

**ASSESSMENT OF BIOPHILIC DESIGN STRATEGIES IN THE DESIGN OF A
HOLIDAY RESORT IN ABUJA, NIGERIA**

BY

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ABSTRACT

A number of research works relating to occupational health and leisure science highlighted recovery as a process which takes place during a period an individual is not working. Across the globe, people tend to pursue their vacations in a setting, according to their preferred recreational activities and what would they like to experience. In line with the above, people are known to spend 90% of their time indoors and with this, a large population of people that occupy urban areas can recurrently tend to be separated from nature. Literatures have established that holiday resorts are tourism engineered facilities which are very useful for boosting national economy and enhancing both psychological and physical well-being of people. Biophilia being natural and of nature friendly design strategies would lead to an effective habitat for people through texture, appearance and effects of the building in the contexts of the nature in the space, the natural analogues and the nature of the space. This research aims to incorporate biophilic principles in the design of a holiday resort in Abuja with a view to improving the performance of indoor spaces. This research employs the use of simple random sampling for Observation (Post Occupancy Evaluation) of twenty-six (26) resorts across Nigeria, while purposive sampling was employed in the distribution of two hundred (200) questionnaires. The results were analysed through the use of chi-squared and the building condition index (BCI) and presented through the use of tables and charts. It was found that there is a significant relationship between the absence of biophilic features or elements and the user perception on their significance in a holiday resort. The findings showed that users had the highest dissatisfaction towards natural analogues on a 60-percentage rate. The usage or implementation of these design strategies or elements in a holiday resort showed a percentage rate adoption of 32.9%, also indicating that they have not been adopted or implemented on a percentage rate of 67.1%. This shows the poor adaptation and implementation of biophilic design strategies in the design of holiday resorts. This research recommends that designs should be made to consider the patterns of biophilic design features, so as to optimise the experience of tourists to these locations.

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CHAPTER ONE

1.0

INTRODUCTION

1.1 Background to Study

The work-life stress of everyday can affect the performance of people and impact the health and well-being of persons either directly or indirectly over an extended period of time. De Bloom *et al.* (2010) highlighted that the impact of work-life stress includes but is not isolated to an unhealthy diet, possible blood pressure, lack of sleep and exercise. Research works relating to leisure science and occupational health, highlights recovery as a process which takes place during a period an individual is not working (Päivärinne *et al.*, 2019). Geurts and Sonnentag (2006) explained that more often than not, man innately has a biological connection with nature.

Fritz and Sonnentag (2006), Kalichman *et al.* (2012) and Rook and Zijlstra (2006) agrees that breaks on work days and time after work in the evening, vacations and weekends can aid recovery. It can then be asserted from the explanation of Geurts and Sonnentag (2006) and the works from Fritz and Sonnentag (2006), Kalichman *et al.* (2012) and Rook and Zijlstra (2006) that recovery occurs in a place; which means that the nature of that place is important for recovery to take place. Hence, the recovery of a person from stress is sensitive to place and space. Therefore, to help fight such stress, people need a measure of their time away from the sources of stress in their environment; these places of stress could be their workplace, school, or even their homes.

Across the globe, people go for vacations according to what they will like to experience. Kler (2009) explained that a serene environment and natural landscape are important aspects that influence the choice of a recreation place. Ibimilua (2009) added that tourist

destination is the location of attention which a tourist would want to stop over for holiday, education, relaxation and other functions. This makes tourism a vital sector to any nation in the world. This is not only about people going on vacation from one place to another but also because of the economic significance as it can help boost the Gross Development Product (GDP).

Nigeria is a country with diverse landscape, plenty of beautiful scenery and many tourist destinations with historic significance. Adedipe and Adeleke (2016), described Nigeria as a country made for tourism; having over 521 languages and over 1150 dialects and ethnic groups with rich cultural heritage, natural resources, wildlife and a beautiful climate (Masade, 2017). A biophilic design for a resort in a place like Nigeria would not only help in making more room for recovery and boost health by reducing stress, but also boost the national economy while causing socio-cultural bonding. It is worth adding that Dahlgren *et al.* (2005) pointed out that because of the job demands throughout the week, adults complain for the insufficient recovery time and look for more time away from work. Part of the essence of architecture is the art of using natural spaces to create artificial forms for expression. This can be seen in the representation of human imagination over materials, methods, and manpower. All these helps to put man in possession of his own space. Frank (1930) expressed that architecture gives man a great sense of himself embodied in a world created by him. To this end, architecture is useful in creating senses in man and can help the expression and relaxation of the person.

It is in this line that Heerwagen (2000) suggests that biophilia (which has progressed) can promote behaviours that are inked to enjoying nature and in turn aiding survival and fitness and shift the focus from non-functional behaviours. However, in modern

architecture and design, biophilia can get lost. Biophilic design is a brilliant method of creating stable environments for work and living (Kellert and Calabrese, 2015). This implies that biophilic design includes nature in an architectural design, thereby unconsciously reconnecting to nature in our constructed world. Biophilic design has recently been incorporated in design, thereby improving the health and performance of building occupants, this is a great feat as people mostly spend 90% of their time indoors (Rai *et al.*, 2020).

Since the biophilia is a design approach that seeks to connect building occupants more closely to nature through the incorporation of natural lighting, ventilation and natural landscape features and other elements for creating a more productive and healthier built environment for people, it would also be fitting for a holiday resort. A resort according to Shelton and Sultanov (2001), is a destination located to offer a wide range of climates, a unique view of nature, culture and give experiences. Thus, it can possess a number of features that would be included in the biophilic design.

1.2 Statement of the Research Problem

The United States Environmental Protection Agency, (2001), published that a high number of people spend about 90% of their time indoors. McMichael (2000) and Bloch *et al.*, (2015) expressed that a large population of people that occupy urban areas can recurrently tend to be separated from nature. This happening can have a negative effect on the behavioral, mental and physical lifestyle of the people. To add to that, the nature of the design of a building can also contribute to the recovery of people in urban areas. People with stress related diseases can also be found in Nigeria, with a prevalence of psychosocial stress risk factors reaching 67.72% and psychosocial stress-related health

outcomes compiled, the only headache, with neck and back pain with prevalence estimated at 73.26% (Onigbogi and Banerjee, 2019). This can actually be contained through the presence of buildings which can merge their need for recovery with the need to also incorporate cultural education. It is an interesting combination that has not been deeply researched and can serve as a sustainable contribution to both the physical health and socio-cultural health of the country.

Holiday resort buildings have the potential of aiding with an environment which can provide recovery, reconnect people with nature, and re-introduce people to the rich cultural background from their roots (Shelton and Sultanov, 2001). This research work intends to tap into that initiative by proposing a holiday resort in a quest to create spaces that can help people relieve from the stress of the hustle and bustle of the urban environment, bring the bring people from various background together to appreciate the wealth of the Nigerian cultural diversity and integrate meaningful natural attributes such as fresh air, daylight, vegetation, and views of nature which could enhance human health and well-being through a biophilic environment.

1.3 Aim and Objectives of the Study

The aim of this study is to incorporate biophilic principles in the design of a holiday resort with a view to improving the performance of indoor spaces.

The objectives of this research are to:

- i. Assess the perception of resort users on their relationship with and proximity to nature.
- ii. Assess the biophilic design features that can be adopted in a holiday resort design.

- iii. Identify the challenges confronting holiday resorts that can mitigate use of biophilic features.
- iv. Propose a holiday resort design that effectively incorporates biophilic design strategies.

1.4 Research Questions

This research has questions which are deliberate to conduct the study effectively. The questions include;

- i. What is the perception of users to the relevance of nature to a resort?
- ii. What are the biophilic features that are present in holiday resorts and what are the ones required?
- iii. What are the challenges confronting holiday resorts that can mitigate use of biophilic features?
- iv. What is the impact of a biophilic design on users and how can it be incorporated?

1.5 Scope of the Study

A Holiday resort is an occupied facility for lodging, intended first and foremost for people on vacation and typically situated in tourist hotspots such as beaches, spas, historic or scenic areas, ski parks, seashores. The dissimilarity to a hotel lies in the variety of services and facilities obtainable. A Holiday resort characteristically includes amusement and leisure activities. We can articulate that a Resort is a self-contained enterprise, providing for the majority of a vacationer's desires while remaining on the premises (lodging, food, drink, sports, entertainment and shopping). This study would primarily focus on resort buildings and biophilic principles that are obtainable in the built environment. This would be done to help meet the aim of this research.

1.6 Justification for the Study

The research on the incorporation of biophilia into the design of holiday resort building with the wellbeing of the people of the urban areas that surround it has never been of greater value than it is now, this study would not only go as far finding the areas where building users in resorts can blend not only to the environment, but also with the building physically, psychologically and socio-culturally, thereby merging tourism, education and psycho-therapy (that is, in the aspect of recovery). Brunt *et al.* (2000) discussed that survey showed how possible victimisation is tourists in tourist areas, this further points at the importance of a deliberate input of architectural design to be able to deliberately handle these harms that could interfere with the health and wellbeing of tourists.

Basu (2003) described that the perception and the goals of the different aspects of tourism sustainability is difficult to maximize simultaneously, especially in tourism development. This makes it a subjective experience with an amalgam of products and services. One of the reasons for that, is because of the intangibility of the services it offers. As it involves the selling of experiences as heterogenous product which can be standardize as a service. Demand fluctuations for the services offered here can be unseen, some-times it can-be as a result of two natural causes (climate and natural disasters), other man-made (strikes and international events such as wars and terrorism). In Abuja a holiday resorts will contribute to three high-priority goals of developing countries: foreign-exchange earnings., employment and the generation of income.

1.7 The Research Study Area

Abuja is the capital city of the Federal Capital Territory (FCT) of the Federal republic of Nigeria. It is one of the 37 capitals in Nigeria which contribute to the incessant increase for relaxation especially for foreign visitors. It is found in Latitude 9° 3' 28" N and Longitude 7° 29' 42" E (Worlddata.info, 2019). Abuja is a designed city and was constructed in the 1980s, substituting Nigeria's former capital, Lagos as the capital of the country on 12 December 1991.

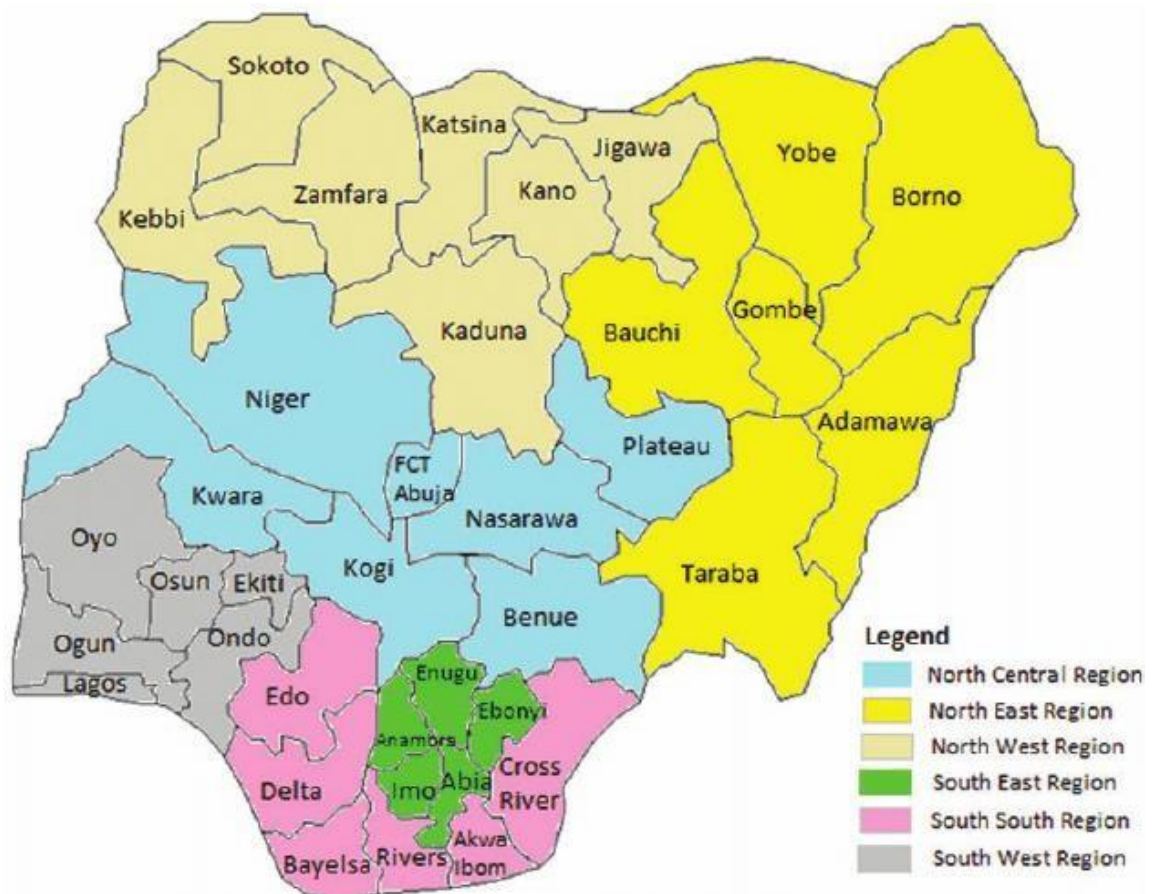


Figure 1.1: The FCT and the 36 state of the Federal Republic of Nigeria
Source: Gayawan *et al.*, (2014)

1.7.1 Topography of Abuja

The city is bounded by numerous hills, grasslands, rainforests and high lands. The study area is underlain by Precambrian rocks of the Nigerian Basement Complex which cover about 85 % of the land surface and cretaceous sedimentary rocks.

1.7.2 Population and occupational demography of Abuja

As at 2006 population census conducted by National Population Commission, the city of Abuja had a total population of 776,298, this made to be ranked among the top ten most populous cities in Nigeria. According to the United Nations, Abuja had a population growth rate of 139.7% from the year 2000 to the year 2010, this feat made it the city with the fastest growing population in the world. In the year 2015, the city was going through an annual population growth of at least 35%, retaining its position as the city with the fastest growing population on the African continent and one of the fastest-growing in the world. Meanwhile, a little closer in the year 2016, the metropolitan area of Abuja was projected at eight million persons, placing it behind only Lagos, as the most populous metro area in Nigeria.

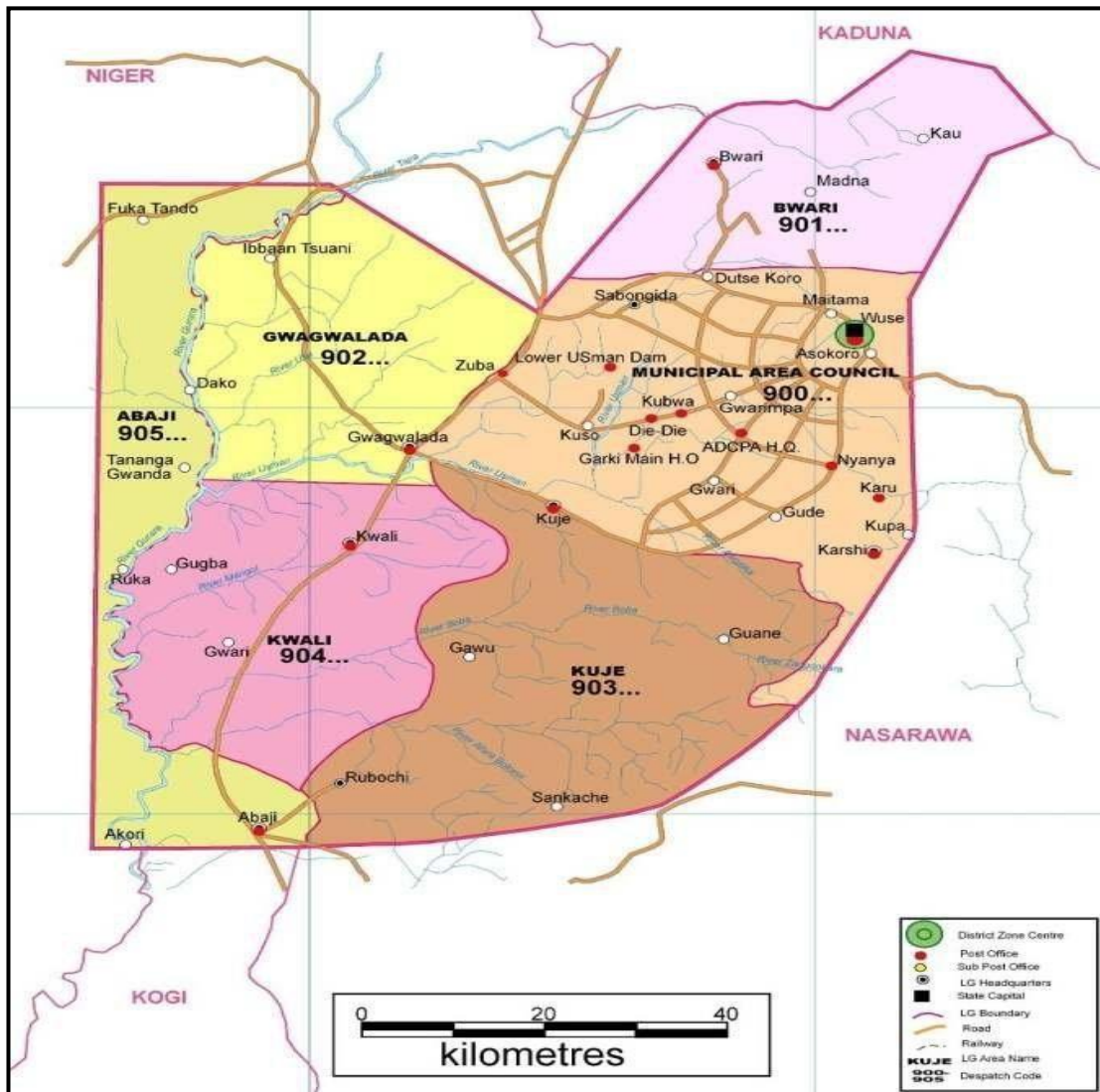


Figure 1.2: Federal Capital Territory (FCT)
 Source: Ozioma *et al.*, (2017)

CHAPTER TWO

2.0 LITERATURE REVIEW

A number of research works relating to occupational health and leisure science have been carried out to check the connection of man with nature. These have led to the study of the relevance of architecture in the creation of artificial forms for expressions replicating nature to help in creating leisure and triggering recovery. This has been seen in the representation of human imagination over materials, methods, and manpower. Relaxed environments and natural scenery have not only been stated to be significant features when selecting a recreation place, but also as tourist destinations. Literatures have been published, to the end that biophilia is a design technique that has come into the 21st century architecture to stay. Based on this premise, coupled with the fact that tourism has long been identified as an effective approach to revitalizing the economy of any destination (Ajake and Amalu, 2012; Long, 2012).

2.1 Tourism and Holiday Resorts

The definition of tourism destination by Burkart and Medlik (1974), Goeldner (2003) and Framke (2001) agrees that it is a particular geographic location visited by tourists which involve a space, a region, a defined area, a landscape, or a self-contained area which could have cultural characteristics a for enjoying different types of travel experiences, tourism products which are serviced by a wide-range of facilities in the aspects of transport, accommodation and feeding. The Network Theory (NT) of tourism destinations asserts that Tourism destinations include a special kind of items that are made of boundaries that are connected with what are called vertices or nodes (Newman, 2003) and support procedures are essential for their success; here, there are no hierarchical ties amongst the several units that offer products autonomously (Zemla, 2016).

Tourism is known to be a huge market across the world. Vengesayi *et al.* (2009) suggested from research that the auxiliary services and people connection are integrated factors. Formica (2002) added that there is a 12% to 43% increase in the significance of attractions as predictors of destination attractiveness. It can then be asserted from here, that the attraction is key to any tourist destination, hence they are basic for visitation. This implies that the points of attraction of the tourism destinations to the tourists could be several, spread around a particular geographic location and yet, be autonomous in their attractiveness to the tourist.

2.1.1 Overview of tourism in Africa

Hoekman and Mavroidis (2015) asserted that the hospitality and tourism sector is one of the most valued treasure in Africa, yet it remains under developed. The industry is currently estimated to be around \$50 billion. Nevertheless, it has been highlighted that the industry is potentially worth \$203.7billion of which till date still remains largely unharnessed. This cumulatively amounts to more than four times of its current value. As it stands with the current growth rate of 5.5 % the projected number of multinational tourists expected to arrive in Africa by the year 2020 is around 77.3 million persons (World Travel and Tourism council, 2014). Subsequently, African Development Bank, (2015) noted that Africa's economic growth rate is considerably higher than the global projected growth rate. Elsewhere the World Travel and Tourism council (2014) opined that the tourism industry is one of the largest industries with its contribution to global economy amounting to \$7 trillion representing around 9.5 % of the global gross domestic product. Its entire influence to employment was approximately 266 million jobs about 8.9 % of global employment. The continued request for travel and tourism, together with its capacity to produce high heights of employment remains and consistently shows the

reputation and value of the sector as an instrument for economic expansion and job creation.

Similarly, Agri *et al.* (2008) reported that the total contribution of travel and tourism to the global economy at \$7 trillion representing 9.5% of global GDP is steadily out growing other areas such as; manufacturing, transportation and business services. In total, 266 million jobs were created by this sector accounting for 8.9% of global employment. It is also noted that tourism offers one out of every eleven new jobs that is created in the world (W.T.T.C, 2014).

2.1.2 Tourism narrative in Nigeria

As it stands, it is apparently clear that presently Nigeria is not regarded as a preferred tourist destination in Africa. Accordingly, Eneji *et al.* (2016) comparatively outlined the contribution of tourism to the GDP of Nigeria to be 5% percent which is lower than the average of the continent. If duly harnessed, Eruotor (2014) its optimistic that tourism can make a significant contribution to the economic development of Nigeria.

The government income from charges collected from the hospitality sector in Nigeria recorded a huge raise from the year 2004 to the year 2009. In addition, a further 313 million naira was received from corporate tax (National Statistics Bureau). The industry contributed to GDP in Nigeria around a billion naira in the year 2011. The WTTC estimates in its study that the industry would produce 897,500 jobs generating billions to the GDP in Nigeria. In its report, the WTTC prediction that the industry will produce more to the Nigerian total workforce in 2012 and that over the subsequent decade, the amount is anticipated to raise by 6.5 percent per annum to N483.4 billion in 2022. Figure

2.1 shows a trend spanning 15 years of tourist arrivals and its contributions to the Nigerian economy. As with the number of arrivals in Figure 2.1 the contribution to the GDP as indicated are also not consistent in increase over the years with rise and fall between year 2010 and year 2011 as shown in Table 2.1.

As shown from the table, despite the country boasting of having over 7000 tourist sites, the share of the sector for total exports was so meager. The table also showed that the influence of the sector to work creation still remains very small, with the percentage share of total jobs ranging from 4.9% in 2005 and a zigzag in succeeding years to 2.70% in 2014. This awful quality could be due to the low index of business assurance in the travel and tourism sector of the country as found in a recent study by (Bello *et al.*, 2014). From the preceding, the solitary way to partake in maintainable tourism is through the growth and expansion of the tourist sites in Nigeria.

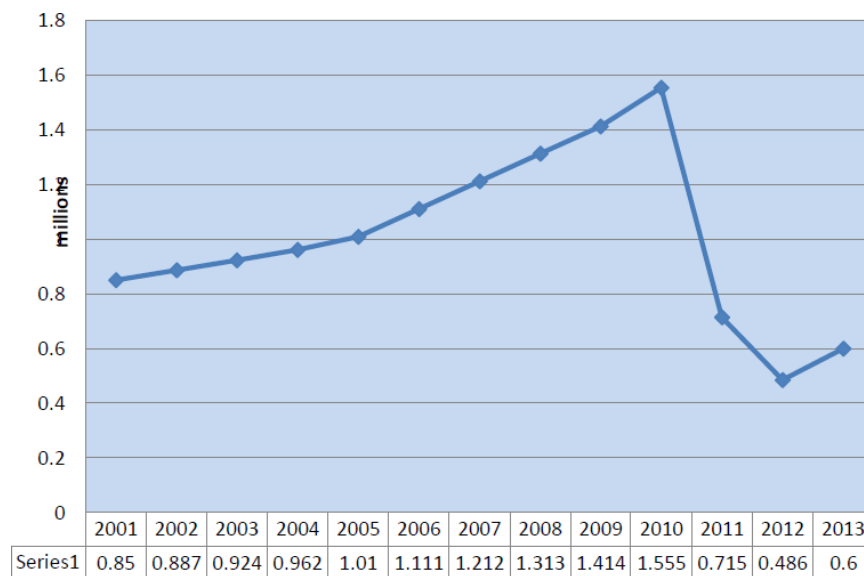


Figure 2.1: International Tourist Arrivals in Nigeria
Source: Bello *et al.*, (2014)

2.1.3 Elements in holiday resorts in Nigeria

Resorts in Nigeria either include activities like fishing, craftwork and farming or are surrounded by host communities whose activities include fishing, craftwork and farming. The activities at holiday periods for the tourists have been observed to involve resorts, relaxation spaces, transportation, swimming, rock climbing, game viewing, horse riding, and site tours (Aniah *et al.*, 2009; Eruotor, 2014).

2.2 Holiday Resorts

The google english dictionary provided by oxford languages (2021) defined the holiday resort as a place that is frequently visited for holidays. A resort can be referred to a destination that is self-contained and can deliver for all travel needs in a single place. You can find food, drinks, entertainment, shopping, and other activities all without needing to leave the property. Constantine *et al.* (2010) added that they distinctively offer more activities on a larger scale compared to hotels. Hassan *et al.* (2010) described resort to a building or a group of buildings that is designed in a unique setting to accommodate both relaxational and recreational activities. There are numerous types of accommodation in the tourism industry of which the holiday resort is one of; others include hotels, motels, guest inns and vacation homes. A resort offers full-service lodging with a variety of amenities and leisure activities that reinforce a relaxing experience.

2.2.1 Classifications of Resorts

For this study, resorts will be elaborately defined with their different classifications. Resorts are the major suppliers of company and entertainment facilities and typically are based in holiday focused settings as listed below. The various types of resorts are listed as follows:

i. A beach resort /island resort or lake resorts

The beach, island or lake resorts as the name implies are usually located next to the water body and it serves a great weekend gateway or for longer vacation. Beach resorts usually offer para-sailing, snorkelling, boating and dive events. Similarly, an island beach is situated near a water body hence it offers fishing, snorkelling, alongside other water sport facilities.

ii. Mountain resort

This type of resorts is normally situated across the top or beneath a mountain, that kind of resort proposes activities like downhill and cross-country skiing, snowmobiling, and sightseeing. They are usually equipped with medical services, helipad in case of emergency evacuation Constantine *et al.* (2010).

iii. Golf resort

They precisely provide to the golfing; they have several clubhouses and golf courses. They usually carry golfing packages which are used by the visitors to cater for their meals, accommodations, cart fees etc. the accommodation can come in several forms, standard rooms or luxurious villas.

iv. Spa resort

This facility usually keeps guests for short periods of time, they provide relaxation and spa services to them for the duration of their stay which is on the average for a week and includes several programs like physical fitness classes, wellness education, steam rooms, spas and healthy food. Such places are usually located near natural hot springs or mineral water.

2.2.2 Characteristics of a resort

Hassan *et al.* (2010) discussed the adoption of vernacular style with resort design. A resort is distinguished by the climate and the activities that make room for recreation as found in it, some of these activities could include; spa, golf, water complex, tennis, beaches, cultural and nature tours, hiking, and skiing (Northern Arizona University, 2018). To supplement these activities, other activities ensue to give guests more convenience, flexibility and refreshing, these activities could range from assistance and lessons for guests to trading of merchandise and equipment to golf tournaments to treatments, exercise, training and special diets at spas to reservations for special guided tours to equipment rental for special activities or events (Northern Arizona University, 2018).

2.2.3 Benefits of holiday resorts

Some of the benefits of holiday resorts as compiled from Fantasy World (2016), Kulusjärvi (2016), and Velissariou *et al.* (2020):

- i. This structure helps in the enhancement of the health of individuals.
- ii. They help in enhancing history and tourism development.
- iii. Holiday resorts aid in quickening both social and regional development.
- iv. These buildings sustain and have the capacity of boosting economic growth.
- v. They also make room for both comfort and convenience for individuals and families.
- vi. Resorts bring a lot of entertainment alternatives for people.
- vii. There is room for both the old and the youth to be entertained.
- viii. Mobility is aided through different means thereby making transportation and movement easy.
- ix. The presence of decent, healthy and rich meals for guests.

2.2.4 Holiday resorts providing attraction, recreation and hospitality

Resorts that provide the services of recreation and attraction are those places that are constructed for sightseeing and unwinding. Places like museums, beaches, zoos and amusement parks usually offer these services. They provide their users with meals and fun activities and sometimes accommodation. Swarbrooke and Horner (2007) stated that tourist centres give services that cannot be taken away from the consumer long after the experience has passed therefore, they should have striking images, facilities and also be preferably sprawled out across large areas of land.

Shaw (2008) made this observation with regards to tourism that even though public attention is glued to design and construction, the vast potentials and innovations of contemporary architecture remains grossly underutilized within this sector. Nevertheless, the process of establishing the corporate image and competitive place of businesses, sites and destinations could be greatly improved. No objective or strategic development has been directed to the connection between tourism and architecture despite close links between the businesses of architecture and tourism. This could have provided the necessary interface with conceptual, theoretical and scientific approaches to promote a new product design paradigm as an emergent economic success instrument. There remain important signatures and highly valued artefacts in historical buildings (Olanusi *et al.* 2015). The goal is to accomplish both sustainable and global tourism growth. One of such contemporary paradigms is the concept of biophilic design.

2.2.5 Theories of environmental design aimed to improve health and wellbeing

Tourism is a prominent cause of growth, development and income, in developing economies as it influences both the local communities and a wider area of places and

activities of the people (Haller, 2012). There are three paradigms that have received considerable attention. The landscape preference is the first among them, consisting of theories and hypothesis that elucidates the influencing factors of an individual's feeling and attitude towards the general landscape.

The second one is sustainability, which has proven to have more influence, well pronounced and is the most researched area of the three theories of environmental design and also the most notable and well researched theory. Sustainable design is aimed at reducing the negative impacts in the environment (Mostafavi and Gareth, 2010) with precise design tailored to use renewable sources and provide a connection to nature for the users (Norton, 2005). Biophilia hypothesis is the third theory which is an offshoot from environmental design and its emphasis is on the existing and notable connection between nature and humans. Health challenges in the society from asthma to obesity, diabetes to depression can also be addressed from the design stage of the building by visionary design consideration of a building. the design and health impacts are connected through deliberate positioning of accessibility, positive health outcomes could be achieved in the building for the people, and society and in turn influence wellbeing, safety and environmental quality (American Institute of Architects, 2019). There are six evidence-based approaches designers can adopt to promote healthy living (American Institute of Architects, 2019):

First approach is the social connectedness which refers to personal, professional associations and heartening behaviors like civic involvement to increase pleasure and guarantee community's occupation more efficiently. Secondly, environmental quality which refers to Avoiding, mitigating and withdrawing chemical and microbial pollutants

that injure communal health. Thirdly, physical activity which refers to inspiring exercise, recreation and other daily goings-on that subordinate the danger of cardiovascular disease and additional health complications. Fourthly, Sensory environments which refers to varying the touch, smell and acoustics of a setting to encourage wellbeing, advance physical, mental and emotional well-being and augment eminence of life. The fifth approach is the natural systems which refers to employing natural forms, various species and current ecosystems that release stress, hasten recovery, boost healthy ingestion and encourage physical and social activity. The sixth approach is safety which involves plummeting accidental wound and crime to eliminate impairments to physical activity and lessen anxiety and stress

2.3 The Effects of Building Spaces on Occupants

The built environment has an effect on the health and productivity of the users due to the indoor environmental quality (IEQ), ventilation, indoor air quality, quality of the building materials and lightening (Ghodrati *et al.*, 2012). The Indoor Environmental Quality (IEQ) can influence occupant productivity in a built environment and occupant productivity can be affected by the indoor environmental quality as acknowledged by a majority of green building rating systems (Al Horr, *et al.*, 2016)

2.3.1 Health and well-being of persons based on interaction with built spaces

It is important that there should be interdisciplinary approach towards handling the issue of urban health and well-being, this would go through and past the complication of urban structures and undercurrents and their possible effect on urban health and well-being (Krefis *et al.*, 2018). The quality of building spaces influences the outcome of medical care as a result of the architectural design being an integral part of the healing process of

the patient (Boubekri, 2008; Formn *et al.*, 1996). Biophilic design strategies work best when they are used in deliberation with the building users, location, and function helps in managing the peculiarity in gender and temperament (Gillis and Gatersleben, 2015).

2.3.2 Occupational health and leisure science

The health of people of working age is paramount to their productivity. For this reason, is the need for leisure which is helpful for shedding off stress. It is recognized that Leisure-time physical activity (LTPA) is connected with constructive health benefits, except that what remains unpredictable is the physical demands which occupations bring (Päivärinne *et al.*, 2019). LTPA is really linked with work ability between young adult men as LTPA is significant, especially with persons subjected to higher work-related physical strain (Päivärinne *et al.*, 2019).

2.3.3 Recovery

Recovery is the process of replenishing resources and reducing work fatigue (Fehrmann and Depenbrock, 2014). The effect of occupational stress on both individuals and organisations is adverse and can negatively affect both economically and health wise too. recovery can happen during work and off-work, it is proven that recovery after work and at weekends is significant for health and wellbeing and better job performance as it involves a physical detachment for the workforce (Fehrmann and Depenbrock, 2014).

2.3.4 Concept of Biophilic Design

According to Kellert and Calabrese (2015), biophilia is the intrinsic human predisposition to associate with nature. Furthermore, biophilic design which is considered an extension of biophilia, is aimed at integrating natural materials, lighting, views and vegetation of

into the built environment. As proposed by Powell *et al.* (2008), the feasibility of implementing this method requires providing many cases and precedents to ensure that this process can be carried out both efficiently and effectively. This promotes institutional adoption of the biophilia theory, recommending the key essentials of a biophilic city and providing facts and reports of towns with successful integration of biophilic components (Beatley, 2010).

According to Ryan *et al.* (2014), has authenticated the significance of biophilic design to humans by scientifically validating the positive psychophysiological and cognitive benefit offered by biophilia in design intervention in the field of neurosciences, and endocrinology. Soderlund and Newman (2015) suggested biophilia as a new model while Downton *et al.* (2016), adopted biophilic design patterns in the new underground railway system in Melbourne.

2.3.5 Biophilia hypothesis versus other environmental design theories

From the era of the eighteenth and nineteenth Century industrial Revolution, the ever-extending footprint of humans has caused immense degradation in the process losing the once intact natural habitat through pollution, deforestation, desertification. To counter these crises there is an environmental movement sometimes referred to as ecological movement (Dosen and Michael, 2013). The most significant achievement of this movement is how it has generated a number of environmental design theories. These theories aim to blend the man-made built environment with the natural surroundings such that it addresses the relevant factors of the environment and while preserving the available resources the adoption of programs, policies buildings and products (Ryan *et al.*, 2014).

2.3.6 The biophilia hypothesis

This explains that there is a bond between existing natural systems and human beings. Wilson (1984) proposed this theory in his book. Biophilia means the appreciation of life and its systems, it first came into play when Erich Fromm used it to explain the psychological theory of being attracted to all living things and Wilson supports this by his own use of the term in the same light. It is a connection of organic design and organic design to the restorative environmental design, and as well, connects leads to a low environmental impact design (Kellert, 2005). Kellert (2005) argued that since humans mostly spend their time in built structures, biophilic design is used to satisfy the need to be close to nature, therefore the inherent goal of biophilic design is to make a natural habitat with modern structures.

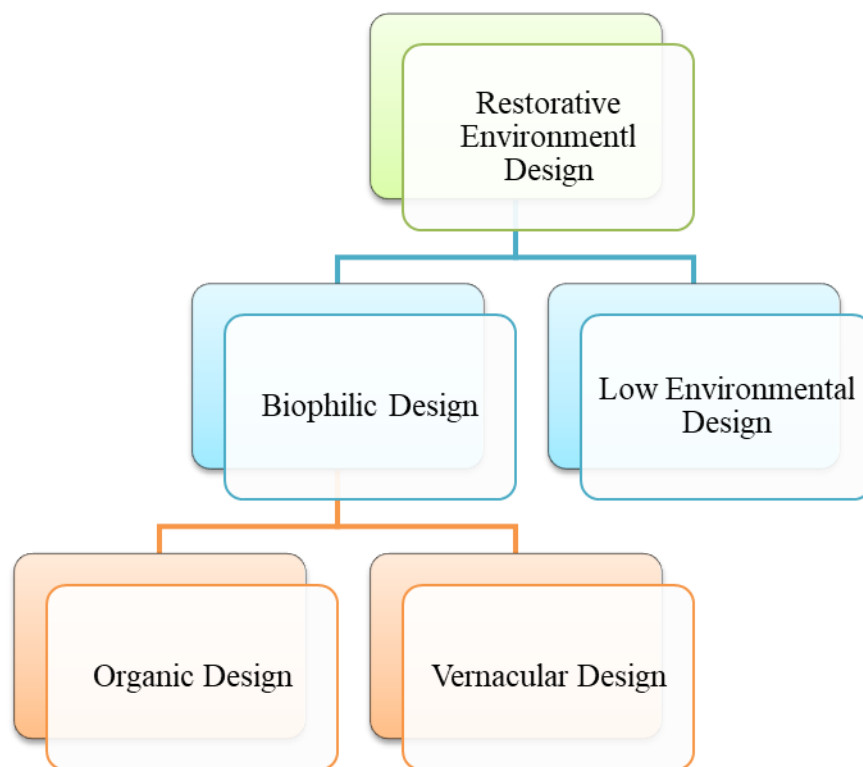


Figure 2.2: Restorative Environmental Design
Source: Kellert, (2005)

The application of these theories is often debated, theories that focus on landscape talk about the composition of landscape elements and their impact on users, however the theory of sustainable design is focused on restoration and conservation and the physical factors that maintain good living conditions.

2.3.7 The essentials of biophilic design in holiday resort

A holiday resort should have views of nature from the window opening in the room, with natural architectural patterns, while adopting sustainably sourced materials and local building materials. The Living green walls and vertical gardens for direct and indirect exposure to nature should be incorporated. Exposure to natural lighting, dynamic and diffuse light, scattered and clustered vegetation, varying height and randomness as well as water features should be adopted to complement the natural scenes. Indoor and outdoor connections to nature, colourful plants and smell from flower pots and gardens should be considered too.

2.3.8 Benefits of biophilic design

Biophilic design is faced with the challenge of providing a framework that caters to the need for a satisfying natural experience indoors (Kellert, 2005; Kellert and Calabrese, 2015; Powell *et al.*, 2008; Ryan *et al.*, 2014). It aims to generate a decent environment for people as a biological organism in the built industry that promotes people's wellbeing. Biophilic design makes room for biological organisms to transform the natural environment in the process of inhabiting it.

2.4 The biological connection of man with nature

The inquisitive search about the connection between natural systems and humans state of wellbeing physically, mentally and emotionally has given rises to different analyses of human experiences of nature which is sometime incoherent, unsystematic and fragmented rather than a comprehensive lasting response (Kellert, 2005). This is in comparison to how more attention has been focused on how the damaged and deteriorated natural systems adversely affects productivity and human health as well as how man activities affect the natural environmental conditions (Mayer and Cynthia, 2004).

2.5 Biophilic Design Strategies

Biophilic strategies include principles, Patterns and Features which are incorporated in the design of buildings to imbibe biophilia into that space. These influence the texture, appearance and effects of the building, its form and spaces on the environment and the occupants (Kellert & Calabrese, 2015).

2.5.1 There are six principles of biophilic design

In the opinion of Kellert (2005) who suggested six of biophilic design features (Table 2.1) with superior influence on the satisfaction derived from the built environment with aim of intending to using the features of the theory of biophilia in the sense of a built environment (Figure 2.3), in order to make it stable, rich and efficient. The principles of biophilic design is divided into six broad categories: environmental features, natural shapes, natural patterns and processes, light and space, place-based relationships and evolved human-nature.



Figure 2.3: A view of falling water by Frank Lloyd Wright, immersed within the natural habitat

Sources: Terrapin, (2012)

Environmental features involve Carrying well-recognized physiognomies of the biosphere into the built environment such as colour, water, air, sunlight, plants, animals and natural materials. Landscapes and geology can provide visual relief as recreational opportunities as seen in Figure 2.4. Secondly in the natural shapes and forms principle straight or rectangular shapes are resisted and domes arches, and vaults are employed. These shapes are a good at emotion-evoking. Simulation of natural features, including biomorphic crafts is also utilized to supplement the design. Thirdly the natural patterns and processes involves the experience of space, transformation, and change overs; gratis dissimilarities, the movement between equilibrium and pressure; ratios, rhythm, and use of scale (Figure 2.5).

Figure 2.4: A view of green vegetation and water fountain providing visual relief and recreational opportunities according to the place-based relationship principle
Source: Stark, (2000)



Figure 2.5: Fractal patterning found in nature.
Source: Kellert (2005)

Fourthly, light and space principle shed an Erudition on why humans respond to light in all its various forms (cool, warm, filtered, shaped, diffused, outside or inside) and appraises how to use it. It also applies to different types of spaces: harmonious, Shaped,

harmonious, dark and light (Figure 2.6). The fifth principle which is the place-based relationship gives an understanding that the position is meaning-based: natural, economic, geological, religious and ecological. An individual can respect and invoke connections in the building community with greater understanding. This however can change one's dynamic connection to nature, and still respond with a strong response to echoes of our long history.



Figure 2.6: Fractal patterning found in space design.
Source: Kellert (2005)

Sixthly, evolved human-nature relationships principle emphasizes the use of layouts to bring to memories, prospect and refuge; order, complexity; curiosity and control; attachment and fondness; safety and protection; learning and exploration; information and cognition. The San Diego Healing garden (Figure 2.7) is an example of some of those gardens that are popular for the use of biophilia for therapy to persons with health conditions.



Figure 2.7: San Diego healing gardens
Source: Stark, (2000)

The principles of biophilic design is divided into six broad categories as explained earlier: environmental features, natural shapes, natural patterns and processes, light and space, place-based relationships and evolved human-nature. These principles are further summarised in Table 2.1

Table 2.1: The six principles of biophilic design

Elements	Attributes of biophilic design
1. Environmental Features	Fire, color, sunlight, ecosystems, water, plants, habitats, landscapes, air, animals, views, green facades, natural materials and geology
2. Natural Shapes and Forms	Botanical motifs, trees & columnar supports, animal motifs, (mainly vertebrate) shells & spirals egg, oval, and tubular forms, arches, vaults, domes shapes that resist straight lines and right angles, simulation of natural features, bio-morphology geomorphology biomimicry.
3. Natural Patterns and Processes	Sensory variability, information richness, age, change and patina of time, growth & efflorescence, central focal point, patterned wholes, bounded spaces, transitional spaces, linked series & chains, integration of parts to whole, complementary contrasts, dynamic balance & tension, fractals, hierarchically organized ratios & scales.
4. Light & Space	Natural light filtered & diffused light, light & shadow, reflected light, light pools, warm light, light as shape & form, spaciousness spatial variability, inside-outside spaces.
5. Place-based relationship	Geographic connection, historic connection, ecological connection cultural connection, indigenous materials, landscape features that define building form, landscape ecology, integration of culture and ecology, spirit of place.
6. Evolved Human-Nature Relationship	Prospect & refuge, order & complexity, curiosity & enticement change & metamorphosis, security & protection, mastery & control, affection & attachment, attraction & beauty, exploration & discovery, information & cognition, fear & awe, reverence & spirituality.

Source: Adopted from Kellert, (2005)

2.5.2 Patterns of biophilic design

In a bid to provide a toolkit for biophilic design, Ryan *et al.* (2014) in the United States presented 14 Biophilic Design Patterns' as shown in Table 2.2 within the context of the interaction between human biological science, nature and the development of the built environment, providing tools for identifying development possibilities and design

processes as a way for successfully improving the health and well-being of individuals and society.

2.5.2.1 Visual connection with nature

This is made up of a perspective at living systems and natural processes. It is gotten after data on visual predilection and rejoinders to views to nature presenting condensed stress. Additionally, positive emotional working, and enhanced awareness and recovery rates, and adaptation to windowless spaces displaying that persons spontaneously add nature content, and answer positively to replicated nature. Researches have proven the ability of the experience of actual nature and sight of pictures of nature in reducing stress (Bloomer, 2008; Grahn and Stigsdotter 2010; Hartig *et al.*, 2003). Visual connections with nature have the ability to cut down stress, and make better disposition (Barton and Pretty, 2010; Biederman and Vessel, 2006; Fuller *et al.*, 2007; Kahn *et al.*, 2008; Vanden *et al.*, 2003).

2.5.2.2 Non-Visual connection with nature

It serves as a reference to nature through haptic, auditory, gustatory or olfactory, stimuli. This is derived from blood data and hormones (Hartig *et al.*, 2003; Orsega-Smith *et al.*, 2004; Park *et al.*, 2009; Ulrich *et al.*, 1991), nervous actions related to cognitive abilities and sounds (Mehta *et al.*, 2012; Ljungberg *et al.*, 2004), and supposed developments in psychological health and serenity as a consequence of non-visual sensory communications with non-threatening nature (Kim *et al.*, 2007; Stigsdotter and Grahn, 2003; Tsunetsugu *et al.*, 2010).

2.5.2.3 Non-Rhythmic sensory stimuli

The experience of visual and non-visual stimuli at the same time change where the interpretation of non-visual senses takes place in the brain; hence, in the occasion when both stimuli occur as connections in nature, a big part of the brain gets happy and the result is more impactful (Alvarsson *et al.*, 2010; Hunter *et al.*, 2010; Kim *et al.*, 2007; Li *et al.*, 2012).

2.5.2.4 Thermal and airflow variability

It is possible to group this as ambient qualities such as air temperature, relative humidity, airflow across the skin, and the radiant temperature of surrounding surfaces; that in summation activate feelings of comfort familiar to those that can be experienced in nature. This design has developed from studies gauging the paraphernalia of natural ventilation, its resultant productivity, well being, comfort and thermal comfort (Heerwagen, 2006; Hescong, 1979; Tham and Willem, 2005; Wigö, 2005), physiology and awareness of time-based and spatial desire (Arens *et al.*, 2006; De Dear and Brager, 2002).

2.5.2.5 Presence of water

This is a state that help the experience of a space through the feeling of water with various senses, this includes visual preference for as well as optimistic emotional replies and environments comprising water rudiments (Barton and Pretty, 2010; Biederman and Vessel, 2006; Karmanov and Hamel, 2008; Orians and Heerwagen, 1993; Ruso and Atzwanger, 2003; Ulrich, 1983; White *et al.*, 2010; Windhager, 2011) decrease in stress, raising the sense of serenity, lower heart rate and blood pressure, and recovered skin conductance from contact to water features (Alvarsson *et al.*, 2010; Biederman and Vessel, 2006; Pheasant *et al.*, 2010), developed concentration and memory restoration

guided by visual stimulation (Alvarsson *et al.*, 2010; Biederman and Vessel, 2006) and established consciousness, psychological and physiological awareness when numerous senses are moved instantaneously (Alvarsson *et al.*, 2010; Hunter *et al.*, 2010).

2.5.2.6 Dynamic and diffuse light

This has to do with the awareness of natural light to human wellbeing. It enables an orientation to the night and day and seasons in response to the position of the sun and cycles and to help direction, and contribute to comfort and satisfaction (Kellert and Calabrese, 2015).

2.5.2.7 Connection with natural systems, biomorphic forms and patterns

Connection with natural systems is made up of interconnected natural forms, animals, plants, soil, rocks and their inter-dependence on each other (Kellert & Calabrese, 2015). Biomorphic forms and patterns are unusually varied with unique patterns found in nature, the shapes of vegetation around the building exterior and other natural items delicately interwoven into the building façades. This can change static spaces into dynamic systems (Kellert & Calabrese, 2015).

2.5.2.8 Material connection with nature, complexity and order

Material connection with nature can be really inspiring, reflecting the dynamic assets of organic matter in a reactive response to survival challenges over time (Kellert & Calabrese, 2015). complexity and order are known for the attendance of high sensory data that is organized with a comprehensible spatial ladder, comparable to the existence of design in nature. It is derived from research on fractal geometries and favored views (Hägerhäll *et al.*, 2004; Hägerhäll *et al.*, 2008; Salingaros, 2012; Taylor, 2006), the

continuous, consistent and physiological stress responses to the complication of fractals in nature, art and architecture (Joye, 2007; Salingeros, 2012; Taylor, 2006); and the expectedness of the manifestation of design flows and outlines in nature (Bejan and Zane, 2012).

2.5.2.9 Prospect, refuge, mystery, and risk/peril

This is a condition that is spatial and peculiar for the presence of an unhindered view over a length for surveillance and planning; as obtained from visual preference research and spatial habitat responses, cultural anthropology, evolutionary psychology (Heerwagen and Orians, 1993) and architectural analysis (Appleton, 1975; Dosen and Michael, 2013). Refuge provides sites of safety and security. As a complementary condition that has the potential to be functional and satisfying in the built environment. this works as vistas to the outside, visual connections between interior spaces, and the occurrence of secure and sheltered settings.

Mystery refers to a spatial condition made up of the promise of more information evident by the presence of partially obscured views or other sensory stimuli that fascinate, interest and entice a person go deeper into the environment (Herzog and Bryce, 2007; Ikemi, 2005; Kaplan & Kaplan, 1989). It is framed by the proclamation of Kaplan and Kaplan (1989) that people have two basic needs in environments: to understand and to explore. Risk/peril refers to models provide an effective range of tools that enhance individual and social health and well-being for understanding design opportunities and ways of design applications.

The fourteen patterns of biophilic design are further summarised in Table 2.2. below;

Table 2.2: The 14 Patterns of biophilic design.

CONTEXT	14 PATTERNS
Nature in The Space	1. Visual Connection with Nature 2 Non-Visual Connection with nature 3 Non-Rhythmic Sensory Stimuli 4 Thermal and Airflow Variability 5 Presence of Water 6 Dynamic and Diffuse Light
Natural Analogues	7 Connection with Natural Systems 8. Biomorphic Forms and Patterns 9 Material Connection with Nature 10 Complexity and Order
Nature of The Space	11. Prospect 12 Refuge 13. Mystery 14. Risk/ peril

Source: Ryan *et. al.*, (2014).

2.5.3 Features of biophilic design

There are twelve (12) features of nature that can be observed in any built environment, namely. These features of biophilic design could be either tangible or intangible while still being visible. They include; colour, water, air and sunlight, plants, animals, natural materials, views and vistas, façade greening, geology and landscape, habitats and ecosystems, and fire.

Colours generates a sense of belonging through the attachment it causes between the occupant and the space (Kellert & Calabrese, 2015). Water provides a photographic stimulation, comforting sounds and acts as a concealment of more everyday sounds of phones and machines (Kellert & Calabrese, 2015). Air creates room for natural ventilation in the space thereby making people feel at home and attracted to the space (Kellert &

Calabrese, 2015). Lastly, sunlight helps in causing a balance in human hormonal levels of serotonin and regulates the production of melatonin; hence, enhancing sleep and reducing sleeplessness (Kellert & Calabrese, 2015).

Plants improve air quality thereby enhance the comfort, satisfaction, performance and well-being of the occupants (Kellert & Calabrese, 2015). Animals involves livestock, aquarium, aviaries, and animals in form of painting, ornaments, decoration and arts. These have been found to intrigue, stimulate, comfort, satisfy and please occupants of buildings (Kellert & Calabrese, 2015). Natural material reveals the organic process of aging, weathering and direct connecting with nature through movement, respiration and sensation (Kellert & Calabrese, 2015). Views and vistas allow the people a sight of nature and a visual interaction with the immediate external environment (Kellert & Calabrese, 2015). Façade greening has been found to raise interest and provoking attraction from passers due to its camouflaging effect. Geology and landscape are a prominent and effective design strategy that gives the perception of firmness and strength (Kellert & Calabrese, 2015). Habitats and ecosystems are effective and prefers the adaptive seasonal change in colour and appearance (Kellert & Calabrese, 2015). The use of fire in a building is complicated and difficult, but when it is properly planned for, it comes with the qualities of colour, warmth, movement, flamboyance and pleasure.

2.6 Summary of literature review

The literature review established that holiday resorts are tourism engineered facilities which are very useful for boosting national economy and enhancing both psychological and physical well-being of people. Holiday resorts could contain relaxation spaces, transportation, swimming, rock climbing, game viewing, horse riding, and site tours.

Food, drinks, entertainment, shopping, and other activities could also be found within it. The image of the tourism destination must be well represented and conveyed considering the available packages, accessibility, attraction, amenities, activities and ancillary services. They are often built on a relatively large spread of land. It was found that biophilia can blend the man-made built environment with the natural surroundings. The term biophilia means love of life or living systems. The fundamental goal of biophilic design is to create an effective habitat for people as biological organisms inhabiting modern structures, landscapes, and communities. Biophilic strategies include principles, Patterns and Features which are incorporated in the design of buildings to imbibe biophilia into that space. These influence the texture, appearance and effects of the building, its form and spaces on the environment and the occupants. The biophilic strategies are primarily grouped into three (3), namely the nature in the space, the natural analogues and the nature of the space. These strategies are found within the principles of biophilia, spread across the elements with very profound characteristic pattern visible and observable in the buildings. Table 2.3 gives a breakdown of the variables of biophilic strategies as extracted from the literature review.

Table 2.3: The Strategy of Biophilic design from literature review

Nature in The Space		Natural Analogues		Nature of The Space	
Environmental Feature	Light and Space	Natural Shapes and Forms	Natural Patterns and Processes	Place-Based Relationships	Evolved Human-Nature Relationship
✓ Colour	✓ Warm	✓ Domes	✓ Complimentary Contrasts	✓ Natural	✓ Prospect and Refuge
✓ Water	✓ Cool	✓ Arches	✓ Balance and Tension	✓ Economic	✓ Order
✓ Air	✓ Shaped	✓ Vaults	✓ Rhythm	✓ Geological	✓ Complexity
✓ Sunlight	✓ Filtered	✓ Simulation of Natural Features	✓ Ratios	✓ Religious	✓ Curiosity and Control
✓ Plants	✓ Diffused		✓ Use of Scale	✓ Ecological	✓ Attachment and Affection
✓ Animals and Natural Materials	✓ Inside Vs Outside		✓ Information Richness	✓ History	✓ Safety and Protection
✓ Landscapes	✓ Shaped		✓ Fractals		✓ Learning and Exploration
✓ Geology	✓ Harmonious ✓ Jarring ✓ Light and Dark		✓ Organized Complexity		✓ Information and Cognition
8	10	4	8	6	8
18		12		14	

Source: Author, (2021)

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

The research was carried out in a process. This process being systematically organized and planned, lead to the arrival of dependable conclusions and recommendations to the problem of people in indoor spaces through the incorporation of biophilic principles in the design of a holiday resort. This stage includes every step of the research in the order in which it was be carried out.

3.1 Research Method

The pattern of the research was firstly based on the identification of the importance of data collection to the findings of the research through the involvement of sound research methods and procedures (Ranjit, 2011). This research employs the use of well-structured questionnaires to organise and identify the various perceptions of occupants to their relationship with nature, the biophilic design features in existing holiday resort in the study area as well as the challenges that confront holiday resorts in the study area to help see how a holiday resort can incorporate biophilic design strategies effectively. In the course of data gathering for this research, data was drawn from the samples using both the probability and non-probability sampling methods.

3.1.1 Probability sampling method

In this method, all the samples had equal chances to be chosen. Hence, it was the availability and the access of the samples to the researcher that caused the choice of the researcher to employ simple random sampling; the choice of resorts that were reachable and whose information were common place for the researcher. This was implored in the

use of the observation (Post occupancy evaluation) tool and the conduction of case studies for data gathering in this research.

3.1.2 Non-probability sampling method

Non-probability sampling entails a preferential influence on three factors which are; the choice of elements in the population, the combinations of elements and the probability of the choice of both the elements and the combinations. This was employed in the distribution of the questionnaires for this research to ensure optimum efficiency. The point of distribution (public centres in Abuja) and the number of respondents (which is 200 people) was carried out through Purposive sampling.

3.2 Sampling Technique

Sampling is defined as the process of segmentation of population chosen for examination. It also includes a subset of the population. The simple random sampling and purposive sampling techniques were used for the collection of data from the field for the questionnaires, observations and case studies.

Samples with were chosen amongst holiday resorts that had a consideration for biophilic design strategies. Five holiday resort centres were observed, they are listed in Table 3.3. below;

Table 3.1: List of sampled holiday resorts

S/N	Name	Location
1	Meadowood	USA
2	Cousine Island	Seychelles
3	The Lodge at Kauri Cliffs	New Zealand
4	Esperanza Resort	Mexico
5	PangkorLaut	Malaysia
6	Hilton Niseko Village	Japan

3.3 Types and Sources of Data

This aspect outlines and establishes the different types of data gathered on the course of the research. These data were used to determine the biophilic design strategies that can be applied in holiday resort design, while investigating the challenges confronting the implementation of these strategies and identifying biophilic design strategies from existing literatures to apply in a holiday resort building design in Abuja, Nigeria.

3.3.1 Primary data

This type of data was obtained directly by the author through fieldwork in and from the holiday resorts within the study area. Open-end questionnaires were administered by the researcher along with personal observations during the fieldwork to collect relevant data for the research.

3.3.2 Secondary data

This type of data is already available and was only retrieved or accessed as needed. The category of data was sourced during the course of this research were from existing

relevant published literature (with most of them coming through the ResearchGate website) and online websites. Some of the secondary data used in this research were publications and a few others unpublished works. Published data that was utilized in this research includes reports from international bodies, books, magazines, public records, statistics, and historical documents. While the unpublished used were found in diaries, unpublished thesis and individual and cooperate research works. The counsel of these publications helped in guiding the understanding of the contextual framework of the research and the gap that exists in the same.

3.4 Instruments of Data Collection

The use of data collection tools to assemble either primary or secondary data was key in this research. For this research, the primary data was gathered through the use of questionnaires administered to the stakeholders of the holiday resorts in Nigeria and observations in the form of post occupancy evaluation (POE) were made from randomly selected resorts in Nigeria, while the secondary data for case studies and discussion was deduced from there viewed literature that was be collected and studied.

3.4.1 Questionnaires

The Purposive sampling method was applied in the distribution of a total of two hundred (200) copies of questionnaire in and around public areas in Abuja (which is the study area). This method was applied specifically to easily get respondents who had a first-hand experience of Holiday resorts either as visitors or as workers. This was used to assess the way occupants perceive their relationship with and proximity to nature even the biophilic features. The questionnaires were administered during the course of this research to users/customers inquiring of their preferences, and key attractors that influenced their

choice of holiday destination. Aspects of the natural environment that makes the resort a worthwhile place for recovery physically emotionally and mentally. The questionnaire was used because of its suitability for the research as it will allow the researcher to compare the answers provided by the respondents and appropriately analyse their perception. The data was then analysed using SPSS and the results are presented in tables and charts.

3.4.2 Observation: post occupancy evaluation (POE)

The Post Occupancy Evaluations (POE) tool was used on a sample size of twenty-six (26) resorts across Nigeria. These resort buildings were randomly selected for this research from sample population of over 38 resort facilities in Nigeria. These resorts were selected by random sampling method which is based on the availability of their information necessary for this research. These resorts are listed in Table 3.1 below;

Table 3.2: List of sampled resorts in Nigeria.

S/N	Name	Location
1	Abraka Turf and Country Club	Delta State
2	Calabar harbour resort and spa	Calabar State
3	E-Class resorts	FCT, Abuja State
4	Eko tourist beach and resort	Lagos State
5	Epe resort and spa	Lagos State
6	Green legacy resort	Ogun State
7	Hermitage Gardens Resort	Lagos State
8	Ikogosi Warm Springs Resort	Ekiti State
9	Inagbe Grand Resort	Lagos State
10	Kamp Ikare Beach Resort	Ondo State
11	La Campagne Tropicana Beach Resort	Lagos State
12	La Manga Luxury Beach Villas	Lagos State
13	Le Méridien Ibom Icon Hotel & Golf Resort	Akwa Ibom State
14	MicCom Golf Resort	Osun State
15	Nike Lake Resort	Enugu State
16	Obudu Mountain Resort	Cross River State
17	Oguta Lake Motel and Golf Resort	Imo State
18	Oxygen Holiday Resort	Imo State
19	Port Harcourt Tourist Beach	Cross River State
20	Rojenny Tourist Village	Anambra State
21	Suntan Beach Resorts	Lagos State
22	Tinapa Resort	Cross River State
23	Virginrose Resorts	Lagos State
24	Whispering Palms Resort	Lagos State
25	Zenababs Half Moon Resort	Osun State

The biophilic design features in existing resorts in the study area were assessed with the aid of post occupancy evaluations (POE). The observations were carried out to highlight the attributes from the six (6) elements of biophilic design which is the environmental features, natural shapes and forms, patterns and processes, light and space, place-based relationship and evolved human and nature relationships.

The use of the POE was adopted from the Australian Association of Higher Education Facilities Officers (2000) to obtain an objective result, this notion was supported by McDougall, *et al.*, (2002), by noting that the POE is one of those tools that can be used for measuring the performance of buildings. Obtaining primary data through this involved the use of observations in a well-structured POE from which data was extracted and analysed through the use of charts and evaluated through the use of condition ratings by using of the scale of assets conditions (The Australian Association of Higher Education Facilities Officers (AAPPA), 2000). The POE was carried-out in the sampled resorts in Abuja. For which a checklist was drawn and used for the evaluation process. The data was then analysed and calculated, from which the biophilic building condition index (BCI) was deduced; to define the significance of the presence of biophilic elements in the sampled holiday resorts that were observed. This is illustrated from (1), (2), (3) and Table 3.2.

$$\text{All Biophilic} = \text{Sum total of the variables to be measured} \times 5 \quad (1)$$

$$\text{ACC} = \text{Total Building Component for all the variable to be measured} \times 5 \quad (2)$$

$$BCI = \frac{ACC}{\text{All Biophilic}} \quad (3)$$

Where,

All Biophilic = constant presence of all biophilic the elements as multiples of 5

ACC= Asset Current Condition, this is rated as a multiple of 5 by the elements seen

BCI= Building Condition Index

Note: As Built (which represented the constant state of excellent (5), of the building components at construction and instalment) was substituted for All Biophilic (which stands for constant state of excellent (5), if biophilic the elements of each variable are present).

Table 3.3: Ratings of presence of biophilic features and general description from the building condition index (BCI)

Condition Status	General description	Building condition	Condition rating (c)
Very insignificant	The presence of Biophilic features is almost negligible.	0.00-0.19	1
Insignificant	The presence of Biophilic features is very low.	0.20-0.39	2
Neutral	The presence of Biophilic features is average	0.40-0.59	3
Significant	The presence of Biophilic features is noteworthy.	0.60-0.79	4
Very significant	Biophilic features stand out throughout the building.	0.80-1.00	5

Source: AAPPA, (2000)

3.5 Variables of the Study

The identification and testing of the specific and typical subjects on the application of biophilic design principles by assuming one or more divergent values was done in this research. The process included the identification and examination of biophilic design principles applied that are applicable to buildings considered in the cause of the research in other to bring people closer to nature. As explained by Mogbo (2003), the variables named in a research in agreement with the character of their measurement and purpose in

the research study as in this case, with the probable impact of incorporating biophilic design principles on visitors of the holiday resort.

3.5.1 Independent variables

The elements of the data that are already occurring and can neither be controlled nor altered in the concept of biophilic design but were rather beneficial for categorizing the data gotten in the study, they include the following;

- i. Name of resort
- ii. Location of the holiday

These were identified as independent variables in this research as they neither controlled nor altered the data of the research from the results of the respondents in the questionnaire, the samples for the observations and the resorts for the case studies. The name and the location of the resort were taken only to signify their identity and address.

3.5.2 Dependent variables

These variables can change with respect to other factors that are integrated into the resort buildings and consequently affect the user experience. In the samples that were taken in the course of the research. These variables include;

- i. Nature in the space: They include; light and space (fire, sunlight, views and vistas, and ecosystems) and environmental feature (water, plants, animals, and natural materials)
- ii. Natural Analogues: They include; natural patterns and processes (Plants, animals, natural materials, façade greening, geology and landscape) and natural shapes and

forms (biomorphic forms and patterns, material connection with nature, complexity and order)

- iii. Nature of The Space: They include; evolved human-nature relationship (comfort, satisfaction, colour, pleasure, and serenity) and place-based relationship (prospect, refuge, mystery, and risk)

3.6 Analysis of Variables for Integration of Biophilic Design Patterns

It is important in the course of the research that the variables investigated, answered the research questions in achieving the aim of this research. For this purpose, the use of questionnaires, observations, literature review and case studies were adopted for this research.

3.7 Method of Data Analysis and Presentation

The information gathered from different sources was analysed descriptively for the better assimilation and a proper elucidation. In order to carry out an in-depth finding about a subject matter under study, descriptive analysis was used for detailed description.

The chi-square statistical analysis was carried out on the results of this research, it was used in investigating the significant relationship between the nominal (i) and ordinal variables (r) in the research. In doing this, the biophilic variables were taken as nominal variables (i). the data was analysed mathematically as shown in equations (4), (5), (6) and (7).

$$\text{Level of Significance}=0.05 \tag{4}$$

$$\text{Degree of Freedom (df)}=(r-1)*(i-1) \tag{5}$$

$$\text{Calculation for Significant Relationship } (\pi^2)$$

$$E_n = \frac{f_r * f_c}{N} \quad (6)$$

$$\pi^2 = \sum \frac{(D - E_n)^2}{E_n} \quad (7)$$

Critical value/ Error value as obtained from the table

Where,

D = Observed frequencies for each ordinal variable under each nominal variable

E = Expected frequencies for each ordinal variable under each nominal variable

f_r = sum of values of cells on a row (that is, the values for the nominal variables under one ordinal variable) on the table

f_c = sum of values of cells on a column (that is, the values for the ordinal variables under one nominal variable) on the table

N= Common total value for all variables

The Decision Rule is then made considering if the Error value is then found to be less than the Significant Relationship (π^2) then it would mean that there is a relationship between the two categories of variables else, it would be decided otherwise.

3.7.1 Data presentation

The presentation of data was done through the use of descriptive statistics that consists of charts and graph. This was adopted for this project and furthermore enumerated in tabular form, plates of photograph and graphs in order to have clarity in presentation.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

This chapter presents the findings that were made from the field work concerning the perception of resort users on their relationship with and proximity to nature, the biophilic design features in holiday resort design, the challenges confronting holiday resorts that can mitigate use of biophilic features and discussions made on them based on the field survey carried out; stating inferences with regards to the results leading to a proposal for a holiday resort design that effectively incorporates the biophilic design strategies. The full results for the questionnaires and the observation in the post occupancy evaluation for this research that were administered in the field and were discussed and analysed in this chapter are compiled in Appendix C and D respectively.

4.1 Assessing the Perception of Resort Users on Their Relationship with Proximity to Nature

The questionnaires revealed on figure 4.1 and table 4.1 that most of the respondents (50.69%) are neutral about nature. It was further seen that their perception of nature other than neutral, was unsatisfactory which also mean that there was more that could be desired of the resorts as it regards to biophilia.

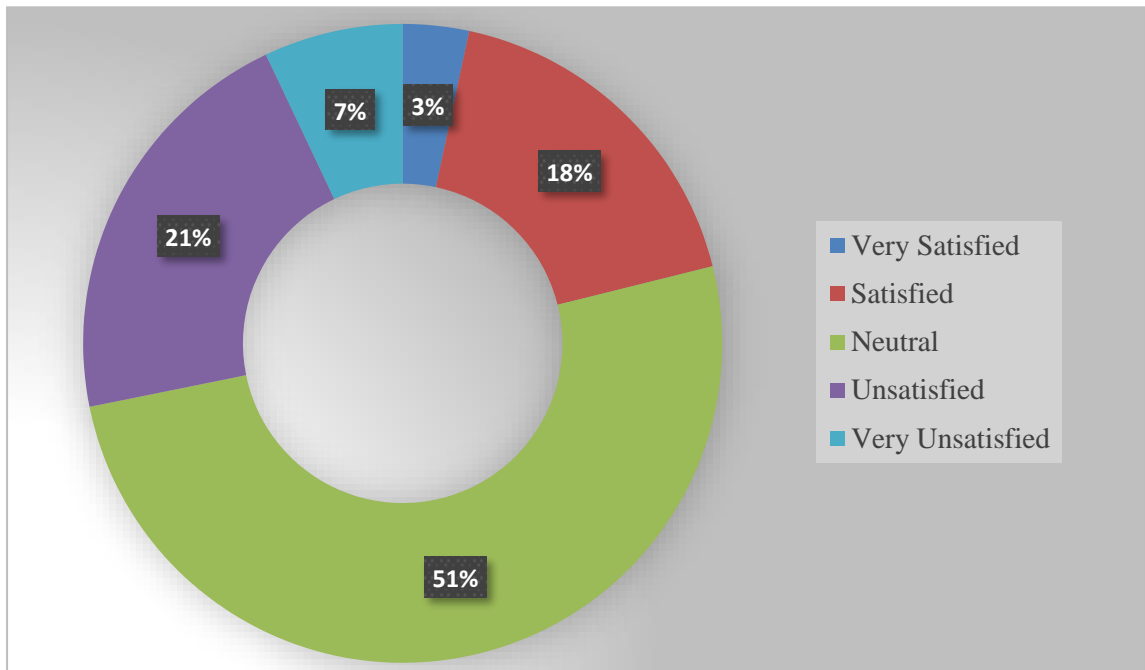


Figure 4.1: Perception of resort users on their relationship with and proximity to nature
Source: Author's work, (2021)

The significance of the relationship between nature in the resorts ((nature in the space, natural analogues and nature of the space) with the perception of people was tested with the chi-squared statistical analysis tool.

H₀ 1 – Nature has a significant relationship with the perception users of holiday resorts.

Table 4.1: Observed frequencies (D)

Variables	Very Satisfied	Satisfied	Neutral	Unsatisfied	Very Unsatisfied	Total
Nature in the space	87	261	520	129	3	1000
Natural Analogues	0	1	355	288	156	800
Nature of The Space	0	200	443	133	24	800
TOTAL	87	462	1318	550	183	2600
<i>Percent (%)</i>	<i>3.35</i>	<i>17.77</i>	<i>50.69</i>	<i>21.15</i>	<i>7.04</i>	<i>100</i>

Source: Author's work, (2021)

Table 4.2: Expected frequencies (E)

Variables	Very Satisfied	Satisfied	Neutral	Unsatisfied	Very Unsatisfied
Nature in The Space	33.46153846	177.6923077	506.9231	211.5385	70.384615
Natural Analogues	26.76923077	142.1538462	405.5385	169.2308	56.307692
Nature of The Space	26.76923077	142.1538462	405.5385	169.2308	56.307692

Source: Author's work, (2021)

Table 4.3: Chi-square points (π_n^2)

Variables	Very Satisfied	Satisfied	Neutral	Unsatisfied	Very Unsatisfied
Nature in The Space	85.66153846	39.05724276	0.337341	32.20501	64.512484
Natural Analogues	26.76923077	140.1608808	6.298135	83.35441	176.50441
Nature of The Space	26.76923077	23.53912754	3.460503	7.756678	18.537201
Calculated Value of Chi-Squared(π^2)				734.9234191	
Number of nominal variables (i)				3	
Number of ordinal variables (r)				5	
Degree of Freedom (df)				8	
Level of Significance				0.05	
Error Value/Critical Value (From Table)				15.507	

Source: Author's work, (2021)

Since the calculated value of chi-squared (734.9234191) is greater than the error value from the table (15.507), the Decision on the hypothesis H_0 1 – Nature has a significant relationship with the perception of users of holiday resorts is accepted as valid. For the reason that there is a significant relationship between nature (the biophilic variables present in the resorts; nature in the space, natural analogues and nature of the space) and the user perception of biophilia in holiday resorts. Based on this result, a majority of the users do not show any form of satisfaction or dissatisfaction with nature in the holiday resorts.

4.2 Assessing the Biophilic Design Features in Holiday Resort Design

In the course of the research, it was observed that only 32.04% of the biophilic design elements (features) were observed to be present in all the sampled resorts (Figure 4.2 and Table 4.4). from among these elements, those in the category of nature in the space were found to be predominantly present by 41%, even though the category with most emphasis by virtue of biophilic design elements is the nature of the space, by 36%.

Table 4.4: Biophilic design features expected at optimum level in all resorts and biophilic design features seen in all sampled resorts in Nigeria

Variables	Frequency	Biophilic design features	Percentage difference (%)
Nature in The Space	84	208	29.25
Natural Analogues	61	208	34.68
Nature of The Space	62	234	36.07
TOTAL	207	646	100.00
Percentage difference (%)	32.04	100.00	

Source: Author's work, 2021

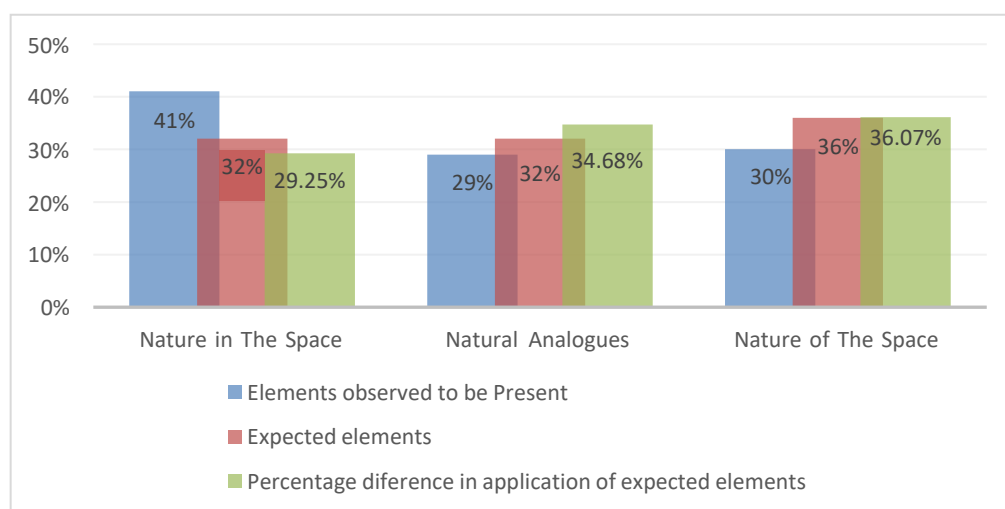


Figure 4.2: Biophilic design features and resorts in Nigeria
Source: Author's work, (2021)

The results for the BCI on Table 4.5 showed that the presence of the biophilic features in the resort buildings (spread across the 26 samples in Nigeria) is insignificant with an index of 0.27. The category of features with a neutrality of presence with BCI of 0.42 are the environmental features found within the resorts. There are two areas with very little evidence and a very insignificant BCI of 0.15; first of these are the Natural shapes and forms and secondly the place-based relationship.

Table 4.5: Use of building materials that connects one to nature

Variables		Asset Current Condition (ACC)	All Biophilic	Building Condition Index (BCI)
Nature in The Space	Environmental Feature	55	104	0.42
	Light and Space	29	104	0.23
Natural Analogues	Natural Shapes and Forms	19	78	0.15
	Natural Patterns and Processes	42	130	0.32
Nature of The Space	Place-Based Relationship	19	104	0.15
	Evolved Human-Nature Relationship	43	130	0.33
TOTAL		207	646	
Average BCI				0.27

Source: Author's Work, (2021)

4.2.1 Biophilic design features in foreign holiday resorts: case studies

4.2.1.1 Meadowood, California, USA

This resort (known as a golf resort) is found in a private in Napa valley and sits on 100-hectares. the attraction for this resort is largely its Michelin three-star restaurant simply called The Restaurant (Figure 4.3). Every single dish here is acknowledgement to the Napa Valley region. It has various facilities like croquet courts, tennis courts, hiking trails, a swimming pool and golf courses complete the country club experience (Lam, 2017).



Figure 4.3: An interesting sight in the night with style at Meadowood.
Source: Opentable, (2019)

4.2.1.2 Cousine island, Seychelles

This is an ecological resort that attracts tourists as they are asked to plant trees and assist the ecologists to monitor wildlife. This region is found in the island 1,600 kilometres east of Kenya, it is one unique from many other islands in the world as there are no other alien mammals (apart from humans, that is.) in it. Endemic plants take up 95% of the island's vegetation. Cousine Island also offers standard resort activities such as a spa, deep sea fishing and a host of water sports (Lam, 2017).

4.2.1.3 The Lodge at Kauri Cliffs, New Zealand

This resort has attraction from tourists from across the world due to its dining facilities, spa and hotel, and most especially the Kauri Cliffs for its seaside golf course (Figure 4.4). The Kauri Cliffs' par-72 golf course stretches curling through marshes, forests, and farmland with a large majority of the holes having a decent sight of the Pacific Ocean, to add to this some among them six are alongside sheer cliffs. The hotel has pleasant diversions for guests and the spa is by a road that turns through a totora tree forest. This resort has three private beaches, one of them is covered with pink. There are tennis courts, infinity pools, mountain bike courses, and even prospects for game hunting (Lam, 2017).



Figure 4.4: Amazing views from the building to the lush green golf course.
Source: Traveller, (2019)

4.2.1.4 Esperanza resort, Mexico

The Esperanza Resort attract tourists with its proximity to the sea, it is locates at the top of the Baja Peninsula with a view of the Sea of Cortez (Figure 4.5), its hotel rooms and villas overlook the ocean of which a lot can see whales in migration in the winter (Lam, 2017).



Figure 4.5: Sight of the ocean in proximity with the resort building.
Source: Kiwicollection, (2019)

4.2.1.5 PangkorLaut, Malaysia

This resort draws tourists from across the world due to its spa village. Here, treatments are given to guests in private spa rooms. There is also the Belian Spa Pavilion that is open all-day as a private compound in it is a nap gazebo, an outdoor whirlpool, a steam room and a yoga pavilion (Lam, 2017).

4.2.1.6 Hilton Niseko Village, Japan

This resort is found on the southern slopes of Annapuri Mountain, in the town of Niseko in Japan' in the Hokkaido island. It has four ski resorts, having separated but interlinked, ski areas (Figure 4.6), all combine to a sum of about 887 hectares. The volume of snow in this resort is comparable to very few across the world due to bouts of winter storms that move from Siberia. On a clear day, the Pacific Ocean is visible from the resort(Lam, 2017).



Figure 4.6: Skiing, and an interesting sight within its natural environment.
Source: Hilton, (2019)

These above case studies from 4.2.1.1 to 4.2.1.6 had some sorts of biophilia expressed in the design of the layout. There is a place-based relationship with the guests caused by the presence of swimming pools, tennis courts, golf courses, croquet courts and hiking trails in the Meadowood resort, California, USA; causing a strong country club experience within the resort. Environmental features like trees (precisely endemic plants), forests, marshes and farmlands bring a decent presence of nature into the space of resorts like the Cousine island resort in Seychelles and the Lodge at Kauri Cliffs, New Zealand. Natural analogue. The ski resort in Hilton Niseko Village, Japan is a resort building that has imbibed in it a combination of curiosity, attraction and a form of organised complexity due to its location in a place with high level of snow and a rare visibility of the Pacific Ocean despite its proximity. These examples buttress one point; there are vast possibilities for the exploration of biophilia in the design of holiday resorts.

4.3 Identify the Challenges Confronting Holiday Resorts that can Mitigate Use of Biophilic Features

The challenges that confront the incorporation of biophilic features in the design and construction of holiday resorts have been opined by the users to be the availability of the materials and the absence of proper information of its essence and usefulness to the environment and the users of the resort itself. The observations and the questionnaires also showed that the perception of the users of holiday resorts is on what they have seen, and to this end, there is difficulty in imagining or picturing the appearance, texture or the experience of seeing, feeling or being in a complete biophilic environment (that is the environment which has had all the biophilic features present; thereby adopting the biophilic strategy) .

4.4 Proposal of a Holiday Resort Design that Effectively Incorporates Biophilic Design Strategies

The perception of the users as obtained from the questionnaires showed a deficit in the presence of some biophilic features in the design of holiday resorts in the country as observed in the POE and on the applications in some of the case studies. The natural analogues like plants, animals (live or sculpted), natural materials in the buildings and façade greening were largely not elements that the users were interested in as a majority of them from Table 4.6 and figure 4.7 were neutral about them. This output can be attributed to the deficiency in these elements even in the design of the resort building as seen on Table 4.7 and figure 4.8, where Natural analogue elements like green facades, animals, Plants, Natural Materials, and Landscape were not popularly used in the design of the resort facilities across the country.

Table 4.6: The biophilic elements in Holiday Resorts with the lowest Perception of Users

Variables		Very Satisfied	Satisfied	Neutral	Unsatisfied	Very Unsatisfied
Natural analogues	Plants	0	0	155	44	1
	Animals	0	0	22	133	45
	Natural materials	0	0	112	23	65
	Façade greening	0	1	66	88	45
Nature of the Space	Sunlight	0	154	45	1	0
	Views and vistas	0	1	174	25	0
	Geology and landscape	0	0	135	42	23
	Habitats and ecosystems	0	45	89	65	1

Source: Author's Work, (2021)

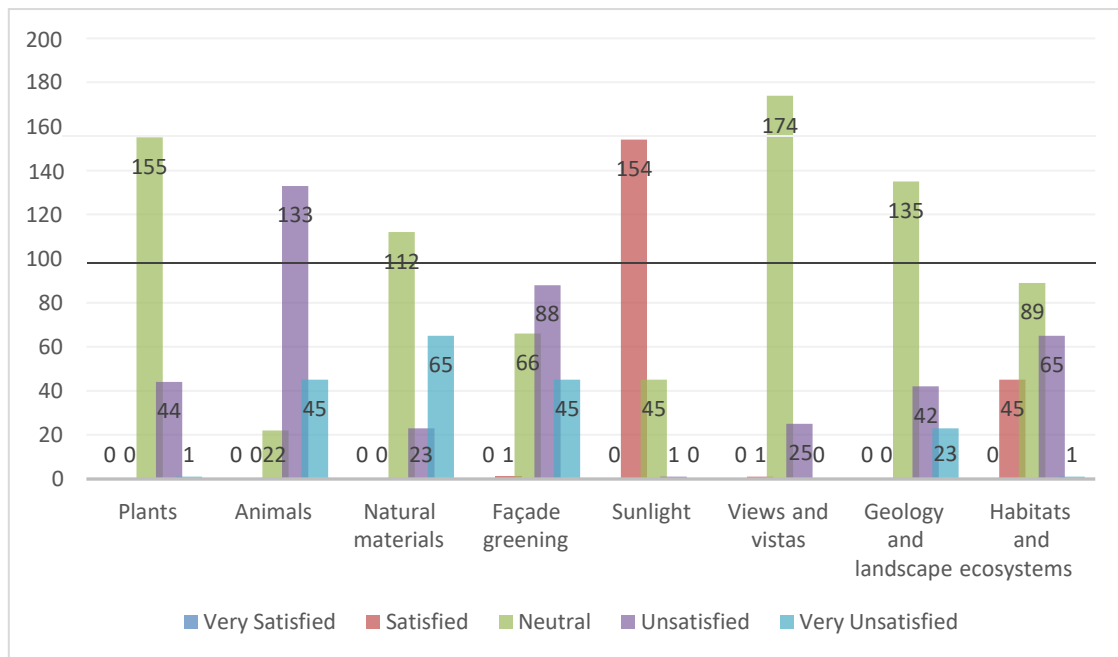


Figure 4.7 The biophilic elements in holiday resorts with the lowest perception of users
Source: Author's work, (2021)

Table 4.7: The biophilic elements with the least presence in holiday resorts

Variables	Natural analogues			Nature of the space		
	Natural shapes and forms	Natural patterns and processes	Place-based relationship	Evolved nature relationship	human-	
Biomorphic Forms and Patterns						3
Material Connection with Nature						11
Complexity and Order						5
Plants						
Animals						
Natural Materials						7
Façade Greening						0
Geology and Landscape						11
Prospect						6
Refuge						8
Mystery						1
Risk						4
Comfort						8
Satisfaction						4
Colour						8
Pleasure						10
Serenity						13

Source: Author's work, (2021)

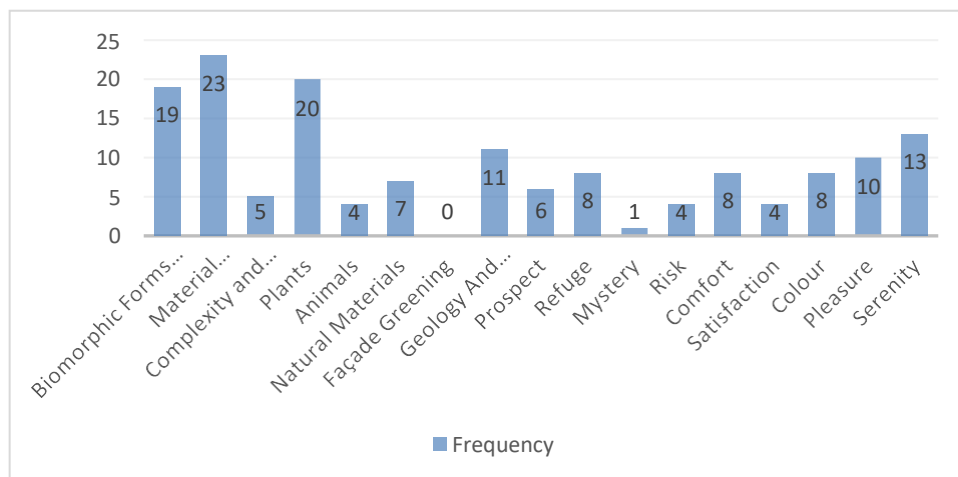


Figure 4.8: The biophilic elements with the least presence in holiday resorts
Source: Author's work, (2021)

From the above mentioned, it is obvious that the presence of the most predominant biophilic elements can be related to their acceptance by the holiday resort users in Nigeria. The percentage dissatisfaction of users (from questionnaire) and percentage presence of elements (from observation) were derived from the data on Appendix 3 and 4 respectively through the equations (8) and (9).

$$\text{Dissatisfaction of users} = \left(\frac{\sum X_n}{\sum Y_n} \right) * 100 \quad (8)$$

$$\text{Presence of elements} = \left(\frac{\sum A_n}{\sum B_n} \right) * 100 \quad (9)$$

Where,

X = Unsatisfaction for one nominal variable

Y = Unsatisfaction for all nominal variables

A = Frequency for on category of variables

B = Frequency for on category of variables

H₀ 2 – There is a significant relationship between the absence of biophilic features or elements and the user perception on their significance in a holiday resort.

Table 4.8: Observed frequencies (D)

Variables	Dissatisfaction of users (from questionnaire) %	Presence of elements (from observation) %	TOTAL
Nature in the space	18.00819	41.97668	59.98487
Natural Analogues	60.57299	30.48306	91.05605
Nature of The Space	21.41883	27.54026	48.95909
TOTAL	100	100	200

Source: Author's work, (2021)

The natural analogues had the highest dissatisfaction of the users towards a holiday resort with a percentage rate of 60% from the observed frequencies in Table 4.8. An average percentage of user's satisfaction towards a holiday resort showed a percentage rate of 33% and an average percentage of elements present or adopted in a holiday resort showed a percentage rate of 32.9% from the observed frequencies in Table 4.8.

Table 4.9: Expected frequencies (E)

Variables	Dissatisfaction of users (from questionnaire)	Presence of elements (from observation)
Nature in the space	29.99243	29.99243
Natural Analogues	45.52802	45.52802
Nature of The Space	24.47954	24.47954

Source: Author's work, (2021)

Table 4.10: Chi-square points (π_n^2)

Variables	Dissatisfaction of users (from questionnaire)	Presence of elements (from observation)
Nature in the space	4.788614	4.788614
Natural Analogues	4.971684	4.971684
Nature of The Space	0.382686	0.382686
Number of nominal variables (i)		2
Number of ordinal variables (r)		3
Degree of Freedom (df)		3
Level of Significance		0.05
Calculated Value of Chi-Squared(π^2)		20.28597
Error value/Critical value (from table)		7.815

Source: Author's work, (2021)

Since the calculated value of chi-squared (20.28597) is greater than the error value from the table (7.815), the Decision on the hypothesis H_02 – There is a significant relationship between the absence of biophilic features or elements and the user perception on their significance in a holiday resort, is accepted as valid.

Based on the above test, the proposed design was made to incorporate all the biophilic design features, thus, including both those that were most prevalent and those that were scarce in the sampled resort into a decent blend for the pleasure and betterment of the users.

CHAPTER FIVE

5.0 CONCLUSION AND RECOMMENDATION

5.1 Conclusion

The perception of the holiday resort users on the relationship with and their proximity to nature was neutral. Implying that the users are generally not mindful of the biophilic features of the holiday resorts. Going further, it was found that the presence of biophilic features in the holiday resorts in the study area is insignificant. Meaning, the biophilic features that make up biophilic buildings by design were largely absent. These results for the perception of the users of holiday resorts and the presence of biophilic features in the resorts (in the study area) were tested and were found to be significantly related. Hence, the user is influenced by what is seen and judges based on what is available. This implies that, the efficiency of biophilia on the user has to be overwhelming to be effective.

The design of a holiday resort with the incorporation of biophilia has to be wholesome and involve a deliberate introduction of the strategies that influence the three basic features:

- i. The nature in the space
- ii. The natural analogues
- iii. The nature of the space

This study also revealed that existing resort centres that were studied adopted only a few of the 14-patterns of biophilic design. More also the use of colourful plants was also visible in the majority of the sample studied with elements such as water, variety of colourful plants and shaded seclusion area incorporated. In terms of non-visual connection with nature, biomorphic forms and patterns only few of the samples adopted

this feature in their design. This study proves that there is little application of biophilic design patterns in the design of the holiday resort which has in turn has limited the potential physical, emotional and psychological benefits to be derived from by visiting these resorts.

5.2 Recommendations

At the end of this research the following recommendations are made to both designers and policy makers to aid in boosting biophilic incorporation in designs so as to aid the growth of the tourism industry and improve the psychological and physiological health of guests.

- i. Designs should be made to consider the patterns of biophilic design features, so as to optimise the experience of tourists to these locations.
- ii. There is need for the government to enact policies that will encourage the incorporation of these features from the conceptual and drawing approval stage of the design before construction begins.
- iii. Architects and designers should be educated of the importance need to bring people closer to nature as this helps the recovery of users to a state of sound health and wellbeing.

5.3 Contribution to Knowledge

This research lays down a guide to help understanding biophilic design strategies and their implementation for enhancement of holiday resorts. Biophilia design strategies have been outlined in the contexts of the nature in the space, the natural analogues and the nature of the space. Nature in the space: They include; light and space (fire, sunlight, views and vistas, and ecosystems) and environmental feature (water, plants, animals, and

natural materials). Natural Analogues: They include; natural patterns and processes (Plants, animals, natural materials, façade greening, geology and landscape) and natural shapes and forms (biomorphic forms and patterns, material connection with nature, complexity and order). Nature of The Space: They include; evolved human-nature relationship (comfort, satisfaction, colour, pleasure, and serenity) and place-based relationship (prospect, refuge, mystery, and risk). The findings showed that users had the highest dissatisfaction towards natural analogues on a 60-percentage rate. The adoption or presence of these design strategies or elements in a holiday resort showed a percentage rate of 32.9% which indicates that these elements have not been adopted on a percentage rate of 67.1%. This shows the poor adaptation and implementation of biophilic design strategies in the design of holiday resorts. It therefore indicates that this Strategies should be considered and adopted in the design of holiday resorts for optimal experience of tourists to these locations.

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APPENDICES

Appendix A: Questionnaire on Assessment of Biophilic Design Strategies in the Design of a Holiday Resort in Abuja, Nigeria

GANA, Francis Mamman Kolo (MTech/SET/2018/9162)

Department Architecture, Federal University of Technology, Minna

QUESTIONNAIRE

SECTION A

1. Category of occupant
 - a. Guest
 - b. Worker

2. If (a) Guest... Times of visit
 - a. 1 (First time)
 - b. 2- 5 times of visit
 - c. 6- 10 times of visit
 - d. Over 10 times of visit

3. If (b) worker... Years of experience
 - a. 1-5years
 - b. 6-10yers
 - c. 11-15years
 - d. 16-20years
 - e. Over 16years

SECTION B

1. How would you rate your satisfaction with the nature of the space as it concerns the following feature in this resort?

	Very Satisfied (1)	Satisfied (2)	Neutral (3)	Unsatisfied (4)	Very Unsatisfied (5)
Water					
Plants					
Animals					
Natural materials					
Fire					

2. How would you rate your satisfaction with the patterns, crafts and designs depiction nature as it concerns the following features in this resort?

	Very Satisfied (1)	Satisfied (2)	Neutral (3)	Unsatisfied (4)	Very Unsatisfied (5)
Plants					
Animals					

Natural materials					
Façade greening					

3. How would you rate your satisfaction with the about the nature of your space as it concerns the following features in this resort?

	Very Satisfied (1)	Satisfied (2)	Neutral (3)	Unsatisfied (4)	Very Unsatisfied (5)
Sunlight					
Views and vistas					
Geology and landscape					
Habitats and ecosystems					

3. How would you rate your satisfaction from your time in this resort?

Very Satisfied (1)	Satisfied (2)	Neutral (3)	Unsatisfied (4)	Very Unsatisfied (5)

Appendix B: Post Occupancy Evaluation Checklist on Assessment of Biophilic Design Strategies in the Design of a Holiday Resort in Abuja, Nigeria

GANA, Francis Mamman Kolo (MTech/SET/2018/9162)

Department Architecture, Federal University of Technology, Minna

POST OCCUPANCY EVALUATION CHECKLIST

SECTION A

Name of Place: Location:

Terrain: Number of Building Blocks:

Building age: Maximum number of storeys:

SECTION B: BIOPHILIC FEATURES PHYSICALLY PRESENT		
S/No	SPECIFICATIONS OF VARIABLES	SCALE OF MEASUREMENT (Scale for “VR1’b,’c”; “VR2’b,’c”; “VR3’b,’c” in no particular order)
VR1a	Nature in The Space	(1)Very Insignificant, (2)Insignificant, (3)Neutral, (4)Significant, (5)Very Significant
“b	Environmental Feature	(<input type="checkbox"/>)Water, (<input type="checkbox"/>)Plants, (<input type="checkbox"/>)Animals, (<input type="checkbox"/>)Natural Materials

“c	Light and Space	(<input type="checkbox"/>)Fire, (<input type="checkbox"/>)Sunlight (<input type="checkbox"/>)Views and Vistas, (<input type="checkbox"/>)Ecosystems
VR2a	Natural Analogues	(1)Very Insignificant, (2)Insignificant, (3)Neutral, (4)Significant, (5)Very Significant
“b	Natural Shapes and Forms	(<input type="checkbox"/>)Biomorphic Forms and Patterns, (<input type="checkbox"/>)Material Connection with Nature, (<input type="checkbox"/>)Complexity and Order
“c	Natural Patterns and Processes	(<input type="checkbox"/>)Plants, (<input type="checkbox"/>)Animals, (<input type="checkbox"/>)Natural Materials, (<input type="checkbox"/>)Façade Greening, (<input type="checkbox"/>)Geology and Landscape
VR3a	Nature of The Space	(1)Very Insignificant, (2)Insignificant, (3)Neutral, (4)Significant, (5)Very Significant
“b	Place-Based Relationship	(<input type="checkbox"/>)Prospect, (<input type="checkbox"/>)Refuge, (<input type="checkbox"/>)Mystery, (<input type="checkbox"/>)Risk
“c	Evolved Human-Nature Relationship	(<input type="checkbox"/>)Comfort, (<input type="checkbox"/>)Satisfaction, (<input type="checkbox"/>)Colour, (<input type="checkbox"/>)Pleasure, (<input type="checkbox"/>)Serenity

**Item(s) NOT available should be rated as ZERO (0) and those available should be rated as ONE(1)

Presence of Biophilic Features

Condition Status	General Description	Building Condition	Condition Rating (c)
Very insignificant	The presence of Biophilic features is almost negligible.	0.00-0.19	1
Insignificant	The presence of Biophilic features is very low.	0.20-0.39	2
Neutral	The presence of Biophilic features is average	0.40-0.59	3
Significant	The presence of Biophilic features is noteworthy.	0.60-0.79	4
Very significant	Biophilic features stand out throughout the building.	0.80-1.00	5

Appendix C: Results for Questionnaire

Assessment of Biophilic Design Strategies in the Design of a Holiday Resort in Abuja, Nigeria

GANA, Francis Mamman Kolo (MTech/SET/2018/9162)

	Variables	Very Satisfied	Satisfied	Neutral	Unsatisfied	Very Unsatisfied	Percentage
Nature in the space	Water	87	103	10	0	0	100
	Plants	0	21	136	42	1	100
	Animals	0	45	110	44	1	100
	Natural materials	0	3	154	42	1	100
	Fire	0	89	110	1	0	100
		87	261	520	129	3	
Natural Analogues	Plants	0	0	155	44	1	100
	Animals	0	0	22	133	45	100
	Natural materials	0	0	112	23	65	100
	Façade greening	0	1	66	88	45	100
		0	1	355	288	156	
Nature of The Space	Sunlight	0	154	45	1	0	100
	Views and vistas	0	1	174	25	0	100
	Geology and landscape	0	0	135	42	23	100
	Habitats and ecosystems	0	45	89	65	1	100
		0	200	443	133	24	
	TOTAL	87	462	1318	550	183	
	Percentage	3	18	51	21	7	100

Appendix D: Results for Observation: Post Occupancy Evaluation (POE)

Assessment of Biophilic Design Strategies in the Design of a Holiday Resort in Abuja, Nigeria

GANA, Francis MammanKolo (MTech/SET/2018/9162)

Variables		Value	Asset	All	Building	
		s	Current	Biophilic	Condition	
			Condition	Index		
			n (ACC)		(BCI)	
Nature in the space	Environmental Feature	Water	19	95	130	0.73
		Plants	23	115	130	0.88
		Animals	5	25	130	0.19
		Natural Materials	8	40	130	0.31
	Light and Space	Fire	1	5	130	0.04
		Sunlight	11	55	130	0.42
		Views and Vistas	12	60	130	0.46
Natural Analogues Natural Shapes and Forms	Ecosystems	5	30	130	0.23	
	Biomorphic	3	15	130	0.12	
	Forms and Patterns,					
	Material	11	55	130	0.42	
	Connection with Nature,					

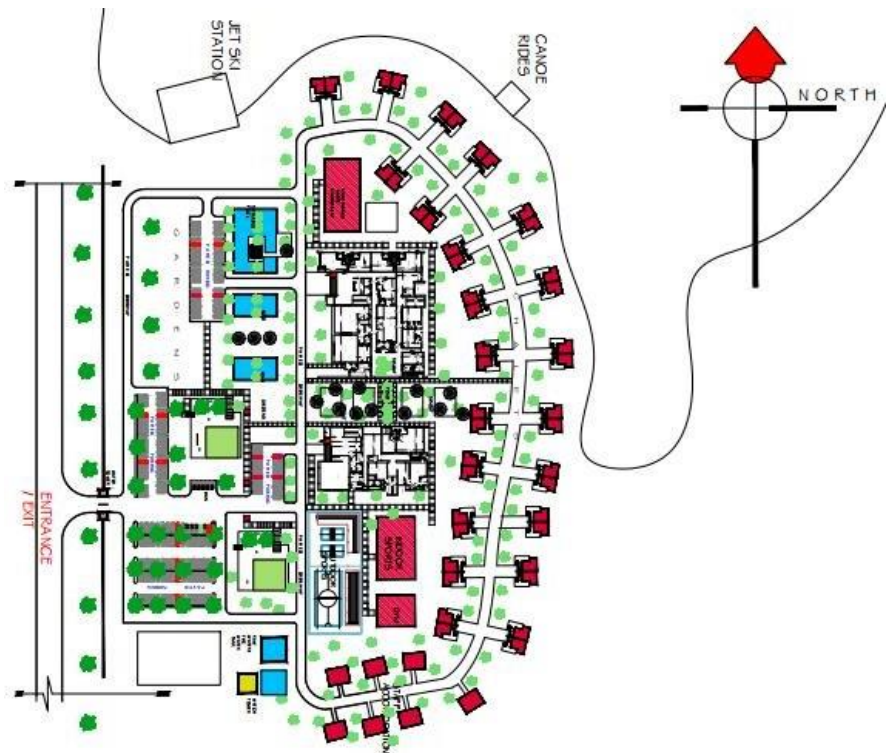
		Complexity and Order	5	25	130	0.19
Nature of The Space	Natural Patterns and Processes	Plants	20	100	130	0.77
		Animals	4	20	130	0.15
		Natural Materials	7	35	130	0.27
		Façade Greening	0	0	130	0.00
		Geology and Landscape	11	55	130	0.42
		Prospect	6	30	130	0.23
	Place-Based Relationship	Refuge	8	40	130	0.31
		Mystery	1	5	130	0.04
		Risk	4	20	130	0.15
		Comfort	8	40	130	0.31
Evolved Human-Nature Relationship	Satisfaction	4	20	130	0.15	
	Colour	8	40	130	0.31	
	Pleasure	10	50	130	0.38	
	Serenity	13	65	130	0.50	

APPENDIX E: PROPOSED HOLIDAY RESORT DESIGN

ASSESSMENT OF BIOPHILIC DESIGN STRATEGIES IN THE DESIGN OF A HOLIDAY RESORT IN ABUJA, NIGERIA

GANAN, Francis MammanKolo (MTech/SET/2018/9162)

Site plan



Perspective 1



Perspective 2



Perspective 3



Perspective 4



Perspective 5



Perspective 6



Perspective 7

