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Green Architecture Approach in Redesign of Popoh Beach Tulungagung Regency

Roy Azwan Saputra, Darmansjah, Benny Bintarjo
University of 17 Agustus 1945 Surabaya, Surabaya, Indonesia

ABSTRACT

The tourism sector plays a strategic role, yet its potential in Tulungagung Regency has not been fully optimized. Although tourism in Tulungagung has generally recovered in the post-pandemic period, specific destinations such as Popoh Beach have experienced a significant decline in visitors from 18,847 in 2022 to 8,761 in 2024. This condition indicates the urgency of redesigning the area. This study aims to redevelop the Popoh Beach area based on Green Architecture principles by identifying inhibiting factors, determining appropriate design concepts, and formulating a sustainable facility redesign model. The research employs a qualitative approach with data triangulation through literature studies, interviews, and field observations. The expected outcome is a design model focused on reducing carbon footprints through passive design strategies, providing coastal environmental education, and empowering the local economy through integrated zoning arrangements. This redesign is expected to offer a solution to declining visitor numbers while ensuring environmental and economic sustainability in the tourism area.

Keywords: *Green Architecture, Popoh Beach, Sustainable Tourism, Economic Empowerment, Redesign.*

Corresponding author
Name: Roy Azwan Saputra
Email: royazwansaputra@gmail.com

INTRODUCTION

The tourism sector is a strategic pillar of Indonesia's economic development, making significant contributions to the national GDP. Fadila (2023) notes that tourism contributed 5.8% in 2023 and is projected to increase to 7.4% by 2027 (BPS, 2023), affirming its role as a driver of both national and regional economies.

Tulungagung Regency, located on the southern coast of East Java, possesses diverse tourism potential, including beach, cultural, and ecotourism attractions. However, this potential has not been optimally utilized and still receives less attention compared to other leading destinations in East Java.

Tourist visitation data from the 2019–2023 period illustrates the dynamics of tourism in Tulungagung. The number of tourists dropped sharply during the pandemic, from 1,503,225 visitors in 2019 to 436,037 in 2021. It then recovered significantly in 2022 with 1,713,765 tourists and increased to 2,238,824 in 2023. This trend indicates the positive growth of Tulungagung's tourism sector in the post-pandemic era.

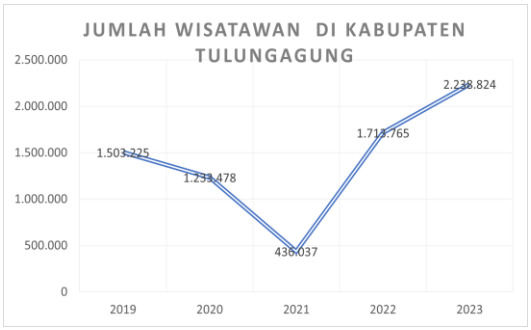

Chart 2. Number of Tourists in Tulungagung Regency
Source: Central Statistics Agency. (2023)

On the other hand, Popoh Beach shows a different trend. Tourist visits declined from 25,100 people in 2020 to 9,100 in 2021, briefly increased to 18,847 in 2022, but then fell again to 12,627 in 2023 and 8,761 in 2024. This contrasting trend indicates uneven development among destinations, highlighting that Popoh Beach requires special attention through an evaluation of its area design, facilities, accessibility, and the implementation of development strategies that are more adaptive to tourist needs.

Chart 2. Tourist Visits to Popoh Beach
Source: Popoh Beach Management

Green Architecture

Green Architecture is a building design concept focused on minimizing negative environmental impacts. Furthermore, Green Architecture aims to create healthy and comfortable living spaces for its users. According to Brenda and Robert Vale (1996) in their book "Green Architecture: Design for A Sustainable Future," Green Architecture is a way of thinking in architecture that pays attention to the natural elements present in a site so that they can be utilized.

Field conditions also support what is stated by Mustafa's research, where Green Architecture encourages the application of integration with nature. Here, green open spaces and natural landscapes are integrated into building design to create an environment

that supports the psychological well-being of occupants while also helping to address urban air pollution issues (Simarmata, 2020).

According to (Siregar, 2012; Ningrum & Hidayati, 2023), green architecture is a movement that uses energy efficiency to protect nature and the environment (eco-friendly construction). According to Pradono (2008), the term "green" is interpreted as an industry that is high-quality, sustainable, and environmentally friendly. Urban air pollution can be reduced by employing green building approaches developed in advanced countries.

Principles of Green Architecture

According to (Brenda & Vale, 1991), Green Architecture has the following principles and parameters:

1. Conserving Energy
   The core idea of green architecture emphasizes efficient and responsible energy use. A building's energy consumption must be considered from the planning stage through to post-construction. The design focuses not on altering existing environmental conditions, but on the building's ability to adapt to weather changes and integrate with its environmental context.
2. Working With Climate
   Buildings are designed by applying green architecture principles that emphasize adaptability to the environment, through the integration of climatic aspects, natural conditions, and the characteristics of the surrounding environment into the design concept.
3. Respect for Site
   The relationship between the building and its site is understood as part of the planning process. To minimize potential negative impacts on the surrounding environment, construction and design aspects must be carefully and integrally planned.
4. Respect for User
   The relationship between the user and green architecture is interconnected. The conditions and needs of users, established from the planning stage to building operation, must be a primary consideration in implementing green architecture.
5. Limiting New Resources
   Building planning is carried out by considering the optimal use of available materials and minimizing the use of new materials. These materials should be reusable or recyclable for other architectural needs at the end of the building's life cycle.
6. Holistic
   All considerations must be fully integrated into the building design because the principles of green architecture are interrelated and cannot be applied separately. Therefore, its implementation is more effective when the existing concept is adapted to the potential of the site and environment.

This research aims to identify the causes of the decline in tourist visits to Popoh Beach amidst the overall increase in tourism in Tulungagung Regency, and to formulate a redesign concept for the area based on Green Architecture to improve environmental quality, user comfort, and the area's appeal.

The contribution of this research lies in developing a study of Green Architecture at the scale of a coastal tourism area, integrating buildings and landscapes sustainably. It also serves as a practical reference for the redesign of Popoh Beach and the development of environmentally friendly and competitive coastal tourism destinations.

METHOD

This study employs a qualitative descriptive approach with a design-based research orientation to examine spatial conditions, environmental aspects, and activity patterns in the Popoh Beach area, as well as to formulate a redesign concept that aligns with user needs and site characteristics. This approach was selected because it provides a comprehensive understanding of area conditions, spatial use patterns, and the relationship between tourists and the local community. The research outcomes are directed toward the development of a design concept that is relevant to on-site conditions and the actual needs of the area.

The research subjects include tourists, local residents and MSME actors, as well as tourism managers and officials of Besole Village. Data were collected through field observations, interviews, documentation studies, and literature reviews from relevant institutions. Observations focused on the physical condition of the area, including facilities, cleanliness, spatial layout, circulation, landscape, and the relationship between tourism activities and fisheries. Interviews were conducted to explore the needs, perspectives, and issues faced by stakeholders. Literature review data were obtained from regional planning documents and relevant studies on marine tourism, green architecture, and coastal area planning.

Research instruments consisted of observation sheets, interview guidelines, visual documentation, area maps, and facility feasibility checklists. Data analysis was carried out qualitatively through data classification, presentation, and conclusion drawing. The analysis focused on identifying key issues, such as spatial conflicts between tourism activities and the fish auction site, declining facility quality, and poorly organized circulation. All analytical findings serve as the basis for formulating the Popoh Beach redesign concept, guided by green architecture principles and sustainable tourism development.

FINDING AND DISCUSSION

RESEARCH RESULT

Implementation of Green Architecture

The application of green architecture in the redesign of the Popoh Beach area positions sustainability as the primary foundation of coastal area planning. Green architecture is understood as a concept that harmoniously integrates buildings, landscapes, and human activities with the natural environment. In the context of Popoh Beach, this

approach is highly relevant for improving the quality of the tourism area while preserving the natural coastal character and existing environmental potential.

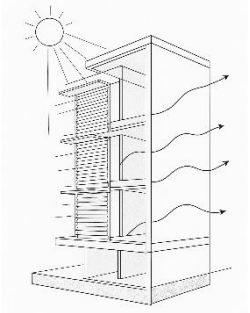

Figure 1. Application of the Conserving Energy Principle
Source: Author's Illustration

The conserving energy principle is realized through building designs that maximize natural lighting and cross ventilation. Building orientation is adjusted to the path of the sun and sea breezes, thereby reducing reliance on artificial energy. The use of renewable energy, such as solar panels on public buildings, serves as a supporting strategy in creating a more energy-efficient tourism area.

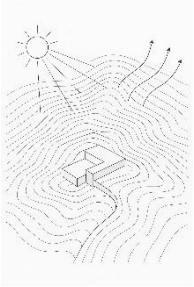

Figure 2. Application of the Working with Climate Principle
Source: Author's Illustration

The working with climate principle is applied by designing buildings and outdoor spaces that are responsive to the coastal climate. Building forms, roofs with wide overhangs, and semi-open spaces function to enhance users' thermal comfort. At the area scale, shading vegetation and protected pedestrian pathways help reduce heat impacts and create a more comfortable environment.

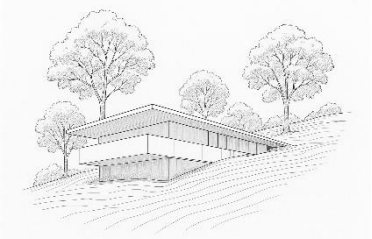

Figure 3. Application of the Respect for Site Principle
Source: Author's Illustration

The respect for site principle is implemented by minimizing alterations to existing site conditions. Building arrangements follow natural contours and preserve coastal vegetation to maintain the beach ecosystem. This approach emphasizes that the development of the Popoh Beach tourism area is carried out without disrupting environmental balance.

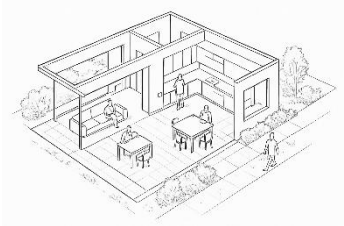

Figure 4. Application of the Respect for User Principle
Source: Author's Illustration

The respect for user principle is expressed through the provision of public spaces that are comfortable, safe, and inclusive. Pedestrian paths, shaded seating areas, and visual orientations toward the sea are designed to enhance visitors' spatial experience. Thus, the coastal area functions not only as a tourist destination but also as a public space that supports user well-being.

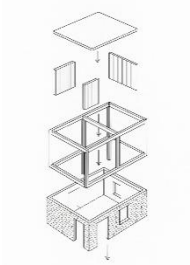

Figure 5. Application of the Limiting New Resources Principle
Source: Author's Illustration

Under the limiting new resources principle, the area redesign emphasizes the use of local and sustainable materials. Reusing existing materials and applying environmentally friendly materials aim to reduce construction waste and environmental footprints. In addition, this strategy strengthens the local identity of the Popoh Beach area.

All green architecture principles are applied holistically in the area planning process. The integration of buildings, landscapes, energy systems, and user activities ensures the creation of a sustainable coastal area. Through this approach, the redesign of Popoh Beach is expected to enhance environmental quality while sustainably increasing its tourism appeal.

DISCUSSION

The discussion on the implementation of green architecture in the redesign of the Popoh Beach area indicates that this approach is effective in integrating buildings,

landscapes, and coastal natural conditions in a sustainable manner. Principles of energy efficiency, climate adaptation, and respect for the site are able to improve environmental quality while enhancing user comfort within the tourism area. This approach confirms that the development of Popoh Beach can be carried out without disregarding its natural character and environmental potential.

However, this discussion has limitations, as it remains conceptual and is not yet supported by measurable technical analyses. Energy-saving effectiveness, building performance, and the ecological impacts of the area have not been quantitatively assessed. In addition, the social and economic aspects of the surrounding community have not been examined in depth, indicating that further adjustments are required for practical implementation.

The implications of this discussion suggest that green architecture can serve as a foundational framework for sustainable coastal tourism area planning. The proposed concept can function as an initial reference in the redesign process of Popoh Beach, while future research should develop more applied and data-driven studies to ensure that its implementation generates optimal and long-term sustainable impacts.

CONCLUSION

The conclusion of this study indicates that although tourism in Tulungagung Regency has experienced positive growth in the post-pandemic period, Popoh Beach has instead faced a declining trend in visitor numbers, suggesting the need for targeted intervention. The application of a Green Architecture approach in the redesign of the Popoh Beach area is considered relevant and promising for enhancing environmental quality, user comfort, and sustainable tourism appeal through the integration of buildings, landscape, and coastal natural conditions. Accordingly, green architecture can serve as a strategic foundation for the development of environmentally friendly and competitive coastal tourism areas, although further, more technical and applied studies are still required to support its optimal implementation.

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