

Aesthetic Analysis Of Sustainable Design Principles in Modern Residential **Interiors**

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Abstract. This study aims to analyze the application of sustainable principles in modern residential interior design and focuses on aesthetic aspects. With increasing attention to environmental sustainability issues, interior design plays an important role in reducing environmental impacts through the selection of environmentally friendly materials, efficient energy use, and space optimization. However, the aesthetic aspect cannot be separated from design, because it plays a role in creating visual comfort and occupant well-being. This study uses a qualitative descriptive method with an interdisciplinary approach, which includes literature reviews, design analysis, and case studies on several interior projects that have successfully combined sustainable and aesthetic principles. The results of the study show that interior design that considers sustainability not only focuses on energy efficiency and the selection of environmentally friendly materials, but also integrates aesthetic elements that enhance the comfort of the space. These findings emphasize the importance of public and designer awareness in creating functional, environmentally friendly, and aesthetic spaces. This study is expected to provide theoretical and practical contributions to the development of interior design that supports sustainability without sacrificing the aesthetic quality and comfort of the space.

Keywords: Interior design, Sustainability, Aesthetics, Residential, Eco-friendly materials.

1. INTRODUCTION

In recent years, the issue of sustainability has become an urgent global concern due to various environmental problems, such as climate change, ecosystem damage and overexploitation of natural resources. Interior design, as one of the elements of human life, has a significant role in supporting the principle of sustainability through the selection of environmentally friendly materials, efficient energy management, and optimization of space functions (Harahap et al., 2024). The application of ecological and efficient materials has been proven to reduce the ecological footprint without sacrificing the aesthetic quality of the design.

However, sustainability in interior design cannot be separated from aesthetic value. Aesthetics plays an important role in creating visual comfort while improving the psychological and emotional well-being of space users. A study states that interior design elements, such as lines, patterns, and material selection, have a significant effect on social interaction and user well-being (Viver, 2024). Design that pays attention to aesthetic aspects can improve quality of life and mental well-being (Hanurawan, 2024). Harmonious interior design between sustainability and aesthetic aspects not only functions technically, but also has a positive impact on social and psychological aspects (Widyakusuma, 2020).

This study aims to analyze the application of sustainable design principles to the interior of modern homes with an emphasis on aesthetic aspects. Based on observations and analysis of several homes that apply sustainable principles, it was found that the interior design used not only focuses on energy efficiency and the selection of environmentally friendly materials, but also combines aesthetic elements that increase the comfort of its occupants.

The background of this research is based on the urgent need for environmentally friendly, aesthetic, and meaningful interior design solutions. In the modern era, designers are faced with the challenge of creating spaces that are functional, artistic, and support the balance between humans, the environment, and technology. Studies on the application of design concepts such as Scandinavian show that a simple and functional approach can increase productivity as well as the comfort of space users. (Putra, 2024). This approach reinforces the idea that aesthetic design does not always have to be excessive, but is able to meet the needs of the space more wisely.

This study uses a qualitative method with an interdisciplinary approach, including literature review, design analysis, and case studies on interior projects that successfully combine sustainability and aesthetics. The results of this study are expected to provide theoretical and practical contributions for designers, academics, and interior design practitioners in understanding the importance of residential interior design in the modern era that continues to develop by combining sustainability principles without sacrificing aesthetic quality. These findings are in line with the increasing public awareness of the importance of sustainability and well-being in everyday life, as well as the need to create spaces that can provide visual and emotional comfort for their occupants.

2. LITERATURE REVIEW

Sustainable Design

Sustainable design not only focuses on environmental aspects, but also considers its impact on the economy and society (McLennan, 2004). In interior design, the principle of sustainability is applied to create spaces that are efficient, environmentally friendly, and aesthetically pleasing. This theory emphasizes the integration of sustainable practices into design, such as the use of eco-friendly materials, energy efficiency, and responsible resource management.

According to (Dipraja & Hidayati, 2023) the main principles of sustainable design include reducing carbon footprints, using recyclable materials, and creating durable spaces with

minimal environmental impact. In interior design, these principles can be applied in several ways to promote sustainability while ensuring functionality and aesthetics.

The connection between humans and nature suggests that integrating natural elements into interior design, such as plants and natural lighting, can significantly enhance quality of life and strengthen the emotional bond between people and their surrounding environment (Kusumarini, 2003). Ecological approach emphasizes the importance of a mutually beneficial relationship between humans and the environment. In the context of interior design, an eco-friendly interior design focuses on achieving a balance between human needs and the sustainability of ecosystems (Hendrassukma, 2011). The approach you're referring to focuses on sustainable materials that not only have a lower environmental impact but also support overall sustainability by considering the entire life cycle of the product and its effects on the ecosystem.

Aesthetics and Function in Interior Design

Aesthetic interior design is designed to influence the feelings and experiences of users, creating an atmosphere that supports their psychological health. A pleasant aesthetic experience can improve quality of life and emotional well-being (Rubiyanti, 2023). Aesthetic theory in interior design emphasizes the importance of creating visually beautiful and comfortable spaces (Sofiana, 2015).

Good interior design combines harmonious visual elements with the function of the space, so that it is not only visually appealing but also provides comfort for its occupants. How human interaction with space can produce a deep aesthetic experience, which ultimately improves the quality of life (Pinem, 2024)Aesthetics and function combine elements of beauty and utility in interior design (Jonatan et al., 2022). In the context of sustainability, efficient and functional design can reduce resource waste, while still creating aesthetic and comfortable spaces for occupants.

3. METHODS

The research method used in this study is a qualitative descriptive method. Qualitative research is conducted by collecting data, facts, and information, which are then explained or described. After that, the data is analyzed using certain techniques scientifically, and finally an interpretation is given to the results of the analysis (Suwendra, 2018). Qualitative methods were chosen because of their in-depth and flexible nature, allowing researchers to explore complex design elements and the subjective nuances that emerge within the space.

This study adopts three main approaches in its methodology, namely literature review, design analysis, and case study. Each of these approaches provides important contributions to data collection and the formation of deeper findings regarding the application of sustainable interior design in residential interior design.

Literature Review: Reviews theories and research related to sustainable interior design and aesthetics, with a focus on sustainable design theory, aesthetics, and spatial sustainability, which form the conceptual basis of the relationship between sustainability and aesthetics in residential interior design.

Design Analysis: Analyzes design elements such as materials, lighting, spatial layout, and color and texture selection, to support the principles of sustainability and aesthetics, with attention to energy efficiency and the use of environmentally friendly materials.

Case Study of Interior Projects: Involves case studies of interior projects that successfully combine sustainability and aesthetics and draws conclusions.

4. RESULTS

This study focuses on the analysis of the application of sustainable design principles in the interior design of modern homes, with an emphasis on aesthetic aspects. Based on the design results of homes that carry sustainable designs, it was found that interior designs that combine the principles of sustainability and aesthetics create spaces that are not only functional, but also comfortable and attractive.

The main findings in this study are as follows:

Selection that Supports Sustainability and Aesthetics

The results of the interior design analyzed prefer the use of natural and environmentally friendly materials, such as recycled wood, solid wood and natural stone. In addition, it also utilizes durable materials such as hollow iron with natural motif coating and glass, thus reducing the need for maintenance and replacement of materials in the long term, supporting the principle of sustainability.



Figure 1. Scheme of materials used

The use of environmentally friendly materials such as processed wood, solid wood, stone and other composite materials (see figure 1) can provide benefits in terms of the environment, health and comfort of the occupants. According to (Syahriyah, 2017) *Green Material* has a broader meaning than just environmentally friendly materials. In general, environmentally friendly materials refer to the material product itself, namely materials that when used and disposed of do not have the potential to damage the environment or endanger health.

One of the important things in building an environmentally friendly building is the selection of materials. The materials used must be environmentally friendly. The concept of environmentally friendly materials aims to reduce energy use, such as electricity, and support efficient development in energy consumption (Nurhakim et al., 2024). According to A. Chamilou et al. (2019) in (Al Mohgny & Raidi, 2024), Aesthetic harmony includes a coordinated balance between visual elements, including materials, to create an attractive and aesthetic space.

Space-Maximizing Design

Modern residential interior design tends to emphasize efficient use of space. Open space planning and the use of minimalist furniture allow for spaces that feel more spacious and comfortable. Sustainable buildings must prioritize the environment and energy efficiency, while still considering the comfort of their occupants (Permana et al., 2024). This efficient use of space also supports sustainability by reducing material and energy consumption.



Figure 2. Floor Plan and Section of Interior Design of a Residential House

In the picture above there is a house with a building area of approximately 132m2, there is a front area in the form of a garden, terrace, living room, 3 bedrooms, family room, kitchen, bathroom and back area. The layout is changed to maximize open space so that it can create lighting and ventilation that is more optimal and healthy for the occupants of the house. Changes to the house design that are made take into account the structural aspects, so as to provide full freedom in the placement of open space to maximize the lighting and ventilation aspects, the design is carried out based on the applicable building area (Diandra et al., 2020). There are various ways to utilize natural lighting from sunlight, which not only aims to add aesthetic value, but also functions as an important element to support indoor activities. (Honggowidjaja, 2003).

Aesthetics of Space in Natural Lighting and Ventilation

Modern residential designs generally maximize natural lighting with large windows and good ventilation. This reduces dependence on electric lights and air conditioning, while providing better air quality for occupants. Natural lighting also enhances the aesthetic elements, creating a bright and refreshing atmosphere inside the home. (Jannah, 2022).



Figure 3. Results of residential interior design

Figure 3 shows a space that is designed to create natural lighting and ventilation that has been optimized by having wide windows as a path for natural lighting and ventilation in the space. According to (Simbolon & Nasution, 2017) The orientation of the building needs to be adjusted to the design objectives and lighting needs of each space. This takes into account the different amounts, qualities, and characteristics of light based on the direction the light enters. The main goal of natural lighting is to provide quality and efficient light while reducing the risk of direct glare, excessive reflections, and too striking differences in brightness levels.

A house has a very important role, so it is necessary to create a comfortable atmosphere for its occupants. One form of comfort is thermal comfort, which is related to the ventilation system in the house (Andriawan, 2021). Natural ventilation is often associated with design elements such as vents, windows, and louvers. In today's design, these elements can be designed to be functional and aesthetically pleasing. For example: Window Design: Large windows or cross-ventilation can help improve air circulation, while adding beauty to the interior space. Natural ventilation acts as a means for air circulation in the room. By continuously bringing in fresh air, natural ventilation helps maintain the coolness of the air in the room while renewing the air quality (Afgani, 2023). Windows designed to maximize airflow and natural light can also be decorative elements that enhance the character of a room. Ventilation Materials: The use of environmentally friendly materials, such as recycled wood or metal, on ventilation grilles or lines can align the ventilation function with aesthetic value and sustainability principles.

A good ventilation system can create a healthier interior space. Smoothly flowing air can reduce excess humidity that can trigger the growth of mold or bacteria. In addition, the presence of fresh air that is continuously renewed also provides thermal comfort and supports the quality of life of the occupants. (Nugraha, 2019).

5. DISCUSSION

Modern residential interior design can successfully combine the principles of sustainability and aesthetics, resulting in spaces that are not only functional and efficient, but also aesthetic and comfortable. According to (Ardyan et al., 2023) The use of environmentally friendly materials and energy-saving technologies applied in residential interior design shows that sustainability does not need to sacrifice visual quality and spatial comfort.

However, the challenge in combining sustainability and aesthetics is to create a design that remains visually appealing without neglecting the principles of sustainability. Some designs may face difficulties in selecting materials that are aesthetically pleasing yet environmentally friendly or integrating effective technology without compromising the aesthetic value of the space (Kerdiati & Darmastuti, 2023). Therefore, it is important for designers to consider the balance between aesthetic and functional elements in the design process. On the other hand, although many houses have successfully integrated the principles of sustainability and aesthetics, this study also shows that public awareness of the importance of sustainable design still needs to be improved. In the future, it is hoped that more houses in the modern era can adopt this design principle to create spaces that not only support environmental sustainability but also improve the quality of life of their residents aesthetically and emotionally (Lidinillah, 2024). This research makes an important contribution to understanding how sustainable design principles can be practically applied in residential interiors, while highlighting the importance of sustainability awareness in modern design.

6. CONCLUSION

This study concludes that modern residential interior design that combines sustainability and aesthetic principles can create functional, comfortable, and environmentally friendly spaces. The selection of environmentally friendly materials, the use of efficient technology, and the optimization of space and natural lighting support sustainability without sacrificing aesthetics. However, the main challenge lies in the balance between the two, such as choosing aesthetic and environmentally friendly materials and integrating effective technology. Nevertheless, this design has great potential in creating spaces that support sustainability and improve the quality of life. This study also highlights the importance of public awareness in adopting sustainable design principles.

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