

Local Building Materials: a Tool Towards Effective Low-Income Housing in Nigeria

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Abstract: Shelter is primary to human existence. It has been rightly adjudged second to food in the hierarchy of human needs. Its inadequacies pose a great challenge in human well-being and it requires thorough research on housing delivery in Nigeria for effective housing. The housing inadequacy propelled most of the low income earners indulged acquiring land and constructing their desired houses. Thus, the challenges of housing affordability persisted. Therefore, this study aims to investigate the factors that responsible for the persistent housing inadequacy and unaffordability among the lower income earners. Thus, structured questionnaires were distributed to 97 randomly selected low income earners across the working sectors in Akure in Ondo State. The data collated were analyzed with SPSS. It was observed from the findings that despite government, public and private individual involvement in promoting and meeting the need of low-income earners housing problems in Nigeria, the input are with high technology and imported materials that make the cost of the housing delivery higher and unaffordable for the lower class. This paper thus, canvases the improvement and adoption of local building materials for effective housing for the low income class.

Key words:Housing delivery • Adoption local building materials • Effective housing • Lower class
• human needs • Nigeria

INTRODUCTION

Considering the health, welfare and productivity of man, housing plays a significant role. Akinola [1] submits that Housing is a spatial and material symbol, a microcosmic reflection of social and cultural expectation. It reflects the cultural, social and economic values of a society and is the best physical and historical evidences of civilization in a country [2]. The importance of housing to man cannot be over emphasized. Man spends most of his time in the 'house'. The attitude of man and his urge to work can be influenced by the type of housing provided. Despite the housing policies embarked upon in Nigeria, there is still poor and generally deteriorating urban housing condition [1]. Housing is not just shelter it involves every other facility that could bring about the comfortability of mankind. Housing quality is determined by the proximity of essential facilities, services and human daily activities. A living environment may not transform to housing if other essential human needs were absent. People would rather remain in a residential area due to the facilities provided within the housing area [3].

However, Salau [4] describes housing as total residential environment including physical structure, all necessary services, facilities and apparatus for the general health and social well-being of man. Noting the significance of housing, most Nigeria Low income classes were living in slum and an environment that run short of essential needs both in urban and rural settings. In line with this, the lower class is more affected in a bid to measure up with Housing challenge. They constitute a higher percentage of Nigeria populace. Olotuah [5] and Abdullahi *et. al.* [6] Submits that the poor are mostly affected by the situation as they reside in slum areas in urban centers and overcrowded population situated in unsanitary condition. Housing provided through various governments was too expensive and fall out of reach of the poor/the lower class. This has always been the situation. A reconnaissance survey of the housing situation in Nigeria painted a pathetic picture of an intractable problem [7]. Effective Housing demand relates to the accommodation for which people are able and willing to pay irrespective of social desires or personal aspiration that cannot be fulfilled for lack of money [8].

Table 1: Imported Building Material for Building Construction in Nigeria and the alternative Local Building Materials

S/N	BUILDING COMPONENTS	AVAILABLE IMPORTED MATERIALS	ALTERNATIVE LOCAL MATERIALS
1	A- SUBSTRUCTURE Foundation	1. Cement – Sandcrete Blocks 2. Mild steel and high tensile steel 3. Steel section 4 flat steel sheets	1. Stones and rocks 2. Stonescrete block unit
2	B- SUPER STRUCTURE Floor	1. Ceramic Tiles 2. Steel reinforcement and structural steel 3. Concrete	1. Tiber 2. Bamboo floor and foist 3. Stones and rocks
3	Structural Frames and Walls	1. Cement sandcrete blocks 2. Lime 3. Steel beams and column 4. Hardboard 5. Fibre glass 6. Bricks 7. Fibre glass 8. Plywood 9. Steel reinforcement 10. Particle Board	1. Plywood 2. Partial Board 3. Unstabilized Earth 4. Fired/unfired clay bricks 5. Hardwood 6. Bamboo walls and trusses 7. Stones and rocks 8. Stabilized laterite earth bricks
4	Roofing	1. Steel reinforcement 2. Aluminum sheets 3. Cement concrete roof 4. Fibre glass 5. Galvanized zinc sheets 6. Steel nails structural 7. Steel section	1. Bamboo roof tiles 2. Timber 3. Aluminium sheets 4. Zinc sheet 5. Asbestos sheet 6. Steel nails
5	Ceiling	1. Steel flat sheet 2. Plaster of Paris (P.O.P) 3. Fibre Boards 4. Timber 5. Plastic sheets 6. Aluminium extrusion sections	1. Plywood 2. Hardwood 3. Fibre matrix ceiling Boards 4. Asbestos sheet
6	Doors and Windows	1. Aluminium extrusion Section 2. Steel sections 3. Glass 4. Fibre board 5. Particle board 6. Ironmongery 7. Steel nails 8. Plywood 9. Hardwood	1. Steel nails 2. Plywood 3. Hardwood 4. Wooden shutters and louvres
7	Electrical Fitting	1. Lift and other electrical Appliance 2. Copper wire 3. PVC pipes 4. Electrical lamps 5. Copper pipes 6. Aluminium wire	1. Moulded wooden lamp holders 2. Aluminium wire 3. Timber poles 4. Copper wire 5. Electrical lamps
8	Plumbing	1. Water heater 2. PVC pipes and fittings 3. Wash hand basin 4. Water closet 5. Ceramics fittings 6. Steel bath 7. Steel pipes and fitting	1. Paint 2. Hardwood paneling 3. Marble 4. Terrazzo 5. Earth plastering 6. Sawdust/cement floor and wall tiles 7. Bricks tiles for floor
9	Finishing	1. Paints 2. Marble 3. Wall paper 4. Terrazzo 5. Fibre Board 6. Plaster 7. Brick tiles 8. Mosaic tiles mineral 9. Plastic sheets 10. Ceramic tiles	1. Ceramic tiles 2. Paints 3. Hardwood paneling 4. Marble 5. Terrazzo 6. Stucco plastering 7. Core and bamboo as partition and wall paneling 8. Sawdust/Cement floor and wall tiles 9. Earth plastering

This is reflected in the poor income of the lower class that makes it difficult to pay minimum cost of the building unit areas and rent for decent housing. Consequent upon this, most of the low income housing was most times hijacked by the higher and middle class. Olotuah [5] stressed that, this led to the growth of squatter settlements in many urban centers with no access to public utilities to public utilities and services. This paper acknowledges various government and private individual participation in housing delivery and established that the inadequacy was relatively based on the cost of the building which traceable to some building construction associated factors such the building materials, land availability and cost, maintenance and workmanship. Thus, via field survey, this study presented the available imported building materials that commonly use in building construction in Nigeria and proffer the alternative local building materials as applicable (Table 1).

Brief Review of Housing: past Governments Involvement: Various Governments have addressed housing problems in different ways. Right from the colonial era to the present time. Akingbohunge [9] submits that a great deal of work has been done and documented by successive writers on housing efforts in Nigeria by way of a review of Government policies and programs [7, 8, 2]. Summarily, the earlier effort was traced to 1928; the pre-independent efforts were purely towards provision of housing for senior government officials and in Government Reservation Area (G.R.A.) subsequent efforts were made in formulating various Federal government for effective housing. It was in the third National Development plan (1975 – 1980) that the low and medium housing received much attention Mortgage bank was introduced to facilitate the housing policy while town and country planning gives way for an autonomous Ministry of Housing and Environment. Housing Corporation was introduced in all the 19 States of the Federation. In the fourth National Development plan (1980-1985) Ministry of Housing becomes an agency for the Federal Housing program and the policy is to enhance the provision of both affordable building materials and low income housing. Though the housing policy witness a serious setback in the fifth national development plan (1986-1991). Starting from 1992 various governments Housing policy has been promulgated to provide specifically for the low and medium income class but the policy suffered a setback owing to several factors. Prominent among the factors is the high cost of housing

materials as it constitutes over 80% of the building cost as supported in table 1.0. Also, the reviews of various past government programs reveal that none of the Housing policy and program have been able to achieve up to 20% success.

MATERIALS AND METHOD

In carrying out this study, questionnaires were distributed to 97 randomly selected low income earners of below grade level seven (7) across the working sectors in Akure, Ondo State in the year 2007. The following experimental variables were considered in the study: Cost of Building construction (CBC), Cost of Land (CL.), Cost of Building Materials (CBM) and Cost of building Maintenance (CM) and Land Scarcity (LS). Hence, it was hypotheses that;

- H1:** Cost of building materials influences the housing inadequacy among the lower income earners in the study area.
- H2:** Cost of building construction influence the housing inadequacy among the lower income earners in the study area.
- H3:** Cost of land influence the housing inadequacy among the lower income earners in the study area.
- H4:** Land scarcity influences the housing inadequacy among the lower income earners in the study area.
- H5:** Cost of building maintenance influence the housing inadequacy among the lower income earners in the study area.

Data Processing: The questions in the questionnaire were analyzed on the basis of 5 point Likert-scale type that ranges from 5 for strongly agree and 1 for strongly disagree. The output of the analysis is presented in Table 2 and 3.

A simultaneous multiple regressions were conducted to ascertain the predicting potentials of the tested variables as indicated above. The adjusted R value was.39. This implies that 39% of the variance in the housing inadequacy was explained by the model which signifies a large effect [10]. It's important to state that the combinations of the tested predicting variable (Table 2) were significant statistically on the housing inadequacy,

Table 2: Means, standard deviation and intercorrelations for housing inadequacy and predictors

variables	M	SD	CBM	CM	LS	CL	CBC
Building inadequacy	13.67	6.96	.52**	.35**	.34**	.42**	.27*
CBM	4.31	2.77	--	.24*	.15	.21*	.27*
CM	4.53	2.18		--	.22*	.42**	.17
LS	4.23	2.13			--	.28*	.45**
CL	5.77	2.41				--	.19
CBC	4.22	2.01					--

*P<.05; ** p<.01

Table 3: Simultaneous multiple Regression analysis summary for housing inadequacy and its predictors

Hypotheses	Variables	B	SEB	<i>ā</i>
	Constant	1.08	2.64	
H1	CBM	1.72	.63	.43**
H2	CBC	.19	.36	.17
H3	CL	1.84	1.22	.36**
H4	LS	0.65	.30	.08
H5	CM	.15	.32	.04

Note. R²=.39; F=10.763, p=0.001

*P<.05; ** p<.01

F=10.763, p=0.001. However, the beta coefficient shown in the Table 3 indicates that the cost of building materials and the cost of land significantly predict the housing inadequacy among the respondents in the study area. Summarily, this finding affirms the hypotheses H1 and H3.

H1: Cost of building materials influences the housing inadequacy among the lower income earners in the study area.

H3: Cost of land influences the housing inadequacy among the lower income earners in the study area.

The finding therefore rejected the hypotheses H2, H4 and H5.

Potential of Local Building Material: Abundant deposits of clay, laterite, stone, lime, agro-industrial waste, timber, bitumen, glass sand etc., in their natural state in Nigeria complements the call for the use of these local materials for building construction purposes. Research has shown that these materials have been found useful in the building construction industry. This study itemizes its usage at various building construction stages and it further tabulates the available imported building materials and the alternative local building material options i.e.

Substructure/foundation: Earth laterite when well treated and stabilized with cement, bitumen, limes, reeds, can be used to achieve desirable strip foundation. Atolagbe [11] submits that compacted soil stabilized with cement can be used very satisfactorily for strip foundation. Stones and rocks with laterite jointly form a very strong strip foundation will stand the test of time.

Flooring: Various building flooring can be achieved with the use of local materials i.e. laterite reinforced with bamboo or coconut palm, can be used as bamboo reinforced terracrete which is as good as concrete slab. Laterite mixed with desirable workability and reinforced with reeds can be rammed as oversite on a well compacted stone hardcore. Timber when well treated impregnated with liquid preservation can be used to achieve good timber board flooring. Bamboo floor and foist provide good building flooring. Cow dung when properly mixed with clay screening produced strong and good looking floor. This can be improved with the addition of fermented leaves and bitumen to further improve the flooring having a reasonable damp resistance. Floor should always be raised above the ground level to reduce water capillarity frequency. Bamboo can also be polished and treated to form Bamboo floor and foist.

Wall and Structural Frames: Baked brick has a conductivity of 0.48 against 0.8 for the hollow concrete block. Jaiyeola [12] quoting Fathy (1973). Brick with laterite joining forms a good building wall with good conductivity advantage over the hollow concrete block. Stone jointed with laterite mortar or lime stabilized mortar produces a desirable building wall with high compressive strength. Coconut palm, bamboo and Timber treated as stakes inside earth form a desirable building wall. Akinmusuru [13] demonstrated the optimal strengthening of wood reinforced earth for walls by the use of these strips per meter width of the wall and a successful and desirable strength tolerance achieved. Earth block jointed with cement stabilized mortar provide a sound building

wall though, the proportion of cement used is still considerable looking at the findings of [12]. Earth when required to mix cement, conserves the volume of cement used because of its cohesive properties. Earth wall can also be reinforced with some additives (Vegetable, stems, reeds and straws) to achieve desirable strength and check cracking in walls. Laterite reinforced with bitumen for wall will have in addition to the strength the ability to act as a repellent to ants and rodents. Madedor and Disu [14] recommends 5% cement stabilization at 1.0N/mm² compaction efforts with seven days curing to make the blocks competitive with sandcrete blocks. As this will be ideal for building walls. Bitumen are heated or dissolved in kerosene or other aqueous emulsion to reduce its viscosity and ensure its thorough mixing with soil [15]. Clay and bricks stand out among other materials for building walls. Bolaji [16] submits that clay products are significant areas that need be explored urgently considering such advantages that go along with its usage. e.g. (Durability, aesthetic, cost effectiveness and fire resistance). He stressed further that clay wall do not necessary require plastering or painting, they do not absorb water hence prevent fungi.

Roofing: Timber coconut palm, pale and stake when well treated can be used as roof trusses and building post/column Bamboo and timber are best used when treated seasoned painted for ceiling boards. Bamboo in particular has a meaningful tensile strength depend on the various species. Fadamiro and Ogunsemi [17] submitted that the ultimate tensile strength of some species of bamboo has been found to be about the same as that of steel at its yield point. (Average 1,400kg/cm² to 2,800kg/cm²) Roofing tiles and sheets produced from stabilized soil remain a very good local material option for building roof. Timber would be in a variety of colors, forms and textures and provides opportunity for imaginative design. It was submitted that the traditional pitched roofs are the best way to cap building on the basis of longevity, on the conservative ground of fitting with other older building and they produce more interesting building [18]. Sun-dried earth blocks bricks have also been used in the constructions of vault and domes, the procedure involves laying and bonding the masonry units over a wooden framework which is to be removed when the vaults or domes becomes dried [15].

Finishes/fittings: Earth stabilized with cement forms a good plastering material. Stones can be used as stone facing on the walls while timbers are good cladding

material damp resistance ability. Core and bamboo as partition and wall paneling, ceramics tiles for wall and floors while stabilized earth are good materials for various building fittings. Windows and doors can easily be produced with timbers when well-seasoned as shown in table 3.

Recommendation: For effective use of local building materials to provide durable and affordable housing for low-income.

- Government should promulgate policy that will encourage the building industry to embark on the production of materials for building construction while the building code should accommodate local materials.
- Local materials training center should be established to train all the stakeholders in building industry on the properties, improvement, importance and usage of local building materials in their locality and methods of handling the materials for construction on site. While Government should review higher Institution curricula that accommodate available local building materials for effectiveness.
- Government should establish local materials factory that will produce all the required local materials for building construction i.e. molding of bricks with additives, preservation and seasoning timber, Testing the compatibility and compressiveness of laterite, cutting and polishing of stones, production of ceramic tiles e.t.c.
- Funds and incentives for research and development activities in Polytechnic, University and other research Institute must be regenerated and provided by both government and the industries while the research area must focus on the processing and utilization of local building materials among others.

CONCLUSION

This study recognizes the significance of housing to man and the dismal performance of both government and private sectors in the involvement of housing delivery in Nigeria dates back to the pre-independence. The involvement of individuals in the construction of their building was acknowledged among the lower income earners as a means of providing themselves an affordable housing. It asserted that the setback witnessed in providing housing for the low-income via their personal efforts was hinged on the high cost of the building materials which can be traced to high rates of imported

materials used for construction that's attracted much cost compared to the local building materials. The local building materials exhibited lower and affordability cost for the lower income. Mores, there is varied alternative building material that can serve the need and purpose of the imported materials if proper knowledge and encouragement were given to the Nigerian citizen by the government. As such, the Nigerian citizen will enjoy housing affordability for the lower income earners that constitutes the larger population.

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