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Design of Cottage and Recreation Area in Sibolga City with a Tropical Architectural Approach

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Abstract. *Sibolga City, located along the seashore and endowed with abundant natural beauty, holds significant potential for development as a marine tourism destination. Beyond its coastal appeal, the city offers opportunities for diverse recreational areas such as camping grounds, botanical gardens, culinary centers, and Mancakrida zones. To support these initiatives, this research investigates the sources of activities and spatial programs that can be realized through the construction of cottages and integrated recreational facilities. Given Sibolga's hot tropical climate, the application of Tropical Architecture is essential to address environmental challenges including solar exposure, rainfall intensity, air humidity, and wind orientation. This study aims to harness Sibolga's environmental assets by proposing sustainable cottage designs and recreational spaces that align with the principles of Tropical Architecture. The research contributes to the development of commercial residential models that are harmoniously integrated with nature, promoting economic sustainability and ecological balance. Methodologically, the study involves interviews, site surveys, and comparative analyses to derive contextual design solutions. The final output is a conceptual design for cottages and recreational areas that reflect climate-responsive architecture and support Sibolga's tourism growth. This research not only enhances architectural knowledge in tropical settings but also offers practical insights for urban planners and stakeholders seeking to revitalize Sibolga City as a vibrant, nature-integrated tourism hub.*

Keywords: *Cottage Design; Environmental Potential; Marine Tourism; Recreational Facilities; Tropical Architecture*

1. INTRODUCTION

Sibolga City is located in the western part of North Sumatra, on the west coast of Tapian Nauli Bay. Being a city located by the sea, Sibolga City has some natural beauty which can become the potential to attract tourists. The potential found in Sibolga City includes natural beauty in the form of beachfront, the charm of a series of islands, has a hill that can be a natural adventure tourism location, to the rich history and culture of Sibolga City [1]. As such, these potentials then become the tourist attractiveness of Sibolga City because tjis can be an essential part of the service economy [2].

Geographically, Sibolga City is a city that has a fairly hot climate. The temperature of Sibolga City ranges from 21.6°C - 32°C with sea surface temperatures ranging from 27.5°C - 28.5°C [3, 4]. Meanwhile, the amount of rain that occurs in Sibolga City tends to be unstable, with the highest rain levels occurring in November and December. In relation to this data, the design of Cottage in Sibolga City uses the Tropical Architecture approach. Karyono states that Tropical Architecture serves to solve climate problems. Climate factors included here are sun, rainfall, air humidity, and wind direction [5]. According to Gut, there are several important

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elements to consider when designing buildings that are responsive to the tropical climate, namely: minimizing heat during the day and maximizing heat at night; choosing an appropriate location based on microclimate criteria; optimizing the building structure, especially regarding thermal storage at certain times; controlling solar radiation; and regulating air circulation [5]. The application of Tropical Architecture in this Cottage building is not fixed only on form, but rather leads to climate responsiveness, environmentally friendly, and considers the sustainable architectural factors of the building.

2. THEORETICAL FRAMEWORK

Building and Environmental Design with a Tropical Architectural Approach

In designing buildings and environments, Tropical Architecture is used as a design approach. The Tropical Architecture approach is an approach to building design that considers climate issues in tropical regions (Karyono, 2016). Tropical climate itself is the climate or average weather that occurs in tropical regions, namely areas around the equator (KBBI Kemendikbud, 2016).

Characteristics and Criteria for Buildings Using a Tropical Architectural Approach

When implementing tropical architecture in buildings, there are principles that must be considered and then applied to achieve the right building design for the right climate. According to Handoko (2019), the following principles can be applied to buildings in humid tropical climates.

Adjusting the angle of the sun's rays on a building can limit and reduce the intensity of incoming sunlight. Solar heat is indeed an essential element for human survival. However, it cannot be denied that solar heat can also be a natural enemy for humans, especially its radiation rays. This radiation becomes a source of serious danger if humans are exposed to it for too long. Therefore, it is necessary to regulate the ability of sunlight to enter the building so that people inside are not exposed to radiation but still receive sunlight as natural lighting. This adjustment can be made by considering the orientation of the building to the sun's rotation. In addition, another way to limit and reduce the intensity of incoming sunlight is by implementing shading from outside the building. According to Satwiko (2015), the following are ways to provide shading to a building.

Providing canopy-type vegetation, meaning trees with dense, abundant leaves. This is related to the evapotranspiration process by the leaves, which can maintain a temperature of around 42°C under the hot sun. Provide eaves to protect the walls from direct exposure to the sun's heat. Installing curtains outside to block sunlight can heat the building walls. Curtains

inside the building are sufficient to block out light, but they still allow heat energy to be transmitted by the walls, making the room even hotter. Provides a double outer sheath (*double-skin façade*) which can prevent the sun's heat from hitting the walls.

Reducing heat gain to the building envelope. This relates to hot steam entering from outside, not carried by the wind, but rather by being conducted by the walls from the outside into the building. While rarely a particular concern, being in a room with high temperatures due to heat traveling through the walls can create feelings of insecurity and discomfort. One way to reduce heat gain to the building envelope is by reflecting solar heat radiation from the building envelope. According to Satwiko (2015), the following methods are used to reflect solar heat radiation. Apply white as the final color to the building envelope, because white can reflect solar radiation so that the heat absorbed by the building envelope will be reduced. Provide a radiation-reflecting layer for the building envelope if you don't want white as the final result of the building envelope. Radiation reflectors are used so that dark colors do not absorb too much solar radiation. Using metal roofs or reflective glass as reflective materials to reflect sunlight. While logically, shiny metal and glass roofs should absorb more heat, adding reflective glass and insulating material to the metal will reflect the sun's heat.

Reducing heat transfer in buildings by selecting materials for the building envelope. The thickness and type of building materials must take into account the surrounding climate to prevent excessive heat gain. Examples of materials that can be used include thick brick walls, as bricks can store a lot of heat, and walls with heat insulators such as glass wool, rock wool, wood shavings, or Styrofoam (Satwiko, 2015). In addition to considering materials, vegetation can also be added around the building to act as a heat barrier. This allows sunlight to reach the building, but some of the light and heat are blocked by the dense vegetation.

Providing natural ventilation provides passive cooling to improve heat dissipation in buildings. With constant wind flowing through a building, a previously hot interior space can feel cooler. This is because natural ventilation continuously draws in cool air from outside and carries the hot air out of the building. This constant air movement allows the hot air to escape, eliminating the need for artificial cooling such as air conditioning (AC).

Using relatively thin and lightweight materials minimizes problems during tropical storms. Tropical regions are susceptible to tropical storms, especially coastal areas, which are also susceptible to storms from the sea. To cope with these storms, which can strike at any time, it's crucial to address them from the outset. One way to mitigate these storms is to use lightweight materials. This selection of lightweight materials ensures that buildings that are likely to be hit by tropical storms will not be severely damaged. If damaged, lightweight

materials, if struck by a person, will not be fatal. Types of lightweight materials that can be considered for use in tropical buildings include wood or lightweight steel.

Use materials resistant to insect attack. Living in a humid tropical climate means a wide variety of insects are present. These insects can be destructive, eating everything. Wood is abundant in nature and is commonly used as a building material. However, given that wood is susceptible to insect attack by termites, this is a matter of concern. Wood can be replaced with stronger and more durable bricks. Iron and metal materials can also be considered as building materials, as they are resistant to insect attack.

Connecting indoor and outdoor spaces using semi-outdoor spaces. When designing spaces in tropical buildings, a space must be provided that connects the outdoor and indoor spaces. This space is semi-outdoor because it is still part of the building but is located outside. This semi-outdoor space can be realized in the form of a balcony, porch, or terrace. This semi-outdoor space is intended to maintain a unified connection between the indoor and outdoor spaces of the building by connecting them with a terrace, porch, or balcony.

3. METHOD

The method for choosing a location and ideas for the project "Design of Cottage and Recreation Area in Sibolga City with a Tropical Architectural Approach" can be described through several stages as follows: The chosen design location is located in Sibolga City, located in the province of North Sumatra which is known for its natural wealth. The natural wealth found in Sibolga includes mountains, hills, beaches, seas, and islands that are still fairly underutilized to attract tourists who want to visit. Based on the assessment of alternative locations that have been carried out, Poncan Ketek Island was chosen as the design location because this island has some natural potential that is suitable to support the function of the cottage. Not only because of the natural potential, there are other aspects to determine the design location of this cottage project. This aspect of location selection is based on Poncan Ketek Island is superior in terms of natural potential, historical value, away from the center of the crowd, and also has a positive view from all directions of the site.

The design theme becomes inseparable from the building. The design theme taken is Tropical Architecture. As mentioned earlier, that the design theme can shape the identity and face, then Tropical Architecture is considered appropriate in this case. With the characteristics of having a sloping roof and having a terrace, Tropical Architecture can shape the face of the cottage building to be like a "house". The house in question here is not only the shape of the house that we know in the tropics, but also as a "house" for a place to relax for tourists on

vacation. Considering the location in a tropical region, international tourists who visit can still enjoy the tropical building architecture presented by the cottage so that it can still attract visitors to vacation and relax in this Tropical Architecture-themed cottage building. To solve the above design problems, there are 3 methods that can be done, which are the data collection method, the analysis method, and the concept exploration method. Then these methods are used to solve problems in architectural design in order to get a good architectural design.

4. RESULT AND DISCUSSION

Bagian Site Profile

The title of this project is entitled: Cottage Design and Recreation Area in Sibolga City with Tropical Architectural Approach. This project is located in Pulau Poncan Ketek , Sibolga City, North Sumatra, where this location is an area with a tropical climate. Buildings and areas in this project will be designed with Tropical Architecture. This Tropical Architecture was selected because Tropical Architecture is a type of architectural design intended to solve problems associated with tropical climates [6]. To see the location, see Fig.1

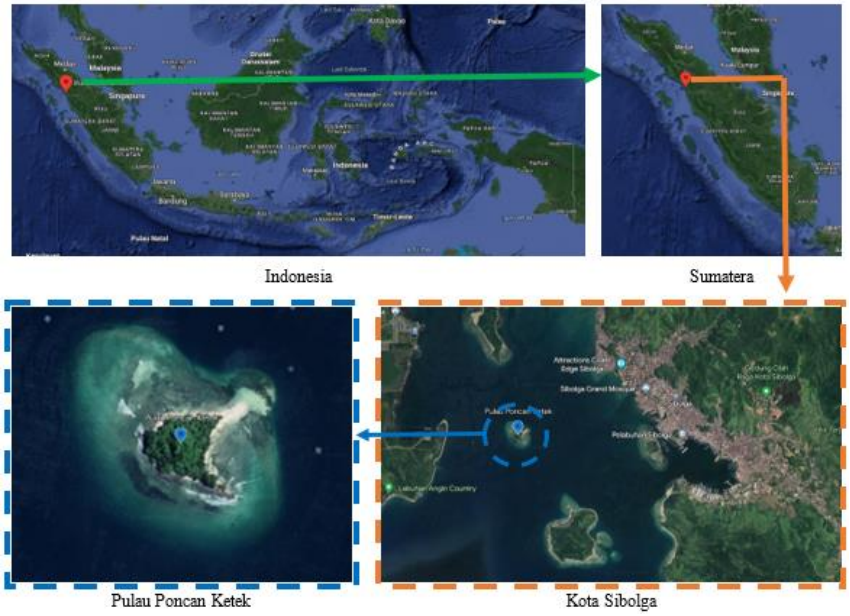

Figure 1. Site Location.

Theme Implementation

The basic concept of designing Cottages and Recreation Area located on Pulau Poncan Ketek, Sibolga City is Tropical Architecture. Tropical architecture is raised in this design related to the environmental and climatic conditions that exist on Poncan Ketek Island, Sibolga City. Humans have a response to the climate of the surrounding environment which can be seen in the activities carried out [7]. This is because the climate in an area affects the activities

and activities carried out. Like during the day, people who live in tropical climates usually do not do activities under direct sunlight. Orientation, arrangement of building mass and vegetation, and landscape layout on the site are solutions to the application of design in an environment that considers climate [5]. As for some things that will be applied to the design of cottages and tourist areas are: 1) Sunlight Control by using existing vegetation on site. Existing conditions are sufficient to meet the needs for sunlight control; 2) Air control is done by creating cross ventilation in the building so as to create comfortable air for humans; 3) Protection against solar radiation and rainfall by creating a facade design that can filter radiation and rainfall so as not to reach into the room; 4) Utilization of tropical materials in buildings to create comfort for building users [8]. The material to be used is steel by considering the efficiency of the facade and the weight of the material which tends to be light. To see an implementation of tropical architecture in cottages unit design, see Fig.2.

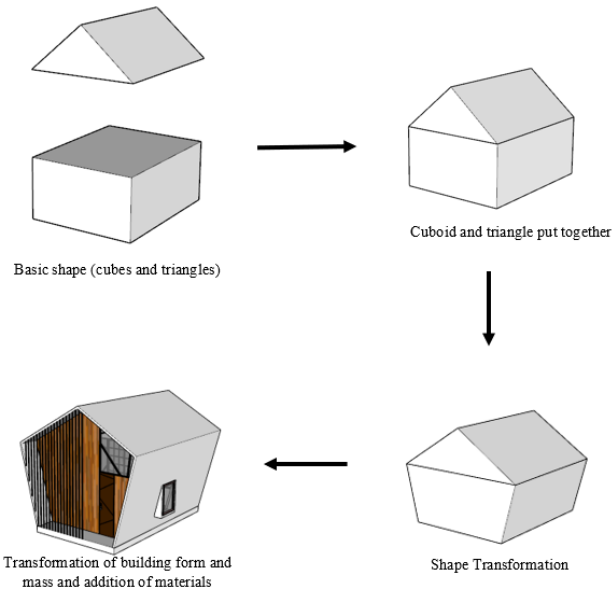

Figure 2. Implementation of Tropical Architecture of Cottages Unit.

Outdoor/Site Design Concept

According to Dennis L. Foster, cottages are a type of accommodation located around natural areas such as beaches or lakes, with separate buildings also equipped with recreational facilities, and can be rented out to families or individuals [9]. Ronald revealed that a commercial cottage facility must meet the requirements where in designing cottages requires adequate facilities and accommodation to support the activities that will take place [10]. With good facilities and accommodation, it can affect the interest and attraction of visitors to come to the cottage. In this design, the buildings on the design site are placed around the water area so that every visitor can see the sea view. There are also buildings that are then placed at the

top of the site and surrounded by forests as a view for the building. When viewed from the character of the site area which is on an island with a sandy beach area, then according to Roziana this cottage is included in the type of beach cottage [11]. In addition to cottages, other areas on the site are also filled with various supporting facilities in order to support tourism activities. In the cottage area itself there are 4 areas which are divided into private areas (cottage area), service areas, public areas, and administrative areas [12]. To see an overview of this site design concept, see Fig.3.

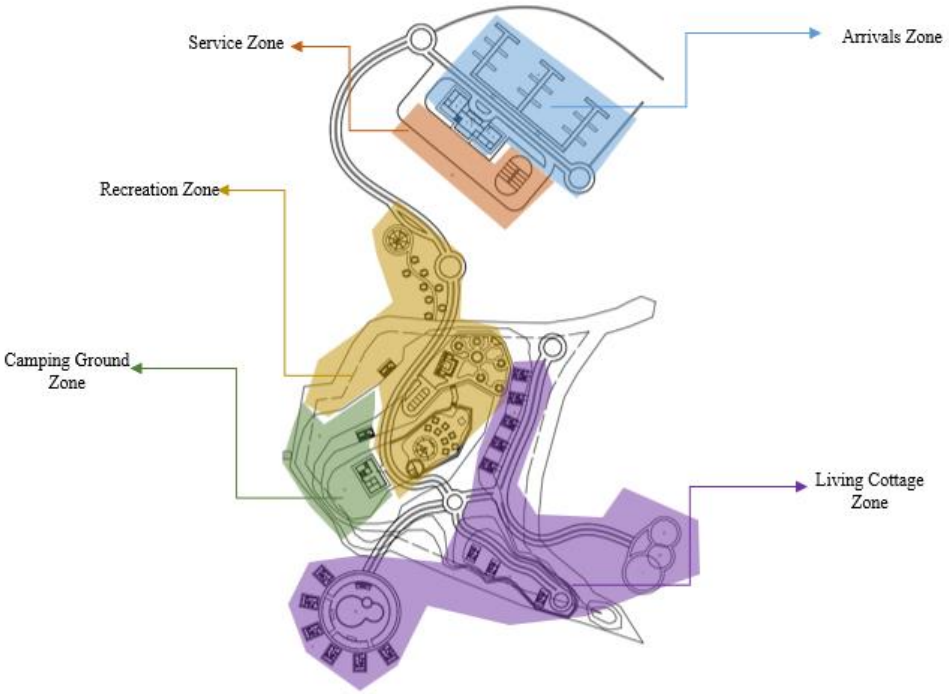

Figure 3. Site Design Concept.

Indoor Spatial Concept

In this project, there are several buildings with different activities. The main buildings that are the main concern in this project are cottages buildings. According to Rizal Sihombing , guest rooms in the form of cottage rooms can be divided into 3 types, namely standard type, deluxe, and suite type [13]. In this design, the cottages are then divided into 3 areas: Rise Cottages area, Seafo Cottages area, and Set Cottages area. The idea behind the name of this cottage division is taken from the placement of the cottage units on the design site. The placement and distribution of cottage forms according to WS Hattrell and Partners [14]are divided into 3, namely the convention cottage form which has a vertical upward form (terraced), a spread cottage form where the cottage building is placed spread out in one area, and a combination. In this design used is the spread cottage form. To see the distribution of cottages area, see Fig 4.

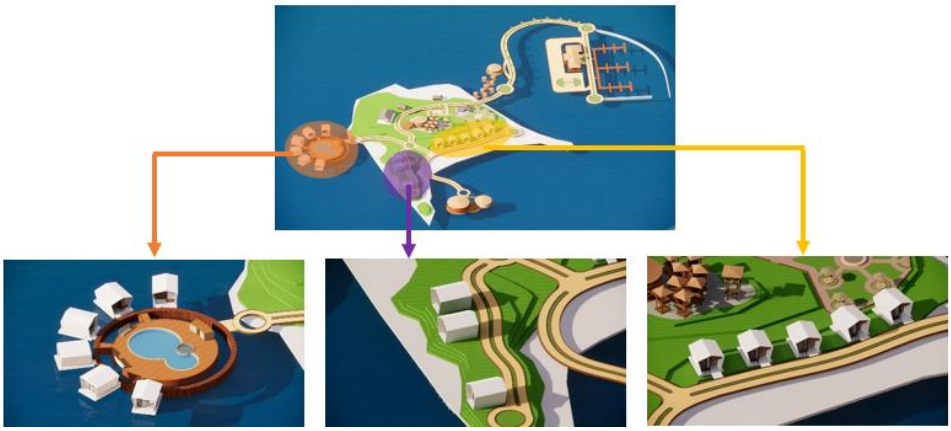

Figure 4. Cottages Distribution.

At Rise Cottage, once inside the door we can see a lounge room with only a sofa and a table. Besides that, there is a partition that separates the room from the lounge and is still closed by the storage cabinet on the side. There is also 1 bathroom, 1 bar counter, and 1 kitchen. For example, see Fig 5.

Figure 5. Rise Cottages Interior Layout Concept.

In Seafo Cottage, because it has a second floor in the building, there is a staircase located in the corner of the building. The room on the 2nd floor also only has furniture in the form of a bed and nightstand as well as a storage cabinet inside. In addition, the building is equipped with a bathroom, lounge, dining room, kitchen and balcony which can be found on the first floor of the building. For example, see Fig 6.

Figure 6. Seafo Cottages Interior Layout Concept.

Structure Design Concept

The structural design used in the cottage building is a wooden structure. This is because the wooden structure is a lightweight material that is suitable for tropical-style buildings. The wooden structure used in this cottage building is used as a column and roof material. Between the roof and column are then connected using bolts and adding additional steel frames at the meeting of the roof and column structures. In addition, wood materials will also be used as beam and wall materials in the building. To see the application of this structure, please see the section drawing in Fig.7.

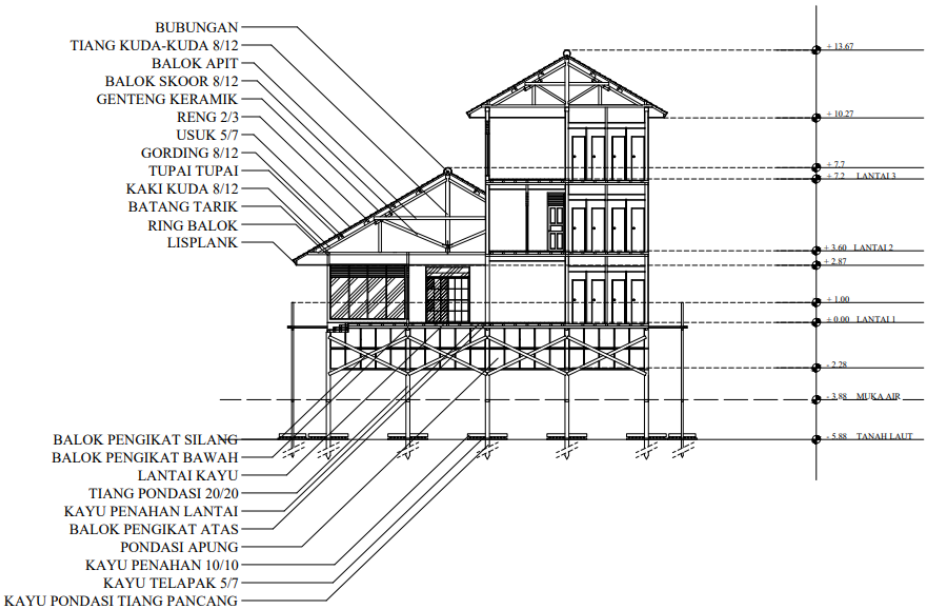

Figure 7. Structure Cutout of Arrival Lobby.

Utilities Design Concept

In designing a building using a tropical architectural approach, the design should be considered in detail in order to minimize the use of electronic devices such as air conditioning and lighting [15]. The design of electrical power by using electricity sources derived from the government and lighting or lighting using sunlight with filters that will be applied to the building facade. Natural lighting is certainly needed at night, but during the day will utilize an open facade and materials that can conduct light without causing the impression of heat. For air and ventilation utilities, natural air will be used in the form of ventilation in doors and windows. For clean water then will use sea water that has been filtered and then channeled to each building, while for dirty water will use septic tanks in the form of communal septic tanks placed at certain points around the design site.

5. CONCLUSION

Poncan Ketek Island, hidden behind the hustle and bustle of Sibolga City, offers unexplored beauty and potential. The island's natural richness and cultural uniqueness offer a golden opportunity to establish a mesmerizing tourist destination, specifically through the creation of innovative cottages and recreational areas. Understanding and appreciating the intrinsic value of Poncan Ketek Island allows visitors to visualize a transformation which not only enriches the tourist experience but also conserves and enhances its rich natural and cultural heritage. Facing the challenges of a tropical climate, the design of this cottage and recreation area not only offers sustainable architectural solutions but also promotes new ways of enjoying the beauty of tropical nature in comfort and elegance. The Tropical Architecture approach is not simply an answer to climate issues. It is a manifesto of how architecture can work harmoniously with nature, using natural ventilation, lighting and neighborhood landscaping to create recreational areas that are healthy, comfortable and at one with nature. Through architectural design and in-depth analysis of local potential and tropical architectural principles, this design project offers a bold and innovative vision of the future of tourism on Poncan Ketek Island. The proposed product design is not simply about building structures, but about creating experiences, enriching human interaction with nature, and celebrating the long-hidden beauty of Sibolga City. By considering local wisdom and eco-friendly technology, Visitors and or tourists can envision a destination that is not only a feast for the eyes but also nourishes the soul and responds wisely to the challenges of the tropical climate.

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