Online at: https://researchtrendsjournal.com **ISSN No:** 2584-282X

INTERNATIONAL JOURNAL OF TRENDS IN EMERGING RESEARCH AND DEVELOPMENT

Volume 2; Issue 6; 2024; Page No. 72-76

(Special Issue)
"National Conference on Design Futures 2024"

How does the application of laterite stone in architectural design enhance user positivity and create uplifting environments?

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DOI: https://doi.org/10.5281/zenodo.14593550

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Abstract

Incorporating natural materials into architectural design has gained significant traction for its ability to transform spaces and improve user experiences (1). Among these materials, laterite stone stands out for its unique combination of aesthetic appeal and functional benefits. This research examines the role of laterite stone in shaping user perceptions of positivity and creating uplifting environments. With its warm, earthy tones and textured surface, laterite stone offers a natural connection that enhances the ambiance of residential and commercial spaces. This study adopts a mixed-method approach, combining surveys and case studies to evaluate how laterite stone impacts mood, comfort, and the overall atmosphere of a space. Findings reveal that the material significantly contributes to a sense of warmth and calm while fostering a welcoming environment (2). Its sustainable and eco-friendly attributes further amplify its positive reception, aligning with contemporary trends in environmentally conscious design.

By providing insights into the application of laterite stone in architectural projects, this research aims to guide designers and architects in leveraging natural materials to create spaces that are visually appealing, emotionally uplifting, and environmentally harmonious. This paper underscores the importance of thoughtful material selection in enhancing spatial experiences and promoting positivity in built environments.

Keywords: Sustainability, natural materials, architectural design, positivity, laterite stone

Introduction

Natural materials like laterite stone are gaining attention in architecture for their sustainability, aesthetic appeal, and thermal efficiency. Valued for its durability and ability to regulate indoor temperatures, laterite is increasingly used to create positive, eco-friendly environments. Research highlights how such materials enhance both the functionality and emotional experience of spaces. This study explores how laterite stone contributes to uplifting, sustainable architectural designs that foster user positivity and well-being

Materials and Methods Case study

St. Gerge Orthodox Church, Chalakkudy, Kerala

The St. George Orthodox Church in Chalakkudy, Kerala, is a significant example of how laterite stone has been used effectively in architectural restoration and design. The church, which traces its origins back to 1615, had suffered extensive damage over time due to neglect and encroachment. However, a major restoration project led by His Holiness Moran Mar Baselious Marthoma Paulose II focused on preserving the church's historical essence while incorporating contemporary design elements.

Laterite stone plays a key role in this restoration, being used in the construction of walls, facades, and the iconic dome. Its rich texture and local availability make it an ideal choice for the project. The use of laterite, along with earth blocks for features like the altar's "cross of light," emphasizes sustainability and regional materiality, showcasing a fusion of traditional architecture with modern techniques.

Additionally, the church's design features symbolic Eastern Christian elements, such as domes, vaults, and arches,

which are incorporated using locally sourced materials like laterite. This enhances both the spiritual and aesthetic experience, creating a sense of timelessness in the church's ambiance. The project is a remarkable example of integrating ecological and cultural heritage through sustainable materials.

Fig 1: St. Gerge Orthodox Church, Chalakkudy, Kerala

The Centre for Development Studies (CDS) in Trivandrum: The Centre for Development Studies (CDS) in Trivandrum, designed by the renowned architect Laurie Baker, serves as an exemplary case of sustainable architecture. The building utilizes laterite stone extensively, an indigenous material that is both environmentally friendly and cost-effective. This material is incorporated into the CDS building in the form of exposed brick and masonry, which are used for both structural and aesthetic purposes.

Laterite stone is particularly beneficial in the tropical climate of Kerala, as it naturally helps regulate the temperature within the building by providing thermal insulation. The porous nature of laterite stone allows for passive ventilation, thereby reducing the need for artificial cooling systems and making the building more energy-efficient. This aligns with Baker's philosophy of using locally available materials that cater to the region's specific needs, ensuring sustainability and reducing construction costs.

In terms of design, the CDS building is laid out with multiple blocks, arranged to follow the contours of the land. This not only minimizes the impact on the natural environment but also maximizes natural light and airflow within the building. The layout allows for open spaces that foster collaboration and interaction among the building's users. This design reflects Laurie Baker's approach to architecture, where functionality, sustainability, and aesthetics come together seamlessly.

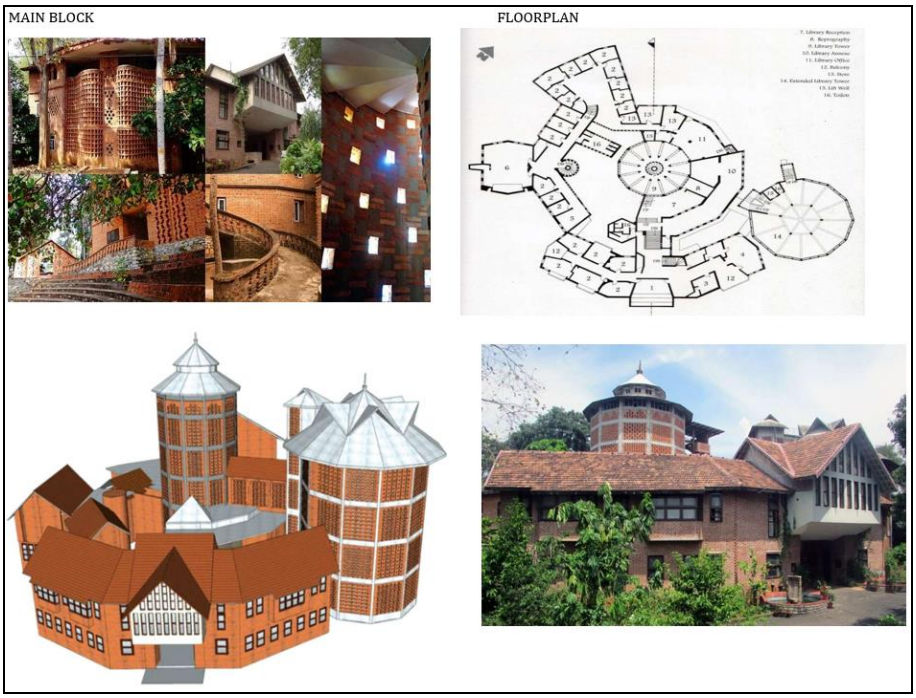


Fig 2: The Centre for Development Studies (CDS) in Trivandrum

Kochi-Muziris Biennale Pavilion, Kochi, Kerala

The Kochi-Muziris Biennale Pavilion in Kochi, Kerala, is a prominent example of integrating laterite stone into contemporary architectural design. Designed by Bijoy Jain of Studio Mumbai, this pavilion is part of the renowned international art exhibition held every two years. The design philosophy revolves around creating a space that blends seamlessly with its natural surroundings while also accommodating modern artistic displays.

Laterite stone was used in this pavilion for its aesthetic, functional, and sustainable qualities. The pavilion's construction involves walls made from laterite stone, which provides natural cooling due to the material's high thermal mass. In the hot and humid climate of Kerala, this stone helps regulate the interior temperature, reducing the need for air conditioning. The stone's porous texture also promotes natural ventilation, ensuring that the space remains comfortable for both visitors and artists.

Additionally, the use of laterite stone adds to the visual appeal of the pavilion, with its earthy tone and textured surface reflecting the local vernacular architecture. The pavilion stands as an excellent example of how traditional materials like laterite stone can be used in modern architectural design to create a functional, sustainable, and aesthetically pleasing space for cultural exhibitions.

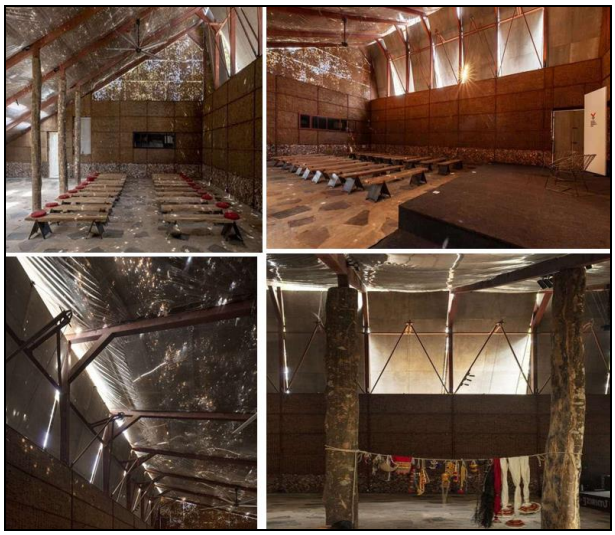


Fig 3: The Kochi-Muziris Biennale Pavilion in Kochi

Literature Review (The Role of Laterite Stone in Sustainable Architecture: A Review of Aesthetic, Functional, and Environmental Benefits)

Sustainability and Durability

Laterite stone is an eco-friendly material due to its low environmental impact during extraction and processing. Its use contributes to sustainable construction practices. It's durable, making it suitable for a wide range of applications in tropical climates where it naturally helps regulate temperature (Somashekar *et al*., 2013; Agarwal *et al*., 2015).

Thermal and Energy Efficiency

Laterite's ability to naturally regulate indoor temperatures has been well-documented. Somashekar *et al*. (2013) found that laterite's high thermal mass helps maintain a balanced indoor climate, reducing the need for mechanical cooling systems. This characteristic not only enhances energy efficiency but also improves the overall comfort of indoor environments.

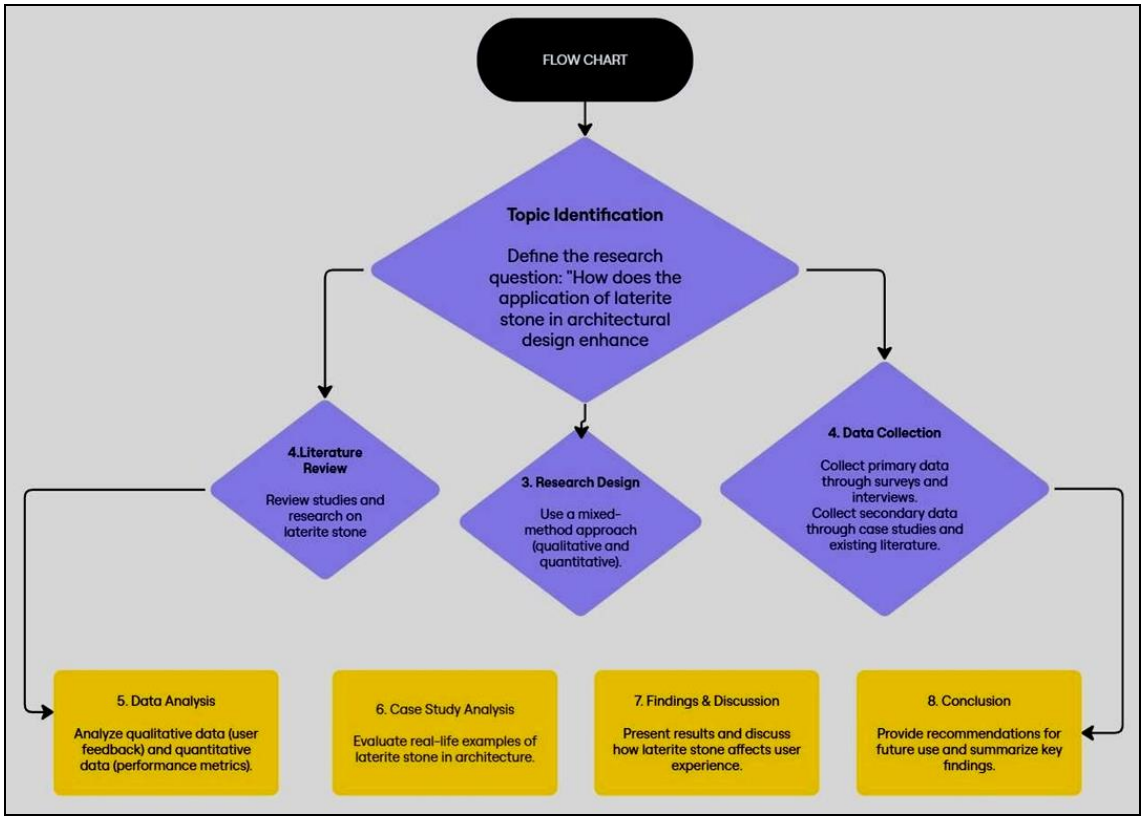
Aesthetic Value and Psychological

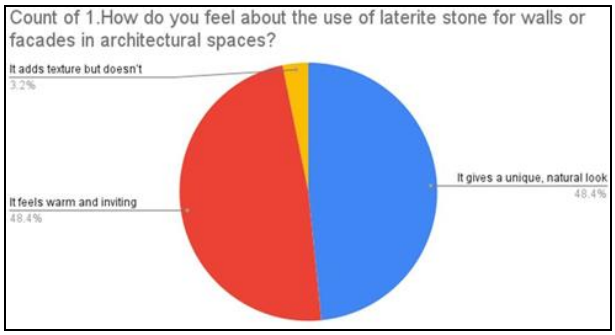
Impact: The visual appeal of laterite stone is another crucial factor. Its warm reddish-brown hue creates a comforting and welcoming atmosphere, which has a positive psychological impact on building occupants. Memon *et al*. (2020) discuss how natural materials like laterite positively influence mood and well-being by creating spaces that evoke warmth and calmness.

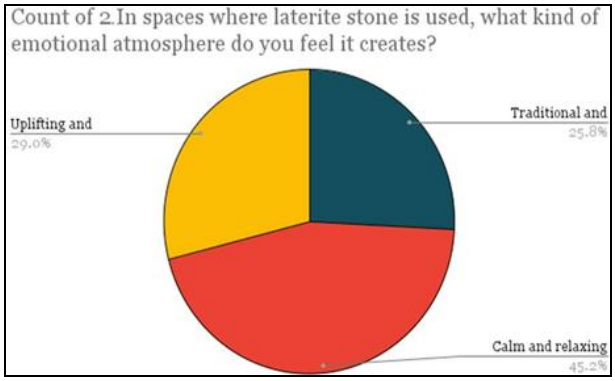
Biophilic Design and User Well-Being

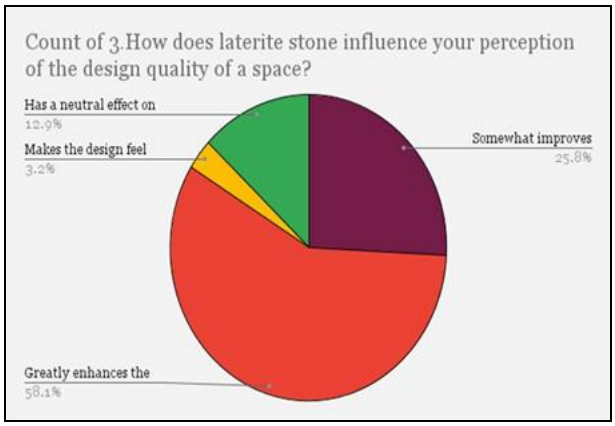
The concept of biophilic design, which integrates natural elements to foster a connection with nature, has gained prominence in architecture. Laterite, as a natural material, aligns with this approach, contributing to both the aesthetic and emotional well-being of occupants. Browning *et al*. (2014) and Khamrui & Roy (2014) emphasize that natural materials, including laterite, can enhance creativity, reduce stress, and improve cognitive function in indoor environments.

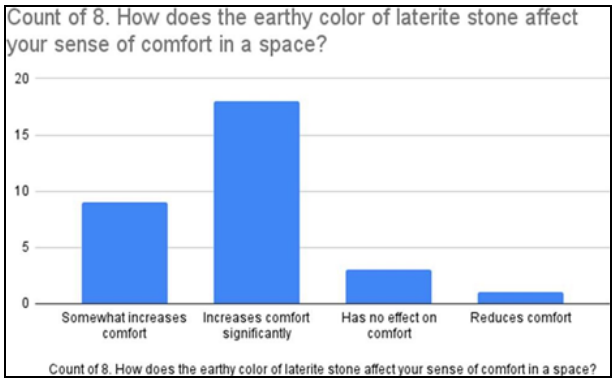
Local Sourcing and Low Carbon Footprint: Laterite stone is often sourced locally, minimizing transportation-related emissions and making it an attractive choice for sustainable architecture. Khamrui & Roy (2014) underline that its use reduces environmental impact and supports local economies.











Results

The findings from case studies, surveys, and literature show that laterite stone enhances architectural design in several key ways:

1. **Aesthetic Appeal:** Laterite stone adds natural warmth, texture, and visual appeal, creating a positive and inviting atmosphere.
2. **Sustainability:** Its eco-friendly properties contribute to energy efficiency and sustainable design practices.
3. **Design Versatility:** Suitable for both traditional and modern spaces, laterite stone can fit various architectural styles.
4. **Challenges:** Issues like rough texture and dark tones can be managed with thoughtful integration of lighting and complementary materials.

Discussion

1. **User Experience:** Laterite stone positively influences emotional well-being by creating a warm and calming environment.
2. **Functionality and Aesthetics:** It blends aesthetic appeal with practical benefits, enhancing both design quality and sustainability.
3. **Practical Solutions:** Combining laterite with modern materials addresses challenges like texture and lighting.
4. **Cultural Relevance:** Laterite stone effectively connects regional heritage with contemporary architectural needs

Conclusion

This research highlights the significant role of laterite stone in architectural design, particularly in enhancing user positivity and creating uplifting environments. The findings reveal that laterite stone's aesthetic qualities, sustainability, and versatility make it a valuable material for both traditional and modern spaces. Its ability to foster emotional connections and provide a calming, natural atmosphere contributes to an overall positive user experience. However, challenges such as its rough texture and dark tones can be addressed through strategic design and complementary materials. The integration of laterite stone in architecture not only supports sustainable design practices but also enhances spatial quality, making it a promising material for future design innovations. This study underscores the importance of materials like laterite stone in shaping environments that promote well-being, comfort, and positivity, providing valuable insights for architects and designers aiming to create meaningful, user-centered spaces.

References

1. Baker L. Architecture of Laurie Baker: A sense of place. New Delhi: Vikas Publishing House; 2002.
2. Briggs GG, Freeman RK, Yaffe SJ. Drugs in pregnancy and lactation: a reference guide to fetal and neonatal risk. 9th ed. Baltimore: Williams & Wilkins; 2011.
3. Ravindra PK. Laterite: The stone that built Kerala. Thiruvananthapuram: Kerala State Science & Technology Museum; 2008.
4. Ramesh B, Rao AS. Sustainability of laterite stone in modern architecture: A review of case studies. J Green Build. 2017;12(3):43-58.
5. Sengupta S, Ranjan S. The role of local materials in sustainable design: Laterite stone as a building material in tropical climates. J Arch Urbanism. 2020;25-39.
6. Koodaaram Kochi Muziris Pavilion: Anagram Architects [Internet]. ArchDaily. Available from: https://www.archdaily.com/921181/koodaaram-kochi-muziris-pavilion-anagram-architects
7. Benny Kuriakose [Internet]. Available from: https://www.bennykuriakose.com
8. Wallmakers [Internet]. Available from: https://www.wallmakers.org

9. Harvard GSD [Internet]. Available from: https://gsd.harvard.edu
10. Kuriakose B. Laurie Baker: The unseen side of the Gandhi of architecture [Internet]. Benny Kuriakose Design Blog. Available from: https://www.bennykuriakose.com/post/laurie-baker-the-unseen-side-of-the-gandhi-of-architecture
11. St George Orthodox Church: Wallmakers [Internet]. ArchDaily. Available from: https://www.archdaily.com/959657/st-george-orthodox-church-wallmakers
12. Jain R. Sustainable architecture: The role of natural materials in contemporary design. Green Press; 2017.
13. Ramesh K, *et al*. Laterite stone in modern architecture: A study on sustainability and aesthetic appeal. J Sustain Design. 2020;12(4):45-60.
14. Singh A, Nair P. Challenges in the application of laterite stone in tropical architecture. Int J Build Mater Res. 2018;9(2):33-49.
15. RoofandFloor. Tracing our history: The palatial mansions of Chettinad [Internet]. The Hindu Real Estate Blog. Available from: https://roofandfloor.thehindu.com/real-estate-blog/palatial-mansions-of-chettinad/
16. Kuriakose B. The timeless charm of laterite stone in Kerala architecture [Internet]. Benny Kuriakose Design Blog. Available from: https://www.bennykuriakose.com/