

# **Designing an Interior Residential House with an Ecological Concept Approach (Friendly Environment)**

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## **ABSTRACT**

The design of residential interiors with an ecological concept aims to create living spaces that are environmentally friendly, sustainable, and support the well-being of their occupants. This approach integrates ecological principles in material selection, space design, and green technology to minimize environmental impacts and optimize energy efficiency. The study examined strategies such as the use of recycled and natural materials, optimization of natural lighting and ventilation, and energy-saving technologies. Materials such as certified wood, bamboo, and VOC-free paint were selected to improve indoor air quality and sustainability (Digitalcommons@usu & Platt, 2007). The design of the space prioritizes natural lighting and air circulation through windows, skylights, and cross ventilation. Indoor plants and energy-efficient equipment such as LED lights are used to beautify the room and reduce energy consumption. Green technologies such as solar panels and rainwater collection systems are applied to reduce dependence on conventional resources. The design results show that the ecological concept in the interior of the house creates a healthier, more comfortable, and more sustainable environment.

## **KEYWORDS**

Interior design, residential, ecological concept, sustainability, green technology, energy efficiency.

## 1. INTRODUCTION

In this modern era, awareness of the importance of environmental preservation is increasing in various circles, including in the fields of architecture and interior design. Climate change, environmental degradation, and the reduction of natural resources encourage various parties to seek more environmentally friendly solutions. One solution that is currently developing rapidly is the application of the ecological concept in residential interior design. Designing a residence that is in harmony with nature not only aims to reduce the negative impact on the environment, but also to improve the quality of life of its occupants through a healthy and comfortable environment. Interior design with an ecological concept approach is a form of human response to environmental issues that increasingly require more attention every day. Eco-design, which is closely related to humans and space, is applied to environmentally friendly interiors or known as eco-interiors. Environmental responsibility in residential interior design can be achieved through:

1. Minimizing the impact on the natural environment through efficient planning themes.
2. Losses associated with the financial and visual impact of the interior of the built home are reduced.
3. Gain insight into the importance of indoor space and its impact on mental and physical relaxation. An environment aimed at eco-friendly interior design. (Varnam & Kodali, 2022)

In addition, eco-interiors can also create living spaces that are not only comfortable and aesthetic, but also sustainable and support environmental sustainability. This approach emphasizes the use of environmentally friendly materials, energy efficiency, good waste management, and the integration of natural elements into residential spaces. Sustainable interior design standards vary and there are several directions, all of which are necessary to find a way and achieve a sustainable interior environment. The use of raw materials must also be considered to overcome the problem of abundance of raw materials and ensure that raw materials are not exhausted. The manufacturing process must pay attention to quality issues and reduce toxic and pollution emissions (Alfuraty, 2020). Designers should pay more attention to the value of applying new materials and new technologies, not only to meet the environmental needs of residents, but also to improve the ecological architecture level of the indoor environment (Yan, 2022).

This study aims to explore the principles of interior design with an ecological concept approach and identify best practices that can be applied in residential design. Through this study, it is hoped that recommendations can be produced that are useful for designers, architects, and other stakeholders in creating residences that are not only functional and aesthetic, but also sustainable and environmentally friendly.

## 2. METHODOLOGY

The method of designing a residential interior with an ecological concept approach using an approach developed by Rosemary Kilmer is divided into two main stages: the analysis stage (programming) and the synthesis stage (designing). The stages in this design process include:

- a. Analysis (Programming)
  1. Commit (Accept the Problem)

The designer begins by deeply understanding the problem to be faced, then committing to solving it by establishing strategies and plans to deal with the problem according to the specified time.

2. State (define the Problem)

The designer compiles a checklist to identify all the needs and components needed to solve the problem. This stage is very important because it can affect the final result of the solution to the problem faced.

3. Collect (Gather the Facts)

The designer understands what problem he is facing and then seeks more in-depth information related to the problem, especially by conducting location surveys, user interviews and observations of the same location.

4. Analyze

The designer collects the information obtained, then identifies it according to the data needed and groups it into categories or graphs.

b. Synthesis (Designing)

1. Ideate

Ideas are developed to achieve design goals. The idea search process consists of two stages. First, the Drawing Phase stage, the designer creates a bubble diagram to describe the proportions of area size, circulation and space boundaries. Second, Concept Statement, the designer uses steps such as brainstorming and discussion to find ideas. Furthermore, the ideas are arranged in sentences that describe the main ideas by considering aspects of safety, comfort and aesthetics.

2. Choose (Select the Best Option)

At this stage, the designer uses personal judgment to choose the best option from various alternative ideas that have been created. The designer compares each option and decides on the choice that best suits the criteria and objectives of the problem at hand.

3. Implement (Take action)

The chosen idea is then presented in physical form such as images, renderings and presentations.

4. Evaluate (Critically Review)

The designer evaluates the success of the design in solving the problem by conducting self-analysis of the design that has been created and asking for opinions from others to get additional perspectives.

c. Feedback

1. Conducting an evaluation to assess each design stage. This step is useful for comparing the extent to which the design is in accordance with the implementation of the project in the field.

### **3. RESULTS AND DISCUSSION**

Minimalist Eco House is an interior design concept that focuses on the use of environmentally friendly materials and materials, as well as optimizing the use of existing natural resources that aim to reduce adverse impacts on the environment and improve the

quality of life (Li, n.d.). The minimalist style in this concept emphasizes simplicity and functionality. This style avoids excess decoration, excessive detail, and emphasizes simple and clean forms. Applying Vertical Garden to the rear dining room and many openings in this space creates an eco-friendly interior and saves the use of natural resources (Ismail & Senousy, 2023). The meaning of the concept of Green Architecture, or Green Building is a building planning approach that seeks to minimize various harmful effects on human health and the environment. As a basic understanding of sustainable green architecture, the interior of the building must have a landscape, interior, which must be attempted to be integrated into its architectural unity (O'reilly, 2018). In principle, the building is able to increase the efficiency of energy, water and material use and reduce the impact of the building on health through the layout, construction and maintenance of the building, which is the entire life cycle of the building. On a small scale, the concept of natural architecture usually focuses more on the use of locally available natural materials, or utilizing natural resources in the surrounding area. Designing an environmentally friendly home by specifically designing it by paying attention to environmental factors starting from its energy use, green environment, and other environmentally friendly aspects (Guner Aktas, n.d.). The house to be designed belongs to Mr. Aji Wiworo who lives at Jl. Sindoro II No. 22, Mojosongo RT.03/RW.32 with a size of 16.5m x 6m.

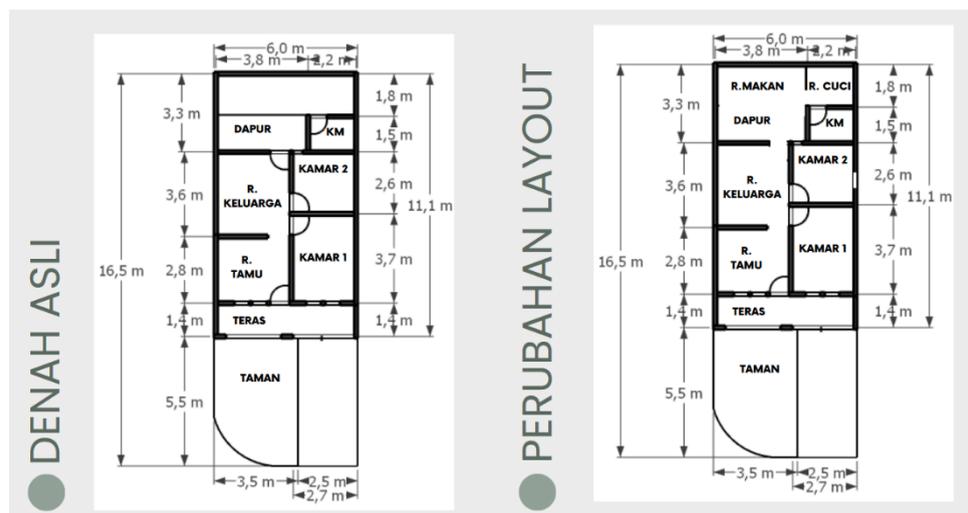


Figure 1. House Layout

In the layout, it can be seen that there are changes in the back, namely the addition of a laundry room and dining room. Changes in the layout of the building are needed so that there is harmonization between the needs of the user's space and the function of the space (Nyoman Santi Aprilia Saputri, n.d.). The problems in each room are as follows:

1. Kitchen: The room is used as a warehouse and there are no supporting facilities.
2. Family room: The room is used as a bedroom and lacks lighting.
3. Living room: Too much unused furniture. Lack of lighting and ventilation.
4. Bedroom: There are no furniture facilities in the room, so the room is not used as it should be. The humidity in this room is also quite high.

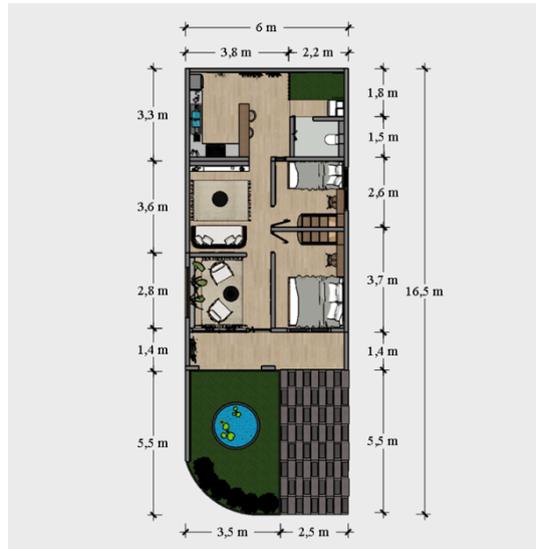


Figure 2. New Layout Design

New layout design is:

1. Living room

Creating a natural and refreshing atmosphere. Glass windows allow natural light into the room, making the living room look brighter and more spacious (Ummul Nafisah & Sri Haryanto, 2023). The use of natural light is very influential in the comfort of interior users (Altawell, 2012). Meanwhile, plants can provide an attractive green accent and improve indoor air quality. Glass windows can help optimize natural lighting in the room. Sunlight can increase the temperature of the room, so glass windows are designed with one-way glass to act as a light barrier that can withstand heat from sunlight. Calathea Luthea plants can help increase indoor air humidity and absorb air pollutants (Burchett et al., n.d.). Good air circulation can help maintain the health and comfort of the room's occupants. Make sure the room has sufficient ventilation and open the glass windows regularly to renew the air in the room. The main approach to improving indoor air quality is to provide adequate natural ventilation. In addition, by avoiding the use of harmful and volatile substances, you can create a healthier indoor environment (Naaz & Jain, 2024). Plants can also help regulate air circulation by providing oxygen and absorbing carbon dioxide. By increasing the number of openings in the living room, it will minimize the use of electrical energy used for lights or air conditioning in the room. Maximizing the use of natural light and circulation will also be healthier both psychologically and psychologically for the occupants of the building.



Figure 3. Living room design

## 2. Family room

The use of neutral colors on the walls, floors, and furniture makes the room look more spacious, clean, and well-organized. As a fundamental feature of interior design, the choice of color of a room is important because color plays an important role in the interaction between humans and their environment. It creates contrast, draws attention, and aids in object recognition and memory. Color conveys a message, focuses attention, and stimulates perception (Jaglarz, 2024). The use of furniture with a simple and functional design gives an elegant and modern minimalist impression. Sufficient light and simple accents such as ornamental plants and pillows provide a touch of warmth to a calm and orderly room. This family room gets air circulation from the middle area and the back area. In this room there are aloe vera plants that can absorb chemical pollution in the room found in cleaning materials and air fresheners. This room is equipped with a rattan sofa, carpet, round stooly table, and TV cabinet. The floor in this room uses vinyl with a wood grain motif. White walls and decorative figures to beautify the room. With the entry of lighting and ventilation from the back room and the front room opening, it will minimize the use of electrical energy used for lights or air conditioning in the room. By maximizing the use of natural light and circulation, it will also be healthier both psychologically and psychologically for the occupants of the building.



Figure 4. Family room design

### 3. Bedroom

The atmosphere created by a modern minimalist style room is a calm, comfortable, and elegant atmosphere. With the use of neutral white on the walls, floors, and furniture, the room looks more spacious, clean, and well-organized. The use of furniture with a simple and functional design gives an elegant and modern minimalist impression. The light from the lamps and windows produces quite bright light. Natural lighting in this room comes from the windows which produce sunlight in the morning and during the day, while at night using artificial lighting from the lamps. Ventilation in this room through natural ventilation from the windows and artificial ventilation from the use of air conditioning in the room. In this room there are pothos plants that can absorb toxins and provide oxygen. With the size of the room that is not large, in the morning and afternoon it does not require artificial lighting from lamps because natural light will enter through the opening windows so that it can save electricity.



Figure 5. Bedroom design

### 4. Kitchen

The use of vertical gardens on the walls in the dining room can provide a fresh, natural, and natural atmosphere. The presence of green plants can provide a sense of calm and relaxation to the occupants of the room, provide an interesting accent to the dining room, and make it look more attractive and different. The application of this vertical garden can make the dining atmosphere more comfortable and reduce stress on the occupants of the room. This kitchen has a skylight window at the top of the ceiling that functions as an intermediary for natural lighting so that it can enter the room more optimally. There is a vertical garden with dragon tree plants (purifying the air, maintaining rich humidity to maintain humidity, and containing antioxidant properties), kaempferia parviflora (reducing radiation, having a relaxing effect), aeschynanthus radicans, and Japanese grass (beautifying decoration). This space is equipped with a kitchen set that is integrated with a dining table, refrigerator, and rattan chairs. The floor in this room uses vinyl with a wood grain motif. The walls are white. This kitchen gets natural lighting and ventilation from the skylight and opening windows in the ceiling, so during the day it does not require artificial lighting from lamps so that it can minimize electricity use (Trifirdausi et al., 2023).



Figure 6. Kitchen design

#### 4. CONCLUSION

This study has summarized the main findings in designing residential interiors with an ecological concept approach. Through in-depth analysis and application of Green Architecture principles, this study has successfully identified various strategies and best practices that can be applied to create environmentally friendly and sustainable living spaces. The results of the study indicate that the use of natural and recycled materials, optimization of natural lighting and ventilation, and the application of energy-saving technologies such as solar panels and rainwater collection systems, can significantly reduce negative impacts on the environment. In addition, the integration of natural elements such as vertical gardens in interior design makes a positive contribution to indoor air quality and occupant well-being.

Practically, the findings of this study provide guidance for interior designers and architects in implementing the ecological concept. These findings also enrich the literature on Green Architecture and sustainable interior design with empirical evidence on the effectiveness of the ecological approach.

To develop and deepen the understanding of interior design with an ecological concept approach, this study suggests several directions for further research:

- 1) Development of Eco-Friendly Materials: Further research is needed to explore and develop innovative and environmentally friendly building materials. These materials must not only have a low environmental impact, but also meet high aesthetic and functional standards.
- 2) Latest Green Technologies: With the rapid advancement of technology, there is a need to conduct in-depth research on the latest technologies in energy and water management. These technologies should be able to improve energy and water efficiency, as well as reduce the carbon footprint of buildings.
- 3) Multiple Case Studies: To evaluate the effectiveness of the application of ecological concepts in various contexts, further research can be conducted by applying this concept to various types of residences in various geographical locations. This will help in understanding how local factors influence the implementation and outcomes of this approach.
- 4) Impact on Occupant Health: Occupant health is an important factor in interior design. Further research is needed to examine the direct impact of the application of ecological design on the health and well-being of occupants in the long term. This study can include analysis of indoor air quality, use of hazardous chemicals, and psychological and physical aspects of ecologically designed living environments.

Thus, this research not only provides practical contributions in the form of design guidelines, but also encourages the development of theory and practice in the field of sustainable interior design.

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