AN ANALYSIS OF THE DEGREE OF QUALITY OF INDIGENOUS BUILDING MATERIALS USED IN LAPAILOCAL GOVERNMENT AREA OF NIGER STATE, NIGERIA

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Abstract

This study examined the degree of quality of indigenous building materialsused in Lapai Local Government of Niger State, Nigeria**.** Adescriptive survey design was adopted for the study. The study utilized both primary and secondary data. A structured questionnaire was used to obtain the relevant data from a sample of 300 participants in the residents while interview guides were used to obtain data from the households. Data was presented using tables so as to compare and illustrate each research finding. Chi-square was used to test the hypothesis formulated. The study found that indigenous building materials are alternative building materials that can be harnessed for construction of houses. The materials are locally available, have high quality, cost effective and houses constructed with them are economical to maintain. Furthermore, it was obtained that the degree of utilization of the materials is also high.

Keywords: Construction, Indigenous building materials, utilization

INTRODUCTION

The construction sector is an important and indispensable sector of every economy; a precursor of national socio-economic development and a yardstick for measuring national progress(Oluwakiyesi, 2011).The sector has to an extent through public infrastructure and private physical structures been supporting the country's economic activities.

The built environment in many developing countries particularly Nigeria is fast degenerating (Lanrewaju, 2012). The factors that are responsible for this can be attributed to rapid urbanization, rural-urban migration, decades of steady economic downturn, decay of urban infrastructure and poor housing quality (Lanrewaju, 2012).The need to reverse this trend calls for the utilization of sustainable building materials for its' construction.

Sustainable building materials could have a substantial influence on the real estate characteristics and the needs for the owner - tenant oriented focused sustainability may become an imperative since it can assist in reducing the environmental impacts related with the extraction, transport, processing, fabrication, installation, reuse, recycling, and discarding of these structure basis materials (Austin 2012; Roux & Alexander, 2007). The use of sustainable building materials can provide reduced maintenance management costs over the life-cycle of the building, as well as including energy conservation, improved occupant health and productivity (Austin, 2012). Indigenous building materials could serve as a sustainable substitute in the face of high cost of imported building products.

Traditional building materials are resources that are found readily in large quantity across Nigeria. The availability may largely be dependent on geographical location of the area as well as the chemical and physical components of such materials (Onyegiri&Ugochukwu, 2016). Some of these local building material like adobe, bamboo, thatch, stones, timber, coconut tree,

grasses etc. are cheap compared to the imported materials.The potential of indigenous materials has been neglected in most developing countries; instead, the values, objectives and techniques of the western industrialized nations have been adopted by reason of imposition, good salesmanship, or simply the desire to emulate. Contributing to the neglect has been tendency of the developing world to turn to the developed world to educate its experts, unfortunately, most often to solve the wrong problems. A solution seem to be in the return to the indigenous technologies and a return to labour-intensive construction for housing, encouraging the adoption of self-help programmes and the utilization of natural indigenous local materials as natural resources for adequate community provision for the teaming population in rural areas

In the past, technological advancement made it possible to acquire building materials from developed countries one after the other. This made government to realize that importing building materials for the industries is expensive (Okunola 1998). Thus, in 1986, the Structural Adjustment Programme (SAP) was introduced to make people rely on their ingenuity, using whatever materials that is available, suitable to their environment and economic situation. Such is the case in Nigeria today and therefore, there is need to face the challenge squarely in order to improve housing affordability in the country. Aside the cost of materials, there are other impediments to inclusive housing for all and sundry. Some of which include the cost of land, construction cost and administrative and management costs (Onibokun, 1985).

Despite the contribution of construction industry to the annual gross domestic product (AGDP) and total fixed capital investment in the country, the industry still faces the challenges of low levels of working capital, high rates of inflation and increasing costs of development/construction (Ofori, 2001; Ihua, 2016).

It has also been established that construction products provide the necessary public infrastructure and private physical structures for many productive activities to thrive. Hence, the industry has a significant effect on the economy during its materials production, importation and usage (Ofori1990; Husseni,1991; Obandan&Uge, 1996).

Unbridled state of importation and taste for foreign materials in Nigeria has since being a cause of concern and worry and only a little is being done to curb the ugly trend or ameliorate the capacity of the indigenous or local materials industry. This scenario has also eroded the confidence Nigerian citizens and stakeholders have in indigenous or locally produced building materials (Ugochukwu, Obinna&Ezeokoli, 2014).

The current incessant rising costs of building materials has led to the question on whether government and stakeholders as well as individuals can embark on andsustain a residential housing units. As a result, stakeholders have continued to make calls for alternative sources of building materials (indigenous). However, there have been doubts on the quality and strength of these indigenous materials to providing a sustainable befitting living abode. The gap created by this question is what the study intends to fill.

Objective of the Study

1. The objective of the study is to ascertain the degree of quality of the indigenous building materials used in Lapai local government of Niger State

Research question

1. What is the level of quality of indigenous building materials used in Lapai local government of Niger State?

Research hypothesis

Ho: Indigenous building materialsused in Lapai local government of Niger State are not of high quality

RESEARCH METHODOLOGY

Research Design

Descriptive survey design was adopted for the study

Survey Research

The survey research involves field reconnaissance visits and administration of well structured questionnaire. Initially a map of Lapai were acquired from the Niger State Ministry of Lands and Survey as well as the Department of town Planning. A number of visits were undertaken to update the map by adding new structures and removing non existing structures and information. Once a credible base map has be prepared, two reconnaissance visits were undertaken to identify and indicate the boundaries of the various districts in Lapai and establish the urbanization stages of the town. This information is necessary and essentially for the delimitation and delineation the four zones proposed for the social survey.

Sampling Framework

For the purpose of carrying out the social survey, the entire study area is zoned into four which include areas along the four geographic coordinates- North, South, East, West in order to ensure that both the old and newer parts of the city are included in each zone. Important streets and or landmarks are used to identify the boundaries of each of these four zones. Three streets that run throughout the length and breadth of each zone and or run 2/3 of the entire length and breadth of each zones are selected using random sampling with the use of random numbers. To locate buildings and respondents for the study, the varying interval of the systematic sampling method was used. When a sampling interval is giving rise to only residential buildings constructed with indigenous or conventional materials, the interval is varied in order to accommodate and or ensure that both indigenous and conventional buildings are selected.

At each building selected for the survey, the materials for constructing the house were noted and the residents/occupants of it are served with a questionnaire. They are also orally interviewed on their perceptions, of the quality, durability and cost effectiveness of the building.

Types and Sources of Data

In the course of the study and also to accomplish the aims and objectives of the study, various methods were used in the process of data acquisition. Data that is used for the work is collected from two (2) major sources which are:

- Primary sources
- Secondary sources

Primary Sources of Data

Structured questionnaire were used to obtain the relevant data fromthe residents while interview guides were used to obtain data from the households. Field observation was also employed.

Secondary Sources of Data

The secondary data is obtained from relevant textbooks, reputable journals, conference and seminar papers, relevant maps, internet and dissertation/thesis, other areas where this data were derived include the department of works and housing at Lapai Local Government Council, Library which were repository of information were also the researcher's source of secondary data for the study. The Population Census Board wasalso visited for the secondary data.

Sampling Techniques

To have a proper coverage of the study area, multistage random sampling was used. This is the division of the study into three (3) aforementioned zones. However, three hundred (300) questionnaires were administered. Similarly, one hundred (100) questionnaires were administered to each of the three zones. Field observation was employed as a technique that wasused.

Method of Data Collection (Instrument)

Two sets of questionnaire were used for this survey. The first questionnaire, PART A were administered on socio-economic and demographic information of respondents, while PART B were administered on the quality and level of utilization of the indigenous building materials. Also oral interview is conducted in the study area.

Validity of the Instrument

In other to ensure relevant question and to reach meaningful conclusion, the research instrument was subjected to meaningful validation through several criticism and amendment. The structured questionnaire was submitted to the project supervisor and some experts in the department of Urban and Regional Planning, University of Nigeria, Nsukka for their contributions. The final copies after thorough scrutiny were produced and sent to the field for administration.

Reliability of the Instrument

For concrete content and validity to be ensured, the questionnaires were pre-tested on twenty respondents in the three zones in the study area. These were retrieved and revalidated by the project supervisor for final approval.

Method of Administration of Instrument

The questionnaires were administered to respondents in the selected zones in the study area. All the questionnaires were administered by hand; none is administered by post or by any electronic device. However, the researcher and his assistant went personally to the selected zones in the study area to administer the questionnaires. All completed questionnaires were retrieved at the spot by the researcher and his assistant. All instructions regarding how the respondents answered the questions were in very simple and clear terms.

Method of Data Analysis

Statistical method of data presentation such as table was used to compare and illustrate research finding. Chi-square was used to test the hypothesis formulated.

RESULTS

Test of Hypothesis

1. **Hi:** The objective of the study was to ascertain the degree of quality of the indigenous building materials

Table 1. Expected frequency for testing howthe quality of indigenous building materials are rated

Options	Frequency	Percentage
Very high quality	97	36.9
high quality	104	39.5
Indifference	37	14.1
Low quality	11	4.2
Very low quality	14	5.3
Total	263	100.0

Table 2. Observed and expected frequency for testing how the quality of indigenous building materials are rated

	Observed N	Expected N	Residual
Very high quality	97	52.6	44.4
high quality	104	52.6	51.4
Indifference	37	52.6	-15.6
Low quality	11	52.6	-41.6
Very low quality	14	52.6	-38.6
Total	263		

Source: SPSS version 23

Table 3. Test Statistics

	Observed and expected frequency for testing how the quality of indigenous building materials are rated
Chi-Square	153.559[a]
Df	4
Asymp. Sig.	.000

Source: SPSS version 23

a. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 52.6.

Substituting values, we have

$X^{2=} \frac{(44.4)^2}{52.6} + \frac{(51.4)^2}{52.6} + \frac{(-15.6)^2}{52.6} + \frac{(-41.6)^2}{52.6} + \frac{(-38.6)^2}{52.6} = 153.559$

$X^2 = 153.559 > 9.49$

Decision Rule

Reject Ho if the calculated value of X^2 is greater than the critical value of X^2 read from the data. Do not reject if otherwise.

Decision

Since the calculated value of X^2(1153.559) is greater than the critical value (9.49) of $X^{2.}$ Therefore, the null hypothesis is rejected and the alternate hypothesis accepted accordingly.

Findings

1. Indigenous building materials are alternative building materials that can be harnessed for construction of houses. The materials are locally available, have high quality, cost effective and houses constructed with them are economical to maintain.
2. The degree of utilization of the materials is also high as a larger percentage of the people have utilized the materials in one element of the building or the other; the most common is the use of timber doors still in vogue throughout the world today.
3. The greatest underlying factor of utilization of the materials by the people is the quality of the materials. This was followed by the availability of the materials. Despite the fact that the building materials are economical in nature, income plays a minor role in the utilization of the materials.

Discussion of Findings

The study found that the indigenous materials being used in LaipaiLocal government are of high quality. The finding agrees withStulz&Mulkerji(1988),Belay, Elias, Johansson, and Johansson,(1995) and Okunola (1998).Stulz&Mulkerji (1988) opine that stone is the oldest and the most abundant and durable building materials, he also posits that bamboo material has a high tensile strength and consequently could be used in building construction, while hardwood is more resistant to biological attack, moisture movement

and distortion. In an experiment conducted in Ethiopia by Belay et al (1995), the result shows that the consumption of burnt/fired clay roofing tile is 120-200(mj/m roof) with a percentage of 12 while that of fibre concrete roofing tile is 35-50(mj/m roof) with a percentage of 3. while, the thermal and surface resistances for burnt clay tiles is O.16(mc/w) with a percentage of 7 while that of fibre concrete roofing tiles is O.13(MC/W) with a percentage of 6 respectively. In the ranking, it shown that fibre concrete roofing tiles was ranked the best, then followed by fired clay roofing tile with thatch roof being the least. Okunola (1998), informed that saw dust cement sheet of thickness 6mm was tested by the Forestry Research Institute in Ibadan and was found to perform satisfactorily with regards to strength and nailing thereby producing a good replacement for modern ceiling materials.

The study also agrees with Idrisu (2003) and Arayela (2005).Idirisu (2003), note that stone material has excellent structural performance, durability and insulating properties against heat and sound. He also revealed that test carried out showed that fibre based ceiling boards are excellent thermal and acoustic materials that can compete very well with the modern ceiling materials.Arayela (2005) pointed that laterite houses are appropriate for a variety of climates and are ideally suited for passive solar heating and cooling. The interior of such buildings stay warm in cold seasons and cold in the hot seasons with little, if any need for auxiliary energy.

The researcher found that one of the greatest reasons for the utilization of the materials in the construction of buildings in Lapai is the high quality of the materials (46.2%), which explains the reason why there is high correlation between the use of the material and the quality. In other words, the quality of the materials affects their use. The higher the quality, the more the materials are being used. The building material that has the best quality according to the perception of people is stone (63.9%). This is followed by stabilized landcrete brick (37.8%) with rammed earth being the least (5.4%). Also, sundried mud brick (58.2%) and burnt/fired clay bricks (41.6%) were also seen as good and durable materials. For roofing materials, fired clay roofing tile (50.6%) and fibre concrete roofing tile (42.3%) were perceived to be of high quality with only bamboo roofing tile ranked to be of poor quality (8.8%). This may be due to the fact that bamboo is easily attacked by insects and termites if not properly being put in use.

Recommendations

Based on the findings, the following recommendations are made:

1. Relevant bodies like Nigerian Building and Road Research Institute (NBRRI), Nigerian Institute for Social and Economic Research (NISER) and other private or non-governmental bodies like the Centre for African Settlement Studies and Development (CASSAD), Center for Earth Technology (CETECH) and Center for Intermediate Technology for Affordable Housing (CITAH) among others in collaboration with the professionals should conduct further studies that will conform to the socio-economic set up of people as well as locally acceptable to the people on the utilization of the materials. The standards should be in line with the national building/ housing standards as well as the various International and African agencies on housing matters. Also, the agencies should do the following among others:

   a. Identify raw materials from research and development.
   b. Provide guidelines on the construction practice for each building material to conform to taste and aesthetics.
   c. Look into the mass production of the building materials.
   d. Undergo training of professionals (e.g. experienced mason, producers etc).

Conclusion

Housing problem is one of the major areas of urban development that is being looked into throughout the world today. Nigeria too is not left out. There were various machineries put into motion such as the setting up of the National Housing policy, State Ministry of Works and Housing to mention a few at both Federal, State and Local Government levels. Despite all these attempts, little success was achieved; as a result of high cost of conventional materials that are imported which makes housing to be unaffordable to the majority of the masses.

In other to achieve sustainable housingin Nigeria, there is the need to embrace the use of cheaper, quality and locally sourced building material to replace the expensive conventional building materials that hinders housing availability and in this regard, planners too would be able to heave a sigh of relief and have a sense of achievement in the planning of the environment through decongestion of houses in cities, contraventions as well as planning controls.

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