Rethinking Bricks as a Means of Improving Social Housing Delivery in Nigeria

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Authors’ contributions

This work was carried out in collaboration among all authors. Author MIO designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author FOE managed the analyses and supervised every stage of the study. Authors JIO and DOK managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

This research appraises the possibility of using bricks as an alternative to sandcrete block towards solving the housing problem of the lower income group in Nigeria. The study adopted the survey method through interview and questionnaires. The simple random sampling approach was used and the sample size of the study was purposively put at 200. A total of 182 were returned and used for analysis. This represents 91% response rate which is very good for this kind of research. The identified perception of how respondents place value on properties and the advantages of bricks were ranked using relative importance index. The study found out that majority of the people in the study area is in the low income group and has never stayed in houses made of bricks. Although the rating of bricks construction was very high, the study found out that its usage in their locality was very poor. It was further revealed that security and condition of the area (0.913), architectural design (0.907) and quality of finishing (0.874) ranked high on the factors that affects the value they placed on property. The study also revealed that durability (0.892), natural material (0.873), promotion of local material (0.869) cost advantage (0.780), easy to recycle (0.766), health benefits (0.770) and others are among the numerous benefits offered by compressed clay bricks. The study...
concluded that the housing deficit problems in the country could be reduced by encouraging the use of compressed clay bricks for massive production of social housing for the lower Income groups. The study recommends that demonstration project that will infuse confidence among the people for using the bricks construction technology for buildings should be encouraged. This will help to improve the acceptability of the material and as well eliminate the bias mindedness and stigma attached to the material.

Keywords: Construction; housing; bricks; social housing; no-income and low-income earners; housing delivery.

1. INTRODUCTION

Housing has been described as a basic human need just as food and clothing [1]. [2] stated that housing is very fundamental to the welfare, survival and health of man. According to [3] housing refers to the physical structure that man uses as shelter and the facilities/ amenities and other aspect of the social environment which links man with his remote and immediate environment. Unfortunately, shortage of housing stock both in number, quality and functionality abounds virtually in every country, especially in the developing and third world countries [4]. The housing situation in the developing world is presently worrisome, and the prospects of escalation of the problem are obvious considering that most of the urban population increase in the world, in fact 95%, will be in the developing world [5]. The quantitative deficit in housing all over the world has been escalating: 650 million in 1990, 760 million in 2000 and 863 million in 2014 [6]. In Nigeria alone, the housing deficit stands at over 17 million units.

According to [7], Nigeria need 17 to 20 million housing units to address the current housing deficit in the country while [8] reiterated that, housing need in Nigeria increases by the day. One of the main causes of this dearth of housing stock as seen by various researchers [1,9-12] is the present high cost of building materials, which consequently has brought about increase in cost of housing and rent, such that low income earners may not be able to afford adequate housing. It is imperative for Nigeria to toe the footsteps of other developing nations such as Brazil, by utilizing its local building materials and technologies in meeting the housing needs of low- and mid-income earners [13]. Stressed that the growing housing needs of low- and mid-income earners could be significantly met through the use of alternative building materials and methods, citing red bricks as viable alternative to sandcrete blocks. It is to this end that this paper seeks to address the current housing delivery problem for the low- and mid-income earners by highlighting the need to encourage the construction of social housing using compressed laterite brick as an alternative to sandcrete block.

2. LITERATURE REVIEW

2.1 Concept of Social Housing

Social housing is interpreted in different ways. However, each country has forms of housing that are broadly designed to satisfy the needs of households who are unable to compete in the marketplace for housing of an acceptable standard [14]. Regardless of the form it may take, social housing is supplied at prices that are lower than the general housing market and it is distributed through administrative procedures [15]. Put simply, Social housing is the response by government to the housing challenges of ‘No and Low’ income earners.

It is no news that majority of Nigerians are in the no-income, low-income and lower-medium income groups [16]. In agreement to this, [17] buttressed this point by stating that Nigeria has overtaken India as the country with the most extreme poor people in the world. This has led to a competition amongst the top class and the middle class in either buying or renting affordable housing.

Also, [18] stressed that this competition drives up the cost of housing so that the most minimal
standard of formal sector housing is unaffordable to the low-income group. For example, according to [19], low-income households spent more proportion of their income on housing than upper-income households and that the low-income groups have diversity of demand for housing. This diversity arises from the fact that the low-income groups may have nothing to spend on housing because almost all their income is spend on daily necessities (basic needs). Now, in the bid to ensure that this class has access to affordable housing, social housing was conceived.

2.2 Definition of No-Income, Low-Income and Lower-Medium Income Groups

The No-income group is here defined as all persons whose income does not exceed the national average of 25% of the National Minimum wage. The low income group is here defined as all persons whose annual income exceeds the ‘No Income’ level, but does not exceed the National Minimum Wage. The lower-medium income group is here defined as all persons whose annual income exceeds the National Minimum Wage, but does not exceed four times the National Minimum Wage. The goal of government is to ensure that this segment of the population has access to housing.

2.3 Suitability of Red Bricks Construction

Brick masonry (construction) is quiet the most famous building material especially in developing countries because it can be handled easily and very cheap in construction [20].

Brick masonry (construction) is still used in many Countries due to its useful thermal conductivity characteristics, sufficient compressive strength, useful soundness, durability, and cheapness and easily available [21,22]. Brick masonry is the process of laying bricks in mortar as the bed and binding material in a proper way which gives composite mass to carry the loads without failing.

According to [23] the main cause which promotes red brick laying to be a viable construction material when accurately specified and erected is that, it possesses the appropriate long-lasting as well as requires little cost to be maintained. Clay brick structures (see Fig. 2) are the combination of brick and mortar assembled together which are said to be orthotropic, inelastic and non-homogeneous [21]. Clay bricks are manufactured following the process of pressing a mixed clay soil into a mould, exposing the moulded piece to sunlight and ending up with firing process. Temperature takes part as a very important item for the progress of brick characteristics [24]. The standard brick size for working purpose is 225 x 112.5 x 75 in mm dimension (see Fig. 1). In addition, this includes 10 mm mortar joints, and then the actual dimension of brick is 215 x 102.5 x 65 in mm dimension.

![Fig. 1. Standard dimension of brick](Source [25])

Similarly, [26] described red brick to be good in resisting compressive strength, poor thermal insulator for heat loss from the building, good fire resistance during the spread of fire and aesthetically superb when given good supervision and workmanship. [26] went further to describe red brick to be suitable for construction in term of its ability to be re-used when demolished for other construction purposes.

2.4 Factors Affecting Property Values with Respect to Home Purchase or Renting

Previous research has found out that the factors affecting residential property value depends on a number of variables because housing is a heterogeneous commodity. According to [27], factors that affect property values can be classified into property variables, environmental variables, neighborhood variables and accessibility variables. Furthermore, [28] put forward the following as factors that affect the value of a property:

1. **Size of property**: One can generally assert that the bigger a property, the higher the value. For example, a piece of land may be more valuable than another parcel an acre of land in similar location.
Also, a 12 storey office complex may command a higher value than a two storey office complex in a similar location. However, size should not be limited to physical outlook alone, it must embrace the extent of use and how fragmented the interest subsisting in such property.

2. **Architectural design:** The design of a building may have an adverse effect on the value of the property. Similarly, a well-designed property enjoys an enhanced value, and ensures that all necessary facilities and utilities are provided and well positioned in a house. For instance, the provision of conveniences and adequate parking space would have a reflection on the property value. A good design should include cross ventilation, good layout and enhancement of the aesthetic convenience and beauty of any property [29].

3. **Quality of finishing:** Finishing being the exposed or visible parts of a building need to exhibit quality aesthetics, durability, and functionality. To achieve good quality of finishing, a high level of workmanship is required at the time of construction or installation. The cost of finishing could be as high as 50% of the total cost of construction and may be more when the very best of finishes are used. Floors may be finished in any of marble, terrazzo, PVC /ceramic tiles and cement screed. Walls are finished with various types of paints, usually texcote, gloss, and emulsion and possibly with marble while polish or gloss paint may be applied to wooden surface. Metal surfaces on the other hand, may be protected with gloss paint or anti-trust coating. The fact is, location provides a reflection on the type of finishes applicable to property in order for such property to command its true market worth, otherwise such building could be rendered physically and functional lay obsolete.

4. **Security and condition of the street:** A residential property in prime location with maximum security for life and properties will attract more demand and it is more valuable to investors and homeowners than a property in slum or congested areas.

5. **Age:** Age is one factor that affects the value of a property most often than not negatively, particularly where the property is not well maintained. As the property is in continues use, the physical fabrics and the functionality of such property can start deteriorating as a result of wear and tear, effects of harsh weather condition and lack of maintenance thereby reducing the value of such asset.

6. **Location:** Location is a major determinant of value for real property. A property located in an urban area will value high but if same property is to be built in an agrarian rural area, the value of such property will drop.
2.5 Advantages of Bricks as a Construction Material

Some of the advantages of bricks as a construction material includes but not limited to the following:

1. Durability: A wall made of bricks does not easily deteriorate like other construction materials. It also reduces the risk of all kinds of crack in the building.

2. Natural material: Bricks are naturally sourced material which the use of it does not have an adverse effect on the environment. The use of bricks does not pollute the environment in any way. Therefore, one can say that bricks construction is an eco-friendly construction material.

3. Health benefit: Bricks are 100% inorganic and absorbs humidity better than other materials used in construction. The use of bricks minimizes the risk of mildew and dust which has an adverse effect on the health of the occupants of the building.

4. Cost advantage: A house made entirely of bricks is cost effective both on the short-run and the long-run. On the short-run, it is cheaper because the raw material used in producing brick is locally sourced and on the long-run it is cheaper because the cost maintaining a brick-made house is relatively cheaper than maintaining a house made of other construction materials.

5. Sound proof: Brick offers the best sound absorption between two rooms. Sound emanating from outside cannot penetrate a building made of bricks easily because the walls are usually very thick.

6. Brick is weatherproof: The most endearing quality of a brick home is its ability to withstand the test of time, even under the harshest environmental conditions. There is no need for painting, sealing or cladding when brick is in use for construction houses [29].

7. Brick is creative and colourful: The aesthetic qualities of a brick makes it stands out among other construction materials. From striking rich chocolate to glorious vintage red to creamy almond etc. the natural earthy material of bricks provide impressive and lasting colour contrast, perfect in any setting [30].

8. Easy to recycle: Being a construction material made from natural earthly material (clay), bricks can easily be recycled and reproduced for further use either in the building industry or the ceramic industry.

9. Earth construction promotes local culture, heritage, and material: The use of bricks in construction of modern buildings helps to retain the sense of African artistic element of our ancient structures. This simply means that the use of earthly material such as brick in construction helps us to retain and in a way promote our local culture, the heritage we have from our fore parents because the brick still returns the clayish colour of the ancient buildings which our ancestors where known for. But now being transformed into modern use through the conversion of clay into bricks for construction of buildings.

2.6 Constraints of Bricks Construction

In his study, [31] reported that in spite of the well-established technology and the good qualities of earth bricks, it also has its limitations at both the public and the private sector level. The constraints are mainly due to:

1. The acceptability of the material in view of bias and stigma attached to the material. Otherwise considered to be the kind material used only by poor people living in rural areas.

2. The overemphasis in the use of materials like sandcrete blocks to be of higher strength in tendency to adopt a safer pattern of using established materials.

3. The lack of demonstration project that will infuse confidence among the people for using the earthen construction technology for housing and buildings

3. METHODOLOGY

This study was carried out in Anambra State, Nigeria, using a survey method. Data was obtained from a survey of high density areas of Awka, Onitsha, Nnewi and Ekwlobia in Anambra state. In each of the selected areas, a questionnaire was administered making a total of two hundred (200) questionnaires. However, Out of 200 questionnaires distributed, a total of 182 were returned completed and used for analysis. This represents 91% response rate which is very good for this kind of research.
With Likert scale, people’s reactions to their perception of value on a house and as well the advantages offered by the use of brick in construction of the new buildings as compared to the former alternative (sandcrete block) was weighted and compared with one another to reflect the impacts of such developments (based on the people’s attached value) on their immediate community. The score for the assessment ranges from 5-1 for strongly agree, agree, undecided, disagree, and strongly disagree, respectively.

Being a survey research, data were collected through structured questionnaire administered to the selected respondents. While, tables, mean score and relative important index (RII) were used for data analysis and presentation. RII was computed using:

\[
RII = \frac{\sum Fx}{A*N}
\]

Where:

- \(\sum Fx\) = Weight given to each statement by respondents and ranges 1 – 5
- \(A\) = Higher Response Integer
- \(N\) = Total Number of Respondents

### 4. RESULTS AND DISCUSSION

Table 1 revealed that majority of the respondents are federal civil/public servant (53.30%) and private employee (20.88%). State civil/public servant, Self-employed and Not employed has a combined rate of 25.82% making it one quarter of the total respondents and hence very relevant to this study.

However, it could be seen from Table 2 that the respondents are largely low and mid-level grade level staff (a combined rate of 75.87%) in their respective working place thereby making them the exact target population for this study.

Table 3 represents the monthly income of these respondents. The results show that majority of the respondents are in the category of No-Income (23.08%), Low-Income (9.34%) and Lower-Medium Income groups (43.41%). Similarly, there percentage rating combined to a whopping 75.83% and 24.17% for the medium and top level earners. This high rate of No-Income (23.08%), Low-Income (9.34%) and Lower-Medium Income groups therefore validates the effort of this study to provide affordable housing to this category of persons despite their poor income level.
Table 5 sought for the opinions of the respondents on what affects the value they place on property. The respondents ranked security and condition of the area 1st with RII value of 0.913, followed by Architectural design 2nd with RII value of 0.907. Also, from Table 5, the impact of perception of property value ranking from 1st to 3rd can be regarded as high, while those ranking from 4th to 6th could be regarded as moderate. Apart from security and condition of the area, the 2nd and 3rd high ranking factor could be achieved with bricks construction with a reasonable degree of ease and flexibility.

Table 6 revealed and ranked the numerous advantages offered by bricks construction especially against other form/alternative building material. It was found that durability (0.892) ranked 1st thereby reestablishing the fact that bricks construction will stand the test of time. Natural material (0.873) and Promotion of local material (0.869) ranked 2nd and 3rd respectively. This is an eye opener and a panacea to the high cost of building material and preference of foreign made materials to the locally made. Since its usage is durable and can be gotten from the abundance of natural material around us, then its usage should be equally encouraged thereby promoting the use of local material.

### Fig. 3. Respondents reaction on ever living in a house made of bricks

![Graph showing respondents reaction](image)

Table 4. Rating of bricks construction

<table>
<thead>
<tr>
<th>Rating</th>
<th>Frequency</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very good</td>
<td>50</td>
<td>27.47</td>
</tr>
<tr>
<td>Good</td>
<td>104</td>
<td>57.14</td>
</tr>
<tr>
<td>Fair</td>
<td>28</td>
<td>15.39</td>
</tr>
<tr>
<td>Poor</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>very poor</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>182</td>
<td>100</td>
</tr>
</tbody>
</table>
### Table 5. Respondents perception of property value

<table>
<thead>
<tr>
<th>Reaction</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>(ΣF)</th>
<th>ΣFx</th>
<th>Mean</th>
<th>RII</th>
<th>Rank</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size of property</td>
<td>32.8%(60)</td>
<td>41.4%(75)</td>
<td>22.4%(41)</td>
<td>1.7%(3)</td>
<td>1.7%(3)</td>
<td>182</td>
<td>732</td>
<td>4.022</td>
<td>0.804</td>
<td>5th</td>
<td>Moderate</td>
</tr>
<tr>
<td>Age</td>
<td>34.5%(63)</td>
<td>34.5%(63)</td>
<td>25.9%(47)</td>
<td>5.2%(9)</td>
<td>0.0%(0)</td>
<td>182</td>
<td>726</td>
<td>3.989</td>
<td>0.798</td>
<td>6th</td>
<td>Moderate</td>
</tr>
<tr>
<td>Location</td>
<td>56.9%(103)</td>
<td>27.6%(50)</td>
<td>12.1%(23)</td>
<td>1.7%(3)</td>
<td>1.7%(3)</td>
<td>182</td>
<td>793</td>
<td>4.357</td>
<td>0.871</td>
<td>4th</td>
<td>Moderate</td>
</tr>
<tr>
<td>Architectural design</td>
<td>65.5%(119)</td>
<td>22.4%(41)</td>
<td>12.1%(22)</td>
<td>0.0%(0)</td>
<td>0.0%(0)</td>
<td>182</td>
<td>825</td>
<td>4.533</td>
<td>0.907</td>
<td>2nd</td>
<td>High</td>
</tr>
<tr>
<td>Quality of finishing</td>
<td>62.1%(113)</td>
<td>27.6%(50)</td>
<td>10.3%(19)</td>
<td>0.0%(0)</td>
<td>0.0%(0)</td>
<td>182</td>
<td>795</td>
<td>4.368</td>
<td>0.874</td>
<td>3rd</td>
<td>High</td>
</tr>
<tr>
<td>Security and condition of the area</td>
<td>69.0%(125)</td>
<td>22.4%(41)</td>
<td>6.9%(13)</td>
<td>0.0%(0)</td>
<td>1.7%(3)</td>
<td>182</td>
<td>831</td>
<td>4.566</td>
<td>0.913</td>
<td>1st</td>
<td>High</td>
</tr>
</tbody>
</table>

5 – 1 (Very significant to Least)

### Table 6. Advantages of bricks construction

<table>
<thead>
<tr>
<th>Advantages</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>(ΣF)</th>
<th>ΣFx</th>
<th>Mean</th>
<th>RII</th>
<th>Rank</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Durability</td>
<td>53.4%(97)</td>
<td>39.7%(72)</td>
<td>6.9%(13)</td>
<td>0.0%(0)</td>
<td>0.0%(0)</td>
<td>182</td>
<td>812</td>
<td>4.462</td>
<td>0.892</td>
<td>1st</td>
<td>High</td>
</tr>
<tr>
<td>Natural material</td>
<td>48.3%(88)</td>
<td>39.7%(72)</td>
<td>12.1%(22)</td>
<td>0.0%(0)</td>
<td>0.0%(0)</td>
<td>182</td>
<td>794</td>
<td>4.363</td>
<td>0.873</td>
<td>2nd</td>
<td>High</td>
</tr>
<tr>
<td>Health benefit</td>
<td>22.4%(41)</td>
<td>44.8%(82)</td>
<td>29.3%(53)</td>
<td>1.7%(3)</td>
<td>1.7%(3)</td>
<td>182</td>
<td>701</td>
<td>3.852</td>
<td>0.770</td>
<td>7th</td>
<td>Moderate</td>
</tr>
<tr>
<td>Weatherproof</td>
<td>22.4%(41)</td>
<td>36.2%(66)</td>
<td>34.5%(63)</td>
<td>5.2%(9)</td>
<td>1.7%(3)</td>
<td>182</td>
<td>679</td>
<td>3.731</td>
<td>0.746</td>
<td>9th</td>
<td>Moderate</td>
</tr>
<tr>
<td>Sound proof</td>
<td>29.3%(53)</td>
<td>48.3%(88)</td>
<td>20.7%(38)</td>
<td>1.7%(3)</td>
<td>0.0%(0)</td>
<td>182</td>
<td>737</td>
<td>4.049</td>
<td>0.810</td>
<td>5th</td>
<td>Moderate</td>
</tr>
<tr>
<td>Cost advantage</td>
<td>19.0%(35)</td>
<td>55.2%(100)</td>
<td>22.4%(41)</td>
<td>3.4%(6)</td>
<td>0.0%(0)</td>
<td>182</td>
<td>710</td>
<td>3.901</td>
<td>0.780</td>
<td>6th</td>
<td>Moderate</td>
</tr>
<tr>
<td>Creativity and colourful</td>
<td>37.9%(69)</td>
<td>53.4%(97)</td>
<td>6.9%(13)</td>
<td>1.7%(3)</td>
<td>0.0%(0)</td>
<td>182</td>
<td>778</td>
<td>4.275</td>
<td>0.855</td>
<td>4th</td>
<td>Moderate</td>
</tr>
<tr>
<td>Easy to recycle</td>
<td>22.4%(41)</td>
<td>44.8%(82)</td>
<td>25.9%(46)</td>
<td>6.9%(13)</td>
<td>0.0%(0)</td>
<td>182</td>
<td>697</td>
<td>3.830</td>
<td>0.766</td>
<td>8th</td>
<td>Moderate</td>
</tr>
<tr>
<td>Promotion of local material</td>
<td>51.7%(94)</td>
<td>32.8%(60)</td>
<td>13.8%(25)</td>
<td>1.7%(3)</td>
<td>0.0%(0)</td>
<td>182</td>
<td>791</td>
<td>4.346</td>
<td>0.869</td>
<td>3rd</td>
<td>High</td>
</tr>
</tbody>
</table>

5 – 1 (Very significant to Least)
Similarly, bricks allow for creativity and aesthetic (0.855), sound proof (0.810), cost advantage (0.780), etc. as they ranked 4th, 5th and 6th respectively. This, especially the cost advantage buttressed the point that compressed red earth bricks could be explored and utilized greatly in providing affordable housing for these No-Income, Low-Income and Lower-Medium Income groups. Another great advantage to note of this brick construction is the easy to recycle (0.766) and health benefit (0.746). This simply connotes that while the materials are sourced locally, its wealth of health benefits can equally not be ignored. On the other hand, red bricks allow for recycling and reusing thereby preserving the mother earth and ensuring sustainability of the environment.

5. CONCLUSION AND RECOMMENDATION

Even though compressed clay bricks have the potential for adoption as alternatives to conventional building materials, this study has found them to suffer persistent discrimination. As the nation’s population grows at an annual rate of 3.2 percent, with more than five million people, it is imperative that we as a nation and industry should tap into the wealth of compressed clay bricks such as Cost advantage, aesthetic, utilization of local material, health benefits and above all durability.

On the other hand, the use of compressed clay bricks in the construction of buildings especially in Nigeria has been constrained by various obstacles. From the perceptions of the respondents interviewed, overemphasis on the use of sandcrete blocks as against compressed clay bricks, lack of demonstration project that will infuse confidence among the people for using brick construction technology and stigma (considered to be the kind material used only by poor people living in rural areas) are the main barriers to the use of compressed clay bricks in construction.

In conclusion, the housing deficit is one of the major problems suffered by urban and rural areas in the country could be reduced by encouraging the use of compressed clay bricks for the mass production of social housing targeted at providing affordable housing for the no-Income, low-Income and Lower-Medium Income groups. The study strongly recommends the use of compressed clay bricks for massive construction of low-cost houses targeted towards providing social housing for people who, due to their low-income earnings, could not afford a decent apartment.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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