

Traditional Building Materials in Housing Construction: Usage and Maintenance Strategy¹

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ABSTRACT

Before the advent of the colonial government, many Nigerians built houses to suit their cultural and climatic conditions using available local building materials. Consequently, houses were built using earth to produce adobe or compressed earth blocks and bricks for walls. Other materials used for walls as well as roofing materials included woods, bamboo, thatch and straws. This research has identified examples of monumental buildings built with traditional materials to include Mary Slessor's House and Old Residency at Calabar; Amalgamated House and Lord Luggards' Residential House in Ikot Abasi (Opobo), amongst others. Despite the fact that we are endowed with abundant natural resources that can meet our need for building construction, we depend largely on imported materials and technology which their high cost have rendered majority of less-privileged Nigerians homeless. To resuscitate the culture of building using local materials, the research recommended that our local building materials should be studied to determine their suitability and usability, while appropriate maintenance strategy is evolved to enhance construction of durable low cost houses conducive for Nigerian environment.

INTRODUCTION

Housing affordability has remained a major concern to most families in urban centres of Nigeria. The Nigerian government over the years has recognized that majority of the urban poor do not have accommodation and that some require special housing programmes to ameliorate the housing problem. Government was for the first time directly involved in housing construction as shown in the 3rd National Development Plan (1975 – 80). This was when the Nigerian Building Society was transformed into Federal Mortgage Bank of Nigeria with an initial outlay of N150m to expand mortgage lending facilities for housing construction. The 4th National Development Plan (1980-85) was targeted at improving the overall quantity and quality of housing for all income groups by adopting realistic designs, encouraging the manufacturing of local building materials, improving

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infrastructural services in existing public residential estates and increasing substantially the number of new housing construction nationwide.

The efforts of government at providing affordable housing for her citizens have been greatly undermined by persistent rise in the cost of building materials amidst present trend of uncontrolled dwindling value of our national currency against foreign currencies. This is because housing construction in Nigeria has become foreign oriented hence very expensive. Affordable housing is that accommodation which can be constructed or acquired from household income without sacrificing other essential needs of the family. Affordability principles provide the guide to housing design and construction. It commences with a simple design that entails the use of available, reliable and durable building materials for construction to achieve cost reduction without compromising quality. The design takes into consideration the physical, cultural and other characteristics of the residential neighbourhood such building is sited.

Housing development is an integral part of the overall neighbourhood development process. It requires the application of capital, labour and management to various aspects of construction project. The provision of housing carries with it various problems such as securing of land and adequate title to it, fund raising, legal control, availability and high cost of required building materials, and diverse climatic and other environmental conditions. These problems, however, depend on developers' taste, state of economy, environmental requirements which exhibits marked regional differences and purpose of the housing development which may be either for self-occupation or investment. The state of housing situation of a community is an indicator to the health and socio-economic wellbeing of her citizens. It has become increasingly glaring that most Nigerians particularly the urban residents live in poor housing while those that have access to decent housing do so at abnormal cost. This is against African tradition and culture where ownership of a personal house is considered as prime value to human existence.

NIGERIAN TRADITIONAL ARCHITECTURE

Before the advent of the colonial government, many Nigerians built houses to suit their cultural and climatic conditions using available local building materials. Then, there was easy access to land for buildings using readily available local materials, while the kinsmen contributed in no means way in the construction process with least financial involvement (Udoudoh, 2016). During this period, houses were built to meet owners' taste and tradition of the community. Nigerian traditional architecture was imbued with great varieties of artistic qualities of art works, paintings and decorations. Those features were as the consequences of geographical and social influences, and ethnic cultural diversities of Nigerian large population. Climate and available local building materials were essential natural factors that dictated and determined the planning and execution of the

architecture of different parts the zones or locations. Nigerian traditional architecture toed the same humble beginning as those of other parts of the world with differences in development relative to zones or localities – adapting peculiar influences that played significant roles in the development of traditional architecture in terms of spatial arrangements and building construction.

Four major traditional architectural groups separated by locations have been identified in Nigeria namely: the Hausa, Yoruba and Igbo the Southern Riverine tribes whose respective architecture adorned and dominated the largest portion of the landscapes of the country with great splendor. The Southern Riverine tribes covers minority ethnic groups which are identified with remarkable aesthetic design of significant values in Edo (Benin), Nupe, Tiv, Efik, Ijaw, Ibibio, amongst others. Social and environmental influences to a large extent influenced the physiology, type, style, usage, spatial pattern, decorative nature of spaces, materials and craft, the building and surroundings.

Chapter 6 of National Housing Policy (1991) focused on trends in building research, materials and construction costs with special emphasize on how the low incomes can build their own houses. It enumerates various strategies that should be pursued to reduce construction costs and achieve self-sufficiency in the basic building materials; and increase in the manpower level for the building industry. The sad story remains the uncontrollable level of housing deficiency which is directly linked to high cost of building materials and designs amidst the dwindling naira value when compared to foreign currencies. The colonization of Nigeria by Britain came with gradual alteration of the building style and attendant importation of foreign materials to replace our traditional building materials and technology. The conversion to this new technique amidst high cost of foreign building materials has resulted to a greater percentage of urban dwellers not being able to provide decent shelter above their heads.

The current wave influencing many Nigerian urban residents is how to construct buildings with foreign architectural design, materials and facilities which has posed serious threat to the existence of many structures which were built with local building materials. In most cases, buildings constructed with local materials are pulled down and replaced with those built with imported materials. The result being that many of our new generation urban centres lack historic buildings and monuments built with local materials that could be considered viable tourists' destinations. This trend has been criticized by Omole and Ogundiran (2011) as being more in tune with foreign technological and economic taste than with intent to exhibit and preserve an accentuation of historic and cultural elements of the community the building is situated. This is against what is happening in many developed countries where historic buildings exist side by side modern buildings, and are maintained and/or preserved as national monuments.

The main reason for this research is to have a rethink on how to construct houses using our local building materials to depict our environment, accommodate the poor and adopt strategies to maintain them for durability. It is expected that this type of houses can be achieved at minimal cost that the poor can afford.

THE CONSTRUCTION INDUSTRY

The construction industry can be defined as an organization that is involved in the building process from conceptualization, design and financing, manufacturing and assembly of building materials and plant, to maintenance of the built estate. The industry requires the judicious use of resources like building materials, manpower, finance, technology and equipment to carry out physical construction which will spur-up economic growth and larger scale employment for the nation. Popoola (1994) describes construction industry as an all-embracing term used to cover two broad aspects. First, as building activities that embody the creation, alteration and repairs of existing buildings for various uses such as residential, commercial, industrial and administration. Secondly, as civil engineering activities which include construction of roads, water distribution and other essential infrastructure. This is why housing is seen to incorporate the shelter, infrastructure and totality of environment.

Before Nigeria became independence in 1960, what is now cherish as modern building construction was prevalence in isolated urban centres that were serving as seats of government and quarters of senior government officials who were foreigners. During this time, buildings constructed with local building materials were allowed to co-exist with modern buildings in urban centres. Many white men even preferred these types of buildings because of their natural peculiarities. The industry in Nigeria today has remained largely import dependent whereas there are prevalent of abundant building materials locally in every nocks and crannies of the country. The industry is a potent motivator of nations' economy by maintaining high level of construction activities that stimulate national development. Its contribution to employment creation is overwhelming. This is done in two ways: the people employed in the industry to work and those that supply the needed working materials in the industry. Quoting Popoola (1994), the industry is a large contributor to national stock of investment goods, the provider of buildings to accommodate a wide range of essential activities and the employer of a large number of peoples either directly or indirectly.

The industry started in Nigeria with the single and double story mud buildings of the traditional craftsmen, who were not only the planners and architects, but builders, engineers, and quantity surveyors. It is a significant consumer of diverse foreign and local materials including timber and plywood; metal fabricated products like iron and steel; sand, stones and cement which are mixed to form to produce concrete. The construction industry is the main driver of urban physical

development and economy as it is supported by conduct of feasibility studies, project design, cost estimation, construction and maintenance services. The rising cost of building construction has become a source of concern to most governments particularly in the developing countries, and this is traceable to the patronage and use of foreign building materials, plant and equipment which are very expensive. According to Onyegiri and Ugochukwu (2016), the desire generated for these materials has a negative impact, leading to reduced value and perceived inappropriateness of locally available materials.

LOCAL BUILDING MATERIALS AND CONSTRUCTION TECHNOLOGY

There are prevalent of substantial building materials in different parts of Nigeria that have been in used prior to the coming of the colonial masters that came to introduce modern types of materials. The most prevalent of these materials are discussed and pictures of such buildings shown below. It is pertinent to state that some of these pictures were captured at sites while others were sourced on-line and used to simplify the study.

i. Mud and Clay: Mud is found in abundant quantity in all parts of Nigeria, particularly in southern region of the country but clay is not available everywhere. The decision as to the type, size and style of building depends on the intending user, quantity and quality of the existing mud or clay to be used. The cultural practice of the rural people indicates that adobe is one of the commonest available building materials used in building construction. Larger amount of clay usually mean using the adobe style while low clay soil is associated with sod building.

According to Onyegiri and Ugochukwu (2016), the local earth technology of Africa has spanned from the employment of raw earth to refined earth brick. The techniques requires employing mud and wattle or mud and daub; a method that uses solid wooden post frame which is first made then filled with adobe balls to create a wall. The walls of the building are constructed layer by layer using the mud bricks and a slurry mixture of earth as the mortar. The walls will be allowed to dry up and binds into a monolithic structure. Thereafter, a dense mud plastic plaster will be applied to strengthen the walls with various additives to smoothen the façade depending on the people's culture. The completed buildings become structurally firm, environmentally sound to withstand climatic hazard and could last for years so long as appropriate maintenance works were carried out.

Experienced has shown that houses built with earth are naturally cool during summer and warm in cool weather. Along with the others materials that have been re-devised, earth as of late gained acknowledgement as a sustainable technology for contemporary buildings. Africa has old recorded history that shows buildings and monuments made of numerous natural materials available in abundance in its geographical landscape. Below is a typical mud and wattle house with mat roof.



Image Source: population.gov.ng Source: UGC Read

Globalization has relegated these types of buildings as being ‘primitive’ because of the building materials used in construction and their relatively low technology compared to present day western (architectural) construction technology.

ii. Wood: A greater part of Nigeria is situated in the thick forest region of the world which is blessed with assorted types of trees which can be cut into wood, processed and used in building construction. The woods are pressed into lumber and timber such as boards, planks, poles, veneer, plywood and other required building materials for diverse purposes. Wood for building large structures may be left in its unprocessed form as logs. The trees are simply cut into needed length, and sometimes stripped of bark before being notched or lashed into place. Fibrous trees like coconut and palm trees also grow naturally or planted for economic purposes. They produce good structural members for roof, wall, lintel, ceiling and bridges construction. Their major advantage is that they are termite resistance and do not easily decay unless subjected to long period of dampness. History revealed that in some parts of the world, many communities preserved their forest or developed community wood-lot from which they grow and harvest trees to build with. As they cut down one, they plant new one as replacement for future use.

A wooden blockhouse is installed on a pre-erected foundation. A wooden blockhouse installed on the foundation should be allowed to stand for about 6 to 12 months to allow for shrinking process. When the walls are ready, then the porch is at work before the roof system of the house is erected. Thereafter, windows and doors, floors and partitions are installed. All these components determine the appearance and reliability of the building. A wooden house gives aesthetic pleasure not only to its owners, but also to builders during its construction (Pramar, 1989).



Mary Slessor's House at Calabar, Cross River State

iii. Bamboo: Bamboo is one of the oldest raw materials used in building construction just like mud and wood. It is generated from raffia or palm trees which are common in the rain belt region of the world and noted for their speedy growth. It can be used in the construction of walls, roofs, floors, doors and windows or as support elements. Basic carpentry, masonry tools and skills are necessary for the construction of bamboo house which may or may not be filled in with soft mud mix. For the bamboo pole to be used, it is first split into half, and then the culms further split into four or eight segments using a sharp knife. The strips from the culms can be used as ties or can be woven together to make strings or ropes.

To achieve a durable building, bamboo canes used should not be exposed to moisture as it is not a good foundation material. Concrete foundations are recommended as they prevent the walls from being affected by humidity. Formworks are erected for the plinth course to be constructed together with the foundations while the walls are constructed between the vertical bamboo columns, as infill. The main posts are erected at all corners and enveloped at a span of about 1.2m each throughout the house. Split bamboo grids are assembled by rope or wire ties and are fixed to plinth and bamboo posts. To reinforce the bamboo grids, as well as to provide a base for the mortar, a chicken steel wire mesh is fixed to the grids. Cement based mortar is then plastered on top to provide overall stability to the wall infill. When the walls setting has been certified adequate, prefabricated timber frames are mounted for windows and door openings. All bamboo columns made from timber are then fixed to a top ring continuous beam at rectangular cross section (Bansal & Zoolagud, 2002).

The roof coverage should be as light as possible in order to reduce lateral seismic loads which may lead to unexpected incidence of building collapse. Simple couple roof is adopted with bamboo trusses used as rafters and purlins. The rafters are fixed to the timber top beam using natural strings (*idut*) derived from raffia palm trees or rubber twins as clamps. While bamboo mat board gussets are used for the truss rafter joints, bamboo mat corrugated sheets are used for roof cladding. Bamboo mat board is also used for doors and window shutters. Bamboo is noted for strength and durability when properly preserved.



A Typical Bamboo House

iv. Thatch/Straw: Thatch is a common building material in most communities of the world. It is a by-product of grown plants, whether cultivated or naturally grown. Large quantities of it could be sourced from the immediate surrounding as a greater proportion of it is cultivated as cereals in the farms. Many traditional houses are built with thatch as wall or roofing materials. The thatch often used as roofing materials are found within the shores of riverine communities from raffia or palm fronds. Straw can be used with adobe bricks or masonry walls or singularly.



A Thatch/Straw House in Middle Belt, Nigeria

v. Rocks: Rock is a very dense building material that has existed from creation. It is known to be the longest lasting of all available building materials. As a dense material, it gives a lot of protection to any structure it is used to produce. There are different types of rocks with diverse attributes. They are readily available and suitable for specific purposes. To bind stones or loose granite pieces together, different forms of mortar are prepared and used. Metal tabs in the structural wall are mortared in between the stones to tie everything together; otherwise the stonework would just peel off the wall. The structural wall serves as a form on one side of the wall to make it really easy to lay up the stonework, provided the rocks have good flat edges to work with. They have been used to construct wall as in the pyramids in Egypt or roofing materials as slate is commonly used in the United Kingdom.



A Typical Rock House

vi. Periwinkle Shale: Periwinkles are small marine snails from the class of gastropod and widely distributed along the mangrove swamps and seashores in the coastal region of Nigeria. They are herbivorous and found in clusters on rocks, stones or piling between high and low tide marks. They are mostly dark and have thick elongated conical shape with narrow deep posterior canals and siphonal notches (Umoh, Odesola and Ujeni, 2009). When the periwinkle is big enough, the edible part is removed after boiling in water, and the calcareous part (shell) dumped as waste. The continuous dumping of these waste shells in great heap often constitutes menace and eye saw especially to the immediate environment. Rather than allowing them in the degrading condition, the shells are gathered in bags and taken to project sites where they are mixed with sharp sand and cement and used as concrete in building purposes. The concrete can be used for casting of foundations, columns, lintels and other purposes in buildings depending on mixture.

vii. Compressed Earth Blocks (CEBs). The use of compressed earth blocks (CEBs) has caught the interest of many architects and real estate investors who are in-search of affordable and sustainable building technology. This has evolved into designing and developing blocks from compressed earth for building construction. Unlike the native adobe block which is a mixture of earth, water and distinct cultural additives molded to desired shape with the hand, compressed earth block is supplemented

with very little quantity of either cement or lime component (about 10%) in its blending process. The blend is not worked to achieve a plastic state, but simply blended until the cement/lime and earth are thoroughly mixed. Afterwards, the mixture is either machine pressed or placed in a mould and compacted with a high level of pressure applied through a hand-operated machine (Ugochukwu and Chioma, 2015). After aeration, the CEBs gain a high compressive strength appropriate generally for up to three floors constructions, though higher potentials can also be attained. These blocks (CEBs) can be left un-plastered, covered with plaster or can be coated with watered earth (muddy plastic mixture), sometimes added with natural colouring. Its facades in comparison to the contemporary urban houses offer a feeling of a cooler interior and the inside temperature is lower than many cement houses.

CASE STUDIES

i. Old Residency now converted to National Museum, Calabar.

The National Museum, Calabar located on top of the old Government Hill was a prefabricated building constructed in Glasgow, Britain and shipped to Calabar in 1881. It was used as the first Government House in 1883, thus serving as the seat of British Consular Administration of the Oil Rivers and Niger Coast Protectorate before that of the Protectorate of Southern Nigeria. It later served as resident of Consular for Old Calabar Province and as a ministerial Guest House in 1950. The Old Residency building in Calabar was declared a National Monument in 1959, and in 1986, building was converted to a museum in consideration to its historic values in terms of remarkable socio-political, administrative and architectural importance.

The Museum stands as an epitome of British Colonial revolutionary architecture based on its cultural concept of foreign influence over traditional architecture in Nigeria. The entire top floor and walls are made of overlapping boards of Scandinavian red-pine wood, with wooden structural pillars and beam framework. However, some part of the building is supported by iron columns and angle-iron beams. The stairs were made of hard wood that ensured of its durability and sustainability to date. The roof was originally made of slates (shingles), protected from the sun with thatch, which was later replaced with heavy gauge corrugated zinc sheets. The projection of the ceiling eaves is 1.2 metres - giving the walls of the building adequate protection against vagaries of weather such as severe sun shine and heavy rainfall (Agbonome and Osefoh, 2016). This elegant colonial building is one of Nigeria's finest examples of colonial architecture of that age, and marked the advent of contemporary architecture in Nigeria.



Views of Old Residency in Calabar

ii. Amalgamation House at Ikot Abasi, Nigeria

The amalgamated house located at Ikot Abasi, Akwa Ibom State was the seat of government during the colonial era. It is a historic site where Lord Lugard lived and signed the law that amalgamated the Northern and Southern Protectorates into one country called Nigeria. It was in this same building that General Olusegun Obasonjo (then former Commanding Officer of the Nigerian Army) and General Phillip Effiong of the Biafran Army signed the declaration of cease-fire that ended the Nigerian civil war in January, 1970.

The Amalgamated House is a one-storey building constructed with seasoned wooden materials. It is situated in an open compound landscaped with assorted types of citrus trees, crops and flowers. The structure was built with wooden wall with corrugated iron sheets as roofing materials. The floor is also made of wood. The building has a wide corridor supported by wooden pillars and wooden windows to enhance cross ventilation of rooms. A visit to the house gives one the opportunity to have a foresight of Sir Lord Lugard's residence, administrative offices, the native authority building, kitchen and beach garden. Other attractions within the vicinity include the brick walled bungalow known as the Opobo District Office, popular Bridge of No Return at the bank of Imo River and a mock grave in memory of the Aba Women's Riot of 1929.



Amalgamated House in Ikot Abasi (Opobo), Akwa Ibom State



Lord Lugard's Residence at Ikot Abasi (Opobo), Akwa Ibom State

There are other buildings built more than 50 years ago with local materials that are still meeting the taste of today with proper maintenance. They include:

- a) The premier block of Hope Waddel Training Institute, Calabar. The single storey building was erected by Rev. Hope Waddel, a Presbyterian Missionary in 1894. Its walls and entire top floor were made up of scandinavian red pinewood. The wooden walls were doubled made of overlapping boards, while the roof was covered with corrugated iron sheets.
- b) The female hostels at the University of Uyo Town Campus, Uyo, Akwa Ibom State constructed in the early 1970s during the era of the then Advanced Teachers' Training College. The walls were constructed with seasoned wood with corrugated iron sheets as roof materials. The hostels are still very strong and habitable by students to date.

B. MAINTENANCE STRATEGY

Maintenance is essential to ensure the developed building attends its purpose, meets the expected taste and enhances its durability. To effectively carry out the required services, the maintenance manager requires a good knowledge of the component building structures, characteristics and construction technology. This is necessary as building maintenance is a specialized aspect of property management which involves carrying out certain activities to preserve, restore or improve the various components of buildings, its services and surroundings to a current acceptable

standard. Maintenance is directed towards controlling the impact of decay and obsolescence, with the ultimate goal being to sustain property utility and enhance its aesthetic and monetary values. It usually includes some elements of improvement although difficult to decide precisely where maintenance stops and improvement starts.

Traditional buildings and monuments in many developed countries are subjected to some kind of protection through diverse strategies of maintenance and preservation. Many privately owned buildings in beneficial use are thus identified for protection by statutes. According to Edward (1978), such statutory controls constitute an important influence on the manner in which maintenance and minor adaptation works are executed. This is not the situation in Nigeria as many of these structures except those acquired by the Federal government through the National Commission for Museums and Monuments are owned by individuals, families, communities and religious groups. These traditional buildings are of various designs which depict the architectural culture of their people.

To achieve good maintenance, the process begins on the drawing board and includes establishing schedules on dilapidation, inspection and maintenance works. It is therefore important that owners and/or occupiers of such projects are represented on the drawing team where design and maintenance decision are considered. Where woods and bamboos are used for construction, such materials should be matured, seasoned and well treated to enhance their durability against termites and other insects' infestation. They should be kept away from water to avoid damping. Where it is noticed that any part of the building is damaged, a replacement should be carried out to avoid quite spread and expansion of the affected areas.

Three forms of maintenance works have been identified to include routine maintenance, planned and unplanned maintenance (Udoudoh, 2016). Periodic maintenance of buildings and other structures has a vital role in the construction industry of any country. The rationale for carrying out maintenance works are outlined below:

i. Durability: Building maintenance helps to prolong the lifespan of buildings and structures. This is through the preservation of the physical and associated services, which enhances their structural efficiency and performance. When a building is maintained to meet expected standard, it adds to the economic growth of the nation.

ii. Income Attraction: A good maintenance culture leads to higher demand and higher demand attracts more income to the developer. Where the buildings are adequately maintained to meet the taste of time, income accruable grows steadily and becomes regular. Even where outright sale is resorted to, reasonable purchasers would declare their interests at current market values, which positively influence the economy.

iii. Reduced Expenses: Where routine and timely maintenance works are undertaken, it serves the cost that would have been expended on total renovation assuming a sudden collapsed or major failure of any components part of the structure occurs. With this done, the building shall continuously be put to same or better use.

iv. Safety: A good maintenance system leads to functionality, sustainability and above all, the safety of the property and lives of the occupants. It is advisable that proper public health policy is targeted at security of lives of occupants of the buildings. In providing adequate security to houses and offices, provision should be made for easy escape during emergency situation like fire outbreak or armed robbery attack.

v. Aesthetic Creation: Aesthetic creation which is an aspect of beautification involves designing and landscaping of the premises with assorted species of flowers and shrubs, planting and fitting of electric bulbs, and accessories. It should be noted that for the aesthetically pleasing environment to be conducive for human habitation, maintenance is an inevitable activity.

IMPLICATIONS FOR THE CONSTRUCTION INDUSTRY

The 4th National Development Plan (1980-85) was targeted at improving the overall quantity and quality of housing for all income groups by adopting realistic designs, encouraging the manufacturing of local building materials, improving infrastructural services in existing public residential estates and increasing substantially the number of new housing construction nationwide. Building materials often constitute the single largest input to housing construction in most developing countries. Since most of these materials are imported into these countries, its high cost poses a great challenge to many households in the course of housing construction. In Nigeria, despite the fact that we are endowed with abundant natural resources that can meet our need for building materials production, we depend largely on imported materials and technologies as earlier stated. This is because planning authorities insist on the use of conventional building materials and technology as a condition for granting building approvals. This planning policy which does not consider affordability criteria and an option of using local building materials has tactically schemed out the low income and poor from housing ownership in Nigeria. The consequent is that majority of the less privilege got involved in informal housing construction in order to provide accommodation for their families.

The ideologies of sustainability had over the years shaped indigenous architectural design, practice and building technology. The technology which is developed from existing natural materials and cyclical regeneration processes has impacted on the judicious use of earth's resources in building construction of houses and monumental structures such as tombs of prominent men, cultural centres and religious temples in both rural and urban centres of many countries. Sustainable construction

requires a critical review of the prevailing practices, sourcing for raw materials and invention of appropriate building technology. It is a generally held view that in many African countries, traditional houses are more sympathetic to the prevailing climatic condition as they provide comfortable habitation and maintains a high level of internal thermal comfort, regardless of prevailing solar radiation outside. As stated by Ugochukwu and Chioma (2015), Africa's traditional architecture made certain that its use of the resources neither diminished their availability, nor adversely affected the ecological balance upon which it relied on as an agrarian society. On the whole, the use of traditional building materials in housing construction has not received greater attention eventhough these materials are readily available, affordable and can deliver the same modern needs when properly utilized.

CONCLUSION AND RECOMMENDATIONS

The use of local building materials and technology has no documented scientific approach to its design and construction. The technology evolved culturally to suit the people as it is less expensive. In the traditional African communities, building materials including earth, timber, straw, stone/rock and thatch were constructed together with the simplest of tools and methods to build houses. Nigerian traditional architecture is imbued with great varieties of artistic qualities of art works, paintings and decorations. Those features were as the consequences of geographical and social influences, and ethnic cultural diversities of Nigerian large population. Climate and available local building materials were essential natural factors that dictated and determined the planning and execution of the architecture of different locations. The abandonment of these building materials came to fore when colonization, which led to industrialization and transportation of foreign building materials set in. The aftermath of this was the creation of negative impression that our local building materials are inferior to foreign materials. This orientation has tactically collapsed the past years of traditional African architecture, technology, entrepreneurship and self esteem.

It is rather unfortunate that many buildings constructed with traditional materials have been abandoned to dilapidate in different parts of Nigeria. The age and lack of maintenance of these buildings have turned some of the neighbourhoods into slums in appearance (Omole and Ogundiran, 2011). To resuscitate the culture of building using local materials, the research recommends that:

- i. Available local building materials should be studied to determine their usability and suitability for constructing low-cost effective buildings.
- ii. Further researches should be carried out on how to improve and maintain the available local building materials for construction of durable houses considering our environment, topography and technology.

- iii. It is imperative that we source for, harness and mass produce local raw materials which are affordable and durable for building construction.
- iv. Adequate renewable arrangements should be put in place to ensure availability of local building materials for more housing construction.

Many Nigerians are of the impression that when they build with local materials, the people see them as being wretched: thus their resort to the use of foreign building materials without recourse to financial implications. We need to return to our local building materials and technologies if we are prepared to provide accommodations at affordable cost to majority of Nigerians. The re-invention should not be on mass production of local building materials alone, but also on construction technique and development of sustainable maintenance culture.

REFERENCES

- Agbonome, P. C and Osefoh, F. C. (2016). Calabar Museum: The SYMBOL AND Epitome of Revolutionary Evolution of Historic British Colonial Architecture Influence over Nigerian Traditional Architecture. *Interdisciplinary Academic Essays: Researchgate*. <https://www.researchgate.net/publication/305851516>, Vol 8, 64 – 81.
- Bansal, A. K., & Zoolagud, S. S. (2002). Bamboo Composites: Material of the Future. *Journal of Bamboo and Rattan*. 1(2), 119-130.
- Edward, D. M. (1978). *Building Maintenance and Preservation*. Building Center Trust Ltd, Lagos.
- Omole, F. K. and Ogundiran, A. (2011). Building Conservation as a Veritable Tool for Preservation of Cultural Heritage: A Case of Historic Buildings in Calabar, Nigeria. *FUTY Journal of the Environment*. 6(2), 81 – 93.
- Onyegiri, I. and Ugochukwu, I. B. (2016). Traditional Building Materials as a Sustainable Resource and Material for Low Cost Housing in Nigeria: Advantages, Challenges and the Way Forward. *International Journal of Research in Chemical, Metallurgical and Civil Engineering*. 3(2), 244 – 262.
- Popoola, J. O. (1994). The State of the Construction Industry in Nigeria. *Journal of the Nigerian Institution of Estate Surveyors and Valuers (NIESV)*. 18(2), 11 – 13.
- Pramar, V. S. (1989). *Wooden Houses and Mansions of Gujarat*. Haveli:
- Udoudoh, F. P. (2016). *Real Estate and Infrastructure Economics in Urban Nigeria*. MEF (Nig.) Ltd, Uyo.

Udoudoh, F. P. (2018). Promoting Entrepreneurship and Capacity Building in Real Estate Development in Nigeria. Building Capacity for Self Reliance: Entrepreneurship and Environmental Development. *Proceedings of International Conference*, Faculty of Environmental Studies, University of Uyo.

Ugochukwu, I. B. and Chioma, I. B. (2015). Local Buildixn Materials: Affordable Strategy for Housing the Urban Poor in Nigeria. *International Conference on Sustainable Design, Engineering and Construction*. Procedia Engineering, www.elsevier.com/locate/procedia. 118(2015), 42 – 49.

Umoh, A. A., Odesola, I. A. and Ujeni, A. O. (2009). The Effect of Periwinkle Shell Ash Blended with Ordinary Portland Cement on some Engineering Properties of Lateritic Block. *Journal of Environment Design*. 4(1 &2), 49 – 53.

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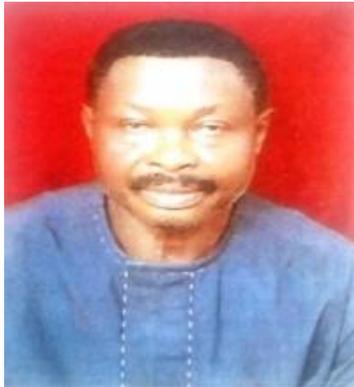
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