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Usability Of Interlocking Earth Blocks In Low Cost Housing Construction In Port Harcourt Metropolis

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Abstract: ***The study centred on the usability of interlocking earth blocks in the construction of Low-Cost houses in Port Harcourt Metropolis. The study sought to ascertain how popular is the use of interlocking earth blocks in the construction of private, public and organizational estate buildings. The population of the study comprised 30 clients and 125 building contractors. The study adopted the descriptive survey design with a self structured questionnaire as the main source for data collection. Two research questions and two null hypotheses were posed and tested at 0.05 level of significance respectively. The mean, standard derivation and the z-test were adopted in the data analysis. The results of the study indicated that interlocking earth blocks are not popular in Rivers State and there are no visible houses in Port Harcourt Metropolis constructed with interlocking earth blocks. Based on the findings, some recommendations were made.***

Keywords: Usability, Interlocking Soil Blocks, Low-cost Houses, Sustainability, Nigeria.

I. INTRODUCTION/BACKGROUND OF THE STUDY

Building construction in Nigeria indeed the world over constitutes the largest single input in housing construction Adedeji, (2008) stated that about sixty (60) percent of the total housing expenditure goes for the purchase of building materials. Also, Arayela, (2005) averred that the cost of building materials constitute about 65 percent of the construction. However, Ogunsemi (2010) opined that building materials form the main factors that restrict the supply of housing and ascertained that they account for between 50-60 percent of the cost of buildings.

While advocating for the use of local building materials for low cost housing construction in Nigeria, Puyate (1997), stated that a brick wall has very good fire resistance and that moderately local materials should be used for low cost housing construction.

Building of earth dates back to 12,000 BC (Pacheco, 2012). It was a phase in the historic development of human shelter. The basic house walls in most traditional architecture in Nigeria were built of earth in simple low-cost and self-help construction arrangement.

Figure 1: Interlocking soil blocks on site

In Nigeria, the ethics of earth buildings are seen in our traditional cities as places of history (Puyate, 2016). These old buildings made of earth or mud are very good materials for promoting healthy life and reducing cost of building construction (Real, 2010).

Figure 2: school building under construction

Modern research according to Minke (2000) and Keefe (2005), has established that earth construction is sustainable with less drain on infrastructure. They further stated that the earth technology has advanced with a modern face of stabilized compressed earth blocks (CEBs) and rammed earth (RE) walls. According to the analysis of Guillaud et al (1985) revealed that, a compressed earth brick wall costs 32 percent less than sand – cement blocks. However, the analysis of Taylor and Luther (2004) showed that the large thermal capacity of earth walls improves their thermal properties above that expected by consideration of R-values alone.

Thus, the research is basically aimed at the enhancement and use of compressed interlocking blocks for construction of low-cost houses in Port Harcourt Metropolis of Rivers State.

II. RESEARCH METHODOLOGY

The following steps formed the research methodology adopted for the study as stated below.

STATEMENT OF THE PROBLEM

In Nigeria and Rivers State in particular housing constructions are on the increase as every average Nigerian wants shelter as one of the basic needs of man. The houses being constructed are in most cases done with foreign materials without the use of local building materials as cement and sand are basic materials for blocks formation instead of the use of local soil for interlocking blocks for walls construction. This constant use of cement has led to the increase in the cost of houses instead of producing low-cost housing for the citizenry. This study therefore is being carried out to ascertain whether local building contractors and clients encourage the use of interlocking soil blocks for low cost housing constructions in Port Harcourt Metropolis of Rivers State.

PURPOSE OF THE STUDY

The main purpose of the study is to determine the usability of interlocking earth blocks in the constructions of low cost houses in Port Harcourt Metropolis of Rivers State. Specifically, the study seeks to determine;

- ✓ The popularity of the use of interlocking earth blocks in the construction of low cost houses in Port Harcourt Metropolis of Rivers State.
- ✓ The number of houses constructed in Rivers State with interlocking earth blocks.

SIGNIFICANCE OF THE STUDY

The study is very significant in that, it would benefit the citizens of Rivers State to learn on how to construct low-cost houses using interlocking earth blocks without spending much money. Besides, the study will help proposed owners of living houses to appreciate the local available earth as durable, low-cost housing construction materials.

RESEARCH QUESTIONS

For the purpose of this study, the following research questions are posed;

- ✓ How popular is the use of interlocking earth blocks in the construction of low-cost houses in Port Harcourt Metropolis of Rivers State?
- ✓ How many houses are constructed with interlocking earth blocks in Port Harcourt Metropolis of Rivers State?

HYPOTHESIS OF THE STUDY

For the purpose of this study, the following null hypotheses were tested at 0.05 level of significance.

- ✓ There is no significant difference in the mean ratings of the respondents on the popularity of the use of interlocking earth blocks in the construction of low-cost houses in Port Harcourt Metropolis of Rivers State.
- ✓ There is no significant difference in the mean ratings of the respondents on the number of low-cost houses built with interlocking earth blocks in Port Harcourt Metropolis of Rivers State.

SCOPE OF THE STUDY

The study was carried out in Port Harcourt Metropolis of Rivers State. The study also centred on the use of interlocking earth blocks only.

POPULATION/SAMPLE OF THE STUDY

The population of the study includes all building clients and building contractors of building projects. The target population comprised 30 building clients and 125 building contractors.

INSTRUMENT OF THE STUDY

The study adopted a personal structured instrument on a five point Likert scale ranging from very popular (5) popular (4), UD (3) Not Popular (2) and Not very Popular (1) with their weighted optional values.

VALIDATION OF THE INSTRUMENT

The instrument for the study was face validated by two experts in measurements and evaluation.

RELIABILITY OF THE INSTRUMENT

In order to determine the internal consistency of the instrument, the reliability test was conducted through a pilot study which was conducted twice and the Crombach Alpha, was applied with an average value of 0.85 which was considered adequate for the study.

METHOD OF DATA ANALYSIS

The data collected were analyzed using the mean and standard deviation to answer the research questions while the hypotheses were tested using z-test.

In addition, from the result, any mean that has a value from 3 and above was accepted while any value that fall below 3 was regarded as rejected as shown in the tables blow.

RESEARCH QUESTION 1

HOW POPULAR IS THE USE OF INTERLOCKING EARTH BLOCKS IN THE CONSTRUCTION OF LOW-COST HOUSES IN PORT HARCOURT METROPOLIS OF RIVERS STATE?

S/No.	Factors	Building Clients			Building Contractors		
		$\bar{X}_1$	SD	Decision	$\bar{X}_2$	SD2	Decision
1.	Interlocking earth Blocks are available every where	1.59	0.92	Reject	1.67	0.66	Reject
2.	Interlocking earth blocks are manufactured daily.	1.32	0.74	Reject	1.70	0.70	Reject
3.	Interlocking earth blocks are bought daily.	1.64	1.03	Reject	1.98	1.10	Reject
4.	Interlocking Earth Blocks are used for construction.	3.25	0.86	Accept	3.95	0.95	Accept
5.	Interlocking Earth Blocks are preferred to sandcrete blocks	2.29	1.58	Reject	2.46	1.33	Reject
	Average Mean	**2.08**	**1.03**	**Reject**	**2.35**	**0.95**	**Reject**

Source: Field Survey, 2018

Table 1: Popularity in the Use of Interlocking Earth for Housing Construction in Rivers State

From Table 1 above, the respondents responded to the items as presented in the tables. For item 1 to 3 and 5 the respondents rejected the factors except for item 4 where the respondents accepted the fact that interlocking blocks are used for construction of low-cost houses with the means and standard deviation of 3.25 (0.86) and 3.95(0.95) respectively.

From the analysis, it is very obvious that interlocking earth blocks are not popular in Port Harcourt metropolis and Rivers State in general. The results of the analysis show that interlocking earth blocks are not found in block molders stands and industries as applicable to sandcrete or concrete blocks.

RESEARCH QUESTION 2

How Many Houses Are Constructed With Interlocking Earth Blocks In Port Harcourt Metropolis Of Rivers State?

S/ No.	Factors	Building Clients			Building Contractors		
		$\bar{X}_1$	SD	Decision	$\bar{X}_2$	SD2	Decision
6.	Clients prefer interlocking earth blocks often.	1.79	0.98	Reject	2.87	0.82	Reject
7.	Buildings of interlocking earth blocks are many in Port Harcourt Metropolis	2.57	0.62	Reject	2.40	0.85	Reject
8.	Government of Rivers State encourages the use of interlocking earth blocks	2.40	0.68	Reject	2.35	0.86	Reject
9.	Houses built with interlocking blocks are more than 100	2.20	0.58	Reject	2.75	0.68	Reject
	Average Mean	**2.19**	**0.72**	**Reject**	**2.59**	**0.80**	Reject

Source: Field Survey, 2018

Table 2: Number of Houses Constructed with Interlocking Earth Blocks in Rivers State

Results from Table 2 indicate that the respondents rejected all the optional items. This shows that there are no visible houses or estates privately owned or constructed houses by the government of Rivers State.

The results also indicate that interlocking earth blocks are not used by neither clients nor contractors in Port Harcourt Metropolis of Rivers State with the results as (1.79) 0.98 and (2.87) 0.82; (2.57) 0.62 and (2.40) 0.85; (2.40) 0.68 and (2.35) 0.86; (2.20) 0.58 and (2.75) 0.68 with overall average means of (2.19) 0.72 and (2.59) 0.80 with clients and building contractors respectively.

HYPOTHESES TESTING

HYPOTHESIS 1

H_{o1}*:*There is no significant difference in the mean ratings of respondents on the popularity of the use of interlocking earth blocks in the construction of low-cost house in Port Harcourt Metropolis of Rivers State.

Respondents Category	$\bar{X}$	SD	N	Df	Z-cal	Z-cri	P	Decision
Clients	1.83	1.01	30	153	-1.85	1.96	0.05	Accept
Building Contractors	2.21	0.94	153					Not significant

Source: Field Survey, 2018

Table 3

The results from Table 3 showed that the values of the means for clients and building contractors are (1.83) and (2.21) with Z-cal (-1.85) @ P (0.05) and the value of Z-tab (critical) 1.96 from the results, it means that there is no significant difference between the mean ratings of the respondents. Hence, the null hypothesis is accepted and the alternative hypothesis is rejected.

HYPOTHESIS 2

H_{o2}: There is no significant difference in the mean ratings of the respondents on the number of low-cost houses built with interlocking earth blocks in Port Harcourt Metropolis of Rivers State.

Respondents Category	$\bar{X}$	SD	N	Df	Z-cal	Z-cri	P	Decision
Clients	2.61	0.85	30	153	-2.73	1.96	0.05	Accept
Building Contractors	3.09	0.86	125					Not Significant

Source: Field Survey, 2018

Table 4

From Table 4 above, the results of the analysis indicated that the means and standard deviation of clients and building contractors are 2.61 (0.85) and 3.09 (0.86) respectively while the Z-cal and Z-cri are -2.73 and 1.96 respectively. From the interpretation of the results the value of Z-cal (-2.73) is less than z-cri (1.96) hence there is no significance. Thus, the null hypothesis is accepted and the alternative hypothesis rejected.

III. CONCLUSION/RECOMMENDATIONS

From the results above, it is hereby concluded that the use of interlocking earth blocks is not popular and the number of houses built in form of estates is not certain as it is not being used as concrete or sandcrete blocks are.

Based on the findings above, it is hereby recommended that:

- ✓ Government should as a matter of urgency advertise the benefits using interlocking earth blocks for construction of public buildings such as schools, hospitals, markets and increase the level of usage in Rivers State.
- ✓ University disciplines as architecture, engineering, building and other disciplines involved in building should include in their curricula courses on sustainable materials and construction techniques.
- ✓ Technical colleges and trades centers should also include the use and manufacturing process of interlocking earth blocks in their training.
- ✓ Clients and building contractors should also be encouraged and educated on building with interlocking earth blocks.

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