rate of building construction at $P > 0.05$; but are highly significant on the cost of house renting and procurement. The cost of an annual rent of RSC, 2BF, and 3 BF has increased by 103%, 120%, and 90% in 2022 relative to 2012 depending on the location and facilities. Also, the procurement cost of 2BF and 3BF increased by 80% and 125% over the consideration period. In conclusion, the delivery of affordable housing units becomes a major challenge facing the exponentially increasing population in Akure due to the high house procurement and rent cost as a result of rising BCM costs. Hence, it is recommended that the government should develop a public-private partnership (PPP) to drive the initiative of low housing delivery. Also, the government needs to ensure that the nation's crude is locally refined to reduce the high foreign exchange involved in importation and thus reduce the BCMs production and construction costs.

Key words: Building construction cost, Building materials, Housing development, Population increase, Akure

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INTRODUCTION

Housing development is an essential index forming the Human Development Index (HDI) of any society. Regardless of human status and class, a certain level of housing accommodation is needed. In view of this, there exists a sudden rise in housing construction industries in Akure. Hence, the increase in building industries has multiple economic growth effects, such as employment opportunities for building professionals (civil engineers, builders, estate managers, town planners, and others) and commodity exchange due to the procurement of building materials. Akanni *et al.* [1] reported that the rise in the construction industry is instrumental to economic growth. Alabi and Fapohunda [2] in their work revealed that the construction of housing has been remarkably developed over some years. Hence, in ensuring a befitting housing for the increasing global population, integration of affordability and sustainability are crucial towards housing delivery and provision [3].

The cost of building construction is increasing at a very fast rate due to an uncontrollable rise in building and construction materials (BCMs). However, the availability and affordability of BCMs determines the realization of housing delivery. For instance, in the studies of Mohammed [4] and Anosike [5], a bag of Dangote cement increased by 37% in 2012 relative to 2009 when a bag was about N 1,850, and currently in 2022, a bag of cement is being sold

for N4,200 with a projected tendency of further increase during the peak demand of the product (August to December). It was revealed that fluctuating costs of BCMs lead to unbudgeted increases in building construction costs.

This situation has led to a delay in the completion of housing construction, and in cost cases abandonment of building construction projects in Nigeria. The field survey in Akure and its environs showed that the region has about 137,000 abandoned building projects and the major challenges of these uncompleted projects are simply the cost of building materials and inflation. Several studies have investigated the dynamics of the cost of building materials for the completion of housing projects [6-7]. However, it is obvious that building is a pivotal and substantial input in building construction [1]. Alabi and Fapohunda [2] showed that improved sustainable housing delivery within the estimated cost, time, and quality in response to stakeholders' BCMs and satisfaction is absolutely important.

Considering the impediments facing building construction in Nigeria, it will be very challenging to meet up with the United Nations Sustainable and Millennium Development Goal for housing for all by the mid-21th Century. However, it is essential that the cost of building materials is expected to be significantly reduced to increase the rate of delivery of affordable housing unit. Based on this, the study seeks to provide information and evaluate the upsurge effects of growing increases in building materials on building construction companies and the delivery of housing units in Akure.

RESEARCH METHODOLOGY

The study used primary datasets which were extracted from the used of structurally designed questionnaires. To complement the questionnaire, direct personal interviews and interactions were conducted with the building professional (civil engineers, quantity survivors, estate agents, architects, and town planners). The choice of the various building materials available for this study for which the market survey was subsequently conducted is first premised on their availability or otherwise in both study areas. The building materials under consideration were the Dangote cement, steel diameters (10 mm, 12 mm and 16 mm iron rod) whereas the types of building construction were one room-self-contained, two bedroom and three-bedroom flat. The market survey of building and construction materials was conducted on 45 major distributors and 10 retailers from six zones in Akure. A total number of 100 questionnaires were administered to the stakeholders in the building professions, whereas 73 recovered questionnaires were used for the analysis. Also, 120 questionnaires were used to extract information on the cost of building materials from the sole distributors, wholesales, and retailers.

Therefore, sample size was computed using the formula by Al-Sedairy [8] as follows:

Sample size = $\eta = n^1 / [1 + (n^1 / N)]$, (1)

where,

$n^1 = S^2 / V^2$, N = total estimated population;

V = standard error of the sampling distribution = 0.05,

S = maximum standard deviation in population at a confidence level of 95%.

Price indexes and inflation rates were computed using Theil's formula:

$$\text{Price index} = \frac{P_n}{P_o} * 100 \quad (2)$$

$$r = 100\left(\frac{P_n}{P_o}\right)\frac{1}{n} - 1 \quad (3)$$

Where, P_o = First value of the index, P_n = the last value of the index, n = numbers of years, and r = rate of inflation.

ANOVA was used to test the main effects of main distribution and retailer on the price of building materials.

RESULTS AND DISCUSSION

Demographic measures of Respondents

Table 1 presents the demographic information (years of experience, educational qualification, age, sex) and the number of the building professional respondents. Architects has the highest respondent of 28.1%, civil engineers represented 20.9%, quantity survivors, town planners, and site manager represented 18.9%, 12.1%, and 20.0%. The result in Table 2 shows that the working experience of the building professionals is sufficient enough to provide significant information to achieve the set objective of the study. The result in Table 2 shows that 75% of the respondents have over 13 years of work experience in the building and construction industry, while 25% of the

respondents have less than ten years' experience. The datasets on the work experience of the professionals showed that the provided high quality information for the study had been gathered.

Table -1 Respondent demographic and position

Respondents	Quantity (q)	Percentage (%)
Architect	19	28.1
Civil engineer	16	20.9
Quantity surv.	14	18.9
Town planners	9	12.1
Site manager	15	20.0
Total	73	100

Table -2 Work experience of the respondents

Work experience in years	Frequency	Percentage (%)
1 year to 5 years	8	10.7
6years-10 years	10	13.7
11 years-15years	20	27.4
16 years-20 years	17	23.4
20 years and above	18	24.7
Total	73	100

Table -3 Price of unit length of steel diameter iron rod

N/S	Year	Y10mm (#)	Y12mm (#)	Y16mm (#)
1	2012	925	1,308	1,685
2	2013	1,050	1,435	4,905
3	2014	1,120	1,672	5,100
4	2015	1,200	1,810	5,100
5	2016	1,310	1,990	5,600
6	2017	1,350	1,910	5,750
7	2018	1,415	1,990	5,815
8	2019	1,845	2,100	6,012
9	2020	2,750	3,345	7,800
10	2021	3,210	4,650	8,300
11	2022	3,300	4,800	8,500

The trend of building construction materials

Steel diameter rod

Table 4 and Fig 1a present the trend of the price of iron rod of diameter 10 mm, 12 mm, and 16 mm from 2012 to April 2022 in Akure, Nigeria based on the market survey carried out. The overall finding showed that there existed increases in the cost of steel rod procurement from year to year. However, the cost analysis of the steel diameters; indicated that price of iron rod of 10 mm diameter (Y_{10mm}) increased by 29 % in 2015 relative to 2012, steel diameter 12 mm (Y_{12mm}), and steel diameter 16 mm (Y_{16mm}) increased by 39 % and 200 % in 2015 as compared to 2012. Also, price increasing trends became larger with the overall changes from 2012 to 2022. The cost of Y_{10mm}, Y_{12mm}, and Y_{16mm} increased by 71%, 266%, and 404% in April April 2022 referenced to the baseline year (2012). Currently, the prices of unit length of 10 mm, 12 mm, and 16 mm steel rods are ₦3,300, ₦4800, and ₦8500. Hence, there is high possibilities that these prices might increase by 10% of the current cost based on the projected behaviour of naira against US dollar. The sudden increase in iron rod has resulted in a number of building construction defects due to design manipulations and compromises. Many building contractors and site engineers in some cases failed to carry out constructions contrary to the structural details and designs due upsurge cost of steel rod. For instance, in the design, where a combination of Y_{12mm} and Y_{16mm} were recommended for the construction of

foundation, column, and beam, the site engineer or contractor may alter the design by using a lower iron yield to save cost and endanger life.

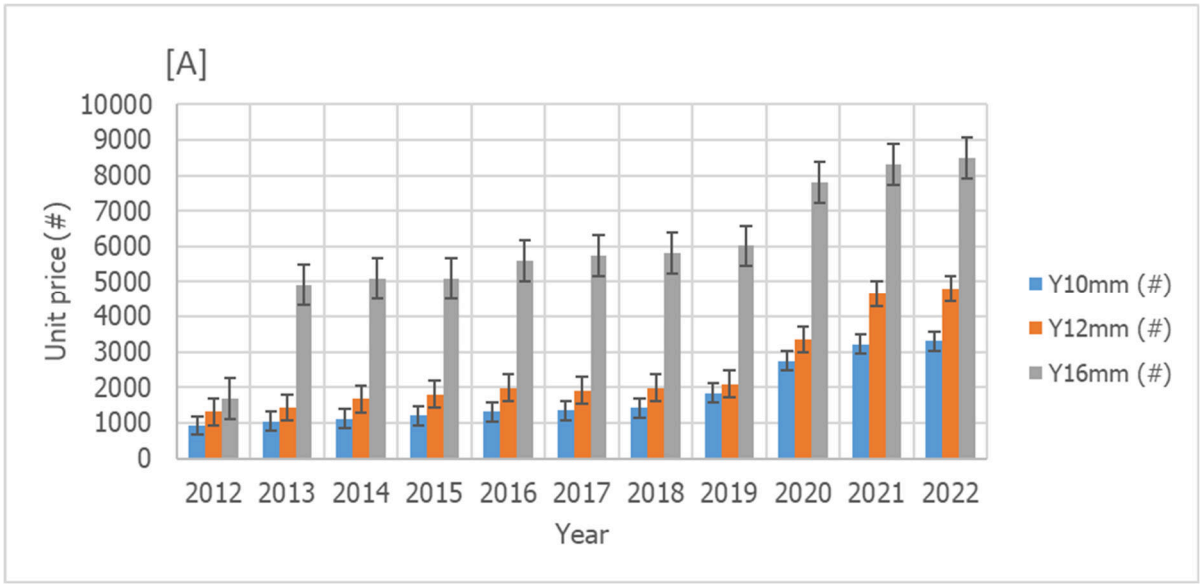

Fig. 1a The trend of steel iron diameters in Akure

Increasing cost of cement

Cement is one the essential components in building construction. Its increasing price is frustrating the construction industries due to high cost of energy and procurement of imported raw materials. The results in Table 3 and Fig. 1b present the cost of a unit bag of Dangote cement from 2012 to 2022. There exists a differential cost price of cement based on seasonality. During the wet season, the price of cement either remain constant or reduce because of possible low demand due to low rate of building construction as a result of devastating rainfall effects. Hence, the cost price normal goes up during the dry season because of high demand as a result increase in construction work. Also, the location of the building construction that significantly affect the price of cement. Average unit cost of a bag of Dangote cement was between ₦1300 to ₦1400 during the low and peak demand period. However, a bag of cement is currently being sold for ₦4,200 in April 2022 with a projected increase during the dry season (October-December).

Table -4 Unit price of Dangote cement

N/S	Year	Lower price (#)	Higher price (#)
1	2012	1,300	1,400
2	2013	1,350	1,600
3	2014	1,400	1,800
4	2015	1,800	2,200
5	2016	1,800	2,500
6	2017	2,500	2,700
7	2018	3,000	3,200
8	2019	3,500	3,700
9	2020	4,000	4,200
10	2021	4,000	5,000
11	2022	4,100	4,200

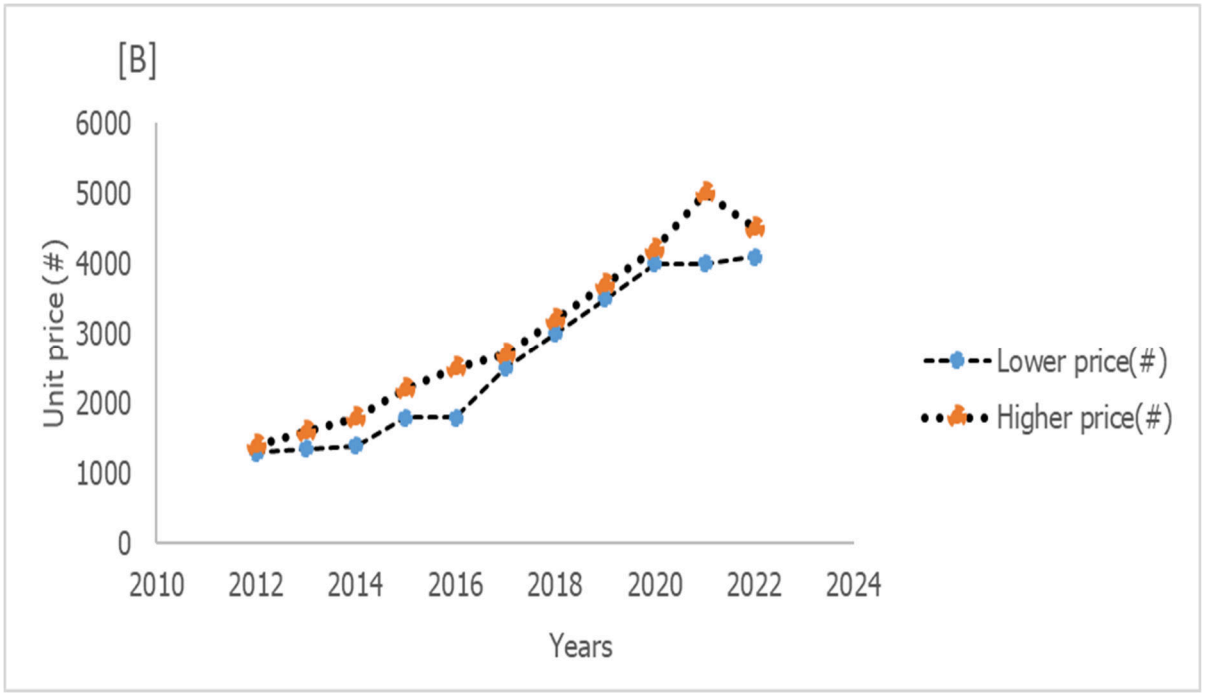

Fig. 1b Fluctuating price of Dangote cement from 2012-2022 in Akure

3.2.3 Effects of rise in construction block prices

An increase in raw materials (cement and sand) are highly responsible for the rise in the block price over the years. The Economic Times (2022) reported that over last decade construction blocks have emerged as a building material of choice and a replacement of clay bricks due to its superiority over later, like high thermal insulation, optimal fire protection, excellent acoustic & earthquake resistance properties. From 2012 to 2022, the prices of cement and sand have increased by 300% and 150%. Overall block production inputs have increased by about 135% with respect to the referenced year (2012). The 9 inches and 6 inches' blocks were sold for ₦150 and ₦100 in 2012 whereas the current unit price of 9'' and 6'' blocks in April 2022 is ₦ 350 and ₦250. (Table 4). However, this represents increases of 133% and 150% for 9'' and 6'' block respectively. The construction of one flat, two, and three bedroom apartments require an estimated construction blocks of 1,300, 2,300, and 3500 block with total construction block cost of ₦ 455,000 for 9''block, ₦325,000 for 6 block'', ₦805,000 for 9'' and ₦575,000 for 6'', and ₦1,225,000 for 9'' and ₦875,000 for 6'' blocks. Therefore, this situation further complicates the construction of affordable housing unit. The finding is similar to the studies of Ayode and Alabi [9], Oladipo and Oni [10], and Lam *et al.,* [11].

CONCLUSION

The overall finding of the study revealed that steadily increase in building construction materials has negative effects on the timely construction and delivery of affordable housing units in Akure. Also, the findings indicated a strong inflationary trend between 2012 through 2022. The cost price of unit length of Y10mm, Y12mm, and Y16mm increased by 250%, 300% and 350% in April 2022 referenced to 2012. Also, the unit cost price of 9'' and 6'' block increased by 133% and 150% and unit cost of cement increased ₦1400 in 2012 to ₦4,200 in 2022. The main reason for the upsurge in the cost of building materials is attributed to the continuous slide of Naira against US dollar and unsustainable government manufacturing policies. Conclusively, the compounded scenarios have led to the abandonment of housing projects due to unbudgeted financial needs. Again, this has been responsible for hike in house rent and lease due to shortage of housing units for teeming population. It is therefore recommended that the cost of building materials should be drastically reduced by 60%; and this will quadruple the rate of construction. Also, the government and other stakeholders should get involved to fund research that will promote local content and the use of indigenous construction materials.

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