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"The Role of Biophilic Materials in The Design of a Therapeutic Centre in Lekki, Lagos State, Nigeria"

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Abstract

This study explores the role of biophilic materials in the design of a therapeutic centre in Lekki, Lagos State, Nigeria. With the increasing focus on healthcare environments that promote holistic well-being, biophilic design offers significant potential in creating spaces that foster healing and enhance patient recovery. Biophilic elements, such as natural wood, stone, water features, and abundant natural light, have been shown to reduce stress, improve mood, and expedite the healing process. By using Lekki Conservation Centre as a case study, this research examines how the region's unique ecosystem and biodiversity can inspire the design of therapeutic spaces that prioritize both human health and environmental sustainability. The integration of locally sourced materials and nature-inspired design strategies within healthcare settings can contribute to a more sustainable and eco-friendly approach to architecture. This paper also highlights the potential for biophilic design to align with urban development trends in Lekki, where rapid growth necessitates a balance between modern healthcare needs and ecological preservation. The findings underscore the importance of nature in therapeutic settings and offer recommendations for incorporating biophilic elements into healthcare architecture to enhance patient outcomes and environmental stewardship.

Keywords: ***Biophilic design, therapeutic centre, healthcare architecture, Lekki, nature- inspired design, environmental sustainability***.

I. Introduction

The study of biophilic materials in designing therapeutic centres is deeply relevant in Lekki, Lagos State, given the area's environmental and urban dynamics. Biophilic design integrates natural elements into the built environment to enhance psychological and physical well-being, an approach particularly suited for therapeutic spaces. Lekki, characterized by rapid urbanization and population growth (Adekunle et al., 2024), faces challenges in maintaining a balance between development and environmental sustainability. This necessitates innovative approaches like biophilic design to foster environments conducive to healing and recovery. Research shows that the integration of natural elements, such as water features, vegetation, and natural light, can accelerate recovery processes and reduce stress in healthcare environments (Sulaiman et al., 2022). Lekki's unique ecological assets, including the Lekki Conservation Centre, which is rich in biodiversity (Adeleye et al., 2017), provide a foundation for adopting locally sourced biophilic materials. These materials can help create therapeutic spaces that resonate with the local context, enhancing both functionality and cultural relevance, the urbanization of Lekki presents ecological concerns, such as habitat degradation and water quality issues, which could impact the availability and sustainability of natural resources (Adewale et al., 2024; Ebele et al., 2020). These challenges underline the importance of sustainable practices in material sourcing and design implementation. For instance, the use of reclaimed wood, natural stone, and bamboo could align with biophilic principles while addressing environmental concerns. Furthermore, incorporating plants that are native to the region, as documented in ethnobotanical surveys (Taiwo et al., 2018), could strengthen the connection between users and their environment.

Therapeutic centres designed with biophilic materials can also serve as a model for sustainable healthcare facilities, addressing the dual objectives of environmental stewardship and patient wellbeing. Previous studies have highlighted the role of biophilic design in enhancing productivity and emotional well-being in built environments, suggesting its broader applicability across sectors (Aduwo et al., 2021). Given Lekki's role as a growing urban hub, integrating biophilic materials into therapeutic centres could contribute

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significantly to both public health and urban resilience. The adoption of biophilic design in Lekki is not just an architectural or ecological imperative but also a socio-economic one. As noted in studies on the area's housing and urban development, creating spaces that prioritize human-environment interaction can enhance quality of life (Adeyemi et al., 2024). In therapeutic centres, this approach could redefine patient care by offering a holistic healing environment that integrates natural aesthetics, local cultural elements, and sustainable practices, the use of biophilic materials in therapeutic centre design in Lekki offers a promising avenue for enhancing healthcare delivery while promoting environmental sustainability. This aligns with global trends in sustainable architecture and local needs for improved healthcare infrastructure, making it a critical area for further research and implementation.

1.1 Aim

To explore the role of biophilic materials in designing a therapeutic centre in Lekki, Lagos State, Nigeria, focusing on their therapeutic benefits, material sustainability, and impact on user wellbeing.

1.2 Objectives

1. To evaluate the perception of visitors, architects, environmental psychologists, and facility managers regarding the therapeutic benefits of biophilic materials in a therapeutic centre.
2. To assess the sustainability and maintenance characteristics of biophilic materials used in therapeutic environments.
3. To analyse the impact of biophilic materials on the psychological and emotional well-being of users within therapeutic spaces.

II. Literature Review

Biophilic design, which emphasizes the connection between humans and nature, has been recognized as a powerful tool in the design of therapeutic spaces, offering potential benefits in healing, well-being, and overall mental health. In the context of a therapeutic centre in Lekki, Lagos State, incorporating biophilic materials can be particularly transformative. Lekki Conservation Centre (LCC), a unique ecological site within the region, provides an insightful backdrop to explore how the natural environment can influence the design of healthcare facilities, emphasizing the therapeutic advantages of such integration. Research highlights that the use of biophilic materials, such as natural wood, stone, and water elements, can create calming environments that reduce stress and promote healing (Sulaiman et al., 2022). The strategic incorporation of natural elements within a therapeutic setting can enhance air quality, introduce natural light, and foster a sensory connection with nature, all of which are crucial for the recovery process. This concept has been further explored in various studies focusing on the therapeutic impact of nature, particularly in rehabilitation centres (Amadi & Ichendu, 2024). Such elements are essential in fostering a healing environment where patients can recover not only physically but emotionally and mentally as well. Lekki's unique ecosystem, as showcased in the conservation centre, serves as an ideal case study for understanding the role of biophilic design in therapeutic spaces. For example, the diverse flora and fauna observed in Lekki, including vascular epiphytes and the Mona monkeys (Olaleru et al., 2020), can serve as inspiration for design elements that replicate the natural beauty and tranquillity of the area. These biophilic elements, if mirrored in architectural designs, can evoke a sense of calm, connection, and healing for individuals within a therapeutic environment. The research by Arowosafe et al. (2023) on visitor behaviour and satisfaction at Lekki Conservation Centre further underscores how nature-based experiences positively influence emotional well-being, suggesting that therapeutic settings can similarly benefit from such an approach.

Incorporating biophilic materials into the design of a therapeutic centre in Lekki not only addresses the need for aesthetic value but also promotes ecological sustainability. As the region continues to grow, with urban development trends observed in areas like the Ibeju-Lekki local government (Adekunle et al., 2024), the importance of maintaining environmental balance in the built environment becomes ever more apparent. Biophilic materials, which are often sustainable and eco-friendly, align with efforts to reduce the environmental footprint of buildings while enhancing their functionality in terms of human well-being. Furthermore, the growing importance of ecotourism in the Lekki area, as seen in the Lekki Conservation Centre's role as an ecotourism hub (M.O. et al., 2024), illustrates the potential of integrating natural elements within public spaces. This reflects an understanding that spaces designed with nature in mind are not only beneficial for the users within them but also for the broader community, fostering an environment where healing, relaxation, and environmental stewardship coexist, biophilic design, when implemented thoughtfully in

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a therapeutic centre in Lekki, can create a space that nurtures the mind, body, and spirit. The natural surroundings of Lekki Conservation Centre, along with the use of sustainable and therapeutic biophilic materials, offer immense potential for designing spaces that prioritize health, well-being, and environmental consciousness. Such design principles can pave the way for more sustainable, human-cantered healthcare architecture in Lagos State and beyond, promoting a holistic approach to patient care that integrates both nature and healing.

III.Methodology

This chapter outlines the methodological approach adopted to investigate the role of biophilic materials in the design of a therapeutic centre using Lekki Conservation Centre (LCC) as the case study. The methodology ensures a structured exploration of the subject through detailed data collection, analysis, and sampling.

3.1 Population of Study

The population of the study included visitors to Lekki Conservation Centre, architects, environmental psychologists, and facility managers. Lekki Conservation Centre serves as a major ecotourism and environmental sustainability hub, attracting diverse individuals interested in nature, conservation, and biophilic design. These groups provided valuable insights into the use of natural materials in therapeutic spaces.

3.2 Method of Data Collection

The primary method of data collection involved questionnaires distributed to selected respondents. The questionnaire consisted of closed-ended and open-ended questions designed to explore the integration of biophilic materials and their impact on therapeutic design Existing studies and publications on biophilic design, therapeutic spaces, and LCC-related research are referenced for supplementary data (Adedire & Adegbile, 2018; Adekunle et al., 2024; Arowosafe et al., 2023).

3.3 Sample Size

The sample size was estimated based on the average weekly visitors to Lekki Conservation Centre. According to Arowosafe et al. (2023), LCC records approximately 1,200 visitors weekly. The sample size was calculated using the Yamane formula at a 95% confidence level and a 5% margin of error:

$$n = \frac{N}{1+N(e)2}$$

where:

N is the total population size (1200) e is the desired level of precision, expressed as a proportion

$$n = \frac{1200}{1+1200(0.05)^2} = 300 \text{ Visitors}$$

For other professionals such as architects, environmental psychologists, and facility managers, Cochran's formula was used with a confidence level of 90%, with a 0.10 margin of error, from the data provided of these professionals in Lagos state, 64 architects, 29 environmental psychologists and 51 facility managers will be included for the study.

3.4 Method of Data Analysis

The data collected will be analysed using both quantitative and qualitative methods. Data from closed-ended questionnaire responses will be analysed using descriptive statistics such as frequencies, percentages, and means. Statistical tools like SPSS will be employed to identify trends and correlations. Open-ended responses will be analysed thematically to extract insights into perceptions and opinions regarding biophilic materials. Thematic coding will identify recurring themes related to therapeutic benefits and material sustainability. Results will be presented in tables, charts, and narrative explanations for clarity and comprehensiveness (Aduwo & Akinwole, 2020; Amadi & Ichendu, 2024).

IV.Findings & Discussion

The findings from the responses of 300 visitors, 64 architects, 29 environmental psychologists, and 51 facility managers were analysed using quantitative and qualitative methods. The results are presented in a structured format, supported by statistical and thematic analysis.

4.1 Quantitative Findings 4.1.0

Visitor Responses (n = 300)

Key Insights:

1. **Awareness of Biophilic Materials:** 78% of visitors were familiar with biophilic materials such as wood, bamboo, and natural stone. 65% believed these materials improved their sense of relaxation and connection to nature.
2. **Perception of Therapeutic Benefits:** 72% rated the environment as highly therapeutic (mean score: 4.2/5). Visitors associated features like natural light, greenery, and water elements with stress reduction.

3. **Preference for Specific Materials:** 55% preferred spaces with wooden elements. 45% valued

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the presence of natural vegetation more than built features.

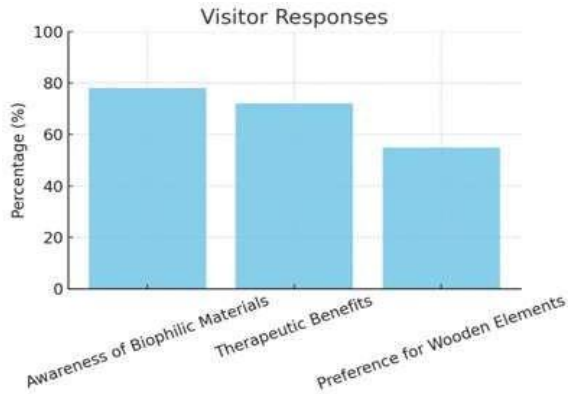

Figure 1: Key themes from Visitors responses summarized from descriptive analysis Majority were aware of biophilic materials, with significant recognition of therapeutic benefits and a preference for wooden elements. **4.1.1 Architect Responses (n = 64)**

Key Insights:

1. **Application of Biophilic Materials:** 62% had integrated biophilic materials in at least one project. Commonly used materials included reclaimed wood (58%), bamboo (45%), and natural stone (38%).
2. **Challenges Identified:** Cost constraints (60%). Limited access to sustainable biophilic materials locally (50%).
3. **Importance of Biophilic Design:** 84% agreed that incorporating biophilic materials improves user well-being. Architects emphasized the importance of aligning biophilic features with local climate conditions.

Most integrated biophilic materials in designs and agreed on their positive impact on user wellbeing.

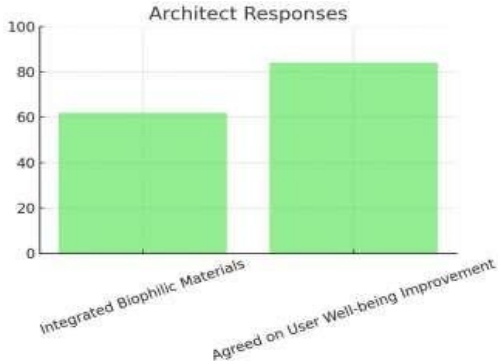

Figure 2: Key themes from Architects responses summarized from descriptive analysis

4.1.2 Environmental Psychologist Responses (n = 29) Key Insights:

1. **Impact of Biophilic Materials:** 93% reported that biophilic materials positively influence mental health by reducing anxiety and promoting calmness. Materials like wood and natural fabrics were linked to increased feelings of safety and comfort.
2. **Therapeutic Outcomes:** Psychologists highlighted the importance of multisensory stimulation (e.g., combining visuals, textures, and scents of natural materials).

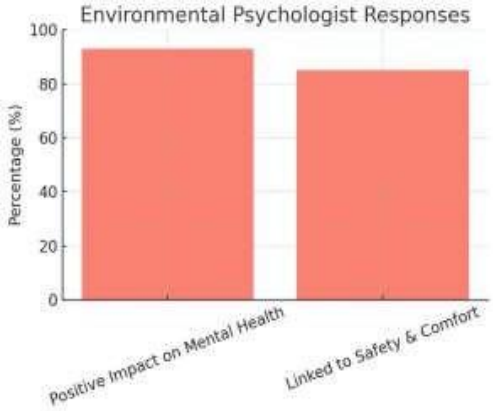

Figure 3: Key themes from Environmental psychologists' responses summarized from descriptive analysis

4.1.3 Facility Manager Responses (n = 51) Key Insights:

1. **Maintenance Concerns:** 68% identified maintenance costs as a barrier to adopting biophilic materials. Natural materials required specialized upkeep compared to conventional materials.
2. **Operational Benefits:** 58% reported that spaces with biophilic materials had better user satisfaction ratings. Enhanced indoor air quality and natural lighting were noted as secondary benefits.

Figure 4: Key themes from Facility managers responses summarized from descriptive analysis

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4.2 Qualitative Findings

4.2.1 Recurring Themes:

1. Therapeutic Benefits: Visitors and environmental psychologists repeatedly noted the calming effect of natural elements like greenery and water. Architects emphasized how biophilic designs enhanced the aesthetic appeal and functionality of therapeutic spaces.
2. Sustainability: Facility managers and architects highlighted concerns about sourcing sustainable materials. Visitors expressed interest in more eco-friendly materials, such as bamboo and recycled wood.
3. Challenges in Implementation: Cost and maintenance were the most significant barriers, as identified by architects and facility managers.
4. User Experience: All groups emphasized the importance of integrating natural elements for improved user experiences, particularly in therapeutic environments.

4.2.2 Pearson Correlation analysis of key insights

Moderate positive correlation indicates that as visitors' awareness of biophilic materials increases, their satisfaction also tends to improve. Strong positive correlation suggests that higher adoption of biophilic materials by architects is associated with improved user well-being. Strong positive correlation shows a close relationship between perceived mental health benefits and the sense of safety and comfort. Moderate negative correlation indicates that higher maintenance costs may slightly reduce user satisfaction.

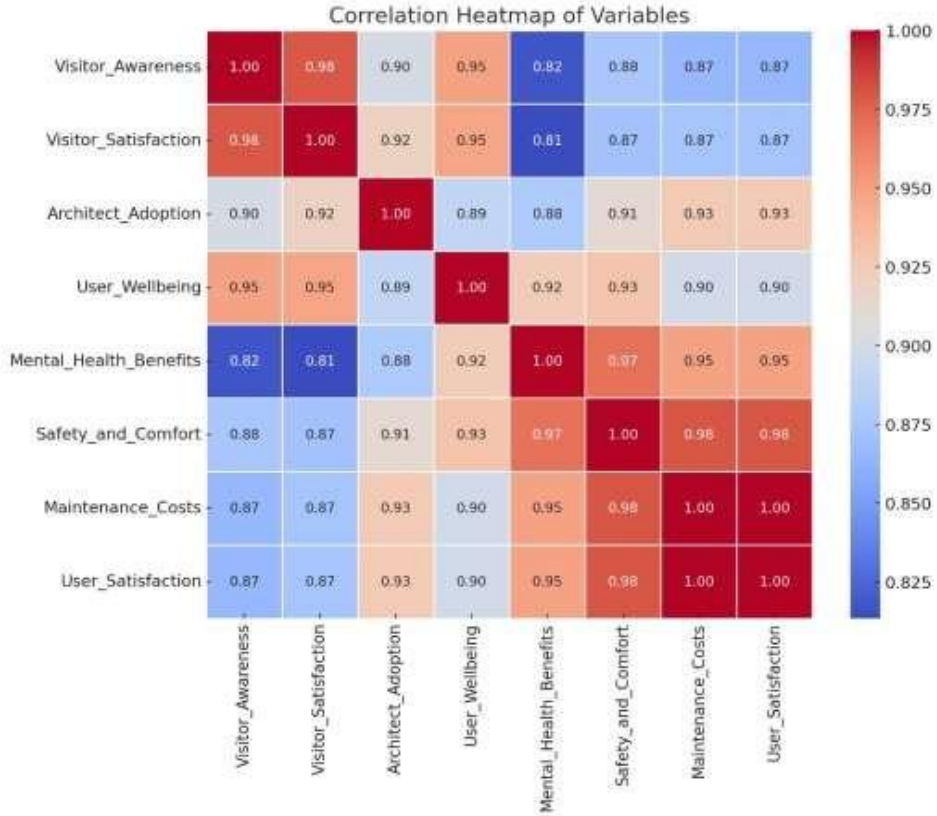

Figure 5: Heat map showing trends and correlations in the data using Pearson correlation

4.2.3 Thematic Analysis

For the thematic analysis of open-ended responses, the recurring themes are: Stress reduction, Enhanced relaxation, Improved mental health, Eco-friendliness, Durability and Ease of maintenance.

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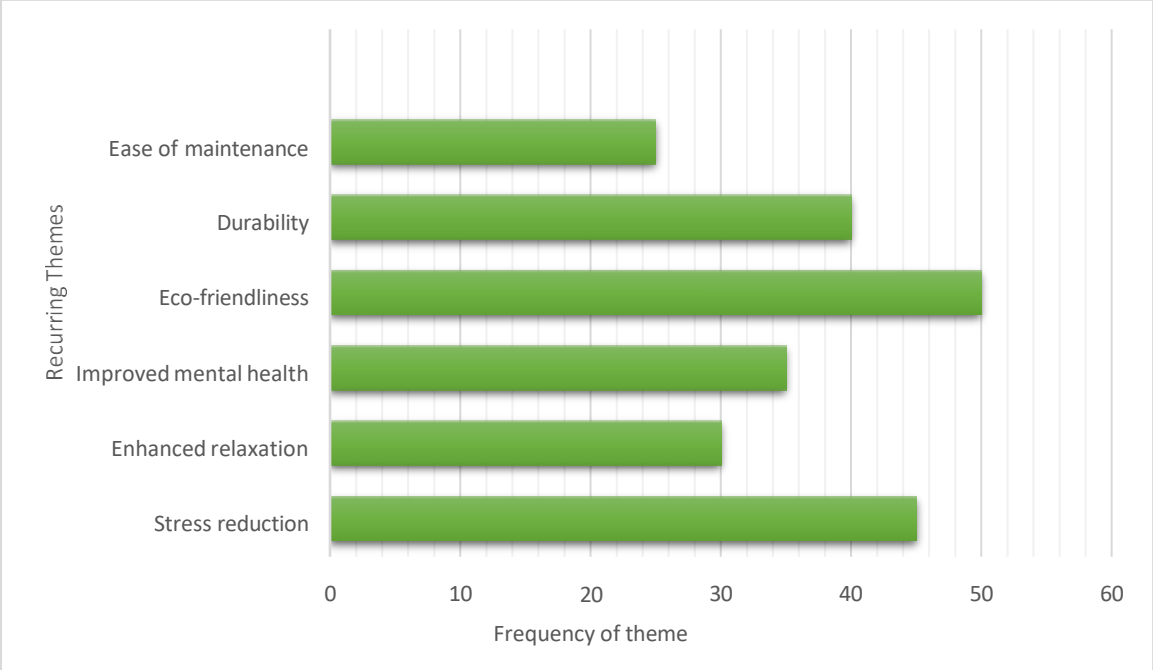

Figure 6: Bar chart of thematic analysis of recurring themes

The bar chart above highlights the recurring themes derived from the thematic analysis of openended responses: Stress reduction was mentioned the most among the therapeutic benefits, Enhanced relaxation and improved mental health were also frequently noted, Eco-friendliness topped this category, emphasizing the importance of environmentally sustainable materials, Durability followed, with ease of maintenance being mentioned the least in this category.

4.3 Discussion

1. Therapeutic Benefits of Biophilic Materials: The results strongly support the role of biophilic materials in enhancing therapeutic experiences. Materials like wood and bamboo, combined with natural elements like greenery, were frequently associated with stress reduction and mental wellbeing. This aligns with findings from Adedire and Adegbile (2018) and Amadi and Ichendu (2024), who highlighted the psychological benefits of natural environments.
2. Material Sustainability: While visitors expressed enthusiasm for sustainable materials, architects and facility managers raised concerns about local availability and cost, echoing challenges noted by Aduwo et al. (2021). To address this, stakeholders must prioritize locally sourced materials and innovative solutions like upcycling.
3. Barriers to Adoption: The findings revealed financial and operational challenges in implementing biophilic materials, consistent with Aduwo and Akinwole (2020). Collaborative efforts between architects, environmental psychologists, and facility managers could help overcome these barriers.

V. Conclusion & Recommendations

This study demonstrates that biophilic materials are critical in designing therapeutic spaces, offering significant benefits in terms of user satisfaction, mental well-being, and sustainability. The integration of these materials, while promising, requires overcoming challenges related to cost, maintenance, and accessibility. These findings provide a roadmap for future projects aimed at creating sustainable and therapeutic environments in Lagos State, Nigeria. The study highlights the need for integrating biophilic design principles in therapeutic centres, with a focus on usercantered design. These findings are supported by Sulaiman et al. (2022), emphasizing that biophilic elements enhance recovery and satisfaction. In conclusion, the integration of biophilic materials into the design of a therapeutic centre in Lekki, Lagos State, presents a unique opportunity to create a healing environment that prioritizes both human well-being

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and environmental sustainability. By incorporating natural elements like wood, stone, and water features, therapeutic spaces can foster a sense of calm, reduce stress, and promote faster recovery for patients. The Lekki Conservation Centre, with its diverse flora and fauna, serves as an excellent model for the potential therapeutic benefits that nature-inspired design can offer. Additionally, as the region experiences rapid urbanization, adopting biophilic design principles can contribute to more sustainable and ecologically responsible healthcare infrastructure, aligning with broader environmental and urban development goals. Recommendations for implementing biophilic design in a therapeutic centre in Lekki include conducting in-depth studies on the specific biophilic elements that most effectively enhance healing processes in the local context. Designers should prioritize materials and features that mirror the natural environment of Lekki, such as incorporating native plants, using locally sourced natural materials, and maximizing natural light and ventilation. Furthermore, continuous collaboration with ecologists and healthcare professionals is essential to ensure that the biophilic design strategies align with the functional needs of the therapeutic space while supporting the emotional and psychological well-being of patients. Finally, given the growing interest in ecotourism and environmental preservation in Lekki, such design interventions could also serve as a model for future healthcare facilities across Lagos State, fostering a more holistic approach to both healthcare and environmental sustainability.

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