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Design of 1-Storey Residential Houses with an Eco-Friendly Concept in North Jakarta

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Abstract. Housing is a fundamental human necessity that provides shelter and protection from environmental elements. In North Jakarta, a region experiencing continuous population growth, the demand for residential areas continues to rise, necessitating well-designed housing solutions. This study aims to develop a design for a one-storey residential house incorporating environmentally friendly principles suited to the urban conditions of North Jakarta. The research applies a descriptive qualitative method, involving site determination, literature review from books and academic articles, location analysis, and the creation of architectural design drawings. Emphasis is placed on integrating sustainable design strategies that enhance thermal comfort, energy efficiency, and spatial functionality. The findings present a residential design prototype that addresses environmental considerations such as natural ventilation, daylight optimization, and material selection, contributing to both occupant comfort and ecological sustainability. The implications of this research highlight the importance of environmentally conscious architectural planning in urban housing developments and serve as a reference for architects and urban planners in designing sustainable residential environments.

Keywords: residential house, eco-friendly, comfort

INTRODUCTION

A dwelling house is a place for humans to shelter, consisting of several rooms separated by partitions, a base on the floor, and a roof that functions as protection from heat and rain (*Ulinata*, 2021). The Province of DKI Jakarta is one of the regions with the highest population density (*Wijaya & Husin*, 2022). The city of North Jakarta, as one of the administrative cities within DKI Jakarta Province, includes residential areas. However, due to the increasing population each year, slums have emerged as many people are unable to access comfortable and livable housing (*Sebastian & Networking*, 2021). Therefore, a well-considered design is needed from an architectural perspective to ensure that residential houses are built to provide comfort for their inhabitants.

A residential house is a fundamental human need that functions not only as a shelter from heat and rain but also as a space for living, interacting, and fulfilling daily routines (Jiboye, 2014; Mekonen, 2022; Nasiri, Piccardo, & Hughes, 2021; Shitaye, 2022; Wang, Wang, Yu, & Wang, 2022). In urban environments, the demand for livable, healthy, and comfortable housing becomes increasingly critical, especially in major cities like Jakarta. North Jakarta continues to experience high population growth, leading to overcrowding and the emergence of slum settlements due to the limited availability of well-designed and sustainable housing (Alqahtany & Jamil, 2022; Ezennia & Hoskara, 2021).

Previous research has emphasized the importance of environmentally friendly housing design to improve energy efficiency and occupant comfort in tropical climates. For example, *Rahmawati et al.* (2020) found that applying passive ventilation and natural lighting significantly reduces energy use while enhancing thermal comfort in urban homes. However, most of these studies remain general and lack focus on single-storey residential designs tailored specifically to the urban density and geographic characteristics of coastal cities like North

Jakarta—where environmental challenges such as tidal flooding, pollution, and urban heat are prevalent.

This reveals a notable research gap in the development of architectural models for single-storey homes that respond both to environmental conditions and urban constraints. The novelty of this study lies in proposing a context-sensitive design that integrates green architectural principles with the functional and spatial needs of low-rise housing in a dense urban setting. The design also takes into account affordability and climate resilience, which are rarely addressed simultaneously in similar research.

The objective of this study is to propose a sustainable architectural design for single-storey residential houses in North Jakarta using an environmentally friendly concept. This research aims to contribute to the development of sustainable urban housing strategies by offering a prototype design that prioritizes occupant comfort, environmental adaptation, and energy efficiency. Ultimately, this study provides practical benefits for architects, urban planners, housing developers, and policymakers by offering an applicable design model to support improved residential planning in densely populated urban coastal areas.

RESEARCH METHOD

The research entitled *The Design of a 1-Storey Residential House with an Environmentally Friendly Concept in North Jakarta* uses a descriptive qualitative method. This approach involves several stages, including:

Location Selection Method

The determination of the location was carried out by selecting one of the residents' plots of land in North Jakarta, where the existing residence will be renovated, planned, and designed using an environmentally friendly concept, and subsequently built. The selected location is on *Jalan Teluk Gilimanuk Blok U9 Kav. No. 9*, *Sukapura*, *Cilincing*, North Jakarta.

Figure 1. Location of the house before renovation

Data Collection and Analysis Methods

Data collection was taken from:

1. Survey and documentation from the results of direct observation at the location.
2. In-depth interviews with residential homeowners by providing several questions that generate answers related to space needs and the application of environmentally friendly concepts.
3. Articles in national journals and international journals, books related to the design of one-story residential houses with an environmentally friendly concept.
4. Data collection from articles in mass journals and international journals, books were then analyzed and then several variables were taken that were used in designing a one-story residential house with an environmentally friendly concept.
5. The results of the analysis of the variables are used as a design concept which is continued to become an architectural working drawing so that it can be used for the development process.

RESULTS AND DISCUSSION

In making the concept of designing an environmentally friendly residential house, it can be done by allocating a portion of the land area to become a green open space (Wibowo, 2017). The method carried out is to meet the minimum requirements of the green base coefficient (KDH) of the land to be designed.

Table 1. Building Intensity Table

Parameter	Plan	Limit	Explanation
Land Area for Planning	363 m²	363 m²	Certificate Result: 363 m²
Ground Floor Area	209.48 m²	217.8 m²	Road Plan: 0.00 m²
Total Building Floor Area	209.48 m²	217.8 m²	L.D.P: 367.03 m²
Basic Building Coefficient (KDB)	57.7%	60%	
Floor Area Ratio (KLB)	0.57	0.6	
Building Height (KB)	1 floor	1 floor	
Green Area Coefficient (KDH)	23.5%	20%	KDH Area: 103.63 m²
Basement Coefficient	–	–	
Use (Penggunaan)			**Residential (Rumah Tinggal)**

Source: processed data

Green Open Space

The green open space at the design location has met the minimum requirements, which is 23.5% of the total land area where this green open space can be used to plant grass or other plants and trees that can help reduce air pollution so that the air quality around the design location can be better.

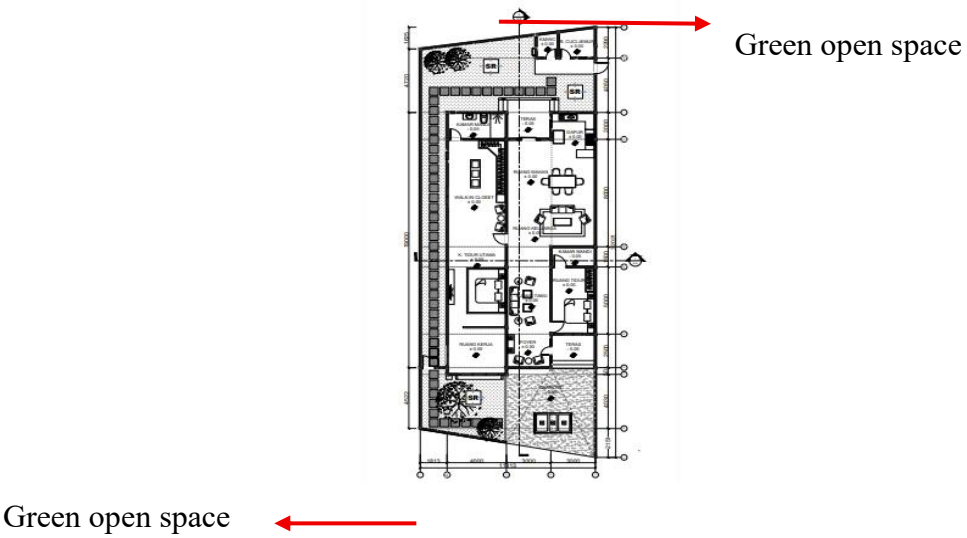

Figure 2. Ground Plan

Use of environmentally friendly materials

The materials used should be environmentally friendly materials by utilizing the development of building material technology to support the creation of environmentally friendly residential houses such as the use of light steel roof frames and not wooden roof frames so that the use of wood for roof frame needs can be reduced so as to reduce the number of trees cut down so as not to cause environmental damage.

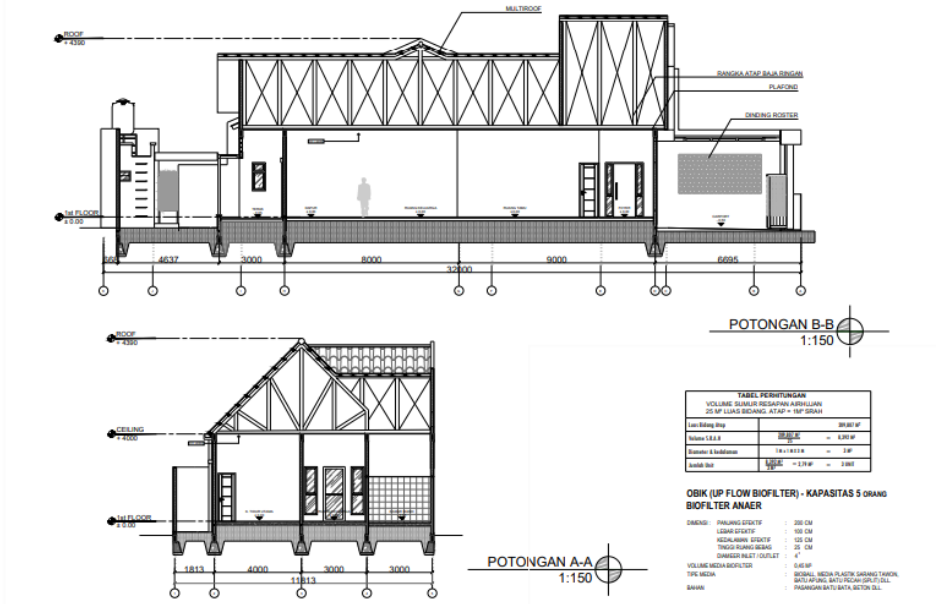

Figure 3. Picture of Visible Pieces of Light Steel Roof Truss

Optimization of Air Conditioning and Natural Lighting

Optimization Natural air conditioning can be obtained from a ventilation system that has an effective and efficient system in terms of residential design so that it can have a sustainable impact (sustainability) (Hanggara, Purnomo, & Walaretina, 2021). The application

of ventilation systems can be carried out with several design methods, including using cross ventilation. The use of cross ventilation can help even out the movement of air in the room, so that air exchange can occur optimally for comfort in the room (Lorenzia, 2020). Cross ventilation is the cross-movement of air from the inlet air opening to the outgoing air opening (Galarza-cuadros, Zambrano-moreira, & Zambrano-solórzano, n.d.).

The design of this 1-storey house also uses a breezeblock as a decorative element that also functions as ventilation that aims to regulate air circulation.

Figure 4. Use of Breezeblocks in Planned Residential Buildings

Natural lighting is lighting that comes from natural lighting objects such as the sun (All., 2014). Optimization of natural lighting can be obtained from the orientation of the building facing north-south and the layout of openings on the north and south sides.

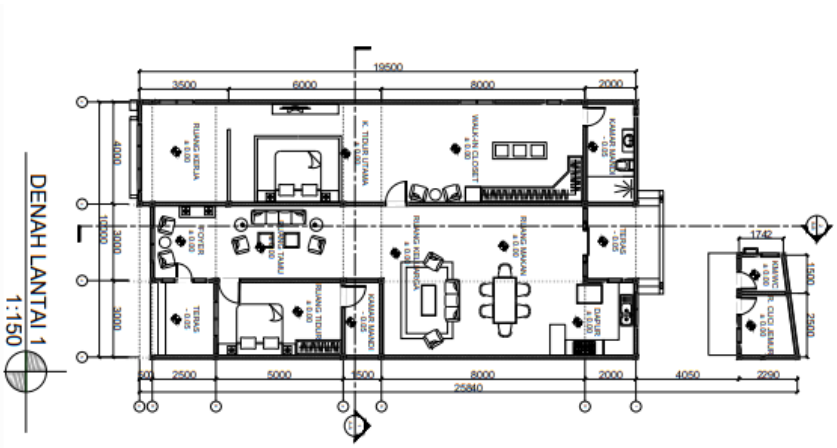

Figure 5. Opening Laying Plan

CONCLUSION

The design of this one-storey residential house applies an environmentally friendly concept through several strategies, including the provision of green open spaces planted with grass, trees, and other vegetation. In addition, it utilizes a light steel roof frame and incorporates *breezeblocks* as decorative elements that also function as ventilation. In the design of this one-storey residential house in North Jakarta, natural ventilation is optimized to enhance air circulation, and natural lighting is maximized by orienting the building to the north and placing

openings on the north and south sides of the structure. The design of this one-storey residential house with an environmentally friendly concept in North Jakarta is expected to serve as an example or recommendation for future residential developments in the area and contribute to improving overall environmental quality.

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