A Study of Vernacular Architecture In Relation To Sustainability; the Case of Northern Nigeria

Noah Ephraim Arome[a], Çiğdem Çağnan[b]

[a]Mimarlık Bölümü, Mimarlık Fakültesi, Yakın Doğu Üniversitesi, 20195906@std.neu.edu.tr
[b]Mimarlık Bölümü, Mimarlık Fakültesi, Yakın Doğu Üniversitesi, cigdem.cagnan@neu.edu.tr

Abstract

The concept of sustainability has over the years become an important subject that architects, designers, planners and stakeholders have taken interest in, so as to preserve the environment and economy from further decadence. In preserving the environment, diligent care must be taken to ensure that sustainable considerations are put in place while providing housing and shelter for the populace. Many people today see vernacular architecture as archaic and neglect the significant response of vernacular architecture with regards to sustainability. Vernacular architecture seems to provide some of these basic sustainable considerations that are eco-friendly, cost effective and employs the use of local technology yet providing the necessary thermal comfort for the wellbeing of its users. The aim of this research is to suggest possible ways these measures can be incorporated in modern day housing environment so as to encourage the sustainability of the culture, economy and climate. Vernacular architecture in Northern Nigeria is analyzed by employing a qualitative research approach. Relevant literatures in this field were reviewed and the results were highlighted to indicate the sustainable measures employed before the use of modern technology. A comparison of the vernacular architecture of the three major ethnic groups in Nigeria in terms of building materials, building form, building layout and aesthetics was carried out. The results showed the common use of open courtyards, mud and thatch for construction with other slight variations resulting from cultural differences and construction skills. These courtyards provides an avenue for family social interaction and for improvement of ventilation. Flats roofs are used in areas with scanty rain, while steep or dome roofs were used in areas with more rain. At the end of the study the environment, religion and culture were identified as key contributors to the vernacular architecture of Northern Nigeria.

Keywords: Vernacular architecture, sustainability, shelter, environment, Northern Nigeria.

Sürdürülebilirlikle İlişkili Bir Yerel Mimari Çalışması; Kuzey Nijerya Örneği

Özet

Sürdürülebilirlik kavramı yıllar geçtikçe çevreyi ve ekonomiyi daha fazla çöküşten korumak için mimarların, tasarımcıların, planlamacıların ve paydaşların ilgi gösterdiği önemli bir konu haline geldi. Çevrenin korunmasında, halk için barınma ve barınak sağlarken sürdürülebilir hususların yerine getirilmesini sağlamak için özen gösterilmelidir. Günümüzde pek çok insan yerel mimariyi arkaik olarak görmekte ve yerel mimarinin sürdürülebilirliğe olan önemli etkisini önemsememektedir. Yerel mimari çevre dostu, ekonomik ve yerel teknolojiyi kullanan, kullanıcıları için gerekli termal konfor gibi temel sürdürülebilir hususlardan bazılarını sağlıyor gibi görünmektedir. Bu araştırmanın amacı, kültürel, ekonomik ve çevresel sürdürülebilirliği

sağlamak için, bu önlemlerin modern konut tasarımlarına dahil edilebileceği olası yolları önermektir. Çalışmada, Kuzey Nijerya'daki yerel mimari nitel bir araştırma yaklaşım kullanılarak analiz edilmiştir. Bu alandaki ilgili literatürler gözden geçirilerek modern teknolojinin kullanılmasından önce uygulanmakta olan sürdürülebilir yerel mimari uygulamaları ortaya konulmuştur. Nijerya'daki üç büyük etnik grubun yerel mimarilerinin yapı malzemeleri, yapı formları, bina düzeni ve estetik açısından bir karşılaştırması yapılmıştır. Sonuçlar, kültürel farklılıklardan ve inşaat becerilerinden kaynaklanan küçük farklılıklarla birlikte, binalarda ortak özellik olarak açık avluların, çamurun ve sazın kullanıldığını göstermiştir. Bu avlular, aile içi sosyal etkileşimi ve doğal havalandırmayı sağlamaktadır. Yağmurun az olduğu yerlerde düz çatılar kullanılırken, yağmurun fazla olduğu yerlerde dik veya kubbe biçimli çatılar kullanılmıştır. Çalışmanın sonucunda çevre, din ve kültür Kuzey Nijerya'nın yerel mimarisini şekillendiren üç önemli etken unsur olarak belirlenmiştir.

Anahtar kelimeler: Yerel mimari, sürdürülebilirlik, barınak, çevre, Kuzey Nijerya.

1. INTRODUCTION

One of man's basic need is shelter. The importance of shelter or housing cannot be overemphasized when we consider human comfort, safety and wellbeing in relation to the harms from wild animals and effect of climate and weather to human lives. The kind of shelter or housing an individual finds himself plays a significant role in influencing their lives. Housing according to Olotuah (1997), includes the environment where humans dwell and how they respond to both physical and biological materials needs. In buttressing this claim, Massoudi, et al (1978), bolstered that for a dwelling unit to deliver the optimum objective, it is imperative that such dwelling ought to offer the least functions that will meet the need of the body, health and spirit of man. From the preceding statements above, a good house must therefore ensure the wellbeing of the occupant's spirit, soul and body. It is also important to understand that housing does not just entail the "building" but also the environment around which the building is situated. Since every environment has its own peculiar climate and weather condition which must be considered in order to achieve the optimal goal of housing, it is imperative to study the different distinctive environment and find out the means and measures available within in order to deliver this optimum goal in a sustainable manner.

The word Vernacular is of Latin origin '*vernaculus*', which means to be 'domestic, indigenous or native'. Vernacular architecture defines the building methodology which employs the usage of available local materials and tradition to respond to the local needs (Fernandes et al., 2014). In a related study, Lawrence (2006), stated that vernacular buildings can be seen as those constructions by man that results from interactions with certain stimulators such as the ecology, material, economy and social factors. Judging from the understanding that vernacular architecture had developed mainly from the method of trials and errors, the dwelling place and the site planning were greatly dependent on the expertise of the builder, the prevailing environmental condition, as well as the available local materials for construction. Vernacular architecture is also regarded as that form of architecture that is indigenous to an exact time or place and does not require the services of a trained architect basically.

1.1 Study Aim and Objectives

This study aims to develop a deeper understanding of vernacular architecture present in northern Nigeria in relationship with sustainable measures. The following are thought out objectives to achieve the above set aim:

i. To carefully examine vernacular architecture and its features.
ii. To highlight some features of vernacular architecture employed in Northern Nigeria
iii. To understand the rationale/factors behind the use of those vernacular features and analysis them in terms of sustainable considerations.

1.2 Methodology

For the course of this study, a qualitative research approach method is used, taking a number of existing literatures reviewed so as to highlight the sustainable features that are employed in the vernacular architecture of northern Nigeria. The study identifies the sustainable design considerations such as its compatibility and response to the topography, weather and climatic conditions, common building plans, materials and low-tech put to use in order to make provision for passive cooling and heating in the traditional dwellings of Northern Nigeria.

2. LITERATURE REVIEW

To further enhance understanding of the subject matter of vernacular architecture in Nigeria, it is important to have a broader look at the Yoruba and Igbo traditional architecture. The Yoruba and Igbos are the next largest ethnic group in Nigeria. In this review, certain similarities they share in terms of their traditional architecture and its response to climate, culture and environment is highlighted.

2.1 The Yoruba Traditional Architecture

The Yoruba vernacular architecture is the architecture of the Yoruba people. They predominantly inhabit the south west region of Nigeria which coincidentally falls within the tropical rainforest. The Yoruba people are identical in language, way of life and beliefs with just a slight variations in parlance. Notwithstanding the incorporation of contemporary way of life, the Yoruba people tend to uphold their resilient connections with traditional beliefs. This is highlighted by Idowu (1996) where he said that the people rarely built for their divinities temples that were splendid in their traditional architecture. Their buildings' form is basically of cuboid shape and is carved around a central courtyard. The typical layout of the family compound is accessed only by one point and this can be seen in the Figure 1 below.

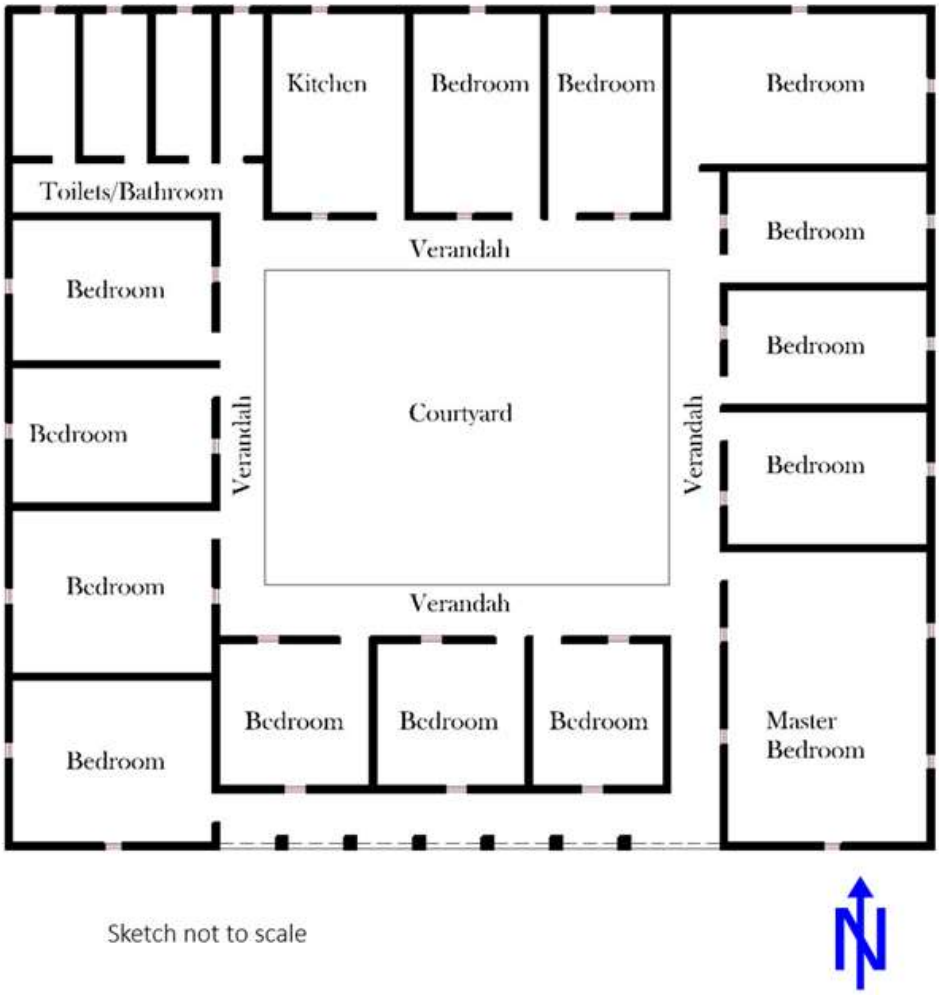

Figure 1: A typical Yoruba compound layout (Author, 2020)

The family head usually resides in the room by the entrance door so he can survey and secure his home. The older children tend to occupy the bigger rooms which are usually by the corners while the other ones are assigned to the children and mothers. Their rooms have small door and window openings, which opens to the immediate courtyard and veranda. Their walls are made from mud which is readily obtainable and is mixed with grass, so as to improve its bonding ability. Just above the window opening, is the ceiling headroom made with mat sourced from fronds of palm. This space in the ceiling space serves as an area for storage of materials deemed valuable. Splits of bamboo is positioned as wooden beams for reinforcement; wetted earth is then poured on the matting to form a slab. Observations shows that most traditional building constructions are carried out during the dry seasons so as to enhance curing of the mud walls.

2.2 The Igbo Traditional Architecture

The Igbo people are found predominantly in the South-east of Nigeria. They occupy states like Abia, Ebonyi, Enugu, Anambra and Imo. Igbo people engage in many commercial activities and are very industrious in nature (Chukwu, 2015). According to Dmochowski (1990), communality is one core concept in the culture of the Igbos and this is well portrayed in the layout pattern of their settlement where each building seeks to imbibe their values in terms of their

spirituality, way of life and culture into their architectural form. The typical Igbo communal settlements has a space at the center, which serves as a meeting point for public gatherings, meetings, discussions and also as a point for other forms of social interaction. A typical Igbo family layout comprises of some of units of dwelling huts, where each hut stands as a separate entity. Their layouts show one entrance and has a wall made from earth to surround it. According to Okoye (2002), the entry point portrays the prestige and family influence and while depict the reputation of the compound head. The buildings are made in either rectangular or circular shapes, this follows also in the roofing form adopted. Thus a house shaped like a rectangle would have a hipped roof while a circular building will have a conical roof. The compound layout has separate sections for men and women, with the children section merged with the women.

Their material for construction consist mainly of bamboo, clay and grasses. These materials are employed to address the local weather conditions. Clay which has a good thermal property is used to make the building walls as it able to suitably moderate temperatures between the indoor and outdoor space as a result of the hot and humid weather condition dominant in southeast Nigeria. Nsude (1987) stated that the use of steeply pitched roof made of thatch was in responds to the hot humid climate and rainfall of the tropics as well as the availability for roof making as shown in Figure 2 and Figure 3. The Igbo architecture is quite similar to the Yoruba's in terms of construction techniques method and material options though in terms of spatial configuration, there is a dissimilarity. The typical Igbo family layout is characterized by discrete units dispositioned relatively to the compound's head dwelling hut, unlike the case of the Yoruba's that supports massing.

Figure 2: Roof construction (google.com)

Figure 3: A steep roof (Ikebude, 2009)

To further enhance the understanding of vernacular architecture of northern Nigeria, a brief comparison in terms of focal point, family size, compound form, openings, decorations and building material of the three major ethnic groups in Nigeria is shown in Table 1.

Table 1: Distinctive comparison of the vernacular architecture of Hausa, Yoruba and Igbo (Revised from Lodson et al., 2018)

	Hausa	Yoruba	Igbo
Focal Point	Emir's palace, mosque, market	Oba's palace, market	Village square, shrine
Family Size	Large because of religious and extended family nature	Large because of extended family practice and multi-habitation	Large because of socio-economic and tended family practice
Open Courtyards	Present	Present	Present
Compound Form/Shape/Roof	Rectangular or circular huts. Gender separation and privacy prioritized.	Little gender separation, rectangular or circular huts arranged in linear pattern around courtyard	Little gender separation, round and rectangular huts
Windows/Door Opening	Narrow/small and few doors and windows	Narrow/small and few doors and windows	Narrow/Small and few doors and windows
Decorations	Rich decoration with reliefs, murals and engravings.	Decorations with murals, relief, pebbles, cowries, seashells and carvings.	Decorations with murals, relief and carvings.
Common Building Material	Mud, grass, cornstalks, timber	Mud, grass, palm fronds and thatch material	Mud, grass, raffia palm and bamboo.

From the foregoing, it is observed that mud and grass were commonly used by the three major ethnic groups, the preference of these materials results from its availability, accessibility and minimal technical skill required to handle its use. The presence of courtyards is also predominant, amongst the three major ethnic groups though for different cultural purposes. Openings of building are small and narrow in size, these were all measures adopted by traditional architecture to help maintain a good and healthy thermal comfort within the interior space in response to the demand of the different climatic, cultural and economic needs of the individual ethnic groups. The decoration patterns, quantity and materials for decoration also varied, this is largely influenced by the availability of the decoration material, the skills of the artisan, and the economic status of the people. The Hausas and Yoruba's have two focal point in similar, though this has a cultural underling purpose, it explains why so much details is paid to those areas. In general, focal points are given more attention as it serves as a place of great significance and prestige to the people.

2.3 Study Area

Nigeria is situated in West of Africa and can be geographically located on 4°N to 14°N, 3°E to 14°E latitudes and longitudes respectively. According to the National Bureau of Statics (2010), Nigeria has an area of 923,768km^2, with 13,878km^2 covered by water. It has a whopping populace of over 198 million people and about 250 different ethnic groups having 500 local languages with varying social ideas and practices. The Hausa-Fulani who are the predominant tribes occupies the North, the Yoruba people occupies the South-West, while the Igbos' occupies the South Eastern part of the country (Figure 4). The landform of Nigeria is such that the north and south plains are interjected by hills and plateaus situated on the epicenter of the nation, with the Sokoto plains on the north-western edge of the country while the plains of

Borno is on the north-eastern edge extends into the basin of lake Chad. The basins of river Niger-Benue forms the key drainage parts for Nigeria. The country is named after Niger River and Benue which are the principal tributaries (Udo et al., 2020).

The tropical climate experienced in Nigeria is such that comes with varying dry and raining season. The south eastern part of the country is mostly wet and dry all year but gets drier farther inland on the southwestern part. The north and west of Nigeria has the savanna climate, while the far north has a steppe climate with slight rainfall. The sunny, hot sunshine and little rain experienced in the Hausa land holds for the great difference in temperature of the night and day time. In general, the length of the rainy season decreases from south to north. The south experiences raining season from the month of November unto March, while the farther north has its own from the middle of May down to September (Udo et al., 2020).

The Hausas predominantly occupy latitudes 3.5^0 E to11.0^0 E, and from longitude 10.5^0 N to 14.0^0 N. Kano serves as the major center for trades and cultures of the Hausas. The early Hausas were animists, though the religion of Islam played a significant dominant role. The culture of the Hausa people culture depicts a measure of developed diversification and specialization, hence, they relied on the sustenance agricultural practice such as the rigorous cultivation of maize, millet, sorghum and other crops cultivated and relied on the principle of crop rotation where they utilize the organic manure waste from the cattle of the Fulani as fertilizer to boost their local economy.

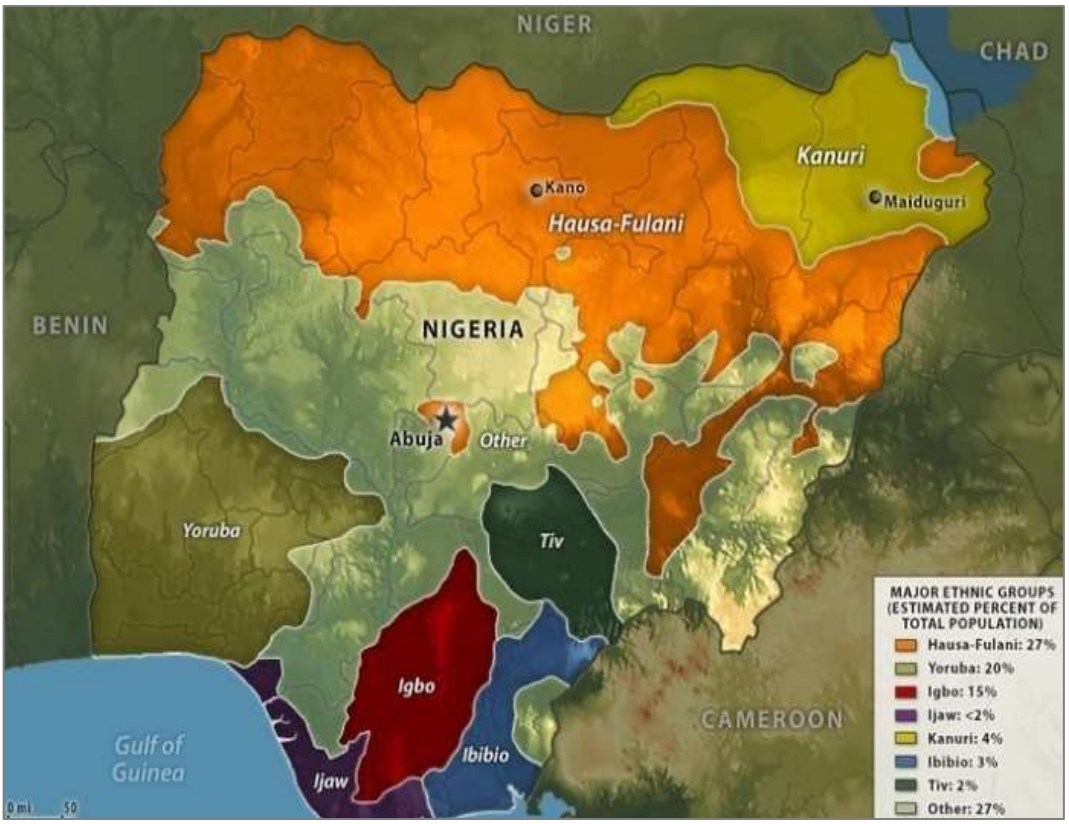

Figure 4: Map of Nigeria showing the major ethnic groups (google.com)

The activity of agriculture has fetched far beyond the provision of a means of livelihood, but has also given them the opportunity to venture into other works like silver mining, thatching, weaving, leather-works and dyeing. The Hausas are well known to travel around to trade off their leather goods, as well as other tourist materials and items.

3. VERNACULAR ARCHITECTURE IN NORTHERN NIGERIA

The vernacular architecture of northern Nigeria is basically defined by the Hausas who constitutes the major population. Vernacular architecture in northern Nigeria therefore describes how the dwelling space and environment of the Hausa people is shaped in a functional manner that corresponds with their way of life. It portrays their believe system and culture as a group of people. Highlighted below are some of the distinctive characteristics in the traditional architecture of Northern Nigeria.

- **Engravings**

Wall engravings on walls are made by local builders, trained craftsperson and very knowledgeable engravers. The surface to be engraved can be flippantly etched with a sharp pointed instrument, or drawn with the hand manually with a good long-lasting marker. The artisan may depend on his free hand drawing expertise or common design elements when crafting. The street facade of the Hausa people is usually decorated with elaborate intertwining arabesque form of relief coated with rich colors. The level and amount of decoration portrays the social status of the individual owner. Figure 5 shows an example of the elaborate use of engravings on the Emir of Kano's palace.

Figure 5: Engravings (URL1)

- **Earth as a Building Material**

Generally, the construction method employed is the wattle and daub technology; it is a building technique that requires firstly, the making of post frames from hard wood and then filling them up with earth balls so as to make a wall. The earth to be used is first scattered on a level surface and watered, with the feet, the earth is then pounded until a uniform thick paste is achieved. The thick paste is left to cure for some days after which the same process is repeated. In order to improve the quality of the earth, some good amount of "datsi" (grass) is added to it. The Figure 6 shows a wall made from earth with column like structures to help enhance the wall stability.

Figure 6: Earth walls (URL2)

- **Stone as Material for Building Construction**

In quite a number of areas in northern Nigeria, stones are commonly used in constructing building foundations because of its ability to limit the capillary action of soil moisture. In parts where heavier rains are experienced, these un-coursed rubbles or stones are put into layers and employed to serve as foundation so that moisture movement upwards is reduced to the barest minimum. Figure 7 below depicts the use of stones for foundation in Northern Nigeria.

Figure 7: Stone foundations (URL3)

- **Grass and Thatch as Material for Building Construction**

Thatch is one very old material used for construction; here the grasses used to make the thatch can be harvested easily from their farms. Thatch which is a good thermal insulator, helps to provide optimum thermal comfort within indoor space. The Hausas make use of the dry stalks left after harvesting their corn and millet to make their roofs and some cases fence. They also bind the thatch material with earth so as to form a composite building material. This thermal property encourages the use of thatch as roofing sheets and for fencing of compounds. Figure 8 shows the application of thatch material for roofing in a compound.

Figure 8: Thatch roofs (URL4)

- **Timber as a Material for Building Construction**

Wood can be sourced from trees and other fibrous plants, it can be used for building construction when pressed into lumber and timber, such as planks and boards. In northern Nigeria, the finest timber employed in construction is quiet heavy, durable and has good resistance to termite attacks. This timber is sourced from the trunk of male palm trees referred to as *giginya* or *daleb* in Hausa dialect. The beams referred to as *azara* is used in making frames, corbels and brackets as structural component for bearing domed and flat roofs. In order to create a shielding layer that disallows storm water from sipping down the roof, a local and efficient technology is employed, and this entails mixing ashes from timber with pods and root infusions and spreading it on the flat roof. This treatment serves as a water proof membrane. Figure 9 shows the application of timber as a structural support for roofing.

Figure 9: Timber for roofing (Mustapha, 2020)

3.1 The Typical Hausa Family Compound

The planning of space entails envisioning the functions to which the space is provided for. It also requires considering the users' needs, aspirations, and the social and cultural background. In Hausa land, the housing pattern is a "general affair" for the community since they are homogeneous in their social cultural heritage. This homogeneity in culture and way of life of the people spreads in terms of their aspirations and needs, where there is a variation, the economic status of individuals is said to be responsible. Hence the Hausa vernacular spatial family compound pattern is greatly similar.

The family compound is that of a homestead situated within a walled compound with a number of huts therein. It has provision for living areas and sleeping areas for both members of the nuclear family and in some cases for the extended family, in it also is the space for domesticated animal rearing and space for the household head to practice his handiwork or craft such as leatherwork or tie and dying. The enclosed courtyards provides a playing ground for young adults and children and serves as common activity area for other members of the household. The Figure 10 below, shows a schematic floor plan of a typical Hausa family compound.

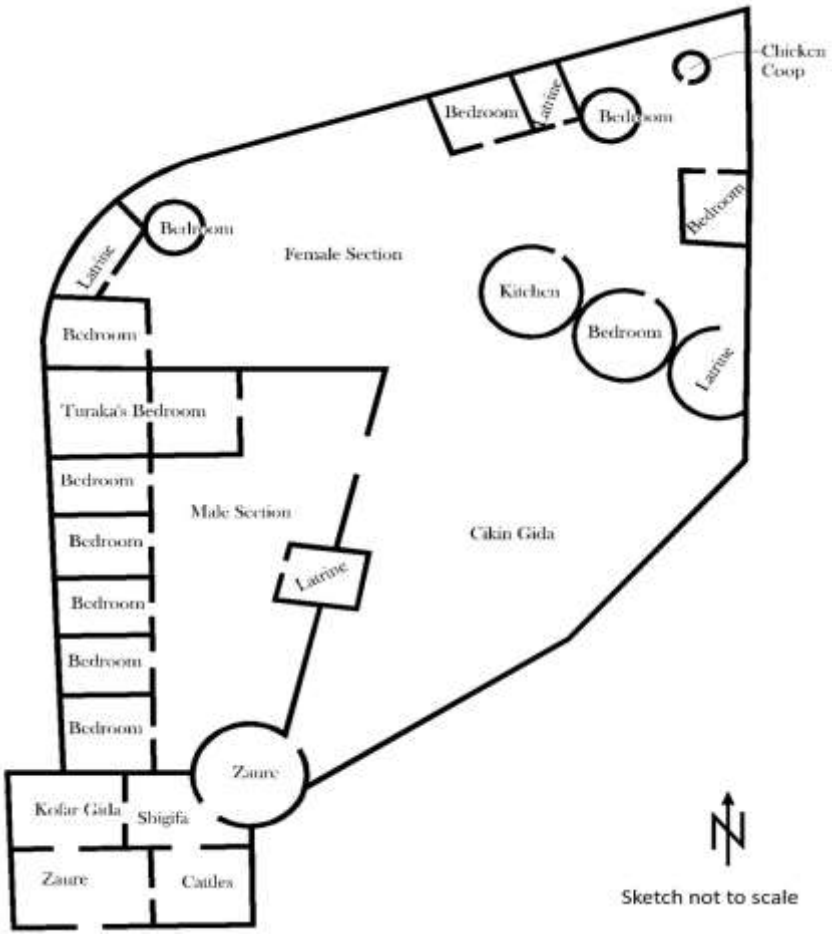

Figure 10: Typical family layout of the Hausa compound (Author, 2020)

The Hausa family compound has a great level of intricacy and clear spatial hierarchy of privacy grading which progresses as one proceeds into the inner space. The compounds are commonly surrounded with a fence of mattings made from grass referred to as "Zana" or with a mud walling. The 'Zaure" which is the central entry hall which opens to the streets serves as the boundary between the outer communal areas from the secluded inner family part. The *Zaure* is an important space because it serves as reception area where adult male visitors are received and also provides an access control and security system for the compound. The *Zaure* most times is decorated with some engravings and paintings, depending on the financial and social status of the house owner. The first courtyard of the house after the z*aure* is referred to as *kofar gida* (which translates as entry door), outlines the limit of access to all visiting male adults with exception to only close family associates to the head of house. After the "Kofar Gida" comes the "Shigifa"; another reception area that opens to an external courtyard. The "shigifa" is a more secluded and smaller internal *zaure* where the family head can socialize and relax privately with close family and associates.

In more wealthier family compounds, the head of the household *Turaka*, may decide to divide his *shigifa* into two sections with one section serving as sitting room and the other a sleeping room, the sitting room has two external doors, one opens to the inner courtyard *cikin gida* while the other to the inner courtyard *kofar gida*. With this opening design, the *Turaka* has the ample opportunity to observe happenings within and around his dwelling place. The *cikin gida* is generally regarded as quarters for women and constitutes the main portion of the compound. It has within it other space functions and facilities that engenders the well-being of the women.

3.2 Common Factors That Hinder Vernacular Architecture in Northern Nigeria

Just like in some other parts of Nigeria, traditional architecture in Northern Nigeria is no longer trending and employed by individuals. This study however, observes some factors identified to be responsible for the hindrance and decline of vernacular architecture in Northern Nigeria, some of which includes:

- ***Human neglect and modernization***: As a result of modernization, there is this disregard for buildings with customary values in present. This modernization trend creates a change in taste of people which leads people to ignore and forget local architectural elements and replacing them with contemporary buildings, since most traditional buildings do not exhibit the modern aesthetic quality and structural flexibility which comes with contemporary buildings and designs.
- ***Socio–cultural Conditions***: Most of the traditional buildings here, require regular maintenance in order to keep the structural stability of such houses. This regular maintenance will as well require good financing. Studies has shown that not everyone has the financial capability to keep this recurrent cost for building maintenance, this in turn causes an discontinuity in the use of vernacular architecture in the Northern Nigeria.
- ***Weather and climate***: The continuous effect of the element of weather (wearing and tearing) causes traditional buildings not to last for too long, this creates a limitation that discourages the application of both the traditional building materials and the construction method in Northern Nigeria.
- ***Discontinuity*:** Where there is no transfer of skills and knowledge from older generation of traditional building artisans to younger ones or absence of adequate documentation of traditional building method or system of architecture, this gives rise to the gap that makes the trade fade. It's being observed that there is not enough being done in passing these skills

to others. This discontinuity hinders the continuity so even in a case where an individual desires to employ traditional architecture, the next and major challenge will be how to get the artisans with the right skills for the job.

3.3 Examples of Sustainable Measures Employed In Vernacular Architecture of Northern Nigeria

Some sustainable measures can be identified from the vernacular architecture of Northern Nigeria and these are highlighted as follows:

- ***Building Technology***: The construction of tall walls as shown in Figure 6 around the courtyards is one climatic response to provide a larger shaded portion. This reduces the effect of solar radiation to the dwelling space and environment. In addition, they made use of higher ceiling to floor heights so as to allow for natural passive cooling where hot air is forced to rise and is replaced with cool air which is heavier and more suitable for human comfort. Areas like Kano, Sokoto and Katsina that experience fewer rains made use of flat roofs while places to the south like Zaria, have their roofs shaped in form of domes, that way the heavier rains experienced there can easily be drained down.
- ***Semi-Open Spaces****:* The *Zaure*, *Shigifa* and *Cikin Gida* serve as semi open space and private family space in the compound layout. The main courtyard which is the *cikin gida* provides a comfortable place for family living, cooking, laundry and other private family activities. Natural lighting and ventilation is enhanced from this irregular shaped courtyard. The location of the kitchen in the compound layout is positioned far away in the courtyard so as to minimize the transfer of heat to the surrounding spaces and also reduce hazards that may result from a fire outbreak.
- ***Building Envelope***: The use of local sustainable building materials like earth, grass and stones are used in construction. The use of mud for the walls is one effective material for thermal insulation, this takes away the need for alternative air conditioning system and heating system. Grass for thatch also provides room for proper air circulation into interior spaces. The use of stones for foundation, provides a good structural base for the huts by preventing soil water seepage that dampens walls and causes the weakening of building structures.
- ***Openings***: The door and window opening are relatively small and narrow, this is to allow for more privacy within the interior space and also reduce the amount of wind and dust that could find its way in. Thatch matting or timber is used to cover the doors and windows, while the entrance to some Zaure could be left open as a sign of welcome.

4. CONCLUSION AND RECOMMENDATIONS

In conclusion, the vernacular architecture of Northern Nigeria can be said to be influenced by three major factors which includes the; environmental, religious and cultural factors. In response to the environmental factor, the availability of the building materials influenced their choice of construction materials, the use of high walls around courtyards to provide shade within the compound, they higher floor to ceiling height to improve thermal cooling. Also, the use of thick mud walls, flat and dome roofs are all sustainable response to the climate.

In the light of religious factor, large spaces like the courtyard built within the compound, provides room to accommodate large people for ceremonies such child naming and weddings, this also serve as space for observing the five times daily family prayers. The separation of men

and women in the compound layout is another dictate of Islam. Houses are built around a courtyard with plans for future expansion as the family grows. The sharing of inheritance after the death of the head of a family, leads to creation of smaller compounds around the original one.

Lastly, the structure of the Hausa family is dynamic in nature, a simple unit can expand into a protracted household compound. The male children gets to begin their married home in the protracted household before proceeding to set up their individual nucleus. Here family inter relationship determines pattern of living.

In a bid to sustain and encourage the vernacular architecture in northern Nigeria, the following measures are recommended;

1. The development of quality and long lasting building materials from the existing vernacular so as to blend with modern architecture.
2. Enhanced awareness and sensitization of stakeholders in the building industry on the importance of adopting traditional practice of sustainability measures in construction.
3. Identify other factors that limits the practice of vernacular architecture in Northern Nigeria.

REFERENCES

Auwalu, F. K. (2019). Exploring the different vernacular architecture in Nigeria. *Int. J. Afr. Soc. Cult. Tradit*, *7*, 1-12.

Adamu, M. S. T. (2005). Interpretation of significant and messages in Hausa traditional architecture. Case of the "Zaure" entrance hall. *Journal of the Association of Architectural Educators in Nigeria. Vol,4*.

Agboola, O. P., & Zango, M. S. (2014). Development of traditional architecture in Nigeria: a case study of Hausa house form. *International Journal of African Society Cultures and Traditions*, *1*(1), 61-74.

Chukwu, J. C. (2015). Traditional Igbo Building Architecture: An Historical Perspective. *Journal of Art and Design Studies. 34 (7-14).*

Danja, I. I., Dalibi, S. G., & Safarov, A. (2017). Factors Shaping Vernacular Architecture of Northern Nigeria. *Journal of Buildings and Sustainability*, (1).

Dmochowski, Z. R. (1990). An Introduction to Nigerian Architecture-Northern Nigeria. *Ethnographica Ltd., London. pp*, *1*(1.10), 1-2.

Ejiga, Opaluwa, Obi Paul, and O. Cordelia. "Sustainability in traditional African architecture: a springboard for sustainable urban cities."*June Sustainable futures: architecture and urbanism in global south Kampala, Uganda* (2012): 27-30.

Fernandes, J. E. P., Mateus, R., & Bragança, L. (2014). The potential of vernacular materials to the sustainable building design.

Hamza, B. The Concept Of Typology And The Hausa Traditional House Classification:Taxonomy Of Architectural Types, Prototypes And Typologies.

Idowu, E. B. (1996). *Olodumare (God in Yoruba Belief)*. Nigeria: Longman.

Ikebude, C. M. (2009). *Identity in Igbo Architecture: Ekwuru, Obi, and the African Continental Bank Building* (Doctoral dissertation, Ohio University).

Lawrence, R. J. (2006). Learning from the Vernacular. *Vernacular Architecture in the 21st Century. Oxon: Taylor and Francis*, 110-127.

Lodson, J., Ogbeba, J. E., & Elinwa, U. K. (2018). A Lesson from vernacular architecture in Nigeria. *Journal of Contemporary Urban Affairs*, *2*(1), 84-95.

Massoudi, A., & Simonian, W. (1978). The Problem of Housing in Developing Countries. *Housing Problems in Developing Countries*, 175.

Mustapha, B. (2020). Hausa Traditional architectural design 7.jpg - Wikimedia Commons. Retrieved March 24, 2021, from Wikimedia Commons website: https://commons.wikimedia.org/wiki/File:Hausa_Traditional_architectural_design_7.jpg

National Bureau of Statistics. (2010). *Annual Abstract of Statistics.* Federal Republic of Nigeria.

Nsude, G. C. (1987). *The traditional architecture of the Igbo of Nigeria* (Doctoral dissertation, Thames Polytechnic).

Okoye, I. S. (2002). "Against History? A Nimo-Born Architecture of Umu Nri (Enugu Ukwu). *Ijele: Art eJournal of the African World*, (4).

Olotuah, A. O. (1997, July). The house: accessibility and development-a critical evaluation of the Nigerian situation. In *The House in Nigeria, Proceedings of the National Symposium, Bayo Amole (Ed.) Obafemi Awolowo University Ile–Ife, Nigeria* (pp. 23-24).

Udo, R.K., Kirk-Greene, A.H.M., Ajayi, J.F.A & Falola, T.O (2020). Nigeria. Encyclopedia. https://britannica.com/place/Nigeria.

URL 1: https://thedotmanka.wordpress.com [retrieved 20, 12, 2020]

URL 2: https://www.skyscrapercity.com [retrieved 20, 12 2020]

URL 3: https://www.flickr.com [retrieved 20, 12 2020]

URL 4: https://www. livingspaces.net [retrieved 20, 12 2020]