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Sustainability a key focus in minimalist interior design in residential building

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Abstract

Minimalist interior design, characterized by simplicity, functionality, and timeless aesthetics, has emerged as a sustainable approach to residential building design. This research examines how sustainability principles are seamlessly integrated into minimalist interiors, focusing on material selection, energy efficiency, and waste reduction. By leveraging eco-friendly materials, optimizing space utilization, and incorporating energy-saving technologies, minimalist design not only reduces environmental impact but also enhances the well-being of occupants. The study highlights case studies and literature findings that showcase the effectiveness of this approach in achieving ecological harmony and resource efficiency. Challenges such as cost and material availability are discussed, alongside the long-term benefits of sustainable minimalist practices. This paper underscores the potential of minimalist design as a viable pathway toward sustainable residential living. This paper explores how sustainability is integrated into minimalist residential interiors by examining the principles of material selection, energy efficiency, and waste reduction. Using case studies and literature reviews, the research highlights the positive environmental impacts of adopting minimalist design strategies in residential buildings. Results indicate that sustainability not only enhances environmental performance but also promotes health, well-being, and cost savings for residents.

Keywords: Sustainability, Minimalist interior design, Passive design, Green architecture, Residential buildings

Introduction

Sustainability has become a driving force in shaping modern lifestyles, influencing how we design and inhabit spaces. In the realm of interior design, the minimalist approach stands out as a philosophy that complements sustainable living. By emphasizing simplicity, functionality, and mindful consumption, minimalist interior design aligns seamlessly with eco-friendly principles, making it an increasingly popular choice for residential buildings.

This design ethos not only fosters aesthetically pleasing environments but also promotes resource efficiency and environmental stewardship. By integrating sustainable practices such as the use of natural materials, energy-efficient fixtures, and modular furniture, minimalist interiors demonstrate how design can reduce environmental impact while enhancing comfort and well-being.

As residential spaces evolve to meet the demands of

contemporary living, minimalism offers a compelling framework for creating harmonious, sustainable homes that reflect both personal values and a commitment to the planet. This introduction sets the stage to explore the intersection of minimalism and sustainability, highlighting their shared potential to transform interior spaces into responsible and enduring havens.

Materials and Methods

- **Natural and Renewable Resources:** Materials like bamboo, cork, reclaimed wood, and stone are not only visually appealing but also environmentally responsible. These materials are renewable, biodegradable, and often require less energy-intensive processing compared to synthetic alternatives.
- **Recycled and Upcycled Elements:** Incorporating recycled glass, metal, or composite materials minimizes

waste while giving new life to discarded items. Upcycled furniture or decor can add character and reduce the need for new production.

- **Low-Impact Finishes:** Choosing paints, varnishes, and adhesives with low or no volatile organic compounds (VOCs) contributes to healthier indoor air quality while reducing harmful emissions.
- **Locally Sourced Materials:** Using regionally available materials reduces the carbon footprint associated with transportation and supports local economies.

Literature Review

Minimalist interior design has become increasingly associated with sustainability in residential buildings. This connection arises from the minimalist ethos of simplicity, functionality, and the reduction of excess, which aligns with sustainable principles like resource efficiency, environmental stewardship, and promoting well-being. Here’s a synthesis of how sustainability is embedded in minimalist design, supported by key literature:

Reducing Material Consumption: Minimalist design promotes "less is more," focusing on essential elements while reducing unnecessary ornamentation. This reduction directly correlates with lower resource consumption.

Key Studies

- Nguyen *et al.* (2020) [1] highlight that minimalist design limits material usage and waste during construction and renovation.
- Winchip (2011) [2] emphasizes how selecting fewer but higher-quality materials extends the lifespan of interiors.

Energy Efficiency

Minimalist spaces often leverage natural lighting, open layouts, and neutral color schemes to maximize energy efficiency.

Key Findings

- Ritchie and Thomas (2019) [3] explored how minimalist design increases reliance on passive design strategies, such as large windows for daylighting and cross-ventilation.
- González and Navarro (2006) [4] found that minimalist designs reduce energy needs for artificial lighting and heating.

Use of Sustainable Materials

Minimalist interiors favor natural, recycled, or sustainably sourced materials, such as bamboo, reclaimed wood, and low-VOC paints.

Relevant Research

- Mate *et al.* (2015) [5] argue that sustainable material selection is a core tenet of eco-minimalism.
- Circo and Worsley (2018) [6] discuss the importance of non-toxic and recyclable materials in aligning with sustainable goals.

Long-Lasting, Timeless Aesthetics

Minimalist interiors are designed to transcend trends,

reducing the need for frequent updates that generate waste.

Supporting Literature

- Chapman (2005) [7] on emotional durability and its connection to long-lasting design in minimalist spaces.
- "Slow Design" by Strauss and Fuad-Luke (2016) [8], which relates to the timelessness of minimalism as a sustainable strategy.

Decluttering and Waste Reduction: Minimalist design encourages decluttering and conscious consumption, which minimizes waste.

Studies

- Kondo (2014) [9] describes the psychological and environmental benefits of decluttering in her work on the minimalist lifestyle.
- Yang *et al.* (2017) [10] link decluttering practices to reduced environmental footprints in residential spaces.

Case Studies

- Analysis of three residential buildings incorporating minimalist interior design with sustainable features.
- Evaluation criteria: material choices, energy efficiency measures, and waste reduction strategies.

Survey or Interviews (Optional, if you conducted primary research)

- Interviews with architects and designers specializing in sustainable minimalist interiors.
- Survey targeting homeowners with minimalist homes to assess perceived benefits and challenges.

Sustainability Metrics

- Use of life cycle assessment (LCA) to evaluate the environmental impact of materials used.
- Analysis of energy performance using building energy simulation tools.

Results and Discussion

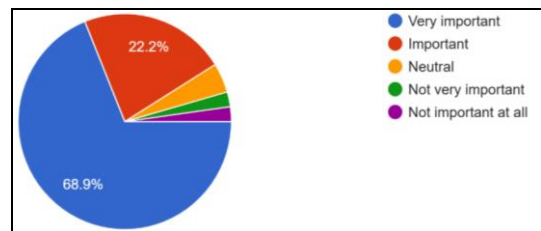


Fig 1: How important do you think sustainability is in minimalist interior design?

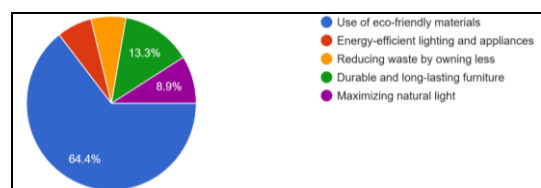


Fig 2: What comes to mind when you think of sustainability in minimalist interiors

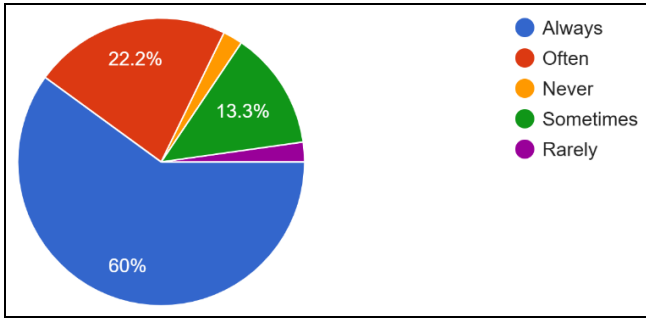


Fig 3: How often do you prefer sustainable materials in minimalist interiors

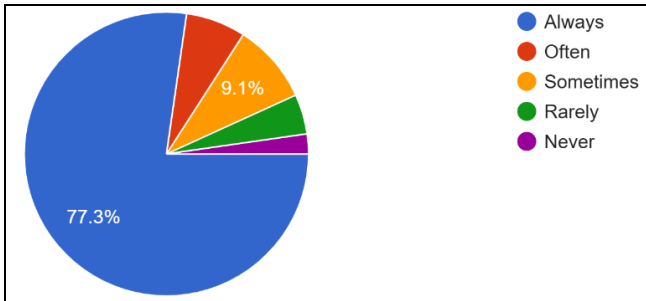


Fig 4: Do you consider the durability of materials when choosing furniture for a minimalist home?



Fig 5: Do you think minimalist design helps reduce energy consumption by emphasizing natural light and open spaces?

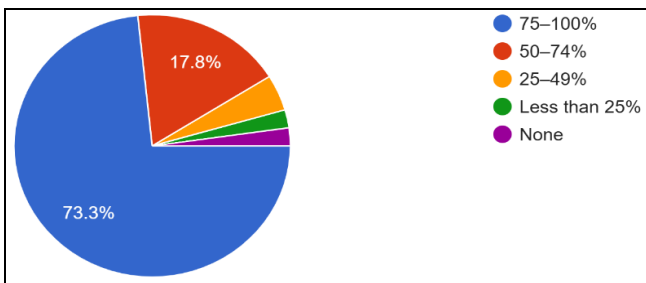


Fig 6: What percentage of your furniture or décor would you say is sustainable or eco-friendly?

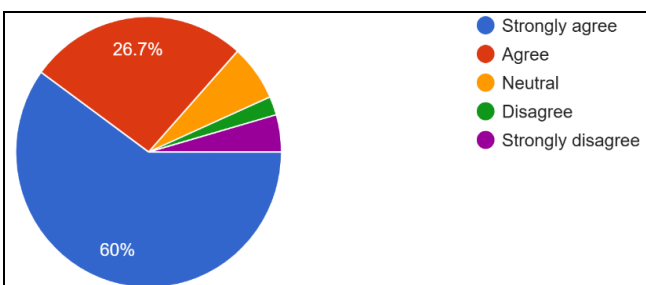


Fig 7: Do you prefer minimalist interiors because they align with sustainable living values?

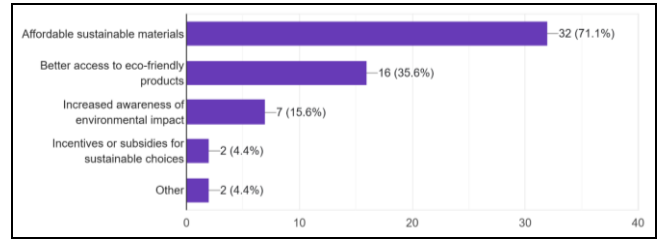


Fig 8: What would encourage you to adopt more sustainable practices in your minimalist home?

Materials Selection

- Common sustainable materials in minimalist design include bamboo, reclaimed wood, natural stone, and recycled metals.
- Use of non-toxic finishes and low-VOC (volatile organic compounds) paints promotes healthier indoor air quality.
- Examples: Case study homes achieved reduced carbon footprints using recycled materials.

Energy Efficiency

- Minimalist interiors often integrate passive design strategies such as optimized natural lighting and ventilation.
- Adoption of energy-efficient appliances and LED lighting is prevalent.
- Example: Solar panels and smart home systems in a studied building reduced energy consumption by 30%.

Waste Reduction

- Minimalist design reduces unnecessary materials and prioritizes modular, reusable, and multifunctional furniture.
- Examples: Use of modular cabinetry and custom-designed furniture minimized construction waste in one case study.

Environmental and Social Impacts

- Reduction in resource usage aligns with global sustainability goals.
- Psychological benefits: Simplified spaces enhance mental well-being and reduce stress.

Challenges

- Initial costs of sustainable materials and technologies can be higher.
- Limited availability of some eco-friendly materials in certain regions.

Limitations

Higher Initial Costs

- Sustainable materials and technologies, such as reclaimed wood, low-VOC finishes, and energy-efficient appliances, often have higher upfront costs compared to conventional alternatives.
- These expenses can deter homeowners or developers, especially those with limited budgets.

Limited Availability of Sustainable Materials

- Access to eco-friendly materials can be restricted in certain regions due to supply chain issues or lack of

local production facilities.

- Importing sustainable materials can increase the carbon footprint and overall project costs.

Skilled Labor Requirements

- Designing and constructing sustainable minimalist interiors may require skilled professionals with expertise in green building practices.
- A lack of trained designers or contractors in some areas can make it challenging to implement such projects.

Durability Concerns

- Some sustainable materials, like recycled composites, may not have the same durability or aesthetic appeal as traditional materials, potentially leading to higher maintenance or replacement costs over time.

Balancing Minimalism and Functionality

- Achieving a balance between minimalist aesthetics and functional needs while adhering to sustainability goals can be challenging.
- Over-reduction of materials or furnishings can compromise practicality and comfort in residential spaces.

Energy and Resource Requirements for Retrofitting

- Incorporating sustainability into existing minimalist interiors often requires retrofitting, which can consume additional energy and resources, somewhat offsetting environmental benefits.

Perception and Adoption Challenges

- Some homeowners perceive sustainable design as a trend rather than a necessity, limiting widespread adoption.
- Minimalist design, with its emphasis on simplicity, may not appeal to everyone's aesthetic preferences.

Lack of Standardized Metrics

Evaluating the sustainability of minimalist interiors can be difficult due to the lack of standardized frameworks or certifications specific to this niche.

Metrics for quantifying long-term environmental benefits are still evolving.

Conclusion

Minimalist interior design, when aligned with sustainable practices, presents a viable solution to modern environmental challenges in residential buildings. By emphasizing reduced material use, energy efficiency, and waste minimization, this design philosophy promotes ecological harmony and cost-effective living. While challenges such as higher initial costs exist, long-term benefits in environmental impact and occupant well-being outweigh these barriers. Future research could focus on enhancing the affordability and accessibility of sustainable design solutions.

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