ISSN: 3107-6513

Evaluating Ceramic and Porcelain Finishes as Cost-Effective Alternatives to Recurrent Painting in Public Buildings in Akwa Ibom State

Udohaya, Emedung, Ph.D
Dept. of Fine and Applied Arts Ritman University, Ikot Ekpene, Akwa Ibom state.
kedianabasikam@gmail.com
Phone: +2348037766977

Abstract— Public buildings in Akwa Ibom State, Nigeria, experience persistent challenges related to the durability and aesthetic performance of interior and exterior wall finishes. Architectural painting remains the dominant finishing method due to its low initial cost and ease of application; however, its vulnerability to humidity, environmental exposure, and surface wear necessitates frequent renewal. These repeated repainting cycles generate ongoing financial burdens and operational disruptions for public institutions. Globally, ceramic and porcelain tile finishes are recognized for their durability and resistance to moisture, yet their suitability and long-term economic viability within Nigeria's public-sector building context remain insufficiently explored. This study presents an interdisciplinary assessment of ceramic and porcelain finishes as alternatives to conventional paint systems, incorporating life-cycle cost analysis, material performance characteristics, maintenance requirements, and sustainability considerations. Drawing on empirical cost data from Nigerian construction markets, life-cycle assessment studies, and building maintenance literature, the findings indicate that high-quality ceramic and porcelain finishes can surpass recurrent painting in long-term cost efficiency and durability, particularly within humid tropical environments such as Akwa Ibom State.

Keywords— Ceramic; Porcelain Finishes; Painting; Public Buildings; Akwa Ibom State

I. Introduction

Public buildings across Nigeria—including government offices, educational institutions, and community facilities in Akwa Ibom State—commonly rely on architectural paint as the primary surface finish for walls and façades. Painting is widely adopted because of its relatively low upfront cost, ease of installation, and aesthetic flexibility. However, in tropical climates characterized by high humidity, heavy rainfall, and intense solar exposure, painted surfaces are prone to rapid deterioration manifested through fading, peeling, chalking, and biological growth. As a result, repainting is often required every two to five years, depending on paint quality and exposure conditions (Aluko, 2021).

These frequent maintenance cycles place significant strain on public-sector budgets, require repeated labor allocation, and disrupt the use of facilities. Within the context of constrained public finances and administrative inefficiencies, identifying more durable and cost-efficient surface finishing solutions has become increasingly important.

Ceramic and porcelain tiles have gained international recognition as resilient architectural finishes due to their hardness, low moisture absorption, and extended service life relative to organic coating systems such as paint (Tilemountain, 2025). Porcelain, a refined category of ceramic fired at higher temperatures, exhibits superior density and mechanical strength, making it particularly suitable for demanding environments. While tiles are commonly used for floors and wet areas in Nigeria, their broader application as wall finishes in public buildings has not been sufficiently examined in academic research, especially within humid tropical regions such as Akwa Ibom State.

This study therefore evaluates the cost-effectiveness and sustainability of ceramic and porcelain finishes as alternatives to recurrent painting in public buildings. The key research questions addressed are:

- How do the initial and long-term costs of ceramic and porcelain finishes compare with conventional paint systems in Nigeria?
- How do durability and maintenance requirements differ between these materials?
- What are the implications for long-term cost efficiency, sustainability, and building performance?

ISSN: **3107-6513**

II. LITERATURE REVIEW

A. Surface Finishing in Building Construction

Surface finishes play a critical role in determining both the visual quality and performance of buildings, particularly in public infrastructure. Conventional paint systems provide surface protection and color but are highly susceptible to environmental degradation. Studies conducted within Nigerian climatic zones indicate that exterior paint coatings typically exhibit a service life of approximately two to three years before significant deterioration necessitates repainting (Aluko, 2021). This short lifespan leads to frequent maintenance interventions and recurring expenditure.

By contrast, ceramic and porcelain tiles are inorganic materials produced through high-temperature firing, resulting in greater hardness, chemical stability, and resistance to moisture. These properties significantly reduce surface degradation and the frequency of maintenance when compared with paint systems (Tilemountain, 2025). Consequently, reduced maintenance demand is a major factor influencing their performance in life-cycle cost assessments.

B. Material Costs in the Nigerian Construction Market

An evaluation of cost-effectiveness requires an understanding of prevailing material prices within the Nigerian construction industry. Market surveys indicate substantial variation in tile pricing based on quality, size, and origin.

Ceramic tiles in Nigeria commonly range between approximately ₦1,500 and ₦10,000 per square meter, while porcelain tiles typically fall between ₦3,000 and ₦38,000 per square meter, with premium imported products occupying the upper price range. In contrast, high-quality exterior architectural paints may cost approximately ₦2,000–₦5,000 per 20-litre container; however, these coatings require reapplication at regular intervals (Aluko, 2021).

Although tile finishes involve higher initial material costs compared to a single painting cycle, these figures must be assessed within a broader life-cycle framework that accounts for service life and maintenance frequency.

C. Durability and Maintenance

Porcelain tiles are produced at higher firing temperatures than standard ceramic tiles, resulting in dense microstructures with water absorption rates typically below 0.5%. This characteristic enhances resistance to staining, moisture ingress, and biological growth. Conventional ceramic tiles may exhibit higher water absorption levels, often exceeding 3%, depending on formulation and firing conditions.

Figure 1 & 2: Church Building using marble-porcelain finishing

Paint systems, by comparison, are more vulnerable to ultraviolet exposure, moisture penetration, and surface abrasion, leading to frequent maintenance requirements. Industry reports suggest that while tiles incur higher upfront costs, their service life commonly exceeds 10 years, whereas paint finishes in exposed conditions often require renewal every 2–5 years (Tilemountain, 2025).

D. Life-Cycle and Sustainability Considerations

Life-cycle analysis (LCA) provides a framework for evaluating materials based on total environmental and economic impacts over their lifespan, including production, installation, maintenance, and end-of-life stages. Comparative studies indicate that ceramic finishes, despite higher embodied energy during manufacture, often result in lower lifetime maintenance costs and reduced material replacement frequency compared with painted systems (Surgelas et al., 2010).

Additional research highlights that finishing material choices significantly influence a building's water footprint, resource consumption, and long-term sustainability performance. Durable materials such as ceramic tiles can therefore contribute to improved environmental outcomes over extended service periods (Abd El-Hameed et al., 2017).

 ISSN: 3107-6513

III. METHODOLOGY

This study employs a comparative life-cycle cost analysis approach, synthesizing Nigerian market price data, documented service life estimates, and maintenance requirements to evaluate total ownership costs for paint and ceramic/porcelain finishes over a 15–20 year planning horizon, consistent with public infrastructure asset management practices. Cost components include material procurement, installation, routine maintenance, and replacement cycles. Qualitative performance indicators—such as aesthetic durability, weather resistance, and sustainability implications—are integrated through contextual analysis and existing literature.

IV. RESULTS AND DISCUSSION

A. Initial Cost Comparison

Initial material costs indicate that painting remains the least expensive option per square meter. However, this assessment excludes primers, multiple coats, and labor costs, all of which are typically required in practice. Ceramic and porcelain finishes demonstrate higher initial costs, particularly at mid- to high-quality levels, but offer extended service life.

B. Maintenance and Service Life

Evidence suggests that exterior paint systems in Nigeria often require full refurbishment every two to three years. Over a 15-year period, this may result in five to seven repainting cycles, substantially increasing cumulative maintenance expenditure. In contrast, ceramic and porcelain finishes generally maintain structural and aesthetic integrity for 10–20 years with minimal intervention, aside from routine cleaning and occasional grout maintenance.

C. Life-Cycle Cost Assessment

When cumulative costs are considered, ceramic and porcelain finishes often demonstrate superior economic performance:

- Paint systems exhibit low initial costs but high cumulative expenses due to frequent maintenance.
- Tile finishes involve higher initial investment but reduced maintenance cycles, resulting in comparable or lower total costs over extended periods.

These findings are consistent with previous life-cycle assessments that identify ceramic finishes as cost-efficient solutions over long-term planning horizons (Surgelas et al., 2010).

D. Sustainability and Environmental Performance

From a sustainability perspective, materials with extended service life and reduced maintenance requirements generally perform more favorably. Paint systems often involve repeated applications, solvent use, and volatile organic compound emissions. Tile finishes, by reducing repainting frequency, may therefore contribute to lower cumulative environmental impacts over a building's lifespan.

V. ILLUSTRATIVE CASE EXAMPLE: PUBLIC SCHOOL IN UYO

Consider a public school building in Uyo requiring exterior wall finishing. If repainting is necessary every three years at an estimated cost of ₦1,200 per square meter per cycle, total repainting costs over 15 years exceed ₦6,000 per square meter. In contrast, installing porcelain wall tiles at an initial cost of approximately ₦5,000 per square meter, coupled with minimal maintenance, results in lower total ownership costs when evaluated over the same period.

VI. CONCLUSION

This study assessed ceramic and porcelain finishes as alternatives to recurrent painting for public buildings in Akwa Ibom State. The findings indicate that:

- **Initial Cost:** Tile finishes involve higher upfront investment than paint.
- **Durability:** Ceramic and porcelain finishes exhibit superior resistance to moisture, staining, and environmental degradation.
- **Life-Cycle Cost:** Over 15–20 years, tile finishes often prove more economical due to reduced maintenance frequency.
- **Sustainability:** Longer service life and fewer replacement cycles contribute to improved environmental performance.

Based on these findings, public-sector building policy and practice in Akwa Ibom State should consider the strategic adoption of ceramic and porcelain finishes in public infrastructure projects where durability, cost efficiency, and long-term sustainability are prioritized.

References

[1] O. O., Aluko. Life Span Prediction of Façade Paint Coatings in Public Residential Buildings in Transitional Climatic Zone of Nigeria. Civil and Environmental Research Journal. Vol. 13 Issue 2, 2021.

[2] F. M. A., Surgelas, G. F., Marques, & Rodrigues, C. D. S. Life cycle analysis of ceramic versus painting materials applied to external walls. *International journal for housing science and its application*. Vol. 34, Issue 1, pp37-46, 2010

[3] Tilemountain. (2025). Porcelain vs Ceramic Tiles: Key Differences, Durability, Cost, and Best Uses.

ISSN: **3107-6513**

Available at www.tilemountain.co.uk/blog/porcelain-vs-ceramic/

[4] Market data on Nigerian tile prices . Available at www.tilesng.com/index.php/price-of-tiles-in-nigeria/