

An Approach for the Integration of Sustainable Strategies from Hausa Traditional Architecture on Contemporary Building Designs in Urban Built Environments in Tropical Climate: A Discourse

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Abstract- The paper attempt to identify sustainable strategies and concepts to stimulate discussion on integrating sustainability in the planning of buildings particularly in contemporary African societies and the role of traditional architecture in empowering and enabling the promotion of sustainable urban built environment. It also argues as biased the recent arguments, by some scholars, on sustainable environment which placed importance on modern technology and the visual environment though putting slight prominence on the natural and green environment in African cities. It again argues that traditional architectures in Africa usually contain sound concepts and strategies which certainly if considered would improve sustainability of the urban built environments. Certainly, the operation of unsuitable modern technologies, appliances, and resources in buildings have endangered the environment and the health of people. This paper therefore addresses the factors of sustainability in Hausa traditional architecture in Northern Nigeria as case study, and attempt to show how those factors could be utilized in the contemporary planning and designs of building hoping it would improve and contribute to the living standard in Africa urban built environment.

Keywords: Sustainability, Traditional Architecture, Contemporary Architecture, Urban Built Environment

I. INTRODUCTION

Global warming and the rise in contaminants and pollutions have make people to basically examine the relationship between humans with nature. It is imperative that the future should be safeguarded for the coming generations. Schmid & Thomas (2018) reported that worldwide, 40 percent of the consumption of energy, 40 percent of the output of waste, and 30 percent of carbon dioxide emissions are due to global building activity. It is accepted that world population is rapidly increasing. It is clearly obvious now that, the erection of buildings and structures

would continue to be crucial. That is the way buildings are designed and constructed would continue to affect the natural environment particularly, in terms of the location of the building on site, and by the utilization of raw material resources for the manufacture of building materials by factories which in turn emit gases and again, by the transportation of materials and resources to site. and through using energy sources such as electricity after the completion of the buildings. Again, this fact was supported by Allu & Ochedi (2015) that buildings forms part of the environment and constitute a large part of the built environment. Thus, their sustainable functions have significant effect on the sustainability of the environment. These facts call for the development of sustainability. Thus, sustainable building design is about reducing such effects by designing and constructing buildings that are suitable for the climate, have minimal negative environmental effects, and are healthy and comfortable for building users.

As a reminder, according to Schmid & Thomas (2018) that sustainable building design for the tropics differs considerably from sustainable building design for temperate areas. This means that before the adoption and integration of the traditional architectural strategies there is the urgent need to understand the prevailing climatic conditions in the tropics before embracing strategies that would be sustainable. Another issue to take into consideration in terms of sustainability in Africa is that the unfortunate blind acceptance and dependence on modern technology must be examine critically. More so the trend is that the technologies are often complex and problematic and therefore, need costly maintenance. Again, according to. Jenson M. K. (2010) architecture's faith in technology in overcoming all obstacles with more modern technology has not been adequately

questioned. However, the over perception and reliance on the all-powerful modern technology must be tested. Architects and Planners ought to reflect on the need to involve seriously the concept of sustainability in the design and planning of cities in contemporary Africa.

Thus, the question to ask is what then is sustainability? And sustainable development? In fact, several definitions were proposed. Unfortunately, almost all the definitions seem inadequate and frequently prove to be only less useful due to prejudice. Berardi (2010) reported that sustainability can be defined as “the capacity for continuance into a long-term future” whereas sustainable development is the process by which we move towards or consider sustainability (Berardi 2008). In fact, the debate in recent years on sustainable development has been pre-occupied with the development of sustainability in almost all sectors of human development. However, most sectors, particularly in Africa are still not given the appropriate emphasis. For instance, buildings intended for human habitation and for other various activities are developed without much emphasis on sustainability in the design concepts. Most of the results are that the built environment ends up with unsustainable buildings in terms of sustainability which are costly to build and maintained and which in fact negatively affect the mental and psychological health of their occupants. Again, according to Fathy (1986), who wrote that before “sustainability” can truly transform the process of architectural design and building construction, the discipline must change the prevailing conception that the solution to the existing disaster will be fundamentally technologically based. That is to reduce or abandon the reliance of buildings and homes on fossil fuels. Consequently, according to Neyestani (2017) the development of new strategies based on renewable energy in building can be very essential for energy conservation, environmental protection, and even future of the earth. Truly, one fact that should be agreed upon is that the building is not just a house it is a home which certainly, establish an understanding of the concept of sustainability and sustainable development.

Given the above explanations, Mochache (1997), lists some of what appears to be the major problems that, why most built environments in Africa are not attaining sustainability and sustainable development.

And amongst the major problems is the decline of vernacular and traditional approaches in architecture and planning. Consequently, this paper is therefore, organized in three sections: Section 1 describes the climatic conditions and the characteristics of Hausaland, the materials of construction and the role of buildings in sustainable growth; Section 2 suggests recognizable traditional architectural characteristics of a sustainable building; and, Section 3 summaries the findings of the assessment and conceptualization of applying traditional architectural strategies on contemporary design and planning to be adopted and integrated in order to achieve sustainability in the urban built environment.

Urban Environment Characteristics of Hausaland

Hausaland is in a tropical climate. The ‘Hausawa’ are the most populous and probably the most significant, single ethnic group in Africa South of the Sahara. According to Oumar (1997), in Nigeria alone they number about 30 million in 1990. And there is a considerable population in other West African countries, such as in Niger, Cameroun, Ghana, Benin Republic and Chad (Adamu, 1978). More significantly, is that Hausa people have been famous for their architectural forms, their construction techniques, wall structures and decorations. For instance, the works of Oumar 1997; Sa’ad 1986; Schwerdtfeger 1971 and many others have demonstrated that fact. Their traditional dwellings have developed in response to the needs of their socio-cultural identity and their religious values. Providentially, their surrounding environment provides the building materials.

It is perhaps significant to know that Hausa civilization is essentially urban (Sa’ad 1981). Of recent, thus, the Hausa major old cities such as Kano and Zaria are composed of several and various forms of contemporary and traditional buildings. Residents live within a tight knit and clustered urban neighborhood. Perhaps the buildings might be largely categorized into three broad types. First, the traditional built forms which might be considered as those structures erected over a century ago. They were entirely erected with traditional materials and in which their composition and organization are based on the socio-cultural and religious values of the inhabitants.

Second, are those built forms which might be regarded as semi-traditional. These are essentially structures, constructed with a mixed of both traditional and 'modern' or contemporary building materials. For instance, erecting zinc roofing sheets over a mud structure. Third, are those built forms which might be referred to as 'Modern' or contemporary buildings. These essentially are constructed with the so-called modern building materials, such as glass, sandcrete blocks, cement, and concrete and so on. The first and the last categories are largely the focus of this paper.

What makes a building sustainable

The question to be raised here is what makes a building sustainable? That is to say what are the natural and local contents within a building that generate the spatial green qualities of space? Most scholars agree that complications are always raised in defining sustainable buildings. Berardi (2008) has reported a unit of measure for sustainability of buildings has recently been offered by sustainability assessment systems. And these have become a framework of reference to assess and measure the sustainability of buildings. He further wrote that according to these systems a building is sustainable if it is built in an ecologically-oriented way which reduces its impact on the environment. As this definition appears to refer to building exclusively it therefore shows that there are limitations to this definition. First it lacks to include some clue on the environmental impact on the building itself. Again, in addition according to Solomon (2005) sustainable designed high-performance buildings are those that through their sitting, orientation, design, construction and operation are highly energy efficient, and have lower operating costs, are better for the environment in broad and specific terms and promote whole health for their users and occupants with measurable results. This description is very broad however, not yet a complete definition. Perhaps, there has to be a mention about acknowledging the fact that sustainable buildings should be less dependent and reliance on modern technology in solving environmental problems.

Again, in terms of measuring the effects of building on sustainable environment the land area covered by the building project itself should be taken into consideration. That is the physical boundaries of the

building project site. However, a collective definition of a sustainable building is still missing (Berardi 2008). Given the above definitions and explanations in, principle, a sustainable building has often been considered as a healthy built environment, based on ecological principles and resource efficiency (Berardi, U. (2018). By breaking down this definition, a sustainable building has been defined as a building with high efficiency in the use of energy, water and materials, and reduced impacts on the health and the environment through better siting, design, construction, operation, maintenance and removal throughout its life cycle (Berardi 2008). Truly to achieve sustainable state in architecture, building materials for construction must be made from either naturally occurred materials or materials made from organic nutrients which could be recycled or renewed naturally without wrongly affecting the environment or the habitat. However, of these arguments there is not a clear-cut accepted definition which is yet to be agreed upon by scholars.

The study however, attempt to address some of the traditional architectural strategies and suggest ways which might lead to a change in the design of contemporary buildings for the African urban built environment, which might include concept of sustainability using Hausa traditional architecture in Hausa land of Northern Nigeria as case study. One worrying reminder and which appears to be accepted by almost all scholars is that global temperature will continue to rise due to climate change. Thus, Markus (2011) poses a challenging question: the challenge is that if global temperature will continue to rise, what then can the architects do in their architectural scheme? Should they continue in their usual design approach that depends on active means of cooling, or should a shift to passive strategy for architectural design be considered as an option? Tablada et al., (2005) has asserted that passive and low energy architecture is a major pathway to achieving sustainable built environment. One comforting cue is that there is a link between the concept and principles of sustainability in specific and general terms with traditional architectural concepts, principles, procedures, strategies, techniques of construction and building forms in Hausaland. In specific terms, therefore, the study attempt to examine Hausa traditional architecture and investigate how it can

promote and integrate sustainability in the design of contemporary buildings in African urban environments. To achieve this goal, the paper will look at four principal elements and components in Hausa traditional architecture. These include:

- i. Window extent (level) and its orientation
- ii. Courtyard, daylighting and air movement
- iii. Outdoor spaces and their orientation
- iv. Use of renewable materials and less consumption of energy and resources
- v. Reduction of waste and carbon emissions and pollutions
- vi. Involving local artisans and craftsmen

Extent (size) of Window opening and its Orientation

Window openings are generally meant to provide air flow for cross ventilation and daylighting into interior of buildings. They might often provide views of the outdoor environment. It at times offers refreshing views of the scenes outdoor. Openings also gives direction to air flow within the interior, However, these functions depend on the design and orientation of the window. These include its dimensions, its shape, location and its orientation. Above all it must satisfy the climatic and environmental requirements of the inhabitants of the building. Consequently, one finds different and various types of window openings, Therefore, some window openings are narrow and their recessed is much deeper others, are wide with little or no recessed (figs 1& 2).

For instance, in Hausa traditional architecture window openings are largely, narrow and rectangular in shape. Perhaps this is meant to restrict a wider view of the outside. Another thing to observe is that the orientation of the building is usually on East-West axis and window openings are located on the North and South elevations. This ensured they avoids the direct heat from solar radiation coming from the west and east directions. It is usual for a typical Hausa man for his building to face the East. This is so as the sun set in the West the shadow of the building cast shade on the eastern façade (front entrance) of the building. This strategy avoids the discomforting rages of dusty dry wind and makes convenient and comfortable for the Maigida to sit and relax and discuss with his guests and friends in the evening after work. However, this is

in contrast to the orientation of courtyards which is at North-South axis. This strategy offers long and wide shade in the mornings and afternoons within the courtyard. In addition, it ensures that the travelling time for the sun to cross the courtyard space is shorter. Thus, as a sustainable strategy it provides long hours of shade both in the morning and afternoon. And also prevent heat from radiation within the courtyard.

Given the above characteristics it would be understood that the traditional wall openings and the orientation of the building are more corresponding to sustainability. First, none or little harmattan dusty winds which comes from the Sahara in the North and North east penetrates into the interior of buildings. Again Agboola & Zango (2014) observed that it is also an intention to eliminate the hot, dry air. Also, the placement and the small size of the window helps in restricting the movement of flies, some harmful insects and reptiles into the interior. Thus, the interior is adequately protected by the introduction of this strategy. It is therefore, in line with the principles of sustainability. As it keeps the occupants safe, secured and healthy particularly from asthmatic and related infections.

Given the above explanations it has been demonstrated clearly that architects, planners and urban designers could take some clues from these traditional strategies and apply them in designs and planning in contemporary urban built environment.



Fig. 1. It demonstrates the extent (level) of window openings in Hausa Traditional Architecture.

Source: Agboola & Zango (2014)

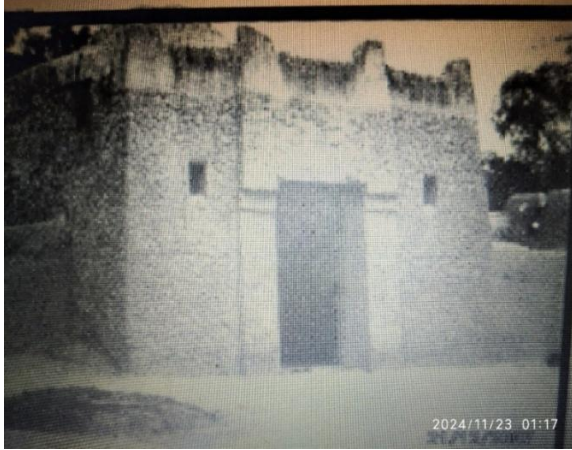


Fig. 2. Entrance of Hausa building showing extent (level) of window openings in Hausa

Traditional Architecture. Source: Adeyemi, (2008) & Garba S.B. (2003).

Use of renewable materials and less consumption of energy and resources

One unfortunate difference between animals or humans in a risky, unfriendly or dangerous situation is that animals or humans can run or move away to safety while buildings cannot run away from earthquake, drought, heat, flood or cold. For this purpose, buildings, adaptations to environmental changes are largely important. It is a fact that most building materials are solid and immobile entities which are either process and manufactured in factories or natural and locally sourced. Materials that are artificially processed and manufactured are mostly nonrenewable and consume a lot of energy in their production and the factories that produces them emit gases which are pollutants and they contaminate the environment and thereby increases the danger of global warming. However, naturally and locally sourced materials are environment friendly in which no artificial energy involved and no pollutants are produce in their production.

Schmid & Thomas (2018) wrote that most of the materials used in building construction are produced using methods with a high energy input (i.e., under high pressure and at high temperatures). According to Agboola & Zango (2014) Hausas preferred the utilization of useful materials such as vegetation and soil that were readily available in their immediate vicinity. Clay and mud used for building are usually

dug out from the ground which are often located at river banks or old pits around the surrounding environment. The clay is mixed with water to form a plastic mold for the mix to be more cohesive and stronger then grass and cow dung are added. Traditional roofing materials include thatch, mud as roofing cover in addition to bamboo and raffia palm fronts which acts as rafters and purlins to support the roofing materials. Unfortunately, the thatch material is highly inflammable. The important factor is that these materials and the strategies employed to utilize them in traditional building and constructions certainly contribute to sustainability and reduce the increasing global warming.

Given the above explanation it is obviously clear that people especially the professionals such as architects, engineers and planners need to reflect on the necessity and importance of breaking away from the heavy dependence on modern technology for heating, cooling and even in the production of some modern building materials.

Involving local artisans and craftsmen

Indeed, craftsmanship can be seen as an attribute of human nature that seeks perfection while carrying out a skillful job. Fathy, H. (1986) described craftsmanship as a fundamental human impulse, the notion of measuring the skillfulness and accuracy of one's manual work. Again, in general, craftsmanship is affiliated with skillful production, usually by hand and to the quality of design (Fathy, H. 1986). It is true that the aesthetic quality of the built environment is not left out of the pursuit for visual and functional sustainability. Various studies have of course, identified diverse aesthetic elements to be responsible for the aesthetic quality of the physical environment.

In traditional method of construction, craftsmanship and expertise has always been said to be one of the determinants of aesthetic quality. More so, the development of Hausa traditional house forms is known to have demonstrated a thorough understanding and meaningful response, in which the styles are not related to individual structures alone but collective neighborhood design on which fundamentally the values and the status of the community lies. It means the notion of aesthetics and beauty depends on the commonly accepted customs,

values and traditions of the community. The craftsmen ensure that identity and symbolic values of the community are sustained and respected. Thus, the importance of excellent craftsmanship to enhance the overall aesthetics of the built environment is so crucial for the survival of traditional architecture and consequently sustainability.

However, the arrival of foreign innovative building materials like cement and corrugated roofing sheet had a huge effect on the physical appearance, in terms of shape, decorations and forms of buildings. For instance, instead of circular shape and forms buildings began to take rectangular and other regular shapes. Again, the shared values and symbolic meaning attach to aesthetics and decorations disappeared. Thus traditional architecture began to have no significance in traditional communities.

As a consequence, it is obvious now that Hausa Architecture with its domed roofs, thick monolithic walls and decorative plasters and colorful imagery, figures, calligraphy, cubicle forms and simple shapes and patterns have been substituted by a quadrilateral sand-screed and concrete model with smuggled foreign Europeans columns and aesthetics in addition to the absence of traditional aesthetics in the built environment in African cities. Therefore, the sustainable growth and development in traditional architecture was lost.

Contributions of Traditional Courtyard to Sustainability:

Undeniably, Islam is the most religion accepted by the Hausa people. It should be understood that it is an injunction in Islam that women in purdah are secluded from the outer male reception areas. It provides privacy for the women and also promote good morals among the family members. This is in accordance with the general belief in Islam. It is good to remember that there is critical spirituality related to sustainability. Furthermore, in Islam the remembrance of God is at the core of the religion. It is among the fundamental doctrines of Islam. Thus, the existence of courtyard among other things serves as a central space in the house for the remembrance of God. This fact is important for spiritual academics. As a result, the family often perform daily congregational prayers, the teaching of Quranic texts and morals to children.

Adamu (2022) wrote that in this regard, Hausa compounds were divided into two areas namely: the front area or the “Zaure,” which mainly belong to the master of the house and the latter part beyond the “Zaure” provided as women quarters arranged around a courtyard. Given the above explanation it is obviously clear that this is in contrast to the contemporary buildings found in modern urban centres in Hausaland where courtyards are almost nonexistence.

According to Markus (2011) most residents have experienced constant problem of thermal performance in buildings due to high indoor temperature conditions. He further, concluded that the use of passive design strategies such as good courtyard and building orientation, building materials, and natural ventilation can improve cooling naturally and bring to minimum the energy required for cooling in buildings. To comprehend the significant contributions of traditional courtyard to sustainability it perhaps should be examined in terms of its planning and orientation, control of air movement and the provision of daylighting.

(i) Planning and Orientation:

A North-South axis of the tropical climate in Hausaland faces the conventional rising sun from the east and the setting sun in the west. This teaches that a rectangular building, should run along all east-west axis so that its long elevations will face North and South. This configuration minimizes thermal exposure to the hot solar radiation. In traditional planning the courtyard in contrast, is usually orientated at the east-west axis. The courtyard is flanked on both sides to the North and South by living and sleeping areas while on the East and West sides, cooking, storage, washing and toilets facilities are usually located (as discussed above). This configuration again, minimizes thermal exposure from the sun radiation on the walls of the living and sleeping areas. This traditional principle if utilize by contemporary buildings would certainly reduce or even eliminate the use of mechanical and electrical energy for cooling.

(ii) Control of Air Movement and Day-Lighting:

Again, the carefully oriented courtyard geometry allows the required daylight to penetrate significantly

into the building spaces for the period needed by the occupants, than would be possible in contemporary or modern buildings. Much of this daylight is diffused light. Solomon (2005), observed that diffused lighting is the most ideal form of illumination for healthy conditions. Another important fact is that the courtyard also allows the occupants to enjoy the delightful variations in light conditions that occur as the sun crosses the sky

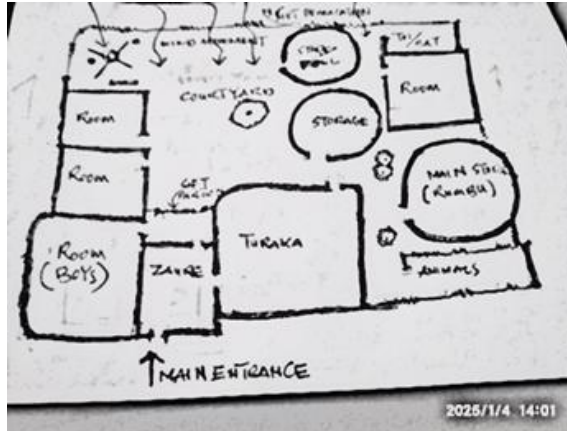


Fig. 3 Typical Plan of Hausa Compound
Source: Author Freehand Sketch (2025)

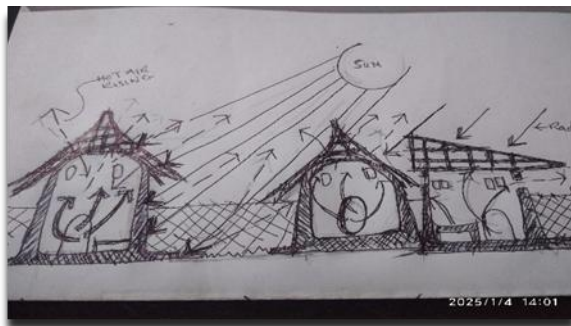


Fig. 4 Typical Cross Section of the Compound
Source: Author Freehand Sketch (2025)

while mixing and giving playful of light and shade coming from branches and vibrating leaves from planted trees in the courtyard.

Again, relying largely on convention current, the courtyard system control air movement by using the heat from solar radiation and heat from the cooking (as domestic cooking usually takes place at the courtyard) activities to activate a natural ventilation system throughout most of the building (figs 3&4). Therefore,

the careful manipulation of natural air movement and daylighting, the traditional strategies used in Hausa architecture, if applied and utilize in the design of contemporary buildings in the tropics, would enhances comfort of the occupants, the sustainability of the buildings and its environment. These traditional strategies would certainly save a significant amount of energy by reducing the need for electrical illumination and ventilation.

A Final word on Traditionalism and Sustainability

From the discussion of the traditional architecture and planning in Hausaland it might be important to realize that the study has largely emphasized the principles and values governing the design and construction of buildings in Hausaland in particular and generally in Africa. From the study perhaps five facts seemed to be demonstrated about the Hausa traditional architecture and construction. These might include:

- (i) That the Hausa, traditional architectural and planning was developed from the forces of the land and local resources.
- (ii) That the Hausa traditional value systems were well considered in the design and development of the architecture.
- (iii) That the evolving architecture was easily adopted by the Hausa society in the subsequent periods by the succeeding generations.
- (iv) That the Hausa society developed built systems were constructed by the people themselves.
- (v) That the contents of the traditional architecture possess sustainable strategies that could be adopted in the planning, design and construction of contemporary buildings in urban areas.

Given the above facts, it is interesting to observe that all the five factors could easily be identifiable and recognized and in agreement with the principles of the concept of sustainability. The work shows that the Hausa has achieved a high degree of sustainability in architecture and construction for their society.

CONCLUSION

In conclusions therefore, these crucial strategies and requirements of sustainability from the Hausa traditional architecture could lay the needed

foundation of the future in developing sustainable living which can fulfilled practically and inevitably in maintaining nature's own creations. Generally, for instance, all plant and animal survival rely on the use of solar energy which demonstrate that life depends on sustainable environment. Therefore, more researches ought to be focus on utilizing solar as a main source of energy. The paper thus, attempted and tried to argue that to promote the principles of sustainable design in contemporary buildings especially in the tropics, home-grown architects should begin to consider some traditional methods, techniques and procedures in the design and construction of building components which take natural energy as its main foundation. The paper shows that the Hausa traditional architecture contain some sound solutions, strategies and methods which might promote and contribute to the sustainable design of modern buildings. These principles deserve careful study particularly by architects. This fact is based on the fact that the less electrical and mechanical energies use the more sustainable the environment becomes. The principles discussed in the paper are those that offer much needed comfort, security and sense of belonging to most of building occupants in tropical climates, particularly in Hausaland. It is therefore worthwhile for architects, planners and engineers to take a close look at the natural environment.

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