MIXED COMPONENTS: THE SPATIAL AND SOCIO-ECONOMIC IMPLICATIONS OF A WALL CONSTRUCTION TECHNIC FOR HOUSING UPGRADE IN OGBOMOSO NIGERIA

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ABSTRACT

This study focuses on mixed components, house upgrading in Ogbomoso, Nigeria. Specifically, the study examines the spatial and socio-economic implications of wall components resulting from a combination of two or more structurally and physically dissimilar materials in a single residential building. This is with the dual objective of first, examining the popularity and thus, level of acceptability of this as house upgrading technique across the city; and second establishing in which socio-economic class of residents the practice is more prevalent. The study was carried out on 1,247 sampled houses across the three distinct residential zones of the city. Descriptive and inferential analysis of scores show that the strategy is significantly popular among residents in the high, followed by the low, and least in the medium density residential zones of the city.

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INTRODUCTION

Provision of adequate, decent housing accommodation for the citizens, has been described as a most intractable problem of the Third World nations, including Nigeria (Agarwal, 1981). In Nigeria, studies in the urban cities of the country with glaring evidence of inadequate housing and infrastructural facilities to match immigration have proved this again and again (Acquaye, 1985; Abiodun, 1985; Salau, 1990; Adedokun, 1990; Atolagbe, 2011). These studies, severally reiterated the widening gap between households with and without decent housing facilities in the Nigerian urban areas; despite government attempts at reducing same through series of public housing finance policies and schemes. The crux of the problem is the low financial capacity of governments to facilitate minimally decent housing units for the needing populace (Gana, 2011; Matazu, 2011), and the inability of the majority of Nigerians to afford same. This is attributed to high cost of land, import-based building materials and technics and the low income regime of the working class. The solution to Nigerian housing problem has therefore been located in the use of low-cost (or non-cost), materials, technics and energy (Atolagbe and Fadamiro, 2005). The latter include indigenous, or locally sourced materials and technics with minimal or non-import content, which are today popularly attested to and cupiously advocated in contemporary research findings.

Studies by Agarwal (1981), I.L.O. (1987), Chukwuali (1992) and Ayeyemi (2007), recommend the use of earth for walls, floors and roof. Similarly, Akinmusuru (1985), Olateju (1993), and Adewumi and Osunade (1997), recommend the use of bamboo and splints for earth reinforcement. Generally, Olateju (1989) and Atolagbe and Adeyemi (2000), have demonstrated the cost-effectiveness of locally sourced building materials for low-cost housing in Nigeria.

These findings, however, have little impression on the majority of aspirants into house-ownership; who consider the use of indigenous materials and technics as de-meaning to their social status in the community. Thus, except for the very low socio-economic class in the city, most housing aspirants crave the use of conventional building materials and styles that have large import content; and are relatively more cost-intensive.

Houses have life spans, that may vary with the materials, technics and quality of workmanship. Atolagbe (1995; 2011:49), established that the oldest set of houses in Ogbomoso are in the high density residential zone of the city. These are houses of indigenous materials that have been constructed since precolonial days. A greater number of the roof and wall components

of these houses are today at different stages of dilapidation; calling for renovation in the form of repairing or replacing. Repairing or replacement of roof components vary very little in the city. Ever since the use of metal roof in the colonial period, most houses had gradually changed roof covering from thatch to metal sheets. At the time of data collection for this study, virtually all permanent residential houses in all the zones of the city had adopted metal roof covering over wooden or timber structures. Replacement of dillapidating roof components is still, today, very predominantly done with metal sheets.

The focus of this study, however, is with wall components; in which the replacement of a broken-down part may, probably (hypothesis) vary with the zone and the socio-economics of residents in the city.

Generally, from reconnaissance study, wall components are popularly mixed in the following variations in the city.

- coursed earth and sand-cement block walls.
- coursed earth and earth brick walls.
- coursed earth and metal (roof sheet) for fencing.
- sand cement brick and plank/wooden slab walls.
- Sand cement blocks/burnt bricks.

Details of what wall mixes are popular or most frequent in each zone of the city are not currently the concern of this study; but rather, the popularity of this strategy of housing improvement (in any form), in the city? What is the proportion of mixed and single wall components in each zone of the city? What percentage of walls in each zone of the city have what number of mixed wall components? In which zone do we have the largest mixes? What is the spatial and socio-economic implications of the findings.

METHODOLOGY

The study city, Ogbomoso, was divided into three city blocks; viz, the high medium and low density residential zones. All streets in these zones were listed from the street map of the city, giving a total of 36, 30 and 28 in the high, medium and low density zones, respectively. Through a multi-stage sampling procedure, every fifth house was sampled from fifty percent of the streets from each zone, giving a total of 1247 houses in the city, at 507, 377 and 363 houses from the high, medium and low density residential zones, respectively. Observations were made

in each sampled house to determine answers to three pertinent questions. The first was a two-variable question: to know if the house had only one or more than one wall components. Answers were recorded as "No" and "Yes" for houses with one and more than one wall components, respectively (Table 1) The second question was of five variables; to know how many wall components each sampled house had. These ranged from one to more than four wall components per house in the city (Table 2). Scores, obtained for each of the two questions were recorded for houses in each zone of the city. The third objective sought to examine the relative level of income of residents in the different zones of the city. This was based on the monthly income of heads of sampled households. These were subjected to descriptive analysis, through the use of contingency tables. A Chi-Square test was run on each, to examine the significance of the scores as distributed across the zones of the city.

FINDINGS AND DISCUSSIONS

In this section, findings on houses with single and mixed wall components and the mixed-component status of housing walls across the zones of the city are discussed. The socio-economic and spatial implications of multiple wall components are also discussed.

Houses with Single and Mixed Wall Components: About 67 percent of houses in the city have more than one, as against 28 percent, that have only one wall component. Across the city, about 42, 16 and 19 percents of the houses have walls consisting more than a component in the high, medium and low density residential zones of the city. In contrast houses with only one wall component are significantly more in the low, followed by the medium and least in the high density residential zones of the city, respectively. Thus, houses with one wall component significantly decreases with increasing residential density; whereas those with mixed walls are higher in the high and lowest in the medium. The result is significant at 99 percent level of confidence; with a Chi-Square value of 112.177 and probability value of 0.000. This result is understandable considering the history and characteristics of houses in the three zones of the city. Houses in the high residential zone of the city are older in age, built during the precolonial period of Nigerian history and are thus expected to contain more walls with structural problems occasioning replacement of whole or dilapidate portions. Secondly, wall materials in this zone are predominantly of earth; an indigenous wall material that is structurally weaker in tension and thus have shorter life spans. In contrast, houses in the medium and low density residential zones

are increasingly of sandcrete blocks, which are more structurally stable (Table 1). The percentage of houses with mixed components in the low density residential zone is higher than in the medium density zone. This may appear as an aberation, considering houses in the medium are older than those in the low density zones. The explanation for this can be provided from the findings in Atolagbe (2011); which showed that an increasing number of indigenous housing form (with earth walls), have recently been put up in the low residential, post-independent zone of the city. These set of earth-wall houses are structurally worse off than older ones in the high density residential zone of the city for two reasons.

First builders with building skill in indigenous earth, has for long been at worrisome decline in the industry. The very few ones remaining are old and retired. In any case they can no longer mutter enough energy to cope with the mixing, threading and kneading that building earth requires to make a plastic, workable material for a strong earth wall. Second, the new generation of builders are not in the least interested in indigenous building practice, as residents' disdain for these walls have rendered the market unimpressive. Consequent upon these, earth walls in the low density residential zone of the city are much less structurally viable and thus, more readily succeptible to untimely failure. The failure of these recent walls in the low density residential zone may explain the higher percentage of walls with multiple component in the low, than the high residential zones (Table 1).

Table 1: Houses with Single and Multiple Wall Components

Is wall of mixed or single component	**Residential Density Zones**								**Chi-Sq Value**	**P. Value**
	High		Medium		Low		Total			
	No	%	No	%	No	%	No	%	112.77	0.000
No response	25	4.9	18	4.8	13	3.6	56	4.5		
Yes	212	41.8	69	16.2	69	19.1	841	67.4		
No	270	53.3	290	76.9	281	77.4	350	28.1		
Total	507	100	377	100	363	100	1247	100		

Source: Author's Computation Using SPSS 10 (2011)

Component Status of Walls: The distribution of houses with respect to the number of wall components is shown in Table 2. Houses with only one wall component stands at 67.4 percent in the city. This consists of 53.3, 34.5 and 7.4 percents of housing walls in the high, medium and low density residential zones of the city. These represent houses in the city, whose walls have no need for rebuilding or replacement. They can be passed for houses whose walls are still stable, or at least has no need for remediation attention of owners, for now.

The largest category of houses in the city are those with two, (coursed earth and sandcrete), wall components. This accounts for over 78 percent of the houses in the city, prevailent at 24.1, 13.0 and 16.0 percents in the high, medium and low density residential zones of the city. Such category of walls is highest (24.1%) in the older, precolonial parts of the city- the high density residential zone (Figures 1).

Figure 1: Sandcrete and Coursed Earth Mix; Baale Aguodo Compound (High Residential Density Zone).

This is followed by the low and medium density zones in succession. The trend is similar for houses with three (3) wall components in the city; at 13.0, 2.1 and 2.8 percents for high, medium and low density zones.

Majority of the dilapidate earth walls in the high density residential zone are still being replaced with earth walls. Since these replacements are with similar materials, the walls are still of one-component; and not mixed. This may also account in part for the significantly higher number of one-component walls in the high than the medium density zone of the city. In addition residents in the high density residential zones often remain in their houses inspite of visible signs of failure; for lack of financial where-wither to effect replacement of ailing components.

Figure 2: Apaina Compound, Masifa Area, Ogbomoso: Earth sandwitched between sandcrate block wall (in circle)

Figure 3: Back of Apaina Compound, Masifa Area, Ogbomoso: (Coursed Earth with Sandcement blocks).

About 24 (4.7%), 12 (3.2%) and 1 (0.3%) of houses in the high, medium and low density zones of the city have four (4) or more wall components. The list of wall components in the city consists of coursed earth, earth bricks, sandcrete blocks and burnt earth bricks; wooden slabs and metal sheets. Of these, the combination of coursed earth and sandcrete walls is most popular Figures 1, 2 and 3.

Table 2: Wall Components across the city.

Wall Components	Residential Density Type								Chi-Sq Value	P. Value
	High		Medium		Low		Total			
No response	No	%	No	%	No	%	No	%	119.778	0.000
	25	4.9	18	4.8	13	3.6	56	4.5		
One wall components	270	53.3	290	34.5	281	77.4	841	67.4		
2 components	122	24.1	49	13.0	58	16.0	229	78.4		
3 components	66	13.0	8	2.1	10	2.8	84	6.7		
4 components	21	4.1	7	1.9	0	0	28	2.2		
More than 4 wall components	3	0.6	5	1.3	1	0.3	9	0.7		
Total	507	100	377	100	363	100	1247	100		

Source: Author's Computation, (2011).

Socio-Economic Implications of Mixed Wall Components: Atolagbe (2011) has demonstrated that education, employment, house-ownership, etc; status of residents in Ogbomoso increases significantly with lower density residential zones. The specific objective of the study in this respect is to verify this by examining the relative income of residents from the three residential zones of the city. The findings from such verification exercise (Table 3), show that residents with the highest monthly income are found significantly, in the lower density residential zones. Specifically, the entire residents in the city earning above ₦80,000 per month are exclusive to the low density residential zone. Similarly, residents earning ₦(20,001 – 40,00), ₦(40,001 – 60,000) and ₦(60,001 to 80,000) Nigerian Naira increase, significantly with lower density residential zones (Table 3). The result with a critical value of 29.588, and significant at 99 percent level of confidence, shows that economic status increases with lower density residential zones. But results from Tables 1 and 2 show that the incidence of mixed wall components increases with residential density zones. Therefore, the practice or phenomenon of mixed wall components is significantly more popular among the poorer, residents of the higher density residential zones of the city. The implication is that most residents involved in replacing broken parts of a wall with a dissimilar component are those who can ill afford the cost of

putting up a new house. In contrast, in the high density residential zone of the city, it should be noted that majority of the mixed components in the low density residential zone consist of sand-cement bricks and sand-cement blocks. Perforated blocks and steel grilles are other wall components more popular in the low, less so in the medium and least in the high density zones of the city. These are modern devices deployed by more affluent residents to increase the aesthetic and security values of their houses. They were not objects of this study.

Table 3: Income of Household Heads across the Zones of Ogbomoso.

Monthly Income in Nigerian Naira	Residential Density Zones								Chi-Sq Value	P. Value
	High		Medium		Low		Total			
	No	%	No	%	No	%	No	%	260.512	0.000
No response	151	29.8	88	23.3	80	22.0	31.9	25.6		
₦(1 – 20,000)	350	69.0	216	57.3	129	35.5	55.7	55.7		
₦(20,001 – 40,000)	06	1.2	53	14.1	92	25.3	12.1	12.1		
40,001 – 60,000	0	0	20	5.3	39	10.7	4.7	4.7		
60,001 – 80,000	0	0	0	0	15	4.1	1.2	1.2		
80,001 and above	0	0	0	0	08	2.2	0.6	0.6		
Total	507	100	377	100	363	100	1247	100		

Source: Author's Computation, (2011).

CONCLUSIONS AND RECOMMENDATIONS

Mixed wall component, the practice of replacing broken down parts of the wall of a house with another, often of different material component is done in every part of Ogbomoso. It is however more popular among residents in the higher density residential zones of the city with low economic capacity to make complete change of dilapidate components.

The incidence and indeed, the frequency of mixed wall components in the city also has socio-economic implications. Education and employment (Atolagbe 2011), and monthly income (Table 3), all increase with low density residential zones. Therefore, mixed wall components is more popular among the lower income groups of residents, mostly in the high density residential zones of the city. It is probably a viable method for these class of residents to sustain the stability of their houses; as well as their house-ownership status.

Only about 28 percent of houses in the city are built of only one wall-component. Barring about 4.5 percent that showed no response to the question, the bulk of the houses in the city, (67.4 percent), including some springing up in the new developing (low density), part of the city have their walls built from two to five components. This percentage, in a way, constitute the proportion of houses in the city whose households rely on this method to maintain a minimally decent residential accommodation. The method therefore deserves further studies, for further improvement of their strategy. It is in pursuance of this that the following recommendations may be pertinent.

The government, through the Ministry of Housing and Environment, should commission Universities and Research Institutes to conduct further research into this method of the poor. The studies should examine the structural compartibility of the different mixes, the financial implications in the choice of the composite components and the response of such mixes to the climate and living comfort of residents. Studies should also include appropriate finishes for the different mixes for sustainable housing and environmental aesthetics.

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