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Understanding of Environmental Architecture in The Development of Campus II of Darunnajah Al-Islamy Junior High School, Kepil, Wonosobo

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ABSTRACT

Kepil Wonosobo area is a region that has the potential for developing sustainable environmental architecture. This study aims to evaluate the implementation of environmental architecture principles in Kepil Wonosobo, identify the challenges faced, and provide recommendations for improving environmental architecture practices in the region. One of the projects in the Kepil area is the Development of Campus II of SMP Darunnajah Al-Islamy. Development projects need to prioritize aspects of environmental architecture so that development does not damage the environment. This study will reveal the understanding of environmental architecture of the actors in the development of Campus II of SMP Darunnajah Al-Islamy Kepil Wonosobo. The research method used is a survey of a combination of primary and secondary data. Primary data were obtained through direct observation and interviews with relevant stakeholders, while secondary data were obtained through literature studies and available information about environmental architecture projects in Kepil Wonosobo. The survey results show that awareness of environmental architecture in Kepil Wonosobo already exists, with the majority of respondents stating a good understanding of its principles. Several projects have

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implemented environmental architecture principles, such as the use of environmentally friendly materials, energy efficiency, water management, and attention to green open spaces. However, there are still challenges in implementation, including awareness and education that need to be improved as well as limited resources.

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1. INTRODUCTION

In the era of global development that increasingly emphasizes sustainability, the role of environmentally friendly architecture or *green building* becomes crucial to address environmental crises and resource efficiency challenges in the construction sector (Obinna Iwuanyanwu et al., 2024). The application of green building principles is not only a response to environmental degradation but also a reflection of collective awareness to create a healthier and more sustainable future. This aligns with the growing demand for buildings that are energy-efficient, minimize waste, and enhance the quality of life for both occupants (Jin et al., 2024). However, the success of implementing green building concepts relies heavily on the commitment of all stakeholders, including policy makers, developers, and project owners (Periyannan et al., 2023). Without clear direction and active participation—especially from the project owner—the realization of sustainable design often becomes limited or even neglected during construction practices (Guo et al., 2024).

Environmental architecture is becoming increasingly important in the context of sustainable development in this modern era (Asif et al., 2024). The principles of environmental architecture emphasize the integration of environmental, social, and economic aspects in the design and construction process of buildings (Obinna Iwuanyanwu et al., 2024). Efforts to apply these principles have become a major focus in the construction industry in various regions, including in Kepil Wonosobo. Kepil Wonosobo, as one of the regions in Indonesia, has interesting potential in the development of sustainable environmental architecture. With its beautiful natural environment and unique cultural richness, Kepil Wonosobo has the opportunity to integrate environmental architecture principles into the development of this region. Therefore, this research survey aims to evaluate the implementation of environmental architecture principles in Kepil Wonosobo, identify the challenges faced, and provide recommendations to improve environmental architecture practices in this region.

Development that does not consider environmental conditions will increase air temperature in an environment. Global warming will occur along with damaged environmental conditions. Human discomfort will occur so that cooling equipment is increasingly needed to create human comfort. (Muazir & Lestari, 2019). Architecture that can cope with climate change is known as adaptive architecture. Several aspects in development need to be combined to be able to create architecture that can cope with climate change. Adaptive architecture can create human comfort by using sustainable architecture (van Ellen et al., 2021). Sustainable architecture has long been emphasized and studied, but the practice or implementation of sustainable architecture often cannot be applied to several building projects. Inappropriate practices also sometimes occur in projects due to the lack of understanding of the development implementer regarding the concept of sustainability (Ashour et al., 2022). Human understanding of the concept of sustainability needs to be emphasized in everyday behavior so that all activities carried out are oriented towards sustainability. Project workers who have behaved in accordance with the concept of sustainability will make a project also oriented towards the concept of sustainability (Peeters et al., 2022). The concept of sustainability is often applied to local or traditional architecture. The concept of sustainability in traditional architecture is manifested in the use of environmentally friendly materials. In addition, traditional architecture can achieve sustainability from the construction system, ornaments, maintenance of openings, the environment, and its spatial organization (Attia, 2020).

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The increasing awareness of the importance of environmental architecture in sustainable development has become a global concern. However, the implementation and application of these practices can vary from region to region, depending on local factors, culture, policies, and available resources (Boarin & Martinez-Molina, 2022). Therefore, it is important to conduct an in-depth survey and research to gain a better understanding of the state of environmental architecture in Kepil Wonosobo. Environmental architecture has become an increasingly important issue in sustainable development around the world. The principles of environmental architecture aim to produce buildings that are environmentally friendly, energy efficient, and contribute to human well-being and the preservation of the natural environment (Pre-proofs et al., 2023). In the context of Indonesia, the application of environmental architecture principles has become an important focus in sustainable development. Kepil Wonosobo, as one of the regions in Indonesia, has interesting potential in the development of sustainable environmental architecture. With its beautiful natural environment and unique cultural richness, Kepil Wonosobo has the opportunity to integrate environmental architecture principles into the development of this region. However, to achieve this, a better understanding of the state of environmental architecture in Kepil Wonosobo, as well as the challenges and opportunities faced in implementing these practices, is needed. This background is an important basis for conducting a research survey on environmental architecture in Kepil Wonosobo. The survey aims to evaluate the implementation of environmental architecture principles in this region, identify the challenges faced, and provide recommendations for improving environmental architecture practices more broadly.

Increasing awareness of the importance of environmental architecture in sustainable development has become a global focus (Brambilla & Sangiorgio, 2020). Indonesia itself has taken steps to encourage the implementation of environmental architecture through relevant policies, guidelines, and certifications. However, each region has its own uniqueness and challenges in implementing environmental architecture principles according to local characteristics. In the context of Kepil Wonosobo, this study will provide a deeper understanding of the implementation of environmental architecture principles, as well as the factors that influence its success in this region. This information will be the basis for better decision-making and policy formulation in developing sustainable environmental architecture in Kepil Wonosobo. By conducting this research survey, it is hoped that existing environmental architecture practices in Kepil Wonosobo can be identified, as well as the challenges and opportunities that can be encountered in implementing them. The results of this survey will provide valuable insights for the government, architects, and related industry players to improve understanding and efforts in realizing sustainable environmental architecture in this region.

The purpose of the study is to evaluate the extent to which environmental architecture principles have been implemented in the construction of Campus II of SMP Darunnajah Al-Islamy Kepil Wonosobo. This survey will identify development projects that have implemented environmental architecture practices and assess the extent of their success in achieving sustainability goals.

2. METHOD

The research uses a qualitative paradigm using data collection methods of observation, interviews and documentation. Observations were conducted by conducting direct observations of the construction project of campus II of SMP Darunnajah Al-Islamy Kepil Wonosobo to obtain information on design, materials used, and other sustainable practices.

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Interviews were conducted with relevant stakeholders, such as architects, builders, developers, and local communities. These interviews aimed to gain a deeper understanding of the implementation of environmental architecture, the challenges faced, and the potential for development in this area.

a)

b)

Figure 1: a.Research Location, b. Development progress
(Source: Author, 2024)

Stages of the Research Process:

1. **Problem Identification and Research Objectives**
   The research began by identifying the problem related to the implementation of green building principles and their impact on economic efficiency in the construction project.
2. **Literature Review**
   Relevant literature on green buildings, construction policy, sustainability, and environmental design was reviewed to establish a theoretical framework and justify the research focus.
3. **Research Instrument Design**
   A structured questionnaire using a Likert scale was developed, along with interview guidelines for selected respondents to provide more descriptive input.
4. **Data Collection**
   - The questionnaire was distributed to 10 respondents (8 field workers and 2 office staff from PT. Chimarder 777).
   - In-depth interviews were conducted with the 2 office staff members.

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- **Location:** Faculty of Engineering Construction Site, UNWAHAS, Semarang, Central Java.
- **Date:** April 5–6, 2023.

5. **Data Processing and Analysis**
   - Questionnaire responses were tabulated and scored using Likert scale interpretation.
   - The percentage results were calculated and categorized to assess the level of green building implementation.
6. **Interpretation and Discussion**
   - The results were analyzed in light of previous studies and existing theories.
   - The findings were used to evaluate the role of project owner policies in achieving green building goals.
7. **Conclusion and Recommendations**
   Conclusions were drawn based on the percentage scores, and recommendations were proposed to enhance the success of green building implementation.

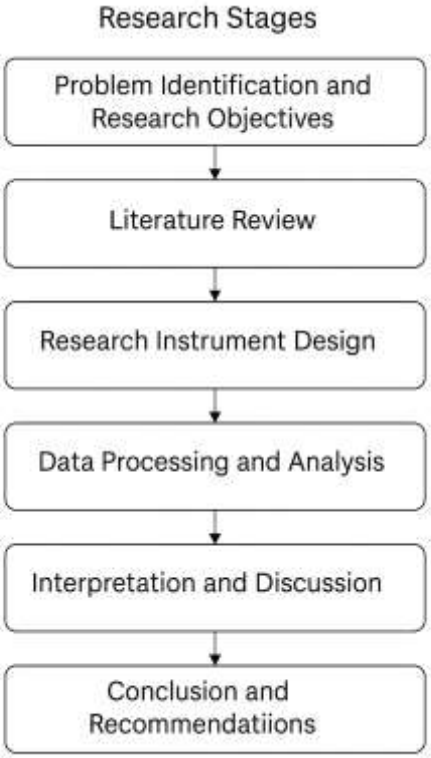

Figure 2: Research Stage
(Source: Author, 2023)

3. RESULTS AND DISCUSSION

3.1. Awareness of Environmental Architecture

The results of the Research Survey on Environmental Architecture in Kepil Wonosobo show a good level of awareness of environmental architecture in the area. The majority of respondents in this survey stated that they have a good understanding of the principles of environmental architecture and recognize the importance of considering environmental aspects in development.

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Figure 3: Use of bamboo for concrete supports
(Source: Author, 2023)

Awareness of environmental architecture in Kepil Wonosobo is reflected in the knowledge possessed by related stakeholders, such as architects, builders, and local communities. They understand the importance of considering environmental factors in the design and construction of buildings to achieve sustainability and energy efficiency. Respondents in this survey also realized that environmental architecture can provide significant benefits, both in terms of environment and social. They acknowledged that environmental architecture practices can reduce negative impacts on the environment, save energy, improve quality of life, and create a healthy and comfortable environment for building occupants. In addition, this survey also revealed that there is a high interest from the community to support and participate in sustainable development. The Kepil Wonosobo community welcomed the concept of environmental architecture and realized their role as consumers who can influence the demand for environmentally friendly buildings. Although awareness of environmental architecture already exists, this survey also indicates that further efforts are needed to increase the understanding and awareness of the community and industry players regarding environmental architecture practices. Information and education campaigns can be an effective step in increasing understanding and awareness of the benefits and practices of environmental architecture in Kepil Wonosobo. Overall, the survey results show that awareness of environmental architecture in Kepil Wonosobo already exists, but still needs to be improved. By increasing understanding and awareness of environmental architecture, it is hoped that it can encourage broader and more sustainable environmental architecture practices in Kepil Wonosobo.

3.2. Implementation of Environmental Architecture Principles

The Implementation of Environmental Architecture Principles in the results of the Research Survey on Environmental Architecture in Kepil Wonosobo covers several aspects. The project in the construction of campus II of SMP Darunnajah Al-Islamy Kepil Wonosobo has implemented the use of environmentally friendly materials. For example, the use of recycled materials such as recycled wood or building materials that have sustainability certification. The use of environmentally friendly materials helps reduce the environmental impact of the production process and construction waste. Interview result from informant: "Yes, I have awareness about environmental architecture and its benefits for our environment and health. I participate by choosing environmentally friendly products, such as energy-saving lamps, wise use of water, and separating waste. I also support developers who pay attention to environmental aspects in their projects."

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The project in the construction of campus II of SMP Darunnajah Al-Islamy Kepil Wonosobo has implemented a design that optimizes energy use. For example, the use of energy-efficient lighting systems, the use of renewable energy sources such as solar panels or solar water heating systems. This practice helps reduce energy consumption and carbon emissions of buildings. Answer from the informant: "I see an increase in the implementation of environmental architecture in Kepil Wonosobo. More and more projects are paying attention to the use of environmentally friendly materials and energy-efficient designs. However, there is still room for further improvement, especially in terms of public awareness and education about the benefits of environmental architecture."

Several projects have involved environmentally friendly water management. For example, the installation of rainwater harvesting systems for non-potable use or efficient wastewater treatment systems. Good water management can help reduce clean water usage and optimize available water resources. Informant's response: "We believe that environmental architecture is the right step for the future. By implementing environmental architecture practices, we can contribute to environmental conservation, increase energy efficiency, and provide a better quality of life for our property occupants. In addition, more and more consumers want environmentally friendly buildings, so we see this as a business opportunity."

A small number of projects in Kepil Wonosobo have considered the existence of green open spaces and tree planting around buildings. This practice helps improve the quality of the environment around the building, provides a cool place, and improves air quality. Answer from the informant: "One of the main challenges we face is the availability of environmentally friendly building materials. Sometimes it is difficult to get these materials in this area. In addition, the cost of construction using environmentally friendly materials can also be higher. However, we are trying to find a solution by collaborating with suppliers and looking for more economically affordable alternatives."

Figure 4: Use of wood for several supporting materials
(Source: Author, 2023)

Several projects have adopted environmentally friendly technologies to monitor and optimize the use of energy, water, and other resources. For example, the use of intelligent automation to adjust lighting and room temperature as needed. The use of this technology helps reduce unnecessary energy consumption and minimizes waste of resources. Although the implementation of environmental architecture principles is already in place, the survey also revealed that there is still potential to improve the implementation of these practices in Kepil Wonosobo. Factors such as awareness, resources, and regulations can affect the level

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of implementation of environmental architecture in this region. In order to improve the implementation of environmental architecture, recommendations in the survey include increasing education and awareness, developing supportive regulations, and providing incentives to industry players to implement environmental architecture practices. With these steps, it is hoped that environmental architecture practices in Kepil Wonosobo can continue to improve and contribute to the sustainable development of the region.

3.3. Disscussion

Various construction techniques need to be applied to achieve energy-efficient buildings. The concept of sustainability will improve many other aspects such as social aspects, economic aspects and environmental aspects. The application of the concept of sustainability in buildings is manifested in green building regulations. Many criteria are assessed in realizing green buildings such as the use of energy consumption, both water and electricity (Soussi et al., 2023). The way to protect against environmental damage can use one of the natural mining materials such as magnesite which is done with an industrial waste processing process. Construction waste processing requirements are also carried out strictly so that the environment is not damaged (Švajlenka et al., 2021). The selection of materials in construction is a must in order to create sustainability. Some buildings also implement modifications to building ventilation that allow for energy savings. One element is the modification of the lattice as an environmentally friendly building element (Prasad et al., 2022). The use of lattices as building elements will make unhealthy air content easily escape. The quality of air in the room will also affect energy savings (Hermawan et al., 2023).

Vernacular buildings are included in sustainable buildings that can make their occupants comfortable. Typology is one of the areas in the field of architecture that can create a high level of thermal comfort. Typology in architecture can affect the air content in a building (Widera, 2021). The relationship between typology and sustainability will make a difference in the thermal conditions of the environment. Architectural elements need to be designed optimally to create human thermal comfort (Hermawan & Švajlenka, 2021). The challenge of sustainable design will create efficiency in the energy sector. The use of renewable energy is one of the things that needs to be done to create an energy-efficient design. The implementation of environmental architecture principles is one thing related to energy savings (Giuzio et al., 2024). Technology is one aspect that can help realize sustainable and energy-efficient designs. The concept of smart buildings makes buildings have environmentally friendly energy management. Energy savings will be easier to do with advanced technology (Ahad et al., 2020).

4. CONCLUSIONS

The Environmental Architecture Research Survey in Kepil Wonosobo has provided valuable insights into the state of environmental architecture in the region. The conclusions of this survey indicate that awareness of environmental architecture in Kepil Wonosobo already exists, with the implementation of environmental architecture principles carried out in several projects. However, this survey also identified several challenges faced in implementing environmental architecture in Kepil Wonosobo, such as the availability of environmentally friendly building materials, higher costs, and the level of awareness that needs to be improved. Therefore, recommendations have been made to improve the practice of environmental architecture, including increasing public education and awareness, developing supportive regulations, providing incentives to industry players, and further research and development.

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With increased awareness and collaborative efforts from various parties, environmental architecture in Kepil Wonosobo has the potential to develop sustainably. The implementation of environmental architecture principles will provide significant benefits, including reducing negative impacts on the environment, efficient use of resources, and improving the quality of life for the community. This survey provides an initial understanding of the practice of environmental architecture in Kepil Wonosobo, however, it is important to conduct further surveys and more in-depth research to obtain more comprehensive information. With the right efforts, environmental architecture in Kepil Wonosobo can continue to develop and make a positive contribution to the sustainable development of this region. The successful implementation of environmental architecture requires cooperation between the government, industry players, the community, and related professionals. In maintaining environmental sustainability, environmental architecture has a key role in creating environmentally friendly buildings, energy efficient, and contributing positively to the balance of the ecosystem. With continuous research and efforts, it is hoped that environmental architecture in Kepil Wonosobo can continue to improve, become a good example, and have a positive impact on environmental sustainability and the quality of life of the community in the region.

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