

## **IMPROVING THE AESTHETICS OF RESIDENTIAL AREAS IN NIGERIAN URBAN CENTRE: A NEED FOR CONSIDERATION OF FENCE DESIGNS AS PART OF AN ENTIRE BUILDING DESIGN.**

*Adedayo, O. F., Ayuba, P., Isah, A.D. and Yelwa, M.U-K., Department of Architecture, Federal University of Technology, Minna, Nigeria.*

### **Abstract**

*The beauty of an urban centre is a function of the buildings and the infrastructures. A building is considered beautiful when it can be appreciated from outside, this however, is not possible in the residential areas of most urban centres in Nigeria. The beauty of the building is covered up by the fence or distracted by the nature of the fence. The type of fences found in the urban centres tend to hide the entire building from the access road and in most case only the roofs of such houses are visible. This trend gives the urban centre a view best described as a jungle of walls. This paper examines the nature and function of fences in residential areas, it takes a look at the benefits derivable by a change in current fence design. The paper advocates for necessary laws that should govern the construction of fences, it makes a case for Architects to include fence designs as part of building designs. The paper examines the generation of street character using fences. The paper concludes that there is an urgent need for a change so as to improve the beauty of urban centres and general living conditions of the urban dwellers.*

**Keywords: Residential, Fence, Urban, Beauty, Character**

### **Introduction**

The beauty of an environment is a function of the beauty of the smaller units and sections that make up such an environment. In the case of the urban centres we live in today, the beauty of such urban centres is a product of the infrastructures, people and culture of such urban centre. Whereas it might not be very visible to determine how the people and their culture affect the urban centres, it would be much easier to visualize the effects of the various infrastructures in these urban centres. The type, nature and manner of use or arrangement of these infrastructures often help describe how an urban centre is viewed. There are several infrastructures found in the urban centres of Nigeria, however this paper examines the trend of fences in residential areas of the urban centres, with a view of showing the need for greater attention in this aspect of the built environment in order to improve the beauty of Nigerian urban centres.

### **Urban Centres and Buildings**

The major physical make-up of urban centres are buildings, these buildings are used for various activities based on the need of man. These buildings serve as office accommodation, markets, schools, hospitals and many more, but the most important function is that of accommodation. A great percentage of the buildings found in the urban centres serve residential purpose, yet it is still not enough. According to Zubairu (2006) the UN projection of demographic growth of developing countries will add about 2 billion new urban residents in the next twenty years. This projection gives a view of the need of residential houses in the urban centres. The growth of the urban centres in Nigeria could be linked to the concentration of major basic facilities such as schools, hospitals and parastals. This action creates an erroneous believe for the average person of success as soon as he gets to the urban centres.

The nature of the buildings in urban centres often reflect the type of activity performed in such a building and the in most cases the level of wealth associated with the users. It is

common to find that most private parastatals offices are often the finest while that of government public buildings are often times than not in a poor state, this disparity is also visible in their surroundings. The sad thing is that this trend is also revealed in the residential areas within the urban centres though in a different form.

### **Residential Buildings in Urban Centres**

One of the problems of the new millennium facing man today is that of overpopulation (Obi, 2006). This problem translates to various aspects of our society and life, it implies that available resources which hitherto were adequate were becoming inadequate. It is safe therefore to conclude that residential buildings are also a problem for this millennium. According to Olotuah and Adesiji (2006) the growth rate of urban population is more pronounced in Nigeria than most other countries in the African Continent. This is true based on the population of Nigeria, hence it implies that the urban centres in Nigeria are facing a lot of housing problems. Past governments have tried to solve the problem of housing but with little impact, however the common trend now is the provision of housing by private organizations or individuals in various forms. The scheme adopted by most urban dwellers is that of self help housing which intern could lead to the development of slums.

The residential houses provided by government in the urban centres are often mass type of housing with basically one design. The areas where these houses are often located were serviced with good supporting facilities and were often allocated to a particular class of urban dwellers. This trend created a social stratification order, with the increase in population and the inadequacy of government to meet the demand in housing, urban dwellers who could afford to build their personal houses began to build and vacate government owned house and hence the quality of such house began to drop. Gradually government withdrew from housing and as is the case presently in Nigeria government is selling the houses it used to own. This act has forced many people to build, buy or rent a house. The visible change in housing that accompanied this trend was the introduction of fences within in the residential areas, several reasons could be adjudged for it. Worthy note here is that fences were not part of government form of housing in the urban centre but rather it is a product of the individuals who dwell in these urban centres.

### **Nature of Fences in Nigerian Urban Centres**

The type and nature of the fences found in urban centres of Nigeria vary both in design and function. The growth of the urban centres has brought along a lot of problems that require adequate consideration. People of questionable character are found in the urban centres, hence it was not longer enough to have barriers in form of flowers and hedges around a building to stop people from trespassing and committing crime. Buildings based on their level of significance and function/activity carried out within them required various level of security. It is common to find low fences around buildings that have security personnel who man their premises, in other cases you find high fences around buildings leaving the passer by with no clue as regards what goes on inside such buildings.

Fences in most civil buildings are a combination of low walls, pillars and iron rods. They are used to achieve various patterns and allow for view of the building from the access roads. The same can not be said for that of factories and some other buildings, here high walls are used as fences and in some cases electrocutable wire mesh are fixed on top of the fences. The basic desire of these owners is simple and that is to keep as many intruders away from their property or activity. It is worthy of mentioning that these fences add to the appearance of our urban centres, however the function of these fences is being called to question as is evident with the level of crime experienced in the urban centres. The nature

of fences found in residential areas is one that calls for immediate attention, because the nature of residential areas is taking a new look.

### **Fences in Residential Areas**

Residential areas are made up of houses meant to serve as accommodation for the occupants and some other supporting facilities such as corner shops. The process of owning a home starts from acquiring the land, securing it, building and protecting it from trespassers. This need to protect one's home in the urban centre has brought about the type of fences we see in most residential areas. The nature of fences varies amongst individual location. In urban centres where there is high crime rate you find fences that cover up the whole house. In other urban centres where the crime rate is not so high the fences are still high often just allowing the view of the roof alone from the access road. It is common sight to find beautiful houses with plain high walls as fence, these fences rather than complementing the beautiful houses most times take away from it or simply hide it. According to Zubairu (2006) the early architect was known as the master builder, he was in charge of practically of everything on the construction site. The question is how many of these fences are designed by architects in the residential area. The answer is very few; this assertion is made because you would not find any architect who would want to knowingly hide his work. The type of fence found around any house is a function of the desire and fears of the occupants. The sad story is that most of these high fences are found within the residential areas housing those in the middle and high class of the society in the urban centre. The slums which houses the poor is often without any fence and in places where they are found, they are very low of about 750mm high, used basically to demarcate plot.

### **Problems of Fences in Use in Residential Areas**

The major function of a fence is that of security for the occupants of the house, this is why their design and nature vary. It is observable presently that these fences do not offer the required security as evident in the level crime in the urban centre. According to Okpoechi (2005), in recent years urban areas have become very complex and difficult to control. This is reflected in the height at which fences are built. This trend has its problems associated with it.

**Aesthetics:** Aesthetics as an important objective of design is a way of securing attractive solution by the choice of materials, size and other relevant factors. (Fadamiro & Atolagbe, 2005). This objective is often not reflected in the fences in residential areas because the importance of fence design is often neglected. The plain appearance of these fences robs the main building of its beauty, because it hides the main building which attention is often concentrated on. The type of fence in use in residential areas of urban centres end up making the urban centres have an appearance of what could be termed as a jungle of walls.

**Ventilation:** The sizes of plot sold in the urban centres are such that when fences are erected in the form practiced today, the movement of air around the building becomes a problem. The walls (fence) in relation to the building often create a wind valley, such that wind is deflected up and just before it gets down it encounters the building roof. The windows based on their height are in the valley hence air does not come into the building.

**Security:** The fences are meant to offer security to the people behind it, this it does to some extent, however with the level of sophistication in crime and the call for community policing it shows that fence alone can not offer the level of security it is assumed to offer. The high fences found in Nigerian urban centres hide

activities behind it, this makes it difficult for anybody outside the fence to offer any form of assistance if there is any intrusion by intruders.

**Fire escape:** The height of the fence and gate make it difficult for quick response in the case of fire out break within the premises. This is because it becomes difficult for anyone to jump the fence either from within the premises or from outside to offer help.

**Structural stability:** The foundations of the fences are often not as deep as that of the main building, yet they are built to be quite high. The fence is exposed to wind load and this causes a form of concern in the periods of stormy winds. The bending moments of these fences are also high because their centre of gravity is high.

### **The Architect and Fence Design**

The problems associated with the nature of fences in residential areas could be traced to the neglect of fence design in the entire scheme of building design process. This has created a vacuum, which is filled by the client as he so wishes. This paper believes that if the study and design of fences is included in the training of architects the nature of the fences will begin to change. The architect by training is expected to proffer solutions through his designs. The aspects which the architect should consider in the design of fences should aim at solving the problems highlighted above.

**Aesthetics:** Special attention should be paid to appearances of fences so that they complement and reflect the character of the building.

**Ventilation:** Fences should not be built completely solid walls alone rather a combination of iron grills or perforated blocks could be used so as to allow for air to flow with minimum deflection.

**Security:** Rather than rely solely on the height of fence as the major form of security other options should be examined. Enhance visibility from outside should be encouraged as a form of security.

**Fire escape:** The method employed in the case of ventilation could be employed, the benefit is that fire could easily be detected from outside and it would be easy to escape and offer assistance to the occupants.

**Structural stability:** If the height of the fences are reduced and more light weight materials are used the dead load of the fence is reduced. The foundation of fences should also be considered and treated like that of the main building

### **Street Character of Residential Areas**

The nature and type of street outlook is a function of the fences and houses that make up the street. According to Eneh (2006), since ancient times designers looked at nature for solutions to their design problems because they saw in nature a perfect model. A careful examination of this statement makes us understand and know where to look for certain things nature has to offer because of peculiar characters. It is like looking at and trail of ants you will notice its character, everything in nature has character, however in urban centres in Nigeria attention is not paid to developing characters for our built environment. According to Motloch (2001) visual overload is a stress on the aesthetics of the environment, the practice in residential areas of urban centres in which the fence design is left to the client's decision gives rise to chaos in appearance of the streets which these fences line which best describes visual overload. This paper views fences as a major way of developing characters for the streets where they are located. They could be of same height, design, material or colour. These characters when developed fully would help in improving the beauty of the street and in turn the environment.

### Need for Laws Governing Design

It is a usual saying that where there is no law, there is no crime. This implies that if there is no law to govern the design and construction of fence as regards approval by the various urban development boards, it would be wrong to blame anyone for this present trend. According to Uji (2004), when people relate or interact with one another, such interaction or interrelationship is regulated by various aspects of the law circumscribing the element exigencies of the interaction. It is obvious from the required drawings to be submitted at the different planning authorities in urban centres in Nigeria, that a vacuum has been created as regards fences design and construction in residential areas. There is a need for the appropriate bodies and professionals concerned with building development in urban centres in Nigeria to fashion out adequate laws regulating our fence design and construction. The authorities should also ensure that there are ways of enforcing such laws and providing adequate penalties for defaulters.

### Conclusion

The design of fence should be given a second look and adequate consideration. This particular aspect which speaks a lot about the aesthetics of an urban centre should not be left at the discretion of the clients alone without any professional input. The benefits of properly designed fence far out weigh the problems of with most fences in-use within residential areas. Fence design should be taught in Nigerian schools of architecture and town planning, semester designs should also comprise fence design along with the main project design. This would make the students get used to such a practice and hence apply it during practice, this would help improve our urban centres in Nigeria.

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1<sup>st</sup> Annual National Conference S.E.T., F.U.T. Minna 28<sup>th</sup> Feb-2<sup>nd</sup> Mar 2007

Conference paper at AARCHES Annual Conference, Federal University of Technology,  
Minna, Nigeria pp1-8

## CONTROL OF INDOOR AIR POLLUTION IN RESIDENTIAL BUILDINGS IN NIGERIA

Arc P. Ayuba, Arc A.D. Isah And Arc O. F. Adedayo, Department Of Architecture, Federal University Of Technology, Minna Niger State.

### Abstract

The World Health Organization (2005), estimates that 4.6 million people die each year from causes directly attributable to air pollution. Many of these mortalities are attributable to indoor air pollution which is responsible for large numbers of deaths and cases of respiratory disease in residential buildings world wide. In Nigeria, there are many sources of air pollution in residential buildings such as burning wood, fire places, stoves, furnaces, incinerators, uncontrolled fires, and motor vehicles generating air pollution emissions. The lack of ventilation indoors concentrates air pollution where people have greatest exposure time. This paper therefore examines adequate ventilation as a key to controlling exposure to indoor air pollution in residential buildings in Nigeria. The paper also looks at the role building materials play in emitting substances that cause indoor air pollution. The paper concludes by suggesting the available indoor air pollution control technologies, devices and urban planning strategies to reduce indoor pollution in the built environment.

**Key words:** ventilation, pollution, control, residential, buildings.

### Introduction

Pollution is the presence of impurities in the environment, these impurities, may be of natural or non-made origin. Natural pollutants include pollen and dust. The most serious and persistent types of pollution result from man's activities (New standard encyclopedia). New Age Encyclopedia defines it as an objectionable change in the physical, chemical or biological characteristics of air, land, or water resource that has an adverse effect on human or animal life or otherwise degrades the environment. Longman Dictionary of Geography defines it as the direct or indirect process by which any part of the environment is affected in such that it is made potentially or hazardous to the welfare of the organisms which live in it, i.e. the results are harmful. Air pollution in the other hand is the release of noxious gases, such as sulphur dioxide, carbon monoxide, nitrogen oxide, nitrogen oxide and chemical vapours. These can take part in further chemical reactions once they are in atmosphere. The atmosphere is a complex dynamic natural gaseous system that is essential to support life on planet earth. Stratospheric ozone depletion due to air pollution has long been recognized as a threat to human health as well as to the earth's ecosystem.

### Sources of Air Pollution

Air pollutants are classified as either directly released or formed by subsequent chemical reactions. A direct release of air pollutant is one that is emitted directly from a given source, such as the carbon monoxide or sulphur dioxide, all of which are by products of combustion; whereas, a subsequent air pollutant is formed in the atmosphere through chemical reactions involving direct release pollutants. The formation of ozone in photochemical smog is the most important example of a subsequent air pollutant. The sources are:

Anthropogenic sources (human activity): this is related to burning different kinds of fuel, burning wood, fireplaces, cooking and heating appliances like stoves, furnaces and

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Anthropogenic sources (human activity): this is related to burning different kinds of fuel, burning wood, fireplaces, cooking and heating appliances like stoves, furnaces and



incinerator. Others include motor vehicles generating air pollution emission and fumes from paint, building materials and furniture cause pollution inside building.

Natural sources: Dust from natural sources, usually large area of land with little or no vegetation. Volcanic activity produces sulphur, chlorine and ash particulates. Methane is emitted by the digestion of food by animals, for example cattle. Smoke and carbon monoxide are produced from wildfires, while Radon gas is from radioactive decay within the earth's crust.

The pollution of the air environment and other human activities has degraded air quality with adverse effect on public health and welfare. The main pollutants from these activities include carbon dioxide, nitrogen oxide, carbon monoxide, nitrogen dioxide, sulphur dioxide, hydrocarbons, cement kiln dust, petrochemical compounds, unleaded gasoline, and totally suspended particulates.

### **Indoor Air Pollution**

It has been recognized many people spend large portion of time indoor as much as 80-90% of their lives (Satterthwaite 2005). People eat, drink and sleep in enclosed environments where air circulation may be restricted. For these reasons, some experts feel that more people suffer from the effects of indoor air pollution than outdoor pollution. A variety of factors contribute to poor indoor air quality in buildings, including indoor pollutants, outdoor pollutants near the building, pollution transport through ventilation systems and emissions from building materials poor indoor air quality can harm the health of families in their own homes. The lack of ventilation indoors concentrates air pollution where people have greatest exposure times. According to Koenigsberger, (1973), the deep body temperature must remain balanced and constant around 37 degree centigrade. Hence, to maintain body temperature in residential buildings, all surplus heat must be dissipated to the environment. Adequate ventilation is therefore a key to controlling exposure to indoor air pollution. However, home should therefore be properly planned and monitored for adequate air flow and proper exhaust systems installed.

### **Role of Architects in Controlling Indoor Air Pollution in Residential Buildings**

#### Ventilation

Humans consume oxygen, taken from the air by breathing, and exhale carbon dioxide. In a closed environment oxygen content is reduced and the carbon dioxide is increased by man's presence. Body smells, fumes and vapours produced by a variety of processes, such as smoking, all add to the deterioration of an enclosed volume of air. A supply of fresh air at a rate substantially higher than the volume of actually inhaled air will be necessary. Our daily life cycle comprises states of activity, fatigue and recovery. It is essential that the mind and body recovers through recreation, rest and sleep to balance the mental and physical fatigue resulting from the day's activities. The control of indoor air quality in residential buildings on man is of considerable importance. The occupants of a building judge the quality of the design from a physical as well as an emotional point of view. The task of the designer therefore, is to create the best possible indoor climate. Human response to the thermal environment does not only depend on air temperature alone. It has been established beyond doubt that air temperature, humidity, radiation and air movement all produce thermal effects and must be considered simultaneously if human responses are to be predicted.

#### The human body

Heat is continuously produced by the body. Most of the biochemical processes involved in tissue-building, energy conversion and muscular works are exothermic, i.e. heat producing. All energy and material requirements of the body are supplied from the

consumption and digestion of food. The deep body temperature must remain balanced and constant around 37 degree centigrade. In order to maintain body temperature at this steady level, all surplus heat must be dissipated to environment. If there is some form of simultaneous heat gain from the environment (e.g. solar radiation or warm air) that also must be dissipated. The human body can release heat to its environment by convection, radiation and evaporation- and to a lesser extent by conduction. Convection is due to heat transmission from the body to air in contact with the skin or clothing which then rises and is replaced by cooler air. The rate of convective heat loss is increased by a faster rate of air movement, a lower air temperature and a higher skin temperature. Radiant heat loss depends on the temperature of the body surface and the temperature of opposing surfaces. Evaporation heat loss is governed by the rate of evaporation, which in turn depends on the humidity of air and the amount of moisture available for evaporation. Evaporation takes place in the lungs through breathing, and on the skin as imperceptible perspiration and sweat. Conduction depends on the temperature difference between the body surface and object the body is in direct contact with. The thermal balance of the body can then be expressed by an equation. If the heat gain and heat loss factors are:

Gain:	Met	=	metabolism (basal and muscular)
	Cnd	=	conduction (contact with warm bodies)
	Cnv	=	convection (if the air is warmer than the skin)
	Rad	=	radiation (from the sun, the sky and hot bodies)
Loss	Cnd	=	conduction (conduction (contact with cold bodies)
	Cnv	=	convection (if the air is cooler than the skin)
	Rad	=	radiation (to night sky and cold surfaces)
	Evp	=	evaporation (of moisture and sweat)

Then thermal balance exists in when  $Met - Evp + or - Cnd + or - Cnv + or Rad = 0$

Heat exchange of a building

A building is also considered as a defined unit and its heat exchange processes with the out-door environment can be examined thus:

Conduction of heat may occur through the walls either inward or outwards, the rate of which is donated as  $Q_c$ .

The effect of solar radiation on the opaque surfaces can be denoted as  $Q_s$ .

Heat exchange in either direction may take place with the movement of air, i.e. ventilation, and the rate of this is donated as  $Q_v$ .

An internal heat gain may result from the heat output of human bodies, lamps, motors and appliances. This is equally donated as  $Q_i$ .

There may be a deliberate introduction or removal of heat (heating or cooling), using some form of outside energy supply. The heat flow rate of such mechanical controls is denoted as  $Q_m$ .

Finally, if evaporation takes place on the surface of the building, (e.g. a roof) or within the building and the vapours are removed, this will produce a cooling effect, the rate of which is donated as  $Q_e$ .

The thermal balance therefore, i.e. the existing thermal condition is maintained if:

$Q_i + Q_s + Q_c + Q_v + Q_m - Q_e = 0$ .  
 If the sum of this equation is less than zero (negative), the building will be cooling and if it is more than zero, the temperature in the building will increase. The indoor air quality therefore needs to be regulated to enhance air flow through residential buildings.

### Residential building planning strategies for control of indoor air quality

**Orientation:** to ensure good quality of indoor air, residential buildings should be properly oriented. This is done by orienting the building in such a way that the largest openings are facing the wind direction as illustrated in the figure below.

**Cross ventilation:** a building with an absence of an outlet opening or with a full partition there can be no effective air movement through a building.

**Position of opening:** to be effective, the air movement must be directed at the body surface. In building terms this means that air movement must be ensured through the space mostly used by the occupants: Through the living zone. If the opening at the inlet side is at a high level, regardless of the outlet opening position, the air flow will take place near the ceiling and not in the living zone.

**Size of openings:** with a given elevational area a given total wind force the largest air velocity will be obtained through a small inlet opening with a large outlet. For effective cross ventilation, there must be at least two openings an inlet and an outlet, on opposite or at least adjacent walls of an enclosure.

**Control of openings:** sashes, canopies, louvers and other elements controlling the opening, also influence the indoor air flow pattern. Sashes can divert the air flow upward. Only a casement or reversible pivot sash will channel it downwards into living zone.

**External features:** Wind shadows created by obstructions upwards, should be avoided in positioning the building on the site in positioning the openings in the building.

### **Suggestions and Recommendations**

The Federal Environmental Protection Agency was created in 1988 in respect of environmental impact. The agency drafted laws and guideline to combat the effects of pollution on our environments, the enforcement of these laws has not been very effective. Therefore the agency should establish more criteria, guidelines, specification and standards for air quality and enhance the quality of Nigeria's residential buildings. This should include:

- 1) The controls of concentration of substances in the air which separate and in combination are likely to result in damage or deterioration of property, human, animal or plant health.
- 2) Minimum essential air quality standards for human, animal or plant health;
- 3) Standards application to emission from any new mobile source which in the agency's judgment causes or contributes to air pollution which may be anticipated to endanger public health or welfare;
- 4) The use of appropriate mean to reduce emission to permissible level;
- 5) The most appropriate means to prevent and combat various form of atmospheric pollution;
- 6) Controls for atmospheric pollution originating from energy sources that is produced by aircraft and other self-propelled vehicles and in built power generation stations;
- 7) The agency should establish monitoring stations or networks to locate where atmospheric pollution exist and determine their actual or potential danger.

### **Conclusion**

There is growing need for environment protection and applicable laws, to stem the consequences of human activities. The activities of design of buildings and their surroundings rest majorly on architects whose responsibility is to adapt to its environment. Every building activity becomes a responsibility for the architects and consequently, they are to re-design their professional role to adapt to changing circumstance of environmental

air pollution in Nigeria. The architect is undoubtedly a major stakeholder in its effective management. (Onolaja 2004). There will be need for substitution of problematic and harmful material by the infusion of cleaner technologies and manufacture of non-toxic products and the efficient use and re use of materials, coupled with organized city-planning- a city where buildings are organized and designed to use solar energy power, cars are powered by solar energy or hydrogen in order to pollute less, green spaces preserved, and expanded recycling schemes and promoted and environmentally friendly buildings designed and modified to suit microclimates. Architects must learn to build naturally by developing projects that are capable of creating clean air.

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## DEVELOPING SUSTAINABLE ADAPTIVE STRATEGIES OF AQUATECTURE IN COMBATING FLOODING IN COASTAL REGIONS IN NIGERIA

Ati, E.C\*

Department of Architecture, Federal University of Technology Minna, Nigeria

\*Corresponding author's email: eneschris@yahoo.com

Isah, A. D

Department of Architecture, Federal University of Technology Minna, Nigeria

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### ABSTRACT

*In Nigeria, cases of flood incidents have been on a steady rise in recent years. It is predicted that with climate change and increased global warming together with the melting of the polar ice caps of the world; the trend is expected to continue. It is therefore imperative to have an adaptive architecture that is able to mitigate the effects of such floods as they happen. Adequate knowledge on such adaptive strategies, been used in coastal areas is still limited. The paper is aimed at investigating the application of the adaptive strategies of aquatecture in coastal and flood prone areas of Nigeria. The research process adopts a descriptive survey method which employs the use of observation schedules, and an in-depth review of existing literature. Findings show a low level of implementation and use of adaptive strategies of existing buildings in these flood prone regions of Nigeria to combat floods leading to these settlements being vulnerable to destruction and damage occurring from floods. It is however pertinent to know that adaptive strategies to combat floods can be employed to allow for a sustainable development in flood prone areas and coastal areas of Nigeria and their adoption is of utmost importance to combat the expected floods in these areas which is a recommendation this paper puts forward. This paper concludes by advocating for the use of adaptive strategies of aquatecture in the flood prone and coastal areas of Nigeria to combat floods.*

*Keywords: Adaptive strategies, Aquatecture, Coasts, Floods, Flooding*

### INTRODUCTION

The need to adapt to the environment has always been a necessity for man, from pre-historic times till modern times. From adapting to living in clusters as society to adapting to the various challenges and environmental situation around him man has always found a way to happily coexists with nature and make the most of it to survive.

The world as it is, is currently plagued with issues of climate change which has led to global warming and that has resulted in increased flooding in coastal cities and flood plains leading to the destruction of lives and properties including buildings (Williams, 2009). Coastal flooding already seen and regarded as one of the most dangerous, harmful and destructive natural disasters in the world (Douben, 2006). A huge percentage of the world's population

almost 21% currently live on adjacent shorelines, making these coastal cities large concentrations of growing settlements, human population and socio-economic activities (du Gommès, Guerny, Nachtergaele & Brinkman, 1997; Brooks, Nicholls, & Hall, 2006). The potential impact of the rising sea level on coastal communities would be quite significant (Kumar, 2006), on the coastline but also specifically on the buildings in these communities that inhabitants live and carry out their daily activities in.

Adaptive architecture is concerned with ensuring that buildings are designed to adapt or work cohesively with the environment in which that building is found. Therefore buildings in coastal areas need to be adapted to be able to combat these floods which are predicted to increase in future (Balica, Wright & Van der Meulen, 2012). The concept of aquitecture is an architectural adaptation typology that is used to manage and control floods. Here water and architecture are combined together to bring about dynamic and reliable solutions to flood related issues in the built environment.

This paper is aimed at investigating the application of the adaptive strategies of aquitecture in coastal and flood prone areas in some parts of Nigeria.

### Coastal Systems

Coastal communities around the world are expected to be increasingly affected by floods due to climate change and its effects. As a matter of fact, some of these coastal communities are already considered vulnerable to the ongoing climate changes (IPCC 2007a, b; Mirza 2003). Accelerated sea level rise with elevated tidal inundation, increased flood

frequency, erosion, water table rise, increased salt water intrusion, storm surges and cyclones are just some of expected results of climate change (Fenster and Dolan 1996). The coasts will be affected the most by these outcomes.

Coasts are dynamic systems, which undergo changes to its form and process at varying times and space as a response to geo morphological and oceanographical factors (Cowell *et al*, 2003a, b). Pressure exerted by human activities on the coasts sometimes dominate and relegate the natural processes to the background.

It is sometimes difficult to identify the impacts of climate change on coasts due to its natural variability, for example erosion on beaches may not necessarily be caused by sea level rise but by other factors such as altered wind patterns, offshore bathymetric changes, reduced fluvial sediment input or hard structures built near the coast (Pirazzoli, Regnaud & Lemasson, 2004; Regnaud, Pirazzoli, Morvan, & Ruz, 2004; Cooper & Navas, 2004; Nicholls *et al*. 2007).

### Floods in Nigeria

In Nigeria, floods have become a major cause of concern particularly in recent times. With a rapidly growing population and urbanization coupled with climate change, floods have become a menace and hazard in the country. In 2012 alone it was estimated that \$16.9 billion was lost in damaged properties, oil production and agricultural produce owing to floods (Amangabra & Obenade, 2015; Egbenta, Udo & Otegbulu, 2015). Prior to recent flood events in Nigeria, floods rarely occurred in Nigeria. Some recorded flood events in Nigeria dates back to the 60s when Ibadan was flooded

by the Ogunpa River leading to loss of life and properties with reoccurrence in the 70s, 80s and in 2011 (Adegbola & Jolayemi, 2012; Agbola, Ajayi, Taiwo, & Wahab, 2012). However, in recent times devastating levels of floods have been witness in various regions of the country from Lokoja, Idah, Benue and Lagos. These floods are predicted to become a staple feature in Nigeria as an impact of global warming and climate change that is being experienced in the world.

According to the Assessment capacities Project (ACAPS) flood briefing note of 2018, floods occurring across Nigeria in 2018 has left devastating effects in its wake, it is estimated that 141,400 people across 12 states in Nigeria have been displaced. Over 108 deaths have been recorded this year alone with the estimated number of 13,000 houses damaged and around 80, 600 people estimated to be living friends and family and in IDP camps already set up.

### Flood Prone Areas in Nigeria

Oladoku & Proverbs (2016), described the varying regions and sources of major

flooding in Nigeria as seen in Figure 1 below and categorised them as follows,

1. Coastal cities and settlements: Nigeria has over 853 km of coastline with extensive low-lying areas that is heavily industrialised and prone to flooding. Lagos, Port Harcourt and Bayelsa are prone to ocean flooding.
2. Communities and Settlements along the two major rivers in Nigeria: As seen in Figure 1 below, the entire area along the coast of both the River Benue and River Niger have been seen to be prone to floods but most especially communities and urban settlement along the river Niger have been affected more by recent floods as witnessed in Lokoja (Amadi & Ogonor, 2015).
3. Communities downstream of dammed Rivers or on the bank of other major rivers are also prone to floods from those rivers or dams.

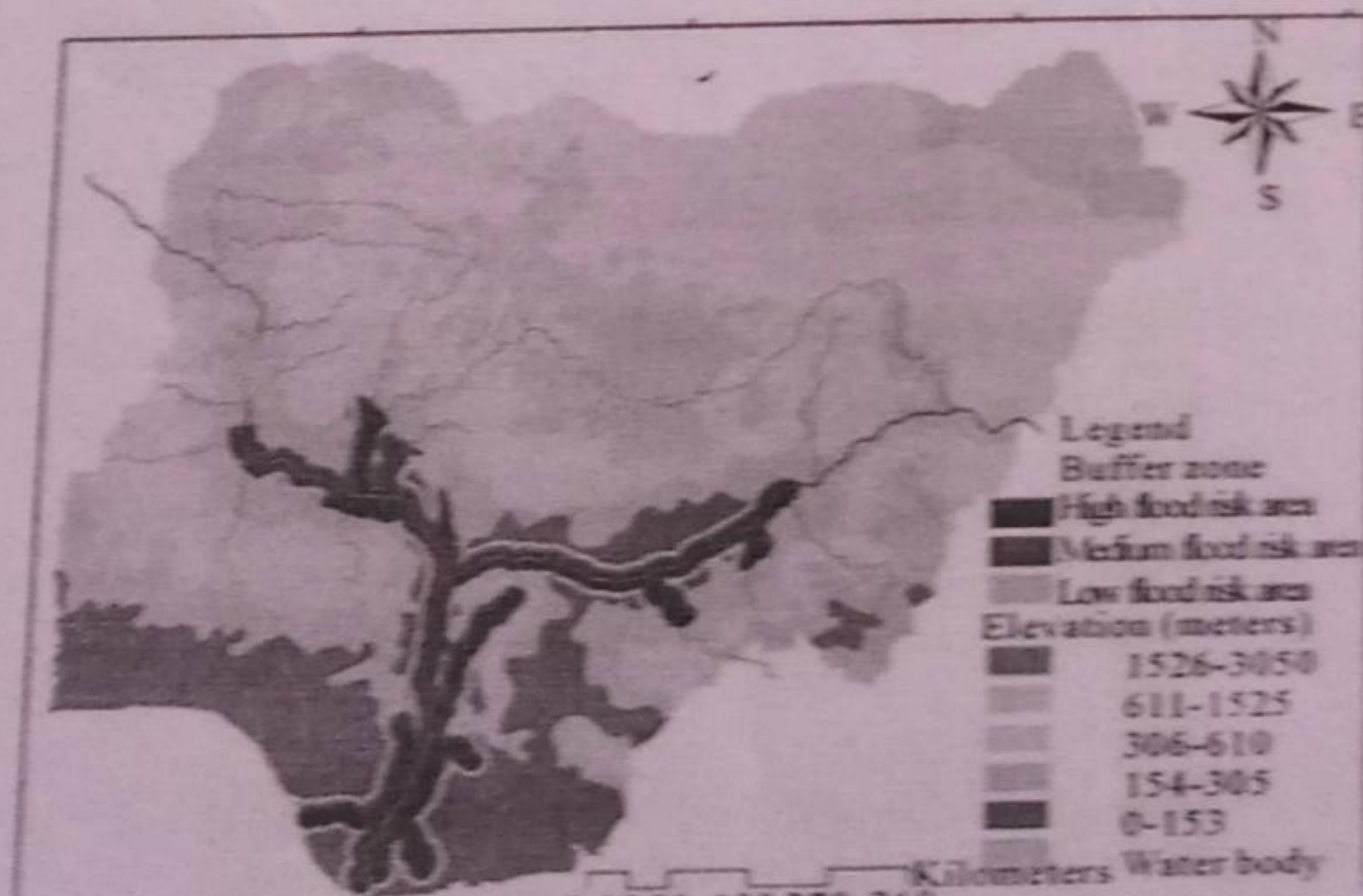


Fig 3: A map of Nigerian Flood plains. (Nkeki, Henah, & Ojeh, 2013)

## Strategies of Aquatecture

Aquatecture aims to harness the inherent potential of water and combine it with the building design to create a dynamic architecture that helps solve critical problems being faced in coastal and flood prone areas. Numerous strategies have been employed all over the world to adapt buildings to flood and all of these strategies all fall under aquatecture. Anderson (2014) and Williams (2009) both highlighted various strategies prominent of which include;

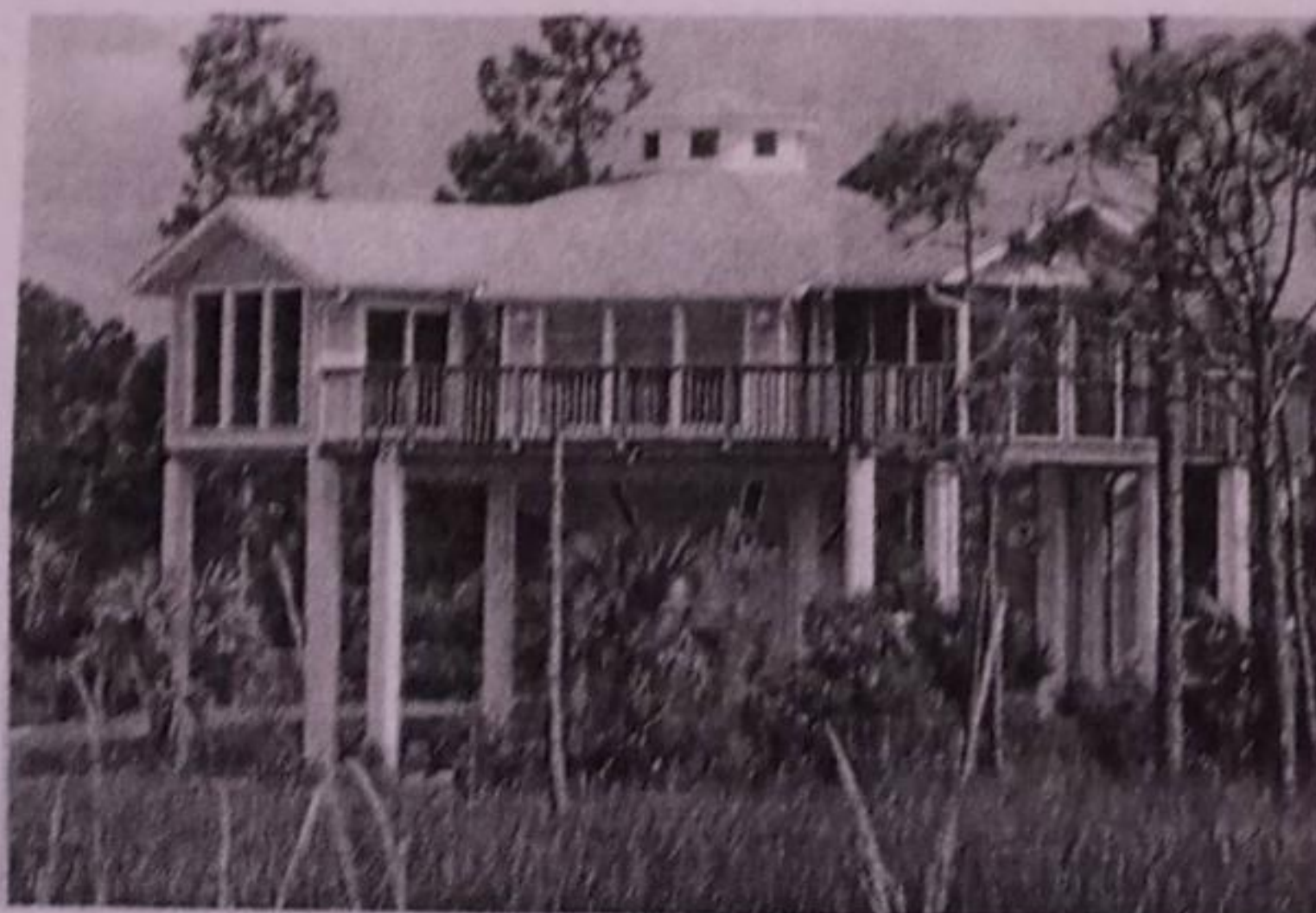
- 1- Terp dwellings- These are artificial mounds of earth made to safe guard against raising water levels (Figure 2). Terps of up to 15 metres in height have been built in times past to prevent floods and it has eventually led to the creation of permanent dyke systems used to protect large portions of land from flood. Terps are no more popular in modern times due to the advent of other strategies used in combating floods.



*Fig 4: Terp Dwelling*

2- Static elevation of the building to a specific height – This is a common means of combating floods and retrofitting buildings to prevent floods by elevating the building to a required height or to a desired base flood

elevation. This causes the living area of the building to be above the floods. (Figure 3). Static elevation can be achieved by either lifting the building or adding elevated floors and upper stories to the building.



*Fig 5: Static Elevation.*



3- Pile dwelling- These houses are often built on concrete, steel or wooden poles in places where it is easy to determine fluctuations in

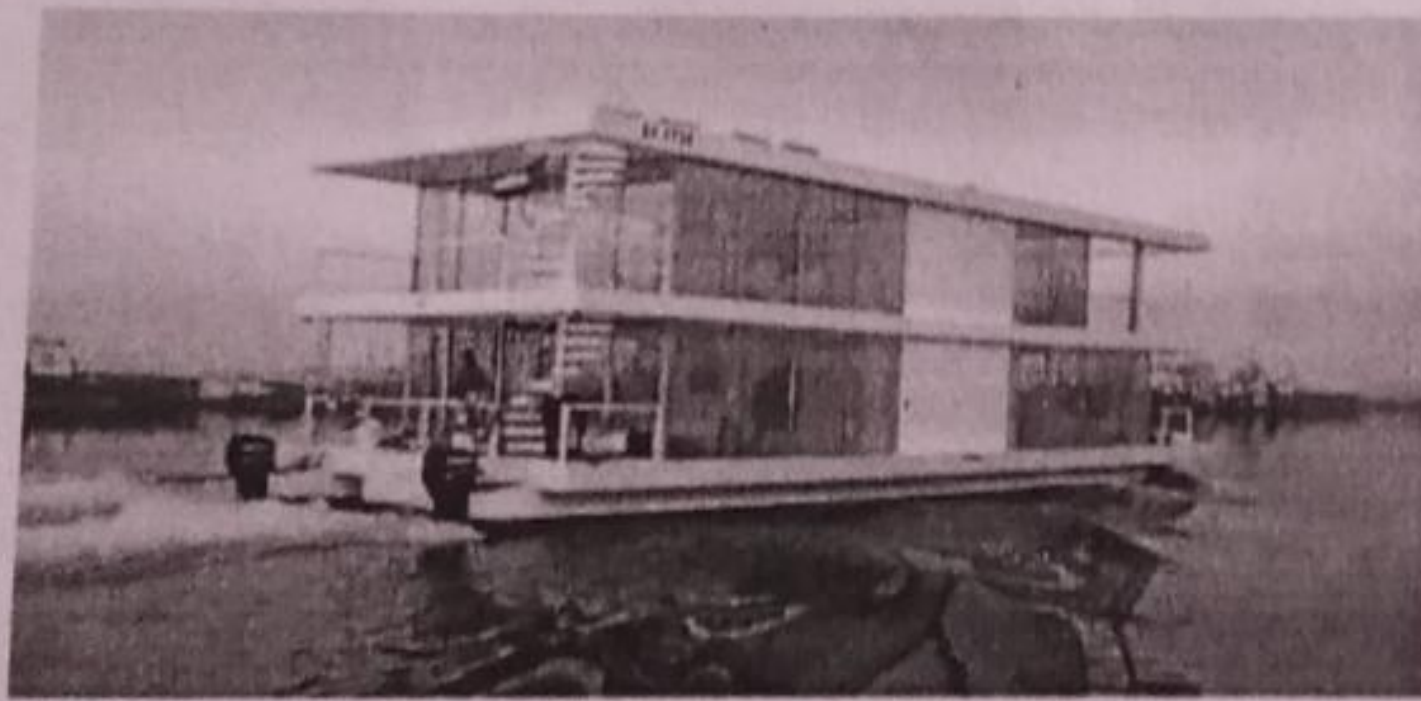
water level. Pile dwellings with different names are used all over the world as a means of protection from floods. (Figure 4).



*Fig 6: Pile Dwelling*

4- Houseboats- This strategy involves the conversion of ships and other water vessels into living spaces. These buildings look a lot like a

normal building on land but are buoyant enough to withstand floods. (Figure 5).



*Fig 7: Houseboat Residence*

5- Amphibious dwellings- This strategy involves the construction of a dwelling on land but is able to float in the occurrence of floods at the same time. (Figure 6). These buildings employ

certain features like hollow basements or pontoons to ensure the building is lifted during floods. When the flood recedes the building then returns to its position on the ground.

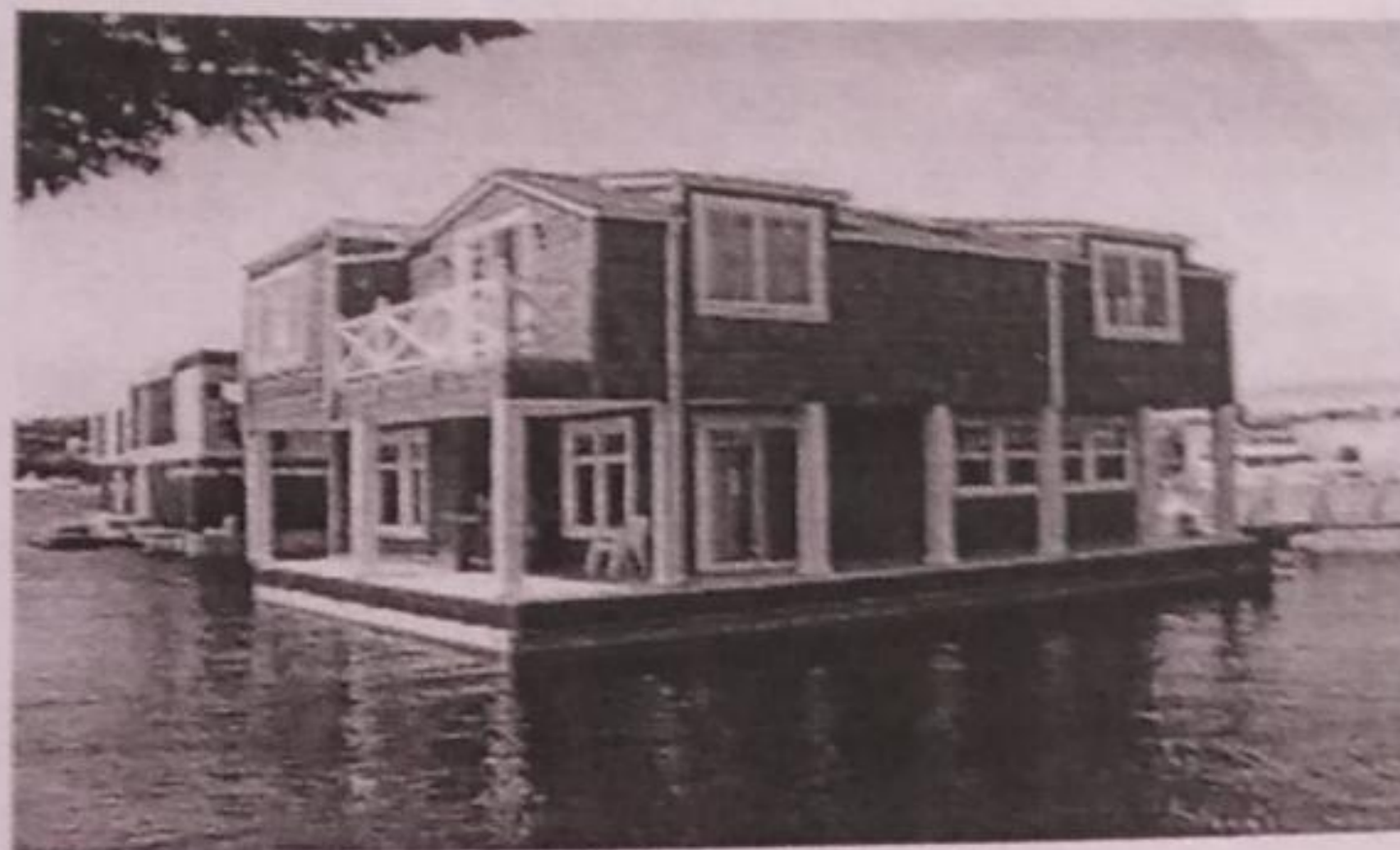


Fig 8: Amphibious Building

Despite the numerous adaptive strategies available in combating floods, amphibious dwellings are proven to be the most effective strategy of aquatecture as it enables coastal and flood prone areas mitigate and recover easily from floods without excess damage occurring (Anderson, 2014). It is paramount that designers and builders look to the opportunities presented by floods and water rather than to the limitations presented.

#### RESEARCH METHODOLOGY

The research method employed in conducting this study was the descriptive survey method which employed the use of purposefully structured observation schedule to obtain relevant data and for the study. A sample of some settlements in and around Lokoja which are known to have been affected by floods were selected and used for the study. The elements that were observed include the population of these settlements, building types predominant in the settlements, presence and nature of adaptive strategies employed in their buildings to combat floods.

The settlements observed are; Koton Karfe, Adankolo, Ganaja, Gadumo and Kpata

#### RESULTS AND DISCUSSION

The results obtained from the observation schedule was documented in tables using the following representations.

1 - Available

0 - Not available.

The result shown in Table 1.0 below shows that none of the settlements observed had any sort of embankments at the bank of the river to prevent flooding from occurring in the first place. Drainages to help control water flow in the case of floods was only found in Ganaja and Gadumo respectively. Of these two aforementioned settlements, only Ganaja had a planned drainage system to help control water in case of floods. However, it is important to note that despite the planned drainage in Ganaja, it proved ineffective in preventing floods due to blockage and excessive volume of water recorded during floods.

Table 1.0 Flood Features of Settlements -

S/N	List of Towns	Embankments	Drainage	Planned Drainages
1	Koton Karfe	0	0	0
2	Adankolo	0	0	0
3	Ganaja	0	1	1
4	Gadumo	0	1	0
5	Kpata	0	0	0

Source: Authors

The results shown in Table 2.0 below also shows an apparent absence of adaptive features for floods in the buildings found in these settlements. The adaptive feature that Ganaja and Gadumo have is the raised

floors which is present in lots of buildings in these areas. However, with flood levels expected to rise beyond two meters, these raised floors are rendered ineffective to help mitigate against floods when it occurs.

Table 2.0 Flood Adaptive features employed in Buildings in the Settlements.

S/N	List of Towns	Raised Floors	Static Elevation	Terps	Boat Houses	Floating Houses	Amphibiou s Houses
1.	Koton Karfe	0	0	0	0	0	0
2.	Adankolo	0	0	0	0	0	0
3.	Ganaja	1	0	0	0	0	0
4.	Gadumo	1	0	0	0	0	0
5.	Kpata	0	0	0	0	0	0

Source: Authors

Figure 7 and Figure 8 below shows the situation in these settlements with buildings and roads completely covered in floods.



Fig 9: Blocked drainage in Ganaja. Source: Authors

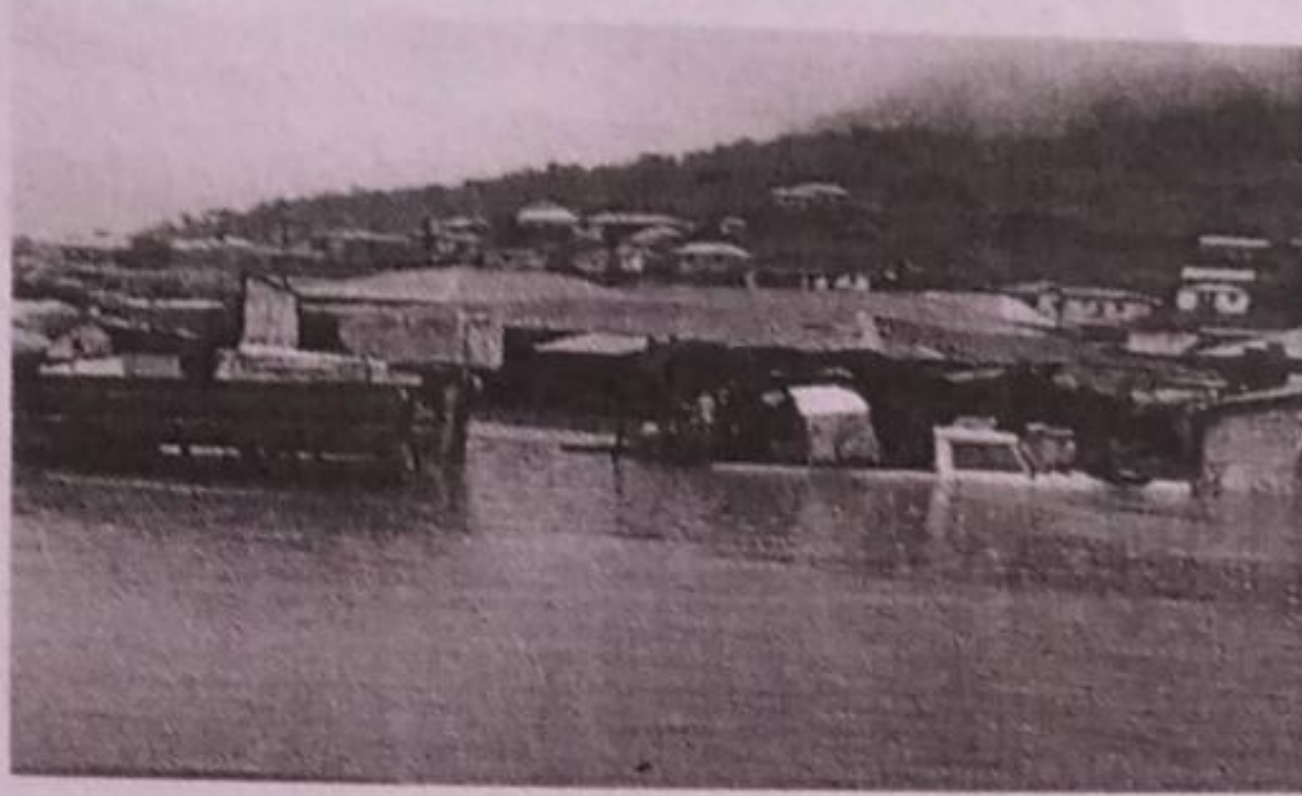


Figure 10: Damage caused by flood in Lokoja. Source: Authors

## CONCLUSION

From the study it is clear that most of these communities have had to grapple with floods and its devastating effects in the past but that has not necessarily been translated into the use of adaptive strategies of any kind in their buildings to combat the effects of these floods. Inhabitants have to evacuate their houses and carry their important properties along with them to houses of relations and friends or to internally displaced persons camps pending when the floods recedes and they can return to their daily lives. These inconvenience on the occupants of these settlements and the governments who have to help evacuate and set up emergency rescue and IDP camps for the flood victims can be prevented by incorporating adaptive features of aquatecture to existing buildings through retrofitting them while also ensuring that all new buildings are able to adapt to the floods predicted.

## RECOMMENDATIONS

From the study the, these recommendations can be applied to help improve the adaptation of coastal and flood prone communities to flood;

- i. The federal government should set up policies and guidelines

aimed at promoting the adaptation of coastal and flood prone areas. These guidelines should cover the design and construction of buildings in this area and should be adhered to strictly.

- ii. Spatial planning of flood prone communities should be carried out to determine the flood risk of such communities and map out strategies to reduce the vulnerability of these communities.
- iii. Adaptive strategies of aquatecture like those noted in the study should be implemented at all phases of the building construction in theses coastal flood prone communities. From the design phase to the construction and finishing stages of the building.

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## USER'S PERCEPTION OF ICONIC BUILDINGS DESIGN IN NIGERIA

**Oluwaseun Raphael Bello and Abubakar Danladi Isah**

*Department of Architecture, Federal University of Technology, Minna Nigeria.*

*Department of Architecture, Federal University of Technology, Minna, Nigeria.*

*Corresponding author's e-mail: ralphs20000@gmail.com,*

### ABSTRACT

Many notable countries has remain relevant in the geographical world through the architectural product associated with it. Iconic buildings, especially, have represented the culture and the practice in a locality. It has also serves in capacity of economic revitalization, preserves historical events, keeps order and meaning of religious concepts and expresses the evolving architecture of a locality. This means that iconic buildings in its originality, representing the sited community, exhibits the uniqueness of their architecture, thereby, capable of improving the economy of the locality through tourism. Therefore, this study was carried out to evaluate the hypothesis that the iconic buildings in Nigeria do not represent the culture and architecture of the sited locality. A total of 480 copies of questionnaire returned were used to examine twelve selected iconic buildings in two prolific cities of Lagos and Abuja in Nigeria. The originality of the iconic buildings was evaluated through the compass of the sited neighbourhood and inhabitants socio-cultural characteristics. Descriptive and inferential statistics were used to establish the relationship between participant neighbourhood and socio-cultural characteristic and the selected iconic buildings. The study concluded that the majority of the architectural landmarks in Nigeria lack cultural and lifestyle representation of the sited communities, thereby fails in its expectation of social and cultural relevance. The implication is that it lacks the uniqueness of local architecture and cultural potentials that is sellable for an economic boost.

**Keywords:** *Iconic Design, Inhabitants, neighbourhood, Nigeria*

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### INTRODUCTION

A building that captivates a city, nation and the world, exemplifying uniqueness is referred to as an iconic building. This type of building portrays an identity borne out of the geography, tradition, behaviours, visions, and history of a community, region or nation of its emergence (Torabi and Brahman, 2013; Ede, 2014). Such building inspires confidence and comfort when its identity is correctly interpreted, being the first thing to be experienced even before the exploration of the building functionality and usability (Jashari-Kajtazi and Jakupi, 2017). A good reference is the Angkor Wat religious building that integrates the Cambodian identity so much that it appears on their national flag. Likewise, an iconic building shows the community's advancement in architecture and technology, its aesthetic ideals, and portrays the mastery of who conceived and its moral concerns (Colin, 2000). For instance, Tokyo sky tower fused an improvement of design technology with traditional Japanese aesthetics. Iconic buildings also aid improvement of cityscapes and the economic development of a locality. Burj al Arab hotel transformed what could be called a sleepy fishing village to a futuristic cyber city with sparkling skyscrapers, shopping malls, water parks, golf course welcoming daily overwhelming reception.

All the above examples of architectural masterpieces have their forms and features representing the culture and value of the sited communities and influential to their economic developments. Thus, the sense of belonging and the relationship with the inhabitants of the community are two priorities considered during the design and construction an iconic building (Adam, 2012).

SECTION FOUR

However, majority of the evolving iconic buildings recently built in Nigeria does not exhibit the architecture and place of where they are established (Taylan 2008; Ayna, 2011). According to Elleh (1996), this is dated as far back as 15<sup>th</sup> century when western architecture was first introduced by the Portuguese. Oraegbunam (2011) stated that the gradual replacement of local architecture originality was from the change in design features, materials used and adopted technology.

Anholt (2005) posits that, "in today's globalized world, every city must compete with every other city for its share of the world's tourists, investors, talent, cultural exchange, business visitors, events and media profile. Arguing a case for the application of branding principles in the marketing of places, Peter van Ham said that "a state just like a company requires a strong brand. Therefore, building forms and feature supposed to be the product of inhabitants' traditions, culture, believes and way of doing things for it to represent and be influential to the sited locality.

It is with this view that this study investigates the perception of iconic buildings by the inhabitants in two prolific cities, Lagos and Abuja in Nigeria, with the view of assessing its relevance and potential for the improvement of the cityscape and the economy of the country. The perception of the inhabitants was measured by considering their socio-economic and socio-cultural characteristics and level of its reflection on the selected iconic buildings in the areas studied.

REVIEWED LITERATURE

Over time, buildings have become the defining pinnacle of the greatness of the residing cities as they improve the skyline and the cityscape of such areas. Structures such as the Tower of Pisa, Eiffel Tower, the Sydney Opera House, the Burj Al Arab, the Beijing National Stadium (the Bird's Nest Stadium), Beijing Water Cube, the Flatiron Building, the Pyramids of Egypt, British Airways London Eye and the Millennium Dome are examples of architectural masterpiece of iconic forms represent the type of architecture that people want and the technological moment (Falamaki, 2006; Torabi *et al.*, 2013).

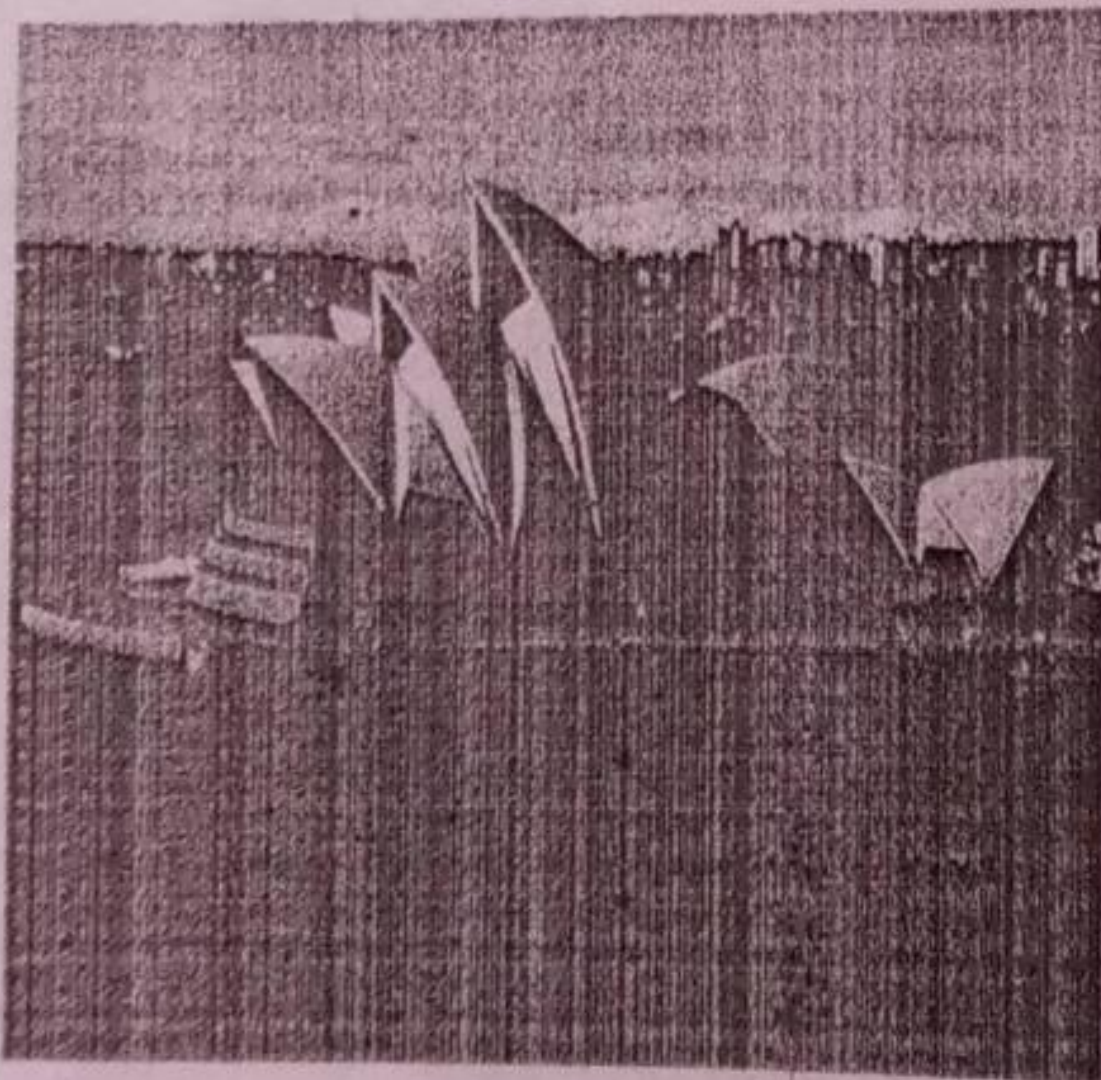


Plate 1: Sydney Opera House  
 Source: Adapted from [www.motherlandnigeria.com](http://www.motherlandnigeria.com)  
[www.visitdubai.com/en/pois/burj-al-arab](http://www.visitdubai.com/en/pois/burj-al-arab)

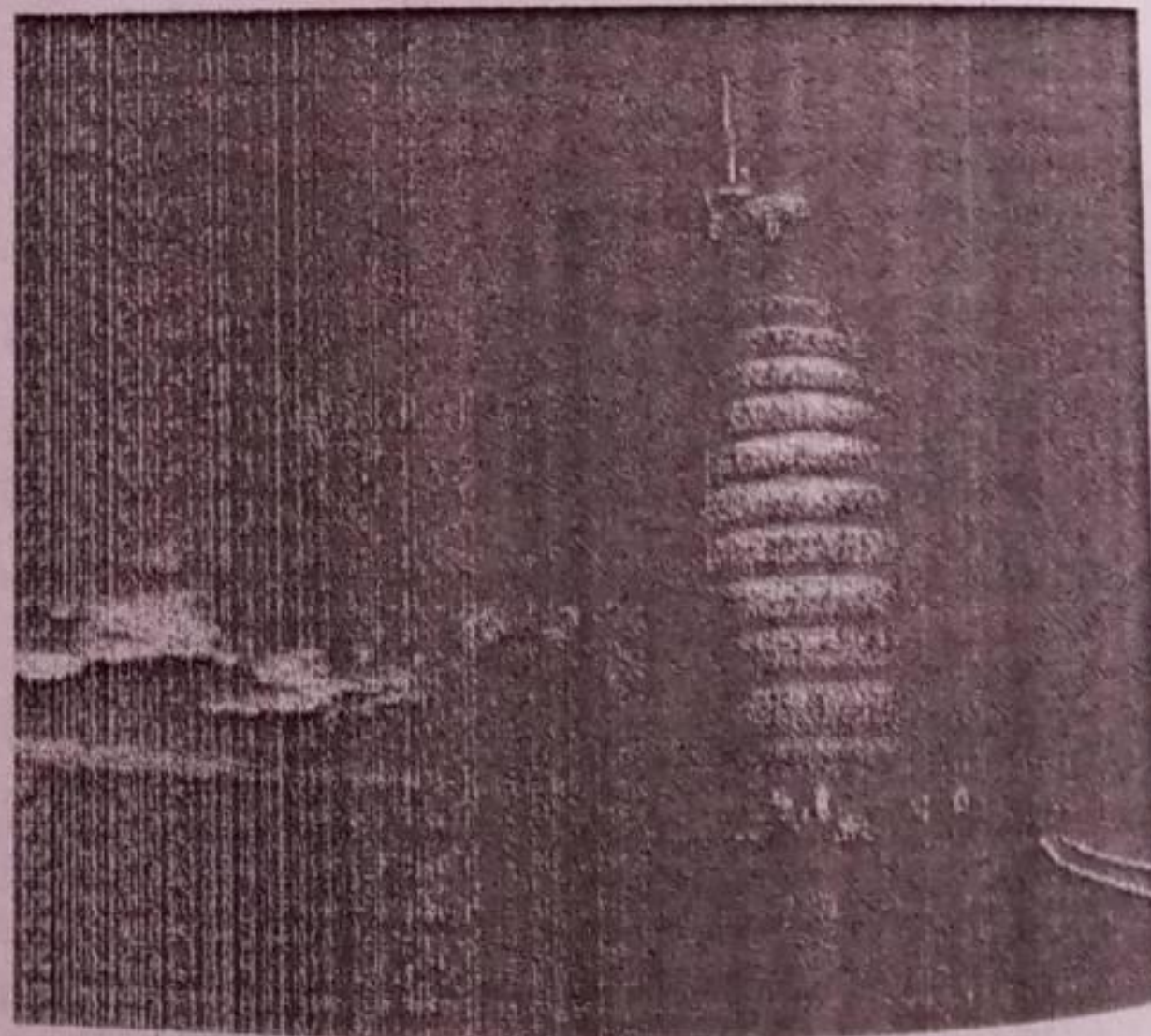


Plate 2: Burj Al Arab,  
 Source: Adapted from

Vitruvius perceived the vocation of the architectural forms to represent different things themselves. In other words, the architectural form has a symbolic vocation, and what the symbol means and the meaning are two points that are to be considered; that is, the identity it portrays (Colin, 2000). These



iconic structures are beautiful in form, serve the designed purpose and create a sense of place by contributing to the public realm (Etheridge, 2007; Ede, 2014). The identity not only provides room for the expression of national identity of where it exists, but also combines this identity with the presence of multinational component (Jashari-Kajtazi *et al.*, 2017). Sometimes with the porosity of boundaries due to modernisation, national identity can be replaced with mere sense of place and collective memories. Thus, landmark architecture should be considered responsible for modelling collective memories of cultural potentials rich in the material and technology of place and become a metaphor of the place where it exists' (Delanty *et al.*, 2001; Jashari-Kajtazi and Jakupi, 2017).

The sense of space or rootedness has a beneficial influence on the strengthening of social bonds and caring about the common good. Initially, these landmark architectures were designed as symbols of secular or religious power, but over time, they have exceeded the fame of their patrons and turned into urban landmarks. This serves as a proof of their cultural importance, and of the fact that by traditional usage they have come to build the identity of the local community. This type of architecture has become an essential resource for meaning and power, and it is produced intentionally to achieve political, social or economic capital.

Another is the famous buildings that are a direct reflection of the needs of ordinary, average residents in urban forms. These designs are built spontaneously, mostly without the participation of professionals, and they reflect the taste and culture of the residents of a given society. They are associated with the way of life, customs and ambitions of the residents, rather than with the principles of official planning composition that is created for the elite. It has been used to vend the local image with the hope of attracting foreign investment, tourists and possible residents.

One can find here the elements of cultural symbolism and the diversity of expression. A manifestation of this can be found in the individualization of detail, specific proportions of urban indoors, the use of small-scale and being part of the social context. Local context emphasises such elements as a direct adaptation for a specific user, spontaneously formed proportions of urban indoors, articulations referring to the aesthetic preferences of residents, details referring to the taste and aesthetic sensitivity of residents and colour scheme that is rooted in tradition. The improvement of this type of architecture is what is termed modern regionalism. The concept of modern regionalism utilises traditional element in a building structure. The modern regionalism concept persists to tackle the diminishing effect of internationalism on reflection about local conditions, which by contrast constitutes the most critical element of regionalism.

Local cultural tradition remains a potential source of new creative inspirations that can be successfully interpreted, enriching the contemporary appearance of public spaces, giving individualised character to housing estates. Integrating local cultural traditions in the development of the architectural masterpieces in Nigeria will result in its enhancement in communal relevance and improve its potential of universal recognition. Such potential can attract inquisitive tourist and, thereby, improve the economy of the sited communities.

## METHODOLOGY

The paper discusses part of the research findings of the study of users' perception of iconic buildings in selected cities of Abuja and Lagos in Nigeria. The researchers sought to find out how the inhabitants in the neighbourhood where the buildings selected are sited perceive the visual aesthetics, the form of the structure and the meaning the form interpreted to them. The buildings selected in Abuja include The NCC building at Maitama, the office/commercial complex at the central area, Nikon luxury apartment, World trade centre central Area, Opic house at Maitama. In Lagos, Civic centre at Ikoyi,

Anglican church of Nigeria at Marina, Cultural centre at Iganmu, Glo house at Victoria Island, Shell house in Victoria Island and Nestol house were selected.

The primary data was sourced through the use of a questionnaire administered to the inhabitants in the selected study area. Also, the study utilised relevant text and publications on the subject matter; which form the background of the study. All the people that both reside in the locality of the selected buildings constitute the general sampling frame for the study. The sample size (n) was calculated regarding the number of participants that is considered adequate using the equation suggested by Creswell (2009, 2014). Using a research sample based on stratified sampling design, a total of 600 participants were administered a questionnaire in the study area. A total of 480 copies which sums up to 80% of the questionnaires administered were returned and used for analysis. The instrument was used to elicit data on vital research factors earlier highlighted.

The questionnaire consists of 24 variables in question format, coined succinctly in short and simple form, thereby avoiding ambiguities. Four (4) variable which are age, gender, income class and education level was used to assess the respondent attributes; and four (4) variables measuring the participant's profession, experience, exposure and familiarity were used to measure their socio-cultural characteristics. The visual aesthetics was measured considering the building roof design, fenestration, colour usage, façade design and the building form or shape. The data collected from the respondents were subjected to both descriptive and inferential statistical analyses.

The descriptive statistics was used to show the frequency and percentile distribution of the results from the study. In utilising inferential statistics, a simple chi-square test and the Kruskal-Wallis Test (H – Test) were used to demonstrate whether or not there is a significant relationship between the socio-economic, socio-cultural characteristic of the respondents and the selected iconic buildings.

## STUDY AREAS

Lagos State is the economic nerve centre of Nigeria. It would be the fifth largest economy in Africa if it were a country. At the inception of Lagos state in 1967, Lagos Island was both the state capital as well as the seat of the Federal Government.



Figure 1: Map of Nigeria showing the study area

Source: Adapted from [www.motherlandnigeria.com/geography.html](http://www.motherlandnigeria.com/geography.html)

However, when Nigeria's federation was restructured into 19 states in 1976, the capital of the state was moved to Ikeja. Lagos state is also made up of five administrative divisions in which Ikeja was one; the administrative division was further divided into local governments.

Abuja is Nigeria's Federal Capital Territory and lies approximately between longitudes 6°46'E to 7°37'E and Latitudes 8°21'N to 9°18'N (Figure 1). It is bounded in the east by Nasarawa State, north by Kaduna State, west by Niger State and south by Kogi State. These locations were selected due to their constant exposure to the modern trend of architectural form aided by the resultant effect of urbanisation and industrialisation engulfing the globe.

## RESULTS, DISCUSSION AND FINDINGS

### Participants' socioeconomic status

Table 1 shows the distribution of respondents' attributes. Majority 66.9% of the respondents fall within the age range of 31-40 years, while 5.4% are 50 years and above. Also, 72.7% of the respondents are male, while 27.3% are female.

**Table 1:** Distribution of Respondents' Attributes.

Attributes	Frequency	Percentage
<b>Age (in years)</b>		
21-30	40	8.3
31-40	321	66.9
41-50	93	19.4
51 and above	26	5.4
<b>Gender</b>		
Male	349	72.7
Female	131	27.3
<b>Academic Qualification</b>		
OND	10	2.1
HND/ BSc	271	56.5
Masters	186	38.8
Ph.D.	13	3.7
<b>Income level per month</b>		
<50,000	18	3.8
50,000-99,000	58	12.1
100,000-149,000	234	48.8
150,000-199,000	138	28.8
200,000 and above	32	6.7
<b>Years of Experience in practice(in years)</b>		
<5	38	7.9
5-9	123	25.6
10-14	276	57.5
15-19	30	6.2
20 and above	13	2.7

## SECTION FOUR

On the distribution of academic qualifications, 56.5% have HND/BSc certificates, 2.1% are national diploma holders, while 3.7% are PhD degree holder. More so, 48.8% of the respondents earn a monthly income between the range of ₦100,000 - ₦149,000, 28.8% earn between ₦150,000 - ₦199,000, while 3.8% of the respondents make less than ₦50,000 monthly. On Respondents' years of experience of the environment and the buildings under study, 57.5% have between 10-14 years of experience, 25.6% have between 5-9 years, while only 2.7% have 20 and above years of experience. The table shows that the participants used for this study are of many, experiences of the buildings selected. Thus, they are qualified to provide reliable data on the preference and perception of the society concerning the twelve buildings under study.

**Users' assessment of the buildings**

The respondents were asked to evaluate the twelve buildings under study. Table 2 showed the respondent's rank of building image base on their perception of preference. Building image 10 was rated as the most preferred with a weighted mean score of 1.3, followed by building image 6 (WMS=1.16), and building image 7 (WMS=1.1); while the three that were ranked lowest are Building image 8 (WMS=0.19), building image 2 (WMS=0.18) and building image 5 (WMS= 0.1).

Also, the respondents were asked to assess the selected building considering their forms and shape, features, material usage and colour applications. Table 3 showed respondents results for the building images 1-10 under study. On the scale of 1-5, the result revealed that innovation in building shape is highly rated with a Mean Weighted Score (MWS) of 4.31, followed by Entrance design with MWS of 3.82, and fenestration design with MWS of 3.27, Facade colour was rated lowest with a mean weighted score of 2.74. Likewise, the respondents were asked to rate the colours used for the buildings. The result in Table 4 shows that the building with cream colour dominance is more preferred, but that of blue dominance is never preferred.

Studies have shown that colour is symbolic and its representation is richly entrenched in people's culture (Gage, 1993; Bleicher, 2012). The choice of cream colour, which is the lighter and creamy shades of yellow could be borne out of its feel of freshness, elegance and joyful expression the colour has on people. It is believed that yellow is a favourite among people with high intellect. Therefore, the choice for the colour is expected since the majority of the respondents are learned with vast experience and exposure.

**Table 2:** Mean weight ranking of the selected buildings

Building image	Most preferred (3)	Less preferred (2)	Least preferred (1)	MWS	Rank
1	96	0	27	0.66	5 <sup>th</sup>
2	0	32	21	0.18	9 <sup>th</sup>
3	0	31	0	0.34	7 <sup>th</sup>
4	24	35	283	0.88	4 <sup>th</sup>
5	0	24	0	0.1	10 <sup>th</sup>
6	122	49	92	1.16	2 <sup>nd</sup>
7	154	33	0	1.1	3 <sup>rd</sup>
8	0	47	0	0.19	8 <sup>th</sup>
9	49	229	5	1.3	1 <sup>st</sup>
10	35	0	0	0.60	6 <sup>th</sup>

**Table 3:** Assessment of the characteristics of the building

	Least preferred(1)	Less Preferred(2)	Averagely preferred(3)	Preferred (4)	Most preferred(5)	MWS
Roof design	35	57	266	65	57	3.10
Fenestration	99	0	80	275	26	3.27
Façade colour	33	91	266	59	13	2.74
Entrance design	0	32	56	357	35	3.82
Innovation in building shape	32	33	35	33	347	4.31

**Table 4:** Respondents' perception of colour usage of the selected buildings

Façade colour in building images	Like Frequency (%)	Dislike Frequency (%)
White	20(4.2)	25(5.2)
Grey	48(10)	25(5.2)
Cream	362(75.4)	0
Blue	0	124(25.8)
Off-white	50(10.4)	306(63.8)

Furthermore, the study investigated the relationship between the participants' attributes and their perception of the twelve buildings selected for this study. The result in table 5 showed there is a correlation between the respondents' attributes and the roof type (Age,  $p=0.004$ ; academic qualification,  $p=0.004$ ; income level,  $p=0.001$ ; experience,  $p=0.015$ ) with exception of the respondents' profession ( $p=0.403$ ). Meanwhile, the window choice (fenestration) only show significant relationship with respondents' age ( $p=0.029$ ) and profession ( $p=0.006$ ).

Similarly, the building colour shows significant relationship with all the respondents' attributes (Age,  $p=0.002$ ; profession,  $p=0.017$ ; academic qualification,  $p=0.000$ ; income level,  $p=0.001$ ; experience,  $p=0.002$ ), the entrance design also has significant relationship with all the participants' attributes except the profession ( $p=0.855$ ). Equally, the table shows that the perception of building innovation is strongly related only with respondents' Age ( $p=0.001$ ), Academic qualification ( $p=0.050$ ) and Income level ( $p=0.018$ ).

## DISCUSSION

The purpose of the study is to investigate the hypothesis stated that the iconic buildings in Nigeria does not represent the culture and architecture of its locality. The study was necessary because several studies have shown the benefit of maintaining a locality identity through architecture to include promoting the image of the locality, thereby, making it attractive for tourism purpose. The buildings selected for this study are not just appealing to the beholder, but are also expected to represent the cultural image, religious facts, and trade centre for Nigerian culture and architecture.

Table 5: Test of the relationship between respondents' attributes and their perception

Perception parameters		Respondents' attributes				
		Age	Prof. designatn	Academic qualificatn	Income level	experience
Roof design	Pearson Correlation	-.132**	-.038	-.131**	-.145**	-.111*
	Sig. (2-tailed)	.004	.403	.004	.001	.015
	N	480	480	480	480	480
Fenestration	Pearson Correlation	.100*	-.126**	-.018	-.013	-.055
	Sig. (2-tailed)	.029	.006	.692	.770	.228
	N	480	480	480	480	480
Façade colour	Pearson Correlation	-.142**	-.109*	-.225**	-.153**	-.140**
	Sig. (2-tailed)	.002	.017	.000	.001	.002
	N	480	480	480	480	480
Entrance design	Pearson Correlation	.156**	-.008	.207**	.193**	.094*
	Sig. (2-tailed)	.001	.855	.000	.000	.041
	N	480	480	480	480	480
Innovation	Pearson Correlation	-.150**	.021	-.089	-.108*	-.071
	Sig. (2-tailed)	.001	.642	.050	.018	.118
	N	480	480	480	480	480

\*Correlation significant at 0.05% \*\*Correlation significant at 0.01%

Listed among the selected buildings is Nigeria world trade centre in Abuja, cultural centre in Iganmu Lagos and the first Anglican church in Nigeria. The Nestoil building was purposely situated at the intersection of two major business districts in Lagos with a visual proximity to Eko Atlantic city and Atlantic Ocean. The building was built to target dynamic businesses, multi-national industries, financial institutions that requires top brand positions. All the building were carefully selected due to their capacity of showcasing the image and culture of the country for tourism improvement.

However, the historical Anglican Church was ranked lowest among the selected building, followed by the world trade centre building. Unlike the elaborate Borobudur Buddhist temple in Indonesia that was designed to take pilgrims on a journey through kamadhatu (the world of desires), represented by the temple's base, rupadhatu (the world of forms), represented by the five square terraces and arupadhatu (the formless world), and represented by the three circular platforms and stupa, the historical Anglican church does not habituate the early religion history as it is expected to portray. This corroborate the study by Onanuga et al. (2016) that revealed that Christianity was one of the factor that strongly influenced architecture and urban design method in Nigeria. He further stated that

the choice western style architecture used to position economic activities and industrialization at the core of the cities for a better communal life did not just fail, but has forever displaced traditional values of community centrality, agricultural focus, and even social interaction among communities.

In contrary, Nestio tower and cultural centre both in Lagos were highly referenced by the respondents. However, the study shows that only the building innovation was the selling property it has. It is the modern material that is celebrated and promoted even in a building meant to promote cultural values. This result, therefore, substantiate many other studies (Chukwuemeka, 2009; Ayna, 2011; Onanuga *et al*, 2016) that have earlier reported that most public building in Nigeria lack merit of contextual harmony that represents and respect the character of a place in accordance with the lifestyle of its people, the material for construction available and their technology of construction. This is due to the receptivity and the amenability to change and access to western education, culture, Christianity and capitalism (Onanuga *et al.*, 2016). The specificity of the designers of these iconic buildings no longer contain the social beliefs and practices of the community where the buildings are sited. Majority of the design innovation is the adoption of influential foreign culture. The local image of the communities where these architectural masterpieces are situated are not reflected in the design product; thereby, the buildings become less relevant and not intriguing to the inhabitant and the world at large.

The study shows that all relationship established in the correlation between the building features and the respondents' attributes were negative. The negative relationship that the buildings selected indicated with the attributes of the respondents' shows the respondents' attributes are good variables to measure the perception of relevant of iconic buildings. It also shows that the features of the selected buildings did not represent the culture and architecture of the people. Consequently, the hypothesis that the iconic buildings in Nigeria do not represent the culture and architecture of the sited locality is accepted. Meaning that the iconic design product studied appears in an unfamiliar identity, so, it is not relevant to the culture and lifestyle of the people there the building is sited.

## CONCLUSION

This study has revealed that the architectural masterpieces with iconic characteristics in Nigeria lack traditional proclivity and neither conserves the historical heritages and values nor express the identity of the locality. The buildings, although fascinating, did not attract the tourist around the globe and less contributory to the economy of the community where it is situated. The study concluded that the majority of the architectural landmarks in Nigeria lack cultural and lifestyle representation of the sited communities, thereby fails in its expectation of social and cultural relevance. The implication is that it lacks the uniqueness of local architecture and cultural potentials that is sellable for an economic boost.

It is, therefore, recommended that design product that optimises resource and fosters equitable resource distribution should be encouraged. Also, emphasis should be laid on the crystallisation of variations of concepts and ideas to reflect the past in order to restore and re-identify the lost glory. Variations derived from traditional culture would be more authentic and long-lasting than variations arising from official fiat or imposed conditions and concepts. Likewise, initiatives should be taken by co-operatives, non-governmental organisations (NGOs) and government agencies, to promote the awareness of indigenous building materials in order to popularise their use. Also, by promoting the use of indigenous building materials, it will employ the unskilled workers and income for the community where the indigenous materials are being harvested. It will create a forum to improve local technology by imbibing western technology.

## SECTION FOUR

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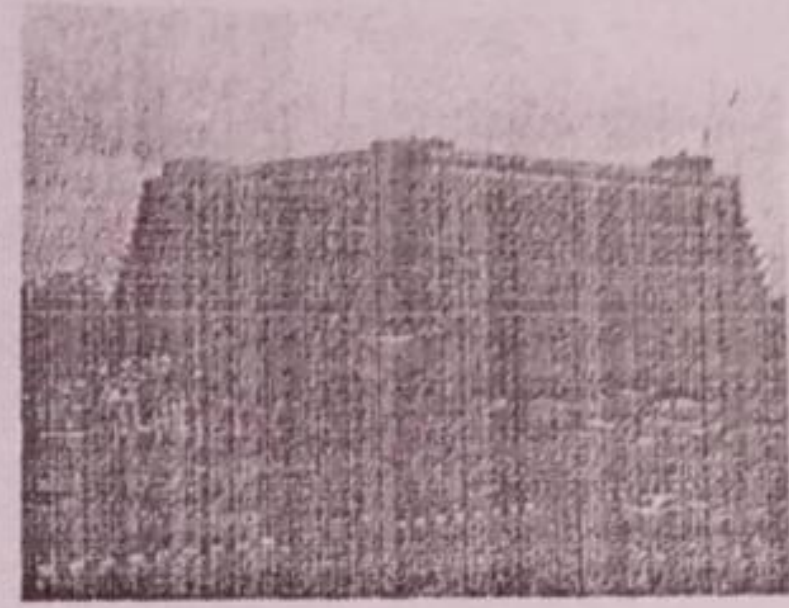
Photo interviewing-analysis: Below are the 10 images of the building samples under study.



Nigeria communication commission Maitama Abuja  
Nicon Luxury Area 8 Abuja



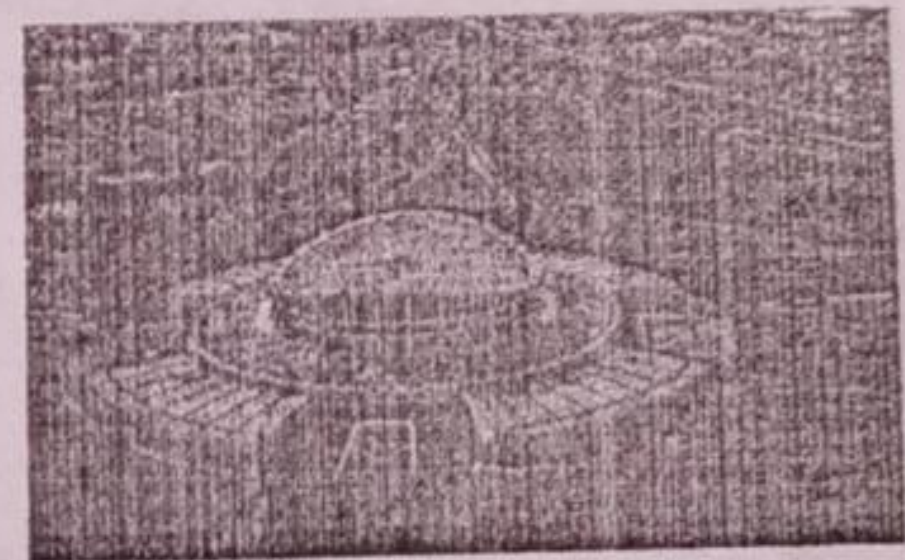
World trade centre central Area Abuja



Civic Centre V.I Lagos State  
centre at Iganmu, Lagos state



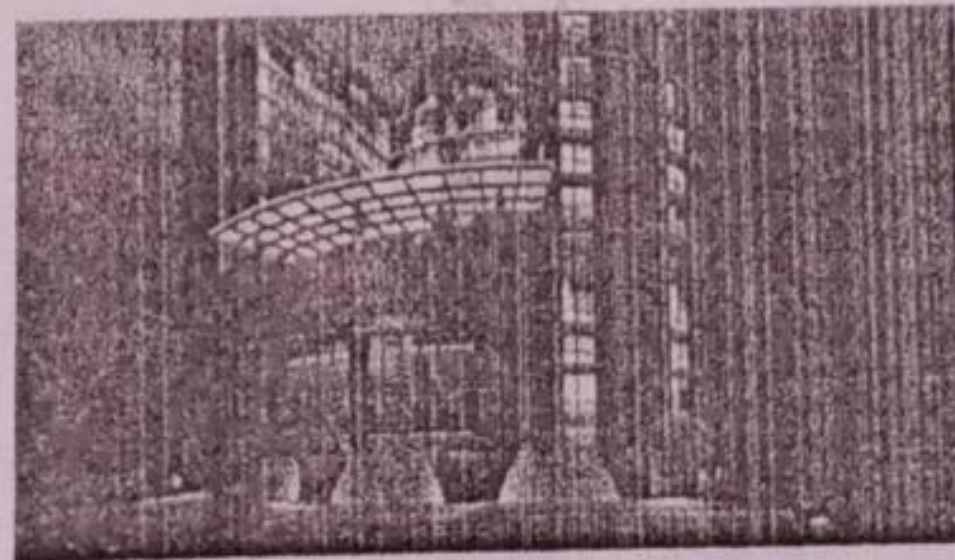
Anglican Church of Nigeria V.I Lagos state



Cultural



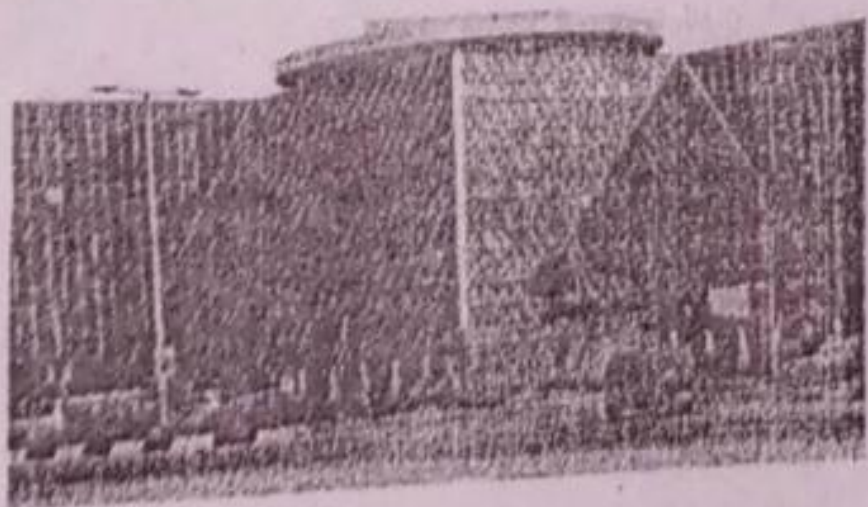
Optic House maitama Abuja  
Lagos State



Glo house V.I Lagos State



Nestiol tower. V.I



Shell house Ikoyi Lagos state

# ANALYSIS OF BIOPHILIC DESIGN PRINCIPLES IN DRUG REHABILITATION CENTRES IN NIGERIA

Kanu, B.C and Isah, A. D

*Department of Architecture, Federal University of Technology Minna, Nigeria*

*Corresponding Author: kanuboluwatife@gmail.com*

## ABSTRACT

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Biophilic architecture is based on the assertion that humans have an innate connection with nature that should be expressed in their daily lives, especially in cities. This, which has not been a strong feature of architectural principles (even though there has been a long tradition of landscape architecture), yet potentially offers great rewards if the assertion is true. However, earlier and more recent studies have revealed that individuals who dwell among the splendours and mysteries of nature are never alone or weary of life thus, implying that there is something infinitely healing in the repeated refrains of nature. This paper is aimed at examining biophilic design principles in drug rehabilitation centres in Nigeria. The research adopts a descriptive research method, with the use of observation schedules, and an in-depth review of existing literature. Samples were taken from rehabilitation centres in Nigeria using the convenience sampling method. Findings show a low level of implementation and use of biophilic design principles in the design of drug rehabilitation centres within the study area. It is however pertinent to know that biophilic design principles are passive and sustainable measures that can be adopted to enhance drug de-addiction and rehabilitation in rehabilitation centres in Nigeria; which is a recommendation this paper puts forward. This paper concludes by advocating for the use of biophilic design principles in drug rehabilitation centres in Nigeria to aid de-addiction and rehabilitation.

**Keywords:** *Biophilic design, De-addiction, Drug, Nature, Rehabilitation*

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## 1.0 Introduction

Over the years, humanity has been evolving in a close relationship with nature and the quality of this relationship is reflected in the emotions, thoughts, culture, and health that every individual or society expresses. In modern times however, the built space has been conceived and designed by giving nature a role that is not only marginal, but also irrelevant to the health and happiness of individuals (Kellert, 2012). Earlier studies (as early as the 1960's) have revealed that individuals who dwell among the splendours and mysteries of nature are never alone or weary of life thus,

implying that there is something infinitely healing in the repeated refrains of nature (Salingaros, 2015).

The term biophilia was coined from two Greek words 'bios' which means life and 'philia' which means to love; suggesting a meaning of anything that is nature loving. The term "biophilia" which was used for the first time in the 1960s by Erich Fromm is the intrinsic human disposition to affiliate with nature" (Kellert & Calabrese, 2015). Although biophilia is the phenomenon, biophilic design is internationally recognized as a process that offers a sustainable design approach aimed at relinking individuals with their natural environment (Downton *et al.*, 2017). It is note-worthy that architecture is not a treatment, but can most significantly become part of the healing process through the creation of spaces that foster and provide meaning to those activities utilized to achieve gradual rehabilitation.

However, according to World Health Organization (WHO), de-addiction is a process of reversing the state of someone physically or psychologically enslaved to a particular habit while rehabilitation is defined as a set of measures that assist individuals who experience or are likely to experience disability or addictions to achieve and maintain optimum functioning in interaction with their environment (WHO, 2016).

The menace of drug abuse and addiction in Nigeria has reached a frightening proportion and has pervaded every fibre of the society, especially in the North-West. The issue of drug addiction over the years has become an issue for National concern in Nigeria and the National Drug Law Enforcement Agency (NDLEA) has continued to come up with measures to aid rehabilitation in a bid to minimally reduce drug addiction in the country (NDLEA, 2018). Part of these measures is to establish fully functional drug de-addiction and rehabilitation centres in areas identified by the agency as areas most affected by this menace in line with the Federal Government policies

against drug addiction. Hence, the need for rehabilitation Centres in those regions. An approach to achieving this is by integrating biophilic design principles which have been argued to have certain effects on the rehabilitation and de-addiction of drug addicts (Ryan *et al.*, 2014).

This paper is aimed at examining biophilic design principles in drug rehabilitation centres in Nigeria.

## **2.0 Literature Review**

### **2.1 Drug Addiction Treatment and Recovery**

Addiction is a preventable and treatable disease. Discoveries in the science of addiction have led to advances in drug abuse treatment that help people stop abusing drugs and resume their productive lives. Addiction need not be a life sentence. Like other chronic diseases, addiction can be managed successfully. Treatment enables people to counteract addiction's powerful disruptive effects on brain and behaviour and regain control of their lives.

Research shows that combining a therapeutic environment, treatment medications (where available), and behavioural therapy is the best way to ensure success for most patients (Namma, 2014).

### **2.2 Theory of Biophilia**

The theory of biophilia was introduced in 1984 by socio-biologist Edward O. Wilson in his book of the same name. However, the first time the notion of biophilia was mentioned was in the late 1960's by Erich Fromm, a German social psychologist. Fromm hypothesized that people have a passionate love of life and all that is alive; it is the wish to further growth, whether in a person, a plant, an idea, or a social group (Fromm, 1973). Wilson's theory of biophilia states that humans have an innate tendency to focus on life and lifelike processes (Wilson & Kellert, 1993).

### 2.3 Biophilic Design

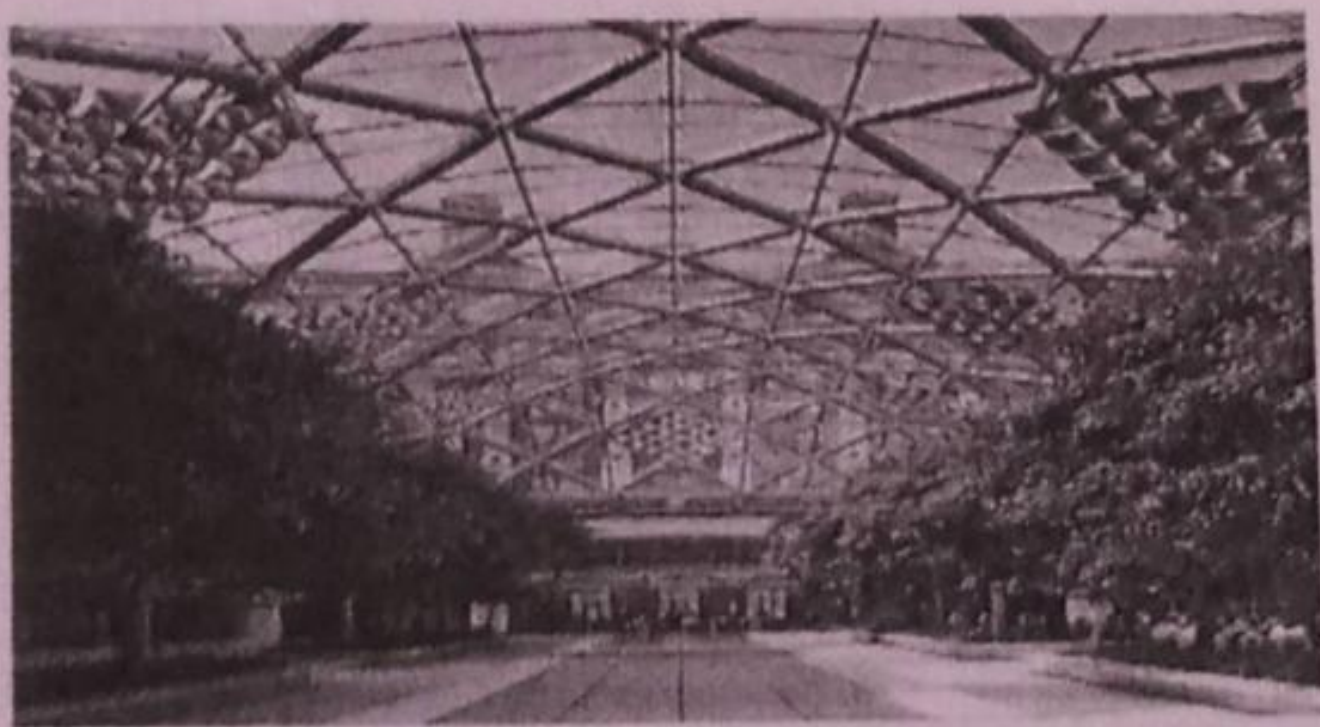
Steven Kellert, a Professor of Social Ecology at Yale, has taken the biological theory of biophilia and applied it to the built environment, coining the term “biophilic design”. The goal of biophilic design is to translate an understanding of biophilia into the design of the built environment, resulting in beneficial contact between people and nature within modern buildings and landscapes (Kellert, 2012).

### 2.4 Dimensions of Biophilic Design

Biophilic design contains two main dimensions: the “organic or naturalistic” dimension and the “place-based or vernacular” dimension (Gamble *et al.*, 2014).

#### 2.4.1 Organic or Naturalistic Dimension of Biophilic Design.

The organic dimension of biophilic design is shapes and forms in the built environment that directly, indirectly, or symbolically reflect the inherent human affinity for nature (Na-umma, 2014). Nature can be experienced directly, indirectly, and symbolically under this dimension of biophilic design.



*Figure 1: Direct connections to nature afforded by natural light and vegetation within an atrium.*

*Source: (<http://www.princeton.edu/pr/pwb/05/0530/3a.shtml>).*

#### **2.4.2 Vernacular Dimension of Biophilic Design**

The vernacular dimension of biophilic design involves buildings and landscapes that connect to the culture and ecology of a locality or geographic area (Hildago, 2014). Vernacular design is a means of creating spaces that reflect the places people live and work and avoid the placelessness prevalent in the built environment today. Furthermore, Kellert *et al.* (2008) classified four different types of vernacular dimensions of biophilic design. These include; Vernacular Design Relating to Ecology of a Place, Vernacular Design Relating to Culture and History of a Place, Vernacular Design Fusing Culture and Ecology and Vernacular Design Avoiding Placelessness.

#### **2.5 Patterns of Biophilic Design**

Ryan *et al.* (2014) refined the six elements and seventy design attributes of Biophilic design with supportive qualitative and quantitative research in both the physiological and the psychological. They recognized that previous design attribute lists were unwieldy and potentially confronting for designers, and then consolidated the design attributes to the following fourteen patterns within three categories as illustrated in **Table 1.0** below

While informed by science, biophilic design patterns are not formulas; they are meant to inform, guide and assist in the design process and should be thought of as another tool in the designer's toolkit. The purpose of defining these patterns is to articulate connections between aspects of the built and natural environments and how people react to and benefit from them.

**Table 1.0** Patterns of Biophilic Design

<b>PATTERNS OF BIOPHIC DESIGN</b>		
<b>NATURE IN THE SPACE:</b> Incorporation of plants, water, and animals into the built environment, especially with movement	<b>NATURAL ANALOGUES:</b> one degree of separation away from true nature; patterns and materials that evoke nature	<b>NATURE OF THE SPACE:</b> the way humans respond psychologically and physiologically to different
<p><b>1. Visual Connection with Nature:</b> plants inside and out, green roofs, living walls, water, nature artwork.</p> <p><b>2. Non Visual Connection with Nature:</b> sun patches, textured materials, bird sounds, weather, nature scents.</p> <p><b>3. Non-Rhythmic Sensory Stimuli:</b> clouds, shadows, nature sounds, water reflections.</p> <p><b>4. Access to Thermal and Airflow Variability:</b> shade, radiant heat, seasonal vegetation.</p> <p><b>5. Presence of water:</b> rivers, fountains, water walls, ponds, day-lighted streams</p> <p><b>6. Dynamic and Diffused Light:</b> light from different angles, ambient diffuse lighting, circadian lighting.</p> <p><b>7. Connection with Natural Systems:</b> seasonal patterning, wildlife habitats, diurnal patterns</p>	<p><b>8. Biomorphic Forms and Patterns:</b> organic building forms, structural systems (savannah effect).</p> <p><b>9. Material Connection with Nature:</b> Materials from nature, reflecting geology and ecology and distinct smell of a place.</p> <p><b>10. Complexity and Order:</b> fractal patterns, sky lines, plant selection and variety, material textures and colours.</p>	<p><b>11. Prospect:</b> views, balconies, 6m and above focal lengths, open floor plans.</p> <p><b>12. Refuge:</b> protected spaces, overhead canopies, or lowered ceilings, places providing concealment.</p> <p><b>13. Mystery:</b> winding paths, obscured features.</p> <p><b>14. Risk/Peril:</b> floor to ceiling windows, water walks, high walkways.</p>
<i>Source: Ryan et al., 2014</i>		

### 2.6 Benefits of Biophilic Design to Patients' Health

Evidence from over three decades of research on the impact of nature on human health and wellbeing can justify the claim that Biophilic design is beneficial to patients' health (Gillis & Gatersleben, 2015).

The most significant body of research to date has shown a strong positive correlation between exposure to nature and psychological well-being measured in a range of ways, including mental restoration, self-esteem, attachment, and anger (Barton & Pretty, 2010; Dallimer *et al.*, 2012).

## **2.7 Application of Biophilic Design in Health Facilities.**

The evolution of Biophilic design characteristics has led to the recently published document "The Practice of Biophilic Design" by Stephen Kellert and Elizabeth Calabrese (2015). There are three kinds of experience of nature that represent the basic categories of Biophilic design framework. These include the **direct experience of nature, the indirect experience of nature, and the experience of space and place** (Kellert & Calabrese, 2015).

### **2.7.1 Direct Contact with Nature**

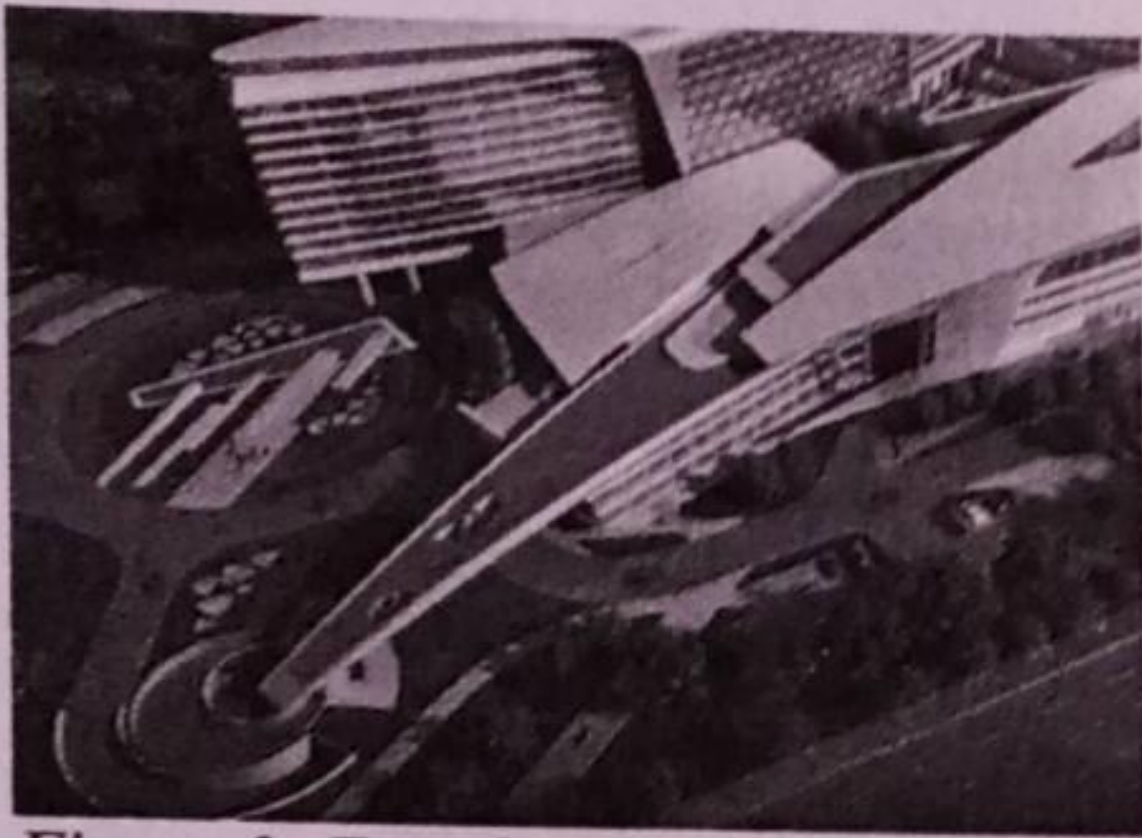
The direct experience of nature refers to actual human contact with environmental features in the built environment. Which comprises of;

1. Natural Features: Water, Air (Natural Ventilation), Sunlight (Daylight) and Vegetation (Plants)
2. Views and Vista: Recovery and patient's wellbeing act upon the natural scenes that are conveyed from the outdoor natural environment (AbdelMeguid, 2014).
3. Natural Landscape and Ecosystem: When design is done considering the natural landscape and ecosystem, long-term sustainability is achieved (Locklear, 2012).
4. Façade Greening





*Figure 2: Nature features in the built environment at Henry Ford West Bloomfield Hospital*  
*Source: <https://www.nytimes.com/2016>*



*Figure 3: Façade greening at Haushan Hospital, Shanghai China*  
*Source: <https://www.greshamsmith.com>*

### **2.7.2 Indirect Contact with Nature**

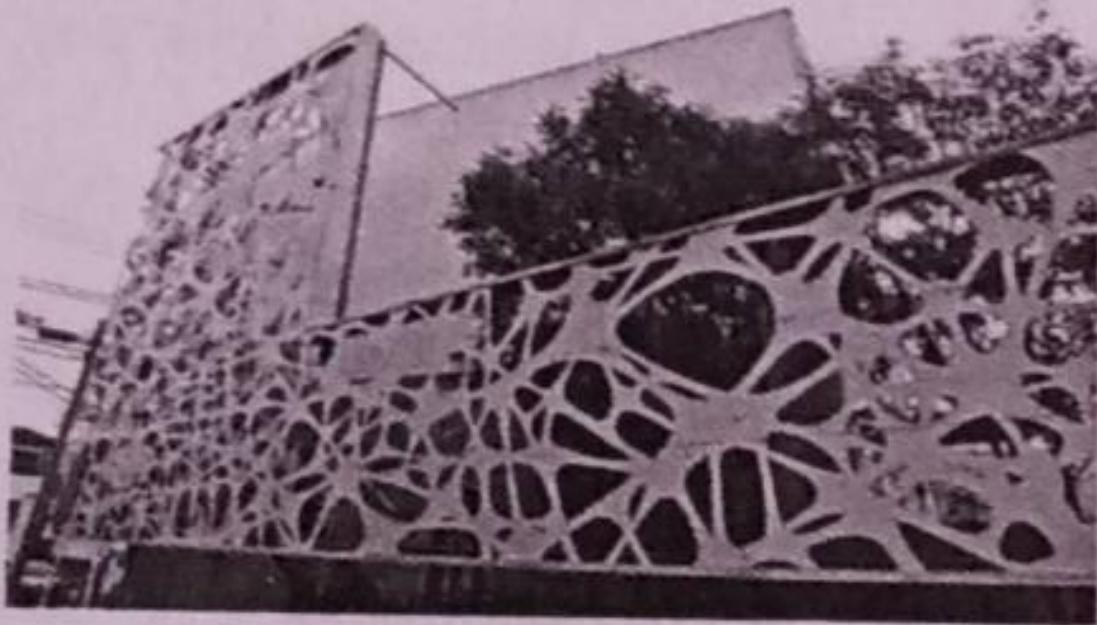
The indirect experience of nature refers to contact with the representation or image of nature, the transformation of nature from its original condition, or exposure to particular patterns and processes characteristic of the natural world. This can be expressed by the use of:

1. Natural materials
2. Natural Colours: Colour affect human behaviour, controls stress, affect the healing status of patients (AbdelMeguid, 2014).
3. Natural Shapes, Forms and Patterns

4. Images of Nature: A recent study by *Gamble et al.*, (2014) concluded that brief viewing of nature pictures offers an inexpensive and enjoyable way to temporarily boost cognitive function in both young and older adults.



**Figure 4:** Use on natural materials at St. Bernard Parish Hospital, New Orleans USA  
**Source:** <https://www.greshamsmith.com>



**Figure 5:** Natural patterns on facade at Airspace Tokyo, Japan.  
**Source:** <https://www.flickr.com>

### 2.7.3 Experience of Space and Place

The experience of space and place refers to spatial features characteristic of the natural environment that have advanced human health and wellbeing.

1. Transitional spaces and Bounded spaces: Transitional spaces include hallways, thresholds, doorways, gateways, and areas that link the indoors and outdoors especially porches, patios, courtyards, colonnades, and more which when well-planned enhance easy use of building spaces. (Kellert & Calabrese, 2015). Bounded spaces give patients a sense of privacy, security and territoriality (Kellert, 2008).

2. Security and Protection
3. Spatial Harmony and Spaciousness
4. Attraction and Beauty
5. Connection to Place: Architecture of Place is about creating designs that make people feel empowered, important, and excited to be in the places they inhabit in their daily lives.
6. Mobility and Way finding: People's comfort and wellbeing often relies on freely moving between diverse and often complicated spaces.

### **3.0 Methodology**

The research employed the descriptive research method which engaged the use of purposefully and well-structured observation schedules to obtain relevant data for the study. A sample of Rehabilitation Centres in Nigeria was selected and used for the study. Convenience Sampling was used for the selection of samples, as selection was done based on rehabilitation Centres that were easily accessible due to the sensitive nature of some rehabilitation Centres in Nigeria. The biophilic elements (variables) observed in the samples taken were targeted towards assessing the following; **direct contact with nature, indirect contact with nature and Experience of Space and Place**

The Rehabilitation Centres observed are;

- i. Ekiti State Government relief and rehabilitation centre, Ekiti State.
- ii. Plateau State rehabilitation centre, Jos, Nigeria.
- iii. Bauchi State rehabilitation centre, Bauchi, Nigeria.
- iv. Rehabilitation Centre for the disabled, Moniya, Ibadan. Oyo state.
- v. Quintessential Healthcare Centre, Jos, Plateau State

#### 4.0 Results and Discussion

The results obtained from the observation schedule were documented in tables as shown below:

S/N	List of Rehabilitation Centres	Adequate Openings		Water Bodies	Courtyard/ Atrium		Facade Greening	Landscape features that blend with the indigenous environment
		Amount	Size		Available	Natural features		
1.	Ekiti State Rehabilitation Centre	X	X	X	X		X	X
2.	Plateau State Rehabilitation Centre	X	X	X	✓		X	X
3.	Bauchi State Rehabilitation Centre	X	✓	X	✓	✓	X	X
4.	Rehabilitation Centre, Moniya, Ibadan. Oyo state.	X	X	X	X		X	✓
5.	Quintessential Healthcare Centre	✓	✓	X	✓	X	X	X
<b>Total (%)</b>		<b>20</b>	<b>40</b>	<b>0</b>	<b>60</b>	<b>33</b>	<b>0</b>	<b>20</b>

**Table 2.0** Assessment of key biophilic elements that reveal direct contact with Nature

✓ – Available                      X – Not available.

Source: Authors

The result obtained in **Table 2.0** above shows that none of the rehabilitation centres had water bodies or façade greening, while only 20% featured landscaping elements that blend indigenous environment. The results further reveal that only 20% of the rehabilitation centres have adequate amount of openings in spaces, while 40% have adequate sizes of openings. In addition, 60% of the rehabilitation centres were seen to have either courtyards or atrium, with only 33% of this 60% possessing natural features or experience. These results reveal that spaces within these rehabilitation centres do not sufficiently allow for users to have direct contact with nature.

**Table 3.0** Assessment of key biophilic elements that reveal indirect contact with Nature

S/N	List of Rehabilitation Centres	Natural Materials	Natural Colours	Natural Forms, Shapes and Patterns	Images of Nature
1.	Ekiti State Rehabilitation Centre	X	X	X	X
2.	Plateau State Rehabilitation Centre	X	X	X	X
3.	Bauchi State Rehabilitation Centre	X	X	X	X
4.	Rehabilitation Centre, Moniya, Ibadan. Oyo state.	✓	X	X	X
5.	Quintessential Healthcare Centre	X	X	X	✓
	<b>Total (%)</b>	<b>20</b>	<b>0</b>	<b>0</b>	<b>20</b>

✓ – Available                      X – Not available.

Source: Authors

The result obtained in **Table 3.0** above shows that none of the rehabilitation centres featured the use of natural colours as well as natural forms, shapes and patterns. However, only 20% of the rehabilitation centres employed the use of natural materials and also images of nature within their spaces. The results show that spaces within these rehabilitation centres provide users with inadequate indirect contact with nature.

Furthermore, the result obtained in **Table 4.0** below shows that 60% of the rehabilitation centres have staircases with widths that are  $\geq 1.5\text{m}$  (which is regarded as adequate for staircases), none of which have natural features along staircases. Also, 40% possess lobbies/halls that have widths  $\geq 2\text{m}$  (which gives an acceptable range of widths for lobbies/halls) and none of the rehabilitation centres have natural features along lobbies/halls. In addition, 40% of the rehabilitation centres have walkways with widths falling within the acceptable range  $\geq 1.2\text{m}$  and only 40% feature natural features along walkways. Further results reveal that only 40% of the rehabilitation centres possess well-spaced public spaces such as receptions and visiting areas and only 20% feature any form of connection to nature within those spaces.

**Table 4.0** Assessment of key biophilic elements that reveal experience of place and space

S/N	List of Rehabilitation Centres	Staircases		Lobbies/Halls		Walkways		Public Spaces	
		Width $\geq 1.5m$	Natural features	Width $\geq 2.0m$	Natural Features	Width $\geq 1.2m$	Natural Features	Spacious	Connection to Nature
1.	Ekiti State Rehabilitation Centre	X	X	X	X	X	X	X	X
2.	Plateau State Rehabilitation Centre	✓	X	X	X	X	✓	X	X
3.	Bauchi State Rehabilitation Centre	✓	X	✓	X	X	X	✓	X
4.	Rehabilitation Centre, Moniya, Ibadan. Oyo state.	X	X	X	X	✓	✓	X	X
5.	Quintessential Healthcare Centre	✓	X	✓	X	✓	X	✓	✓
<b>Total (%)</b>		<b>60</b>	<b>0</b>	<b>40</b>	<b>0</b>	<b>40</b>	<b>40</b>	<b>40</b>	<b>20</b>

✓ – Available

X – Not available.

Source: Authors

The result obtained in **Table 5.0** below shows that none of the rehabilitation centres feature natural elements within their wards or spatial harmony of the built and natural environments surrounding the buildings. Whereas, 20% incorporated the use of traditional building materials and indigenous cultural elements within spaces.

**Table 5.0** Assessment of key biophilic elements that reveal experience of place and space

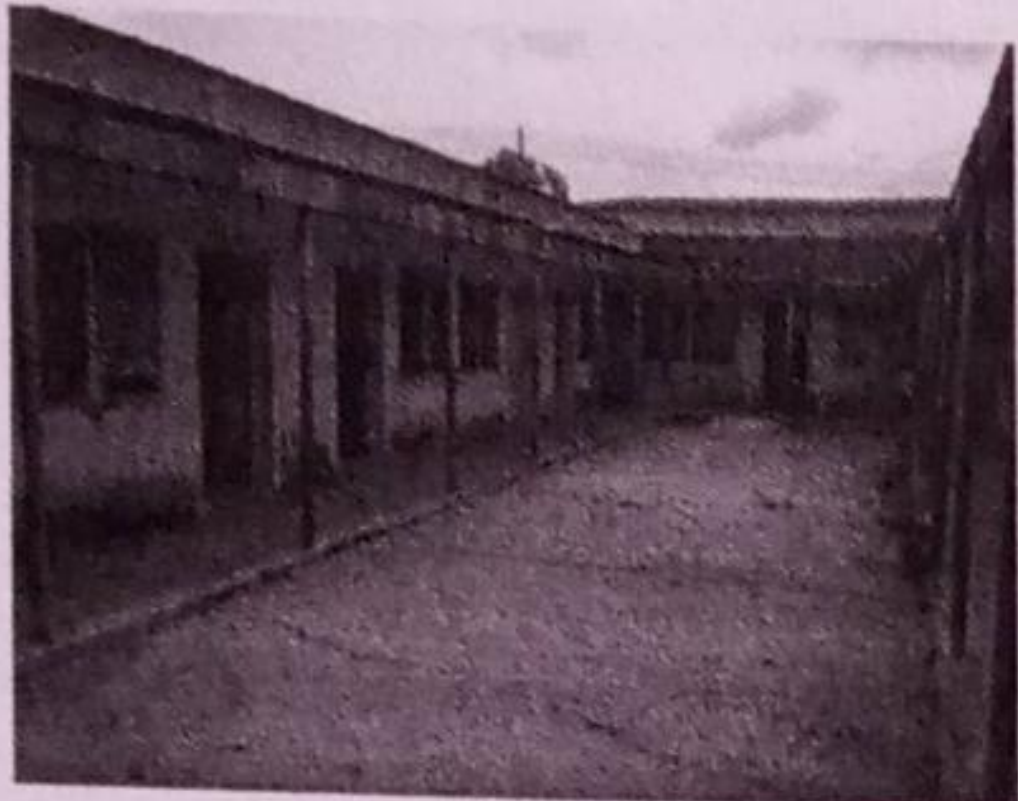
S/N	List of Rehabilitation Centres	Natural features in Wards	Traditional Building Materials	Indigenous Cultural Elements	Spatial Harmony of Natural and Built Environment
1.	Ekiti State Rehabilitation Centre	X	X	X	X
2.	Plateau State Rehabilitation Centre	X	✓	X	X
3.	Bauchi State Rehabilitation Centre	X	X	X	X
4.	Rehabilitation Centre, Moniya, Ibadan. Oyo state.	X	X	✓	X
5.	Quintessential Healthcare Centre	X	X	X	X
<b>Total (%)</b>		<b>0</b>	<b>20</b>	<b>20</b>	<b>0</b>

✓ – Available

X – Not available.

Source: Authors

The result from **Table 4.0** and **Table 5.0** suggests that there is limited interplay of the experience of place and space within the rehabilitation centres



*Figure 6: Courtyard system, Plateau state rehabilitation centre, Jos, Nigeria*

*Source: Authors' field work, (August, 2018)*



*Figure 7: Showing vegetation covers and notable trees and flowers in Rehabilitation centre for the disabled, Moniya, Ibadan .*

*Source: Authors' Field work (August, 2018).*

## **5.0 Conclusion**

From the study it is clear that most of these rehabilitation Centres possessed biophilic elements within their surroundings, but however direct contact with nature was only featured outside the buildings and not within interior spaces. Also, indirect contact with nature was a feature that was seldom observed within interior spaces. In addition, the study revealed that the experience of place and space was not sufficiently introduced into interior spaces, thereby revealing little connection between people and their culture and indigenous environments.

This study therefore indicates that biophilic design principles have not really been incorporated as strong features in the design of rehabilitation Centres in Nigeria as passive and sustainable measures for fostering rehabilitation and in turn, drug de-addiction.

### **5.0 Recommendation**

From the study, these recommendations can be applied to improve the design and operation of rehabilitation Centres in Nigeria:

- i. Biophilia should be adopted as a design principle for the design of health and rehabilitation Institutions as Government policy for better result in the recovery and rehabilitation process.
- ii. Local and indigenous Architecture, building materials, historical elements and cultural features should be used in the development of rehabilitation Centres around Nigeria, as this will make for better connection between people and their traditional habitat which in turn will enhance rehabilitation and recovery.



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