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INTEGRATING ECOLOGICAL ARCHITECTURE IN RESORT DESIGN: A CASE STUDY OF BANOMO RESORT AT MUARA INDAH, NIAS ISLAND

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Abstract

This study emphasizes the importance of applying ecological architecture approaches in the design of tourism areas, particularly resorts located in ecologically sensitive zones such as Nias Island. Using the Banomo Resort—situated near the Muara Indah Suspension Bridge—as a case study, this research demonstrates how ecological architectural principles such as energy efficiency, natural landscape preservation, and the use of local materials can be holistically integrated into spatial concepts, activity programs, and architectural design elements. The findings reveal that such integration effectively minimizes environmental degradation, safeguards the mangrove ecosystem, and fosters a harmonious relationship between humans and nature. Furthermore, the resort is designed to support eco-tourism and water-based recreational activities, which enhance the tourist experience without compromising ecological integrity. This research contributes to the development of sustainable resort models that respond not only to functional and aesthetic needs but also to long-term environmental conservation efforts. The study offers both a conceptual framework and a practical reference for advancing sustainable architectural practices in coastal and eco-tourism-rich regions. So that, the design of the space and activities of the resort building and environment is useful for increasing tourism in Gunung Sitoli by using an ecological architecture approach to design Banomo Resort..

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Key Words

Resort, Nias, Ecological

Abstrak

Penelitian ini menekankan pentingnya penerapan pendekatan arsitektur ekologi dalam perancangan kawasan pariwisata, khususnya resor yang berlokasi di wilayah sensitif secara ekologis seperti Pulau Nias. Studi kasus Resor Banomo yang dirancang di sekitar Jembatan Gantung Muara Indah memperlihatkan bagaimana prinsip-prinsip arsitektur ekologi seperti efisiensi energi, pelestarian lanskap alami, dan pemanfaatan material lokal dapat diintegrasikan secara menyeluruh ke dalam konsep ruang, program aktivitas, dan elemen desain arsitektural. Temuan penelitian menunjukkan bahwa integrasi ini mampu meminimalkan kerusakan lingkungan, menjaga kelestarian ekosistem hutan bakau, serta menciptakan hubungan yang harmonis antara aktivitas manusia dan alam. Selain itu, desain resor juga mendukung kegiatan ekowisata dan wisata berbasis air yang meningkatkan kualitas pengalaman wisata tanpa mengorbankan integritas lingkungan. Penelitian ini memberikan kontribusi terhadap pengembangan model resor berkelanjutan yang tidak hanya memenuhi kebutuhan fungsional dan estetika, tetapi juga mendukung upaya pelestarian lingkungan jangka panjang. Studi ini menawarkan kerangka konseptual sekaligus referensi aplikatif dalam pengembangan praktik arsitektur berkelanjutan di kawasan pesisir dan wilayah dengan potensi ekowisata tinggi. Sehingga, perancangan ruang dan aktivitas bangunan dan lingkungan resor berguna untuk meningkatkan pariwisata di Gunung Sitoli dengan menggunakan pendekatan arsitektur ekologi untuk design Banomo Resort.

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Kata Kunci

Resor, Nias, Ekologi

Introduction

The tourism sector is a sector that is developed in both developed and developing countries. This sector also depends on the ability of human resources and good management of the people themselves. Gunung Sitoli City is the initial gateway to tourism on Nias Island. The location of the site chosen is located in the tourism area, Muara Indah, Gunung Sitoli City. It is called Muara Indah because there is an estuary or meeting point of river water with sea water. Resort planning at this location can be a new effort for a tourist destination. Flanked by Lake Sitefato and the Indian Ocean, this site is also still natural and there are many mangrove forests that have the potential to become one of the recreational facilities for this resort.

With the Ecological Architecture Approach, the natural location of the site is the best solution to this problem. The orientation of the building will pay attention to the balance of nature and the surrounding environment. With the design of the resort will be the first resort that blends with nature, both in South Nias and in Gunung Sitoli. The resort will be designed with facilities and attractions that adapt to the surrounding nature so as to attract tourists, especially young people, to come and stay at this resort and become a means of increasing tourists by the Gunung Sitoli City Government.

Research Methodology

The method used in this study is an exploratory qualitative method based on interview data, observations and facility mapping. This method supports a holistic approach by capturing qualitative insights that are often overlooked in quantitative studies—such as local knowledge, user behavior, and environmental interactions—which are critical in designing architecture that is responsive to both human needs and ecological systems.

a. Data Collection
   As for how to solve architectural design problems with data collection that must be re-analyzed. Through data collection methods, we can get results from design problems and accurate data, namely observing and identifying so that the problem can find a solution.
b. Analysis Methods
   The analysis is carried out to solve existing problems. The analyses carried out include land use analysis, functional analysis, accessibility analysis, building intensity, topography, architectural analysis, vegetation, view, climate, interior layout, structure and construction, utility, building mass and shape concept exploration, building architecture concept exploration, technology concept, space organization, and circulation and achievement concept.

Results and Discussion

The research results show that the principles of ecological architecture have been thoroughly integrated into the design of the Banomo Resort, through various design strategies that consider the balance between human needs and environmental sustainability. One key achievement is the use of local and natural materials, such as wood, which not only enhances the

character of the local architecture but also reduces carbon emissions generated from material transportation.

In terms of energy efficiency, the roof design and building orientation are adjusted to maximize natural lighting and cross-ventilation, thereby reducing the need for electricity for lighting and cooling. Furthermore, solar panels on several roofs of the main buildings serve as a renewable energy source that supports the operation of public facilities such as street lighting, dining rooms, and reception areas. Green roofs are also implemented on several building units as a form of adaptation to the tropical climate, helping to reduce excess heat, improve thermal insulation, and absorb rainwater to reduce runoff.

From a social and economic perspective, the resort design empowers the local community through job creation, the use of local labor in the construction process, and collaboration with MSMEs to provide food, crafts, and tourism services. This demonstrates that architectural design not only impacts the physical aspects of buildings but can also serve as an instrument for sustainable development for the surrounding community.

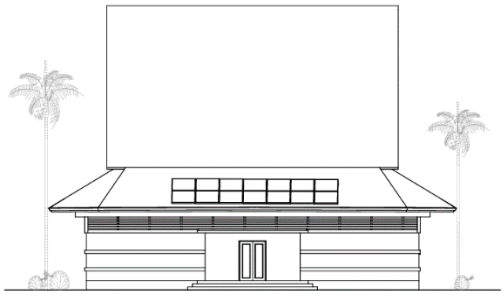

Figure 1. Main Building Front View

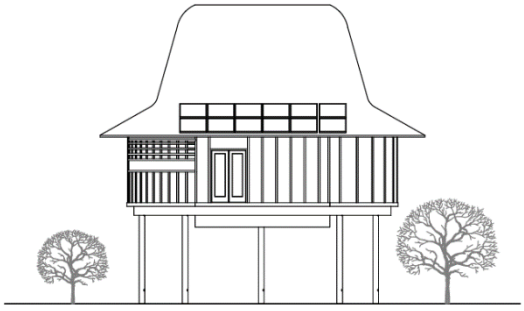

Figure 2. Cottage Front View

Figure 3. Site Axonometri View

In the layout of the Banomo Resort site, pedestrian and light vehicle (buggy) circulation paths are designed as ecological corridors that not only connect functional zones but also maintain the visual and ecological continuity of the landscape. This aligns with the findings of Marpaung et al. (2024) who emphasized the importance of corridors as a binding element in regional development, strengthening spatial identity and supporting sustainable interfunctional connectivity.

Through axonometric site drawings, the integration of architectural and environmental elements in the Banomo Resort design can be fully visualized. The building mass composition follows the natural contours of the site and the dominant wind direction, maximizing cross-ventilation and minimizing disturbance to existing vegetation, particularly the mangrove forest area, which is preserved as part of the natural landscape.

Conclusion

This research reveals that the application of ecological architecture principles in the design of the Banomo Resort makes a significant contribution to environmental conservation efforts while simultaneously improving the quality of the tourism space. Responsive design that adapts to site characteristics and local ecological conditions allows for the creation of a built environment that is environmentally friendly, energy efficient, and in harmony with the surrounding ecosystem. The strategic use of local materials, alternative energy systems such as solar panels, green roofs, and integrated waste management are integral parts of this approach, which has proven effective in reducing the environmental impact of resort development.

These findings have broad relevance for the future development of resort design, particularly in areas rich in natural resources but also vulnerable to ecological damage. An ecologically based approach is a crucial foundation for designing tourism infrastructure that is not only functional and visually appealing but also ecologically sustainable.

As a future direction, architects and tourism developers are expected to adopt contextual design methods, consider environmental aspects holistically, and involve local communities as part of the planning and operational processes. The principles of ecological architecture should be viewed not simply as a technical option, but as part of a professional responsibility in creating long-term sustainable tourism.

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