Architectural Research Journal
https://www.ejournal.warmadewa.ac.id/index.php/arj/index

Implementation of Tropical Architectural Concepts as a Basis for Design of the Pantai Pasir Putih Tourism Area

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How to cite (in APA style):

Senimiawaty. (2024). Implementation of Tropical Architectural Concepts as a Basis for Design of the Pantai Pasir Putih Tourism Area. *Architectural Research Journal*. 4 (1), pp. 27-33. DOI: https://doi.org/10.22225/arj.4.1.2024.27-33

Abstract—Indonesia, being the largest archipelagic nation, has exceptional natural resources that can be used as a standard for the growth of the tourism industry. The Pasir Putih Tourist Destination in Bolaang Mongondow Regency is a natural-maritime tourist area that emphasizes outdoor tourism and recreational activities. Currently, the Pasir Putih Destination Area needs serious attention because of its limited capacity for efficient usage as a vital tourism area. The Bolaang Mongondow Regency is an a part of the North Sulawesi Province. The limited visitor numbers, deterioration of tourist amenities, and inadequate facilities and infrastructure made the Pasir Putih tourism site very unappealing to both domestic and local tourists. The purpose of this research is to examine a tropical architectural approach that can be implemented as a basis for creating the Pasir Putih tourist destination that is able to accommodate all visitors' needs. This study employs qualitative methodologies, utilizing data collection techniques such as literature reviews, observations, interviews, and comparison analyses. The results of the research show that to make the Pasir Putih Beach area a tourist destination that is able to accommodate all visitors' needs, facilities and infrastructure that are in accordance with the suitability standards of the tourist destination area need to be equipped. The tropical architecture approach is implemented to overcome tropical climate problems, especially in coastal areas by planting vegetation, cooling at night, minimizing heat gain from solar radiation in buildings, maximizing heat release in buildings, and implementing tropical designs for beachfront buildings.

Keywords: tourism destination; coastal; tropical architecture; Bolaang Mongondow.

1. Introduction

The Pasir Putih Tourism Destination, located in the Tiga Island Area, is a significant tourist attraction with the potential to stimulate tourism growth in Bolaang Mongondow Regency. It is strategically positioned within the North Sulawesi Province and the Bolaang Mongondow Regency's Strategic Tourism Area. The Pasir Putih tourist destination is centered around natural-marine tourism, with a particular emphasis on outdoor sports and recreational pursuits. The Pasir Putih Destination Area currently demands significant focus due to its restricted potential as a pivotal tourism region in Bolaang Mongondow Regency or within the North Sulawesi Province. The Pasir Putih tourism site remains unappealing to domestic and local tourists due to its limited number of visitors, impaired tourist facilities, and inadequate infrastructure and amenities.

The Bolaang Mongondow Regency Government is presently engaged in the development of tourist destinations within the Bolaang Mongondow Regency. The Regent of Bolaang Mongondow has demonstrated a significant amount of devotion towards the development of tourist attractions in the area. The construction of various amenities funded by the APBN and APBD would enhance the development of tourism attractions in Bolaang Mongondow Regency. Additionally, these facilities will also contribute to an increase in tourist visits to Raja Ampat Papua, thereby benefiting Weda Bolaang Mongondow Regency. Tourists who wish to visit the Raja Ampat Papua tourist destination generally go through Bolaang Mongondow Regency, including Pulau Tiga, which serves as a protective barrier for the white sand tourism area.

The tourist industry is a key driver of economic growth due to its enormous impact on the community's economy. Tourism is a worldwide sector that transcends spatial and regional limitations. The impact of globalization and advancements in information technology and accessibility have greatly enhanced human mobility, making it faster, more diverse, more convenient, more cost-effective, and simpler.

Pasir Putih is a tourism destination. The Bolaang Mongondow Regency Government has designated Pulau Tiga and the surrounding small islands as tourist destinations. The surrounding area is one of Bolaang Mongondow's tourism development nodes, with a focus on marine tourism, as well as the beauty of the beach and underwater panoramas. In fact, on the small islands around Pulau Tiga, aside from having beautiful beaches and underwater panoramas, you can also find turtles and golden birds, which are endemic to the area.
This tourist area boasts an abundance of natural resource potential. One of them is the potential for coral reefs, underwater ecosystems, panoramic sunset views, beautiful beaches, waves, and exotic housing for tourists. So it is not wrong for the Bolaang Mongondow Regency government to designate Tiga Island as one of the tourism development nodes in Bolaang Mongondow with a reliance on marine tourism, both for the beauty of the beach and underwater panoramas.

The aim of developing tourism in Bolaang Mongondow Regency is to make travel a part of realizing and filling the national tourism development pattern, and one of the economic activities and sources of regional income. The goal of this tourism development is to stimulate tourism in Bolaang Mongondow Regency, one of which is the Pasir Putih Beach Tourism Area.

This research seeks to examine a tropical architectural approach that can be implemented as a basis for creating the Pasir Putih Tourist Destination which is able to accommodate all visitors' needs. Appropriate amenities and infrastructure are essential for developing the Pasir Putih area's considerable potential as a tourist destination. In order to establish the Pasir Putih area as a popular tourist destination for both local and domestic visitors, it is imperative to solve all types of issues, particularly those associated with tropical climate challenges, especially in coastal regions.

2. Method

This study uses a qualitative method. The collection of data aligns with the research objectives. We gathered data from a variety of literary sources, such as knowledge books, scientific journals, and the internet, to gather information about general functions, types, and needs. This information aided in the planning process, and we also conducted surveys to identify emerging issues. This system exists and provides clear boundaries for data about beach tourism and tropical architecture.

Literature Review

A. General Overview of Beach Tourism

1. Definition of Coastal Tourism Area

Beach tourism can be defined as tourism that utilizes natural resources and their supporting components, both natural and artificial, or a combination of both (Simond, 1978). Simond (1978) further categorizes beaches into several distinct areas:

a. Beach is defined as the boundary between land and sea. Usually, it is a sandy and sloping beach.
b. Dune, namely the area that is higher than the beach. Usually, it is a stretch of sand whose surface is wavy or forms slowly due to sea currents.
c. Coastal, an area that experiences periodic flooding, combines elements of both beach and dune.

2. Beach Tourism Elements

Inskeep (1998) further said that a tourist attraction must have important elements, namely:

a. Attractiveness
   Tourists travel to visit a place primarily for its attraction, whether it's a primary destination or a secondary one, driven by their desire to witness, experience, and relish its allure. We can categorize attractions as either location-based or permanent.
b. Tourism Infrastructure
   This tourism infrastructure consists of accommodation infrastructure, supporting structure, tourist facilities, infrastructure, community, environment and culture.

3. Criteria for Beachfront Building

a. Coastal Boundary Line
   In Republic of Indonesia Presidential Decree No. 32 of 1990 concerning protected area management, generally, the beach boundary line is at least 100 meters from the highest tide point towards land. This ensures that when sea water rises, it won't inundate the buildings under construction.
b. Site Accessibilities
   According to the Director General of Human Settlements (2000), the distance between the main entrance for vehicles to public spaces or the beach from secondary or tertiary highways is a minimum of 300 meters, while the minimum width for pedestrian paths along the beach is 3 meters.
c. Built Buildings
   According to the Director General of Human Settlements (2000), there are requirements for building buildings on the beach, including:
   1) The land area built for the development of main public facilities with other public facilities is a maximum of 2 km.

2) The maximum building height is 15 meters above the built-up area's average ground level.
3) Buildings in the coastal border area we will only attempt a small number of places of worship, coast guard buildings, public facility buildings (toilets), and wallless buildings with a maximum area of 50 m2/unit.
4) If desired, you can install fencing in the built-up area, with a maximum fence height of 1 meter.
5) There are three types of materials used in buildings on the beach, including wood, concrete, and steel. Each of these materials has its own advantages and disadvantages.

B. Tropical Architecture Overview

Interpret tropical architecture as a specific design for an architectural work that aims to solve tropical climate problems. Tropical architecture is essentially a building style that adapts to tropical climates. Buildings that use tropical architecture generally have the following characteristics:

1. Possess a tall roof with an inclination exceeding 30 degrees. The attic is beneficial for mitigating heat.
2. Ensure that the roof eaves or overskirts are sufficiently broad to mitigate the dampening impact of wind-driven rain. In addition, it functions as a barrier to block direct sunlight from entering the building.
3. Features perforations to facilitate cross ventilation, ensuring a comfortable room temperature.

Tropical designs generally use natural materials whose sources can be found nearby.

1. Tropical Building Characteristics

Basically, the concept of tropical architecture is a building style that adapts to tropical climates. In general, buildings that apply tropical architecture have the following characteristics:

a. The building in question features a high roof that slopes at a rate exceeding 30 degrees. The space under the roof is useful for reducing heat.
b. Ensure that the roof eaves or overskirts are sufficiently wide to mitigate the damping effect of rain and wind. Aside from that, it also serves to prevent direct sunlight from entering the building.
c. Availability of holes for cross ventilation, so the temperature in the room remains comfortable.
d. Tropical designs typically make use of locally sourced natural materials.

2. Strategies for Achieving Comfort Temperatures in Tropical Architecture

In tropical regions such as Indonesia, the difficulty is in maintaining an inside temperature below 28.3 C, which is the maximum threshold for a pleasant warm feeling, even when the outside air temperature reaches around 32 C during the daytime. There are two ways for attaining a comfortable temperature. Within the building, there are two methods of temperature control. Firstly, there is mechanical air conditioning, which relies on machinery to cool the air. Secondly, there is passive design, which maximizes the utilization of natural ventilation.

Mechanical air conditioning devices, often known as AC, enable the achievement of room temperatures lower than 28.3 degrees Celsius, thus guaranteeing a comfortable environment. The utilization of air conditioning diminishes the involvement of the architect in the design process, as the inclusion of an AC unit may ensure the comfort of any room regardless of its design. Transforming an unpleasant outdoor temperature into a pleasant one using mechanical methods is mostly the responsibility of engineers rather than architects.

Architects have the difficulty of optimizing natural air conditioning in order to achieve comfort. How can architects utilize their architectural designs to convert hot outdoor air at approximately 32 °C into more pleasant temperatures below 28.3 °C. There are several ways that might be adopted in respect to natural climate modification:

a. Vegetation Planting
Planting protected trees around buildings as an effort to block direct solar radiation on hard materials such as roofs, walls, parking lots, or yards covered with hard materials such as concrete and asphalt will really help to reduce environmental temperatures. Various studies, including those by Akbari and Parker, show that planting protected trees around buildings can reduce temperatures by up to 3 C.

b. Night Cooling
Computer simulations of the effects of nighttime cooling (night passive cooling) carried out by Cambridge Architectural Research Limited show that a temperature reduction of up to 3 ^{o}C (during the day) can be achieved in buildings that use heavy mass materials (concrete, brick) if the temperature difference between day and night is not less than 8 ^{o}C (the difference between day and night temperatures in cities in Indonesia generally ranges from around 10 ^{o}C).

c. Minimizing Heat Gain from Solar Radiation in Buildings.
There are multiple methods to accomplish this. Initially, it obstructs the transmission of direct solar radiation through transparent walls, so

preventing the occurrence of a greenhouse effect that would otherwise result in elevated temperatures within the building. Secondly, mitigate the transfer of heat from large walls that are directly exposed to solar radiation by implementing certain design measures, such as:

(1) Make a layered (hollow) wall that is ventilated in the cavity.
(2) Place service rooms (stairs, toilets, pantry, warehouse, etc.) on the sides where direct solar radiation falls (east and west sides).
(3) Provide ventilation in the space between the roof and ceiling (in low buildings) to prevent heat accumulation in that space. Otherwise, the heat accumulated in this space will be transmitted downwards, into the space below. This roof ventilation is very important for achieving low room temperatures.

d. Maximizes heat release in buildings.
This can be done by designing architectural designs that allow maximum cross-air flow within the building. Air flow is very influential in creating a 'cooling effect' on the human body, so it really helps achieve thermal comfort.

e. Urban Tropical Design
Every place in the world, with its unique climatic characteristics, should have a unique city design that adapts to the local climatic conditions. The intention is to anticipate human needs for physical comfort, particularly thermal comfort. We need to address air temperature, solar radiation, and high humidity, as they are not necessary for achieving tropical human thermal comfort.

3. Results and Discussion

The Site Existing

Figure 1. The Site Topography
Source: Senimiawaty, 2023

The government has designated the property as a natural tourism area. The white sand tourist area in Sangtombolang District has a range of topographic characteristics, varying from level places with a gradient of 2-5% to sections with a slope of 45%. Which is the primary feature of the white sand coast.

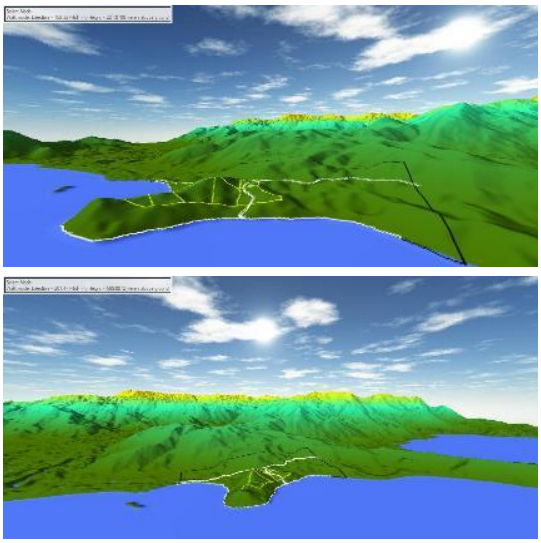

Figure 2. The Site Characteristics
Source: Senimiawaty, 2023

Hidrology and Drainage

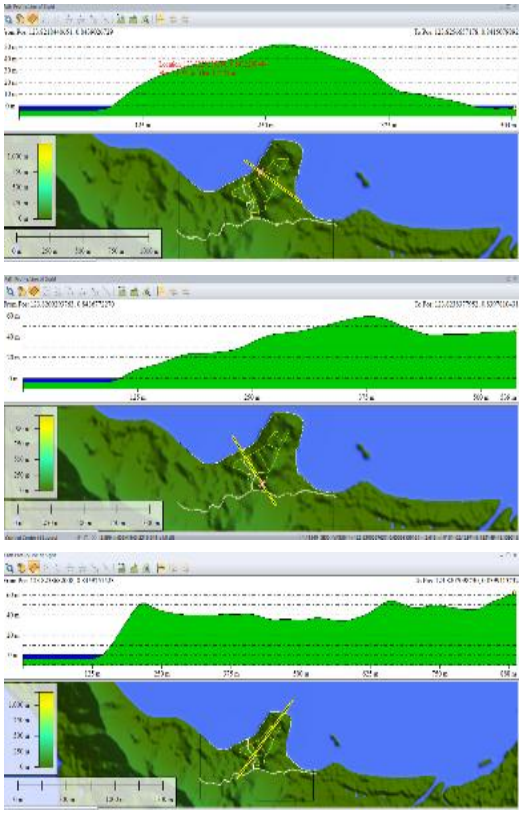

Figure 3. Hidrology and Drainage Characteristics
Source: Senimiawaty, 2023

Hydrological aspects encompass not only the type and quality of water, but also ground and surface water supplies, drainage patterns, and the planning of flood inundation areas. This area is characterized by slopes, most of which are relatively steep, so that surface water from the top of the hill can flow straight down and form a kind of small waterfall. The flow of water runoff tends to be fast, resulting in minimal potential for waterlogging in various places, except for places that have a very gentle slope, namely 0-3%.

Vegetation

The Pasir Putih area is an area planted with a combination of forest plants, garden plants and shrubs. This variation in vegetation is typical of the greenery found in various cultivated areas in North Sulawesi and tropical areas in general. Selection of vegetation with maximum shade in certain areas can be done as an urban canopy, acting as a control for thermal comfort. Vegetation density also needs to be considered because it greatly influences surface temperature.

Figure 4. Vegetation Characteristics
Source: Senimiawaty, 2023

Perceptual Characteristic

Visually, the Pasir Putih area has the potential to have evocative and quite beautiful scenic sequences. This is obtained from variations in climate, which produce attractive landscape patterns. Some points have significant focal points or have a wider visual capture capacity, so their uniqueness must be maintained.

Circulation paths that follow meandering or convoluted routes might elicit sensations of "surprise" and "adventure" as observers are unable to anticipate the subjects they will encounter along the way, therefore rendering the final destination hidden from view. Paths that incorporate several types of terrain on the earth's surface, such as ascending (upward), descending (downward), or horizontal movements, can elicit a range of sensations, ensuring that the spectator remains engaged and avoids monotony. Hence, the amalgamation of velocity and the manner of approach towards an object will elicit a certain emotional response. Therefore, when devising a path of motion, it is imperative to exercise meticulous control.

In terms of spatial relationships, the comparison between humans and their environment exhibits several sizes. Some of these relationships are weakly defined, resulting in a sense of integration with nature where the physical boundaries are not clearly perceived. Some regions have more distinct spatial features due to the presence of tree rows and the surrounding steep slopes or curves.

Figure 5. Perceptual Characteristic of the District
Source: Senimiawaty, 2023

District Development Concept

The Pasir Putih area's potential and regional problems led to the proposal of a regional development concept. Generally, we will divide the area into two zones: the reception zone and the recreation zone. Recreation zones will be divided into medium-high-intensity recreation zones, medium-low-intensity recreation zones, and thematic recreation zones (**Figure 6**). The main road runs from west to east of the area, according to the site topography (**Figure 7**). The primary (existing) circulation runs from the south (main road) to the north. The plan for secondary circulation involves connecting the primary circulation with the tertiary circulation or tracking flow (**Figure 8**). There are several nodes in the area that act as centers of human activity, as well as attractions or elements of surprise (**Figure 9**).

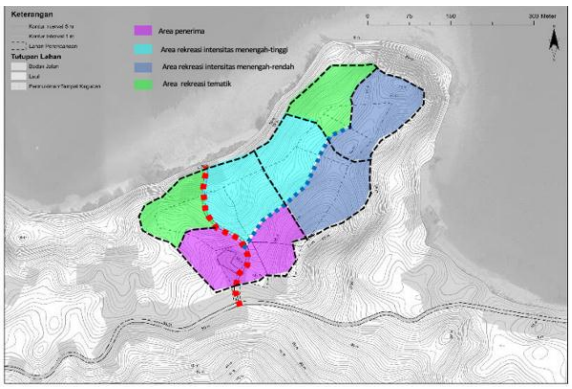

Figure 6. Spatial concepts
Source: Senimiawaty, 2023

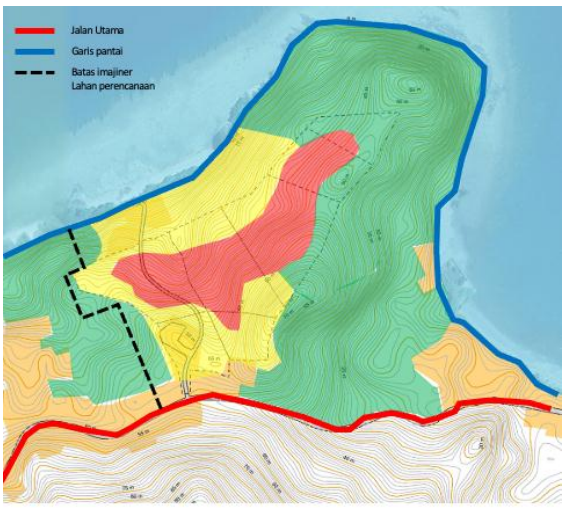

Figure 7. Main Road Planning
Source: Senimiawaty, 2023

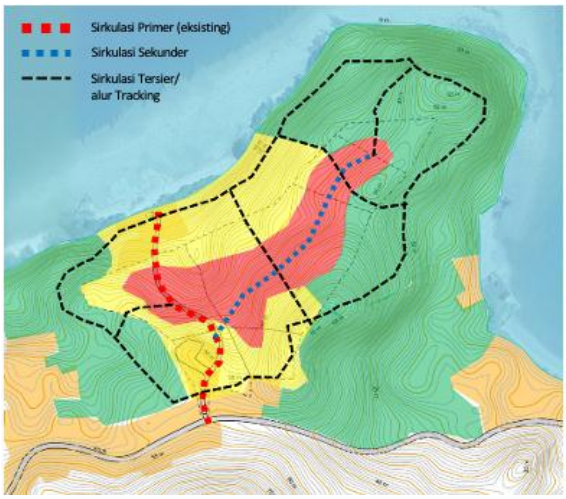

Figure 8. Circulation concepts
Source: Senimiawaty, 2023

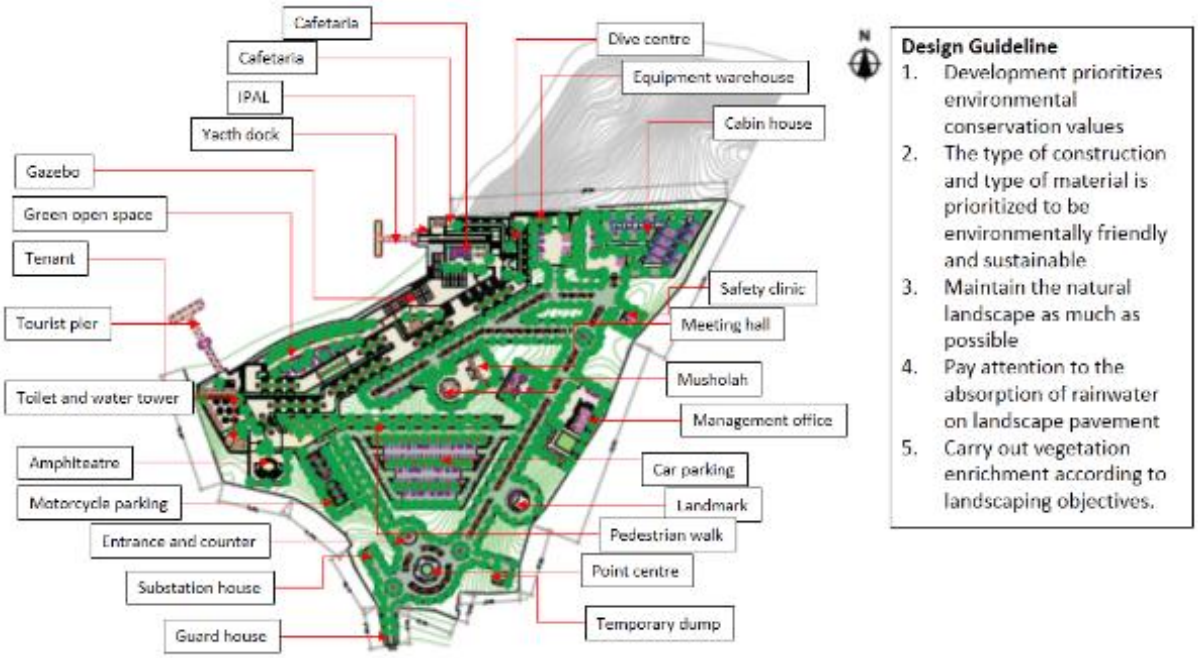

Figure 9. General Design Guidelines
Source: Senimiawaty, 2023

4. Conclusion

In order to establish the Pasir Putih area as a popular tourist destination for both local and domestic visitors, it is imperative to solve all types of issues, particularly those associated with tropical climate challenges, especially in coastal regions. The Pasir Putih area will be completed with infrastructure and facilities to accommodate its role as a regional tourist attraction. Several strategies that will be implemented to implement the concept of tropical architecture in the area include planting trees to block direct solar radiation on hard materials, night passive cooling, minimizing heat gain by blocking direct solar radiation on transparent walls, which can result in a greenhouse effect, reducing heat transmission from massive walls exposed to direct solar radiation, as well as maximizing heat release in the building.

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