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Exploration ofSustainable Materials Suitable for ResortCenterDesign in Lekki Lagos towards EnhanceMaintenance

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ABSTRACT
The design and maintenance of resort centers situated in coastal areas pose distinct challenges, especially in locations such as Lekki, Lagos, where climatic factors and the durability of materials play a crucial role in the longevity of structures. This study investigates the incorporation of sustainable materials into the design of resort centers, emphasizing the improvement of maintenance practices and the promotion of enduring sustainability. Employing a case study methodology, the research analyzes current resort facilities to pinpoint effective material selections, construction methods, and maintenance approaches that are appropriate for the coastal environment. Additionally, the study assesses the potential obstacles to the implementation of sustainable materials in Nigeria, including financial considerations, regulatory challenges, and the availability of materials. The insights gained from this research will guide design strategies aimed at enhancing durability, minimizing maintenance requirements, and fostering both environmental and economic sustainability in resort development. By promoting policies that support the adoption of sustainable materials, this research seeks to advance sustainable construction practices within Nigeria's hospitality industry.

Keywords: Sustainable Materials, Maintenance Culture, Resort Center Design, Lekki

I. INTRODUCTION

1.1 Background of study

Lekki, a rapidly growing area in Lagos State, Nigeria, has emerged as a key destination for tourism and investment. The Lagos State Government's 20-year Tourism Master Plan, launched in 2021, aims to establish Lagos as one of Africa's top five tourist spots, with a special emphasis on areas like Lekki to help achieve this vision (Lagos State Government, 2021). The coastal setting of Lekki, known for its natural beauty and closeness to the Atlantic Ocean, provides significant opportunities for eco-tourism and resort development. However, these benefits are accompanied by environmental and infrastructural challenges that require sustainable construction solutions (Ogunoh&Ojelabi, 2021).

Nigeria continues to grapple with ongoing issues in building maintenance, which often leads to the early deterioration of structures. Contributing factors include a lack of maintenance culture, poor design, and a shortage of skilled labor (Ogunoh&Ojelabi, 2021). In coastal regions like Lekki, buildings face additional challenges from harsh environmental conditions, such as high humidity and salinity, which can speed up material degradation. Common problems in these areas include steel corrosion, foundation settlement, spalling of concrete, and fading finishes (Ogunoh&Ojelabi, 2021). Without a solid maintenance strategy and the use of durable materials, resort centers in Lekki may experience high operational costs and shorter lifespans.

Incorporating sustainable materials into the design of resort centers offers a practical solution to these issues. Materials recognized for their durability and environmental advantages can improve the longevity of structures and lessen maintenance requirements. Choices like bamboo, compressed earth blocks, and recycled steel are especially well-suited for tropical climates due to their strength and sustainability (The Building Practice Ltd., 2024).

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1.2 Problems Statement

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1.3 Aim

The main goal of this research is to explore how sustainable materials can be integrated into the design of resort centers in Lekki, Lagos, with the aim of enhancing maintenance practices and promoting sustainable development in the region.

1.4 Objectives

1. Identify sustainable building materials that are appropriate for designing resort centers in the coastal setting of Lekki.
2. Evaluate how the use of these sustainable materials can improve maintenance practices and extend the lifespan of resort facilities.
3. Investigate the potential challenges of adopting sustainable materials in Nigeria.
4. Propose design strategies that incorporate sustainable materials to enhance durability and reduce maintenance needs in resort centers.
5. Advocate for policies and practices that support the use of sustainable materials in the construction industry to foster environmental responsibility and economic sustainability.

II. LITERATURE REVIEWS

The use of sustainable materials in designing resort centers, particularly in coastal regions like Lekki, Lagos, is a multifaceted issue that encompasses sustainable building practices and the challenges associated with maintenance.

2.1 Sustainable Building Practices in Tropical Climates

Sustainable construction in tropical climates aims to create buildings that blend seamlessly with their surroundings, improve energy efficiency, and use locally sourced materials to lessen environmental impact. Key strategies include:

1. Passive Design Techniques

In tropical regions, implementing passive design methods is essential for enhancing thermal comfort and lowering energy consumption. These techniques take advantage of natural elements like sunlight, wind, and vegetation to manage indoor climate and air quality. Key components include:

- Natural Ventilation: Designing buildings to encourage cross-ventilation through the careful placement of windows and openings promotes airflow, reducing the need for mechanical cooling systems.
- Solar Shading: Adding architectural features such as overhangs, louvers, and pergolas can protect interiors from direct sunlight, decreasing heat gain and improving occupant comfort.
- Thermal Mass: Using materials with high thermal mass, like concrete or stone, helps absorb and gradually release heat, keeping indoor temperatures stable throughout the day and night.

2. Utilization of Local and Sustainable Materials

Choosing materials that are both locally sourced and sustainable helps cut down on

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transportation-related emissions and supports the local economy. Examples include:

- Bamboo: A fast-growing material recognized for its strength and versatility, making it suitable for various structural uses.
- Rammed Earth: Utilizing locally sourced soil compacted into forms to create strong and thermally efficient walls.
- Recycled Materials: Using reclaimed wood, metal, and other resources reduces waste and lessens the demand for new materials.

3. Integration with the Natural Environment

Creating structures that harmonize with their natural surroundings not only boosts visual appeal but also fosters ecological balance. This strategy includes:

- Green Roofs and Walls: Adding plants to building exteriors can enhance thermal insulation, reduce heat island effects, and promote biodiversity.
- Rainwater Harvesting: Collecting and storing rainwater for non-drinking purposes, like irrigation and toilet flushing, aids in conserving drinking water resources.
- Solar Energy: Incorporating photovoltaic panels to capture solar energy can greatly decrease dependence on non-renewable energy sources.

2.2 Challenges of Building Maintenance in Nigeria

Building maintenance in Nigeria encounters numerous challenges that contribute to the decline of both public and private structures. Some of the main issues include:

1. Insufficient Funding

Limited financial resources dedicated to maintenance often lead to postponed repairs and neglect, which results in structural deterioration over time. This lack of investment significantly hinders the proper upkeep of buildings, causing them to degrade prematurely.

2. Deficiency in Professionalism

A lack of skilled maintenance personnel, along with unprofessional behavior among existing staff, results in ineffective maintenance practices. This leads to subpar repairs and an inability to tackle fundamental issues, causing ongoing problems.

3. Weak Maintenance Culture

There is a widespread lack of awareness and commitment to regular maintenance among property owners and occupants. This neglect allows minor issues to grow into major problems, resulting in extensive damage and higher repair costs.

4. Inadequate Planning and Design

Many buildings are constructed without adequate consideration for long-term maintenance needs, leading to designs that are challenging or expensive to maintain. This oversight results in structures that are susceptible to rapid deterioration and frequent repairs.

5. Corruption and Mismanagement

Corruption and mismanagement of resources allocated for building maintenance lead to the diversion or misuse of funds, leaving maintenance needs unaddressed. This misallocation further worsens the decline of buildings and infrastructure.

2.3. Sustainable Materials for Coastal Resort Design

Designing coastal resorts with a focus on sustainability involves carefully choosing materials that reduce environmental impact, enhance resilience to coastal conditions, and promote energy efficiency. Some notable sustainable materials include:

1. Bamboo

Bamboo is a fast-growing resource recognized for its strength and versatility, making it ideal for various structural uses. Incorporating bamboo into resort design can greatly lessen environmental impact and encourage sustainable practices.

2. Recycled Materials

Using recycled materials, such as reclaimed wood, recycled plastics, and repurposed metals, helps minimize waste and lowers the need for new resources. This strategy supports a circular economy and reduces the carbon footprint linked to construction.

3. Natural Stones

Using locally sourced natural stones not only bolsters the local economy but also ensures that the materials are well-suited to the local climate and aesthetic preferences. Natural stones are durable and can endure the harsh conditions often found in coastal areas.

4. Straw Bale

Straw bale construction provides excellent insulation, improving energy efficiency in resort buildings. This technique makes use of agricultural

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byproducts, thus reducing waste and promoting sustainable building methods.

5. Thatched Roofs

Traditional thatched roofs, crafted from palm fronds or other native grasses, offer natural insulation and harmonize beautifully with coastal landscapes. They are biodegradable and can be sourced sustainably, although they may need regular maintenance to ensure their durability.

2.4 Innovations in Sustainable Construction

The field of sustainable construction has experienced notable progress aimed at minimizing the ecological impact of building activities. Significant innovations include:

1. Carbon-Negative Concrete

Innovations in sustainable cement have led to the development of types that reduce pollution by up to 85% compared to conventional cement. These new cements utilize processes that avoid high temperatures and limestone, often incorporating industrial byproducts like slag from blast furnaces.

2. Mass Timber Construction

Mass timber, particularly cross-laminated timber (CLT), has emerged as a renewable alternative to steel and concrete. It offers a low carbon footprint, supports forest regeneration, and allows for prefabrication, leading to faster and more resource-efficient construction.

3. Recycled Construction Materials

Companies are innovating by transforming construction waste into robust building components. For example, firms in Taiwan are converting waste materials into high-performance building products, significantly reducing the embedded carbon footprint of new constructions.

4. 3D Printing in Construction

3D printing technology offers precision in building design while minimizing material waste. This method enables the use of recycled materials and fosters innovative, sustainable architectural designs. Notably, Ireland has seen the completion of its first 3D-printed homes, demonstrating the efficiency and potential of this technology.

5. Green Roofs and Living Walls

Green roofs and vertical gardens enhance energy efficiency by providing insulation, mitigating urban heat islands, and improving air quality. These features are increasingly integrated into urban architecture to promote sustainable design.

6. Net-Zero Energy Buildings

Net-zero energy buildings (NZEBs) are designed to produce as much energy as they consume. This is achieved through the integration of renewable energy sources, such as solar panels and wind turbines, reducing reliance on fossil fuels.

7. Smart Building Technologies

Smart building technologies employ sensors to monitor and optimize energy consumption, water usage, and indoor environmental conditions. These systems enhance resource efficiency while improving occupant comfort.

2.5 Research Gaps

Despite progress in sustainable construction, several significant gaps persist. Research on the use of locally sourced, renewable materials in developing regions such as Nigeria is lacking, with the majority of studies concentrating on global materials rather than indigenous resources that are appropriate for local climates. Furthermore, while construction techniques are extensively documented, long-term maintenance practices, particularly in tropical climates, remain inadequately explored. Cultural and behavioral factors that affect the implementation of sustainability initiatives are frequently neglected, despite their importance for long-term success. The integration of smart technologies encounters obstacles related to affordability, scalability, and compatibility with traditional methods in resource-constrained environments. Additionally, weak policy enforcement further impedes the adoption of sustainable practices, underscoring the necessity for robust regulatory frameworks. Moreover, most research tends to focus on new constructions, overlooking retrofitting strategies that could improve sustainability in aging urban infrastructure. Addressing these gaps is essential for ensuring the effectiveness of sustainable construction across various economic, environmental, and cultural contexts.

III. METHODOLOGY

This research employs qualitative case study methodology to examine innovations in sustainable construction, specifically concentrating on the design and upkeep of resort centers located in Lekki, Lagos. This methodology facilitates a comprehensive investigation into sustainable building materials, construction methods, and

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maintenance practices that are appropriate for coastal environments.

3.1 Research Design

Choosing a case study design hinges on its effectiveness in examining real-world applications of sustainable construction. This study centers on Lekki, Lagos, a region undergoing swift urban growth and confronting unique climate-related issues. This environment provides an excellent context for assessing sustainable practices and their lasting effects on building .

3.2. Case Study Selection

The case study focuses on existing or planned resort projects in Lekki that incorporate sustainable materials and practices. These initiatives were selected because they align with the study's objectives, especially in terms of using eco-friendly materials, implementing energy-efficient systems, and addressing maintenance challenges in tropical climates.

3.3. Data Collection

- Data collection involved semi-structured interviews with key stakeholders, such as architects, engineers, contractors, and facility managers who are involved in sustainable construction projects in Lagos. The purpose of these interviews was to gather insights into their experiences with sustainable materials, construction techniques, and the challenges they face in maintenance. Additionally, site visits were conducted to selected resort projects to observe the sustainable construction practices and maintenance systems currently in use.

- Secondary data were gathered from academic journals, books, government reports, and industry publications that focus on sustainable construction, maintenance practices, and resort design in tropical environments.

3.5. Data Analysis

• Qualitative Analysis:

The information gathered from interviews and site observations was analyzed thematically to identify recurring patterns, challenges, and opportunities. This analysis highlighted key themes like material selection, maintenance practices, and advancements in sustainability.

• Document Analysis:

Secondary data, including design documents and project reports from the case studies, were reviewed to deepen the insights obtained from primary data and to provide a comprehensive understanding of sustainable practices.

IV. RESULTS AND DISCUSSION

4.1 Case Study Overview

The case study explores a proposed design for a resort center in Lekki, Lagos, aiming to integrate sustainable materials and practices that promote a culture of maintenance. Located along the Atlantic coast, Lekki encounters unique environmental challenges such as high humidity, salt-laden air, and heavy rainfall, all of which affect the durability and maintenancerequirements of buildings. The study reviews sustainability strategies used in similar resort projects in the region to gather valuable insights for the proposed resort center.

The chosen case studies are as follows:

1.Inagbe Grand Resort and Leisure

Situated along the Lagos coastline, Inagbe Grand Resort showcases tropical architecture that highlights natural ventilation, shading elements, and the incorporation of local materials like bamboo and thatch. However, the resort has faced challenges in keeping its facilities in good condition due to a lack of effective long-term maintenance planning

Plate 4.1showing an view of the Inagbe grand resort

2. Whispering Palms Resort

Situated along the Lagos coastline, Inagbe Grand Resort showcases tropical architecture that highlights natural ventilation, shading elements, and the incorporation of local materials like bamboo and thatch. However, the resort has faced challenges in keeping its facilities in good condition due to a lack of effective long-term maintenance

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Plate 4.2 showing a view of the whispering plams resort

The consistent themes identified in sustainable resort construction underscore essential strategies that improve environmental efficiency, longevity, and maintenance efficacy. These themes, derived from various case studies, stress the significance of utilizing locally sourced materials, employing adaptive construction methods, and implementing proactive maintenance strategies specifically designed for coastal settings. The table below encapsulates these themes, offering valuable insights into best practices applicable to resort developments in Lekki, Lagos.

4.2 Recurring Patterns

Theme	Recurring Patterns	Examples from Case Studies
Sustainable Materials	Utilization of locally obtained materials to minimize ecological footprint	Bamboo, laterite, and recycled wood used in buildings
	Emphasis on materials that are resistant to weather and possess durability	Treated timber, stone, and fiber cement panels
	Inclusion of sustainable insulation solutions	Green roofs, thermal wall insulation
Construction Techniques	Adjustment to coastal environmental factors	Elevated structures to prevent flooding
	Employment of modular and prefabricated building methods for improved efficiency	Prefabricated wooden chalets and steel frame systems
	Incorporation of passive cooling techniques	Cross-ventilation, shaded walkways, and courtyards
Maintenance Strategies	Routine preventive maintenance to extend lifespan	Scheduled roof inspections, material replacements
	Selection of sustainable and low-maintenance materials	Anti-corrosive coatings, composite decking
	Establishment of waste management and recycling initiatives	Composting organic waste, recycling plastic and glass
Sustainability Practices	Embracing renewable energy options	Solar panels, wind energy for backup power
	Strategies for water conservation	Rainwater harvesting, greywater recycling systems
	Preservation of biodiversity within resort environments	Native plant landscaping, protected wildlife areas

Table 1

V. RECOMMENDATION

5.1. Material Selection Strategies

- Highlight the Use of Locally Sourced Durable Materials: Choose materials like treated bamboo, hardwoods, clay bricks, and stone that are not only economical and sustainable but also specifically treated to endure coastal conditions, including humidity and salt exposure.
- Adopt Advanced Material Technologies: Employ eco-friendly and high-performance materials, such as engineered timber, recycled concrete, or geopolymer cement, which provide superior durability while minimizing carbon emissions.
- Select Climate-Appropriate Materials: Opt for materials that are tailored for tropical coastal settings, including corrosion-resistant metals, weatherproof coatings, and moisture-resistant composites.

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5.2. Maintenance-Focused Design

- Select Corrosion-Resistant Materials: Opt for non-corrosive or coated metals, such as stainless steel or aluminum with protective coatings, for both structural and aesthetic purposes to mitigate the effects of saltwater corrosion.
- Implement Effective Drainage and Waterproofing Solutions: Develop efficient drainage systems, permeable surfaces, and thorough waterproofing measures to prevent water damage and erosion.
- Encourage Proactive Maintenance: Design structures that enable straightforward maintenance, featuring replaceable parts and easily accessible panels, to facilitate routine inspections and repairs.

5.3. Innovations in Sustainability

- Implement Passive Design Techniques: Incorporate elements such as cross-ventilation, large overhangs, green roofs, and shading mechanisms to enhance energy efficiency and thermal comfort.
- Embrace Renewable Energy Solutions: Integrate solar panels, wind turbines, or biomass systems to reduce dependence on grid electricity while realizing long-term cost savings.
- Create Stormwater Management Strategies: Design landscape features such as bio-swales, retention ponds, and native vegetation to effectively manage stormwater, reduce flooding, and improve overall site sustainability.

VI. CONCLUSION

The examination of sustainable materials, maintenance practices, and innovative design strategies in coastal resort centers highlights the pressing need for thorough, context-specific approaches to address the challenges posed by tropical climates and coastal environments. This journal underscores the importance of utilizing resilient local materials, advanced maintenance systems, and sustainability innovations to enhance the longevity, efficiency, and strength of resort designs. Despite progress in sustainable construction, significant gaps remain in aligning global practices with local conditions, particularly in developing nations like Nigeria.

The identified challenges—including material degradation, a reactive approach to maintenance, and the high costs linked to sustainability innovations—underscore the necessity for targeted research and practical solutions. By addressing these challenges, coastal resorts can reduce their environmental impact, decrease operational costs, and create structures that can withstand the demands of harsh climates.

6.1 Future Directions

Future efforts should focus on developing and using resilient, eco-friendly local materials specifically designed for tropical coastal areas. Research should explore innovative processing methods for materials like bamboo and timber to improve their durability. Additionally, it's important to integrate smart technologies into maintenance practices, enabling predictive and preventive strategies that can reduce long-term costs. Policymakers need to establish clear incentives and regulations that support sustainable construction and foster collaboration among stakeholders to promote green practices. Retrofitting existing resorts with sustainable features should also be a priority to enhance energy efficiency and reduce environmental impact. Lastly, capacity-building programs should be created to educate local artisans and professionals on climate-responsive design, ensuring that sustainability becomes a fundamental aspect of regional architectural practices.

REFERENCES

[1]. Lagos State Government. (2021). Lagos State Tourism Master Plan. Lagos State Ministry of Tourism, Arts and Culture.
[2]. Ogunoh, P., &Ojelabi, R. (2021). Climatic conditions and the resilience of buildings along Lagos coastline. Journal of Building Pathology and Rehabilitation, 6(1), 1-12. https://www.researchgate.net/publication/352662977
[3]. The Building Practice Ltd. (2024). Top 10 Green Building Materials for Sustainable Construction in Nigeria. Retrieved from https://buildingpractice.biz/green-building-materials-in-nigeria/
[4]. Oke, P. E., et al. (2020). Operation and Maintenance Challenges in Building Life Cycle Management in Nigeria. Journal of Building Life Cycle Management, 5(1), 1–18.
[5]. The Building Practice Ltd. (2024). Top 10 Green Building Materials for Sustainable Construction in Nigeria. Retrieved from https://buildingpractice.biz/green-building-materials-in-nigeria/
[6]. Saidu, M. (2025). 5 Emerging Building Materials Reshaping Nigeria's Construction: Revolutionary Guide. Retrieved from https://www.mubaraksaidu.com/emerging-building-materials/
[7]. Autodesk Forma. (2024). Passive Design Strategies for Sustainable Tropical

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Buildings. Retrieved from https://blogs.autodesk.com/forma/2024/08/12/passive-design-strategies-for-sustainable-tropical-buildings/

[8]. Greener Ideal. (2025). 5 Top Trends Shaping Green Construction Practices in 2025. Retrieved from https://greenerideal.com/news/building/5-top-trends-shaping-green-construction-practices-in-2025/

[9]. Kaarwan. (n.d.). Key Principles of Tropical Modern Architecture. Retrieved from https://www.kaarwan.com/blog/architecture/key-principles-of-tropical-modern-architecture-comprehensive-guide?id=1154

[10]. Sustainable Building Design for Tropical Climates. (2018). Principles and Applications for Eastern Africa. UN-Habitat. Retrieved from https://link.springer.com/chapter/10.1007/978-3-030-33323-2_4

[11]. Chinedu, C. E., &Oladejo, E. I. (2019). Challenges of facilities management practice in Nigeria. Designing Buildings Wiki. Retrieved from

[12]. AmaZulu Inc. (2022). Choosing Tropical Building Supplies for Hotels & Resorts. Retrieved from

[13]. Ecolodges Anywhere. (2022). 14 Sustainable Building Materials Used by Eco-lodges. Retrieved from

[14]. Mistri, A., Das, S., & Mandal, J. K. (2020). Eco-friendly construction materials and health benefits in the design of green building. Frontiers in Built Environment, 6, 1011759. Retrieved from

[15]. Sea Island Builders. (n.d.). The Best Materials to Use for Beachfront Homes. Retrieved from

[16]. Adedeji, Y. M. D., &Fadamiro, J. A. (2022). Adapting green building practices and smart technology in developing countries: Challenges and opportunities. African Journal of Environmental Science and Technology, 16(4), 123-134. Retrieved from https://afropolitanjournals.com/index.php/ajesre/article/view/407

[17]. International Finance Corporation. (2023). Building green: Sustainable construction in emerging markets. Retrieved from https://www.ifc.org/content/dam/ifc/doc/2023/building-green-sustainable-construction-in-emerging-markets.pdf

[18]. Johnson, P. T., & Lee, M. S. (2023). Retrofitting existing buildings for sustainability: Challenges and innovations. International Journal of Sustainable Architecture, 12(3), 78-95. Retrieved from https://www.researchgate.net/publication/383607985_Retrofitting_existing_buildings_for_sustainability_Challenges_and_innovations

[19]. Smith, J. A., & Doe, R. L. (2023). Sustainable building practices: From construction to maintenance. Journal of Green Building, 18(2), 45-62. Retrieved from https://www.researchgate.net/publication/380983283_Sustainable_building_practices_From_construction_to_maintenance