

Lake Singkarak Resort Hotel. A Green Architecture Approach

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Submitted January 1st, 2022. Received in revision June 19th, 2022
Accepted September 21st, 2022. Available online September 30th, 2022

Abstract

Lake Singkarak Resort Hotel is a building that provides lodging, eating and drinking facilities, sports, entertainment, and other facilities for a person or group who is on a tour to Lake Singkarak. The lake is located in Tanah Datar Regency in West Sumatra Province, Indonesia. The purpose of this study is to create a natural image and atmosphere at this resort hotel by using green architecture concept. The concept of Green Architecture is a design and development approach based on ecological principles and environmental conservation, which will produce a building that has environmental quality and creates a better and sustainable life. The use of this concept aims to follow the natural conditions in this area which are still naturally so that the building is in harmony with nature. Green architecture is an environmentally sound architecture and is based on concern for the conservation of the natural global environment with an emphasis on energy efficiency, sustainability patterns and a holistic approach.

Keywords: *architecture, green, hotel, planning, resort*

INTRODUCTION

A lake is an area in the form of a wide basin surrounded by land and filled with water, and separated from the outlet or river that functions to give way and drain lake water. Although they look like much larger oceans, lakes are not part of the ocean, they form part of the Earth's water cycle (Purcell, 2018).

Indonesia has more than 100 reservoirs and about 521 natural lakes, with an area of about 21,000 km² and a total volume of water accommodated of about 500 km³. The largest lake, both in area and volume, is Lake Toba in North Sumatra which is the largest lake in Southeast Asia. Another large lake is Lake Singkarak in West Sumatra. This lake has an area of 107.8 km² and is the second largest lake on the island of Sumatra after Lake Toba (Wikipedia, 2019).

Singkarak Lake is a unique lake located in two regencies at once, namely Solok Regency and Tanah Datar Regency, West Sumatra Province, Indonesia. This lake comes from the Batang Ombilin river. However, some of the lake water is

channeled through a tunnel through the Bukit Barisan to Batang Anai to power the Singkarak hydroelectric power plant near Lubuk Alung, Padang Pariaman Regency (Wikipedia, 2020). Tanah Datar is a district that is believed to be the origin of the Minangkabau people. This is one of the reasons for tourists to visit this district. Not only its interesting history, but this district also has a variety of tourist attractions.

Tourist activities carried out by a person or group will require a means. Not only tourist facilities, but lodging facilities are also a necessity for tourists. Lodging facilities are used as temporary houses during the tour that function as resting places. One type of lodging facility is a tourist hotel. A tourist hotel is a hotel that has special facilities for visitors who want to do sightseeing activities. Various activities are carried out to promote West Sumatra as a tourist destination, with this promotion the number of tourists will continue to increase and this will be anticipated by the construction of hotels or resorts. Not only anticipating the number of tourists but this hotel is also expected to be an attraction to increase the

number of tourists to this area so that it can be a business opportunity for tourism businesses. Tourist opportunities not only benefit investors but can also affect the increase in tourist visits.

Green Architecture Application to Design According to Brenda and Robert Vale in the book "Green Architecture: Design for A Sustainable Future", there are 6 basic principles in applying the concept of Green Architecture in a design (B. Vale and R. Vale, 1996).

1. Conserving energy (energy utilization)
A building should be designed/built with consideration of building operations that minimize the use of fossil fuels.
2. Working with climate
Buildings should be designed to work well with the climate and natural energy resources.
3. Minimizing new resources (Use of Recycled Resources)
Buildings should be designed to minimize the use of resources and at the end of their use can be used for other architectural things.
4. Respect for users (The Role of the Building Can Be Optimal To Fulfill the Needs of the Occupants)
Green architecture considers human interests in it
5. Respect for site
The building is designed to minimize the potential for damage to nature.
6. Holism (Overall Application)
All of the above principles must be applied as a whole as an approach to building design.

From the description above, it can be concluded that Lake Singkarak Besar has the potential to build a five-star resort hotel, precisely in Solok Regency and Tanah Datar Regency, West Sumatra. Therefore, as a means of accommodation that can meet the needs of tourists, both those who need business or those who want to have recreation. The presence of this resort hotel is to provide an alternative to tourists who want to stay. At the same time enjoy the facilities provided and feel the warmth of the surrounding natural atmosphere. Then Resort hotels will be the right solution to meet the demands of the lifestyle needs of tourists. To get one stop vacation entertainment.

The location is located on Jl. Aripantanjung Alai, Aripantanjung, Kec. X Koto

Singkarak, Kab. Solok, West Sumatra (Figure 3).

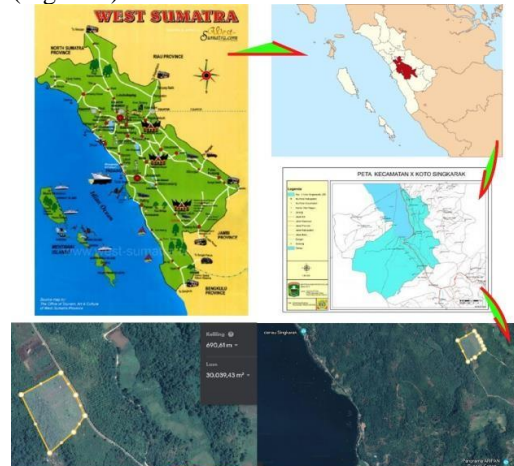


Figure 3. Project location
Source: Google Maps

The location was chosen to be the area closest to Singkarak Lake, the site selection took into account the conditions for considering which location was the best based on the criteria that had been described. Based on these criteria, the following data were obtained:

1. View
View towards Singkarak Lake and Barisan Hills
2. Topography
The land is slightly contoured, but there is also a flat expanse of about 200x100 m
3. Diversity of tourist activities, proximity to tourist attractions, and local potential
Close to many attractions such as the peak of Cinangkiak (3.2km straight on the map), the wind blows (6km), Peak of Gobah (1.3km), and also several other attractions such as Peak Gaguan, Peak Thailand, Peak Aua Sarumpun, Lake Singkarak, tTanjong Mutiara beach, etc
4. Land use
According to the Solok Regency Regional Regulation Number 1 of 2013 concerning the Solok Regency's Spatial Planning in 2012-2013, the land can be used for Agricultural Designations, Fisheries Designations, Mining Designations, Housing and Settlement Designations, Tourism Designations, Industrial Designations, and Other Designations
5. How to reach
The location can be accessed via the

Aripan-Tanjung Alai road, 10 km from the city center of Solok with a travel time of ± 30 minutes, and 2.5 km from the Simpang4 Aripan mosque.

METHOD

- a. Data collection methods used, such as the literature method, were carried out by taking the required data from the related literature. The Interview Method conducted interviews with local residents, and conducted interviews with other villagers. The Lake Singkarak Resort Hotel design method is an explanation of the design process accompanied by theories and data obtained from literature studies and field studies, so that the process can provide an overview that is supportive of the object in the design. The study framework used in the design process of the Lake Singkarak Resort Hotel, West Sumatra in general. The stages of the study used in the design of the Lake Singkarak Resort Hotel, West Sumatra:
1. Search for ideas / ideas for lodging accommodation needs in Solok Regency and Tanah Datar Regency, West Sumatra. inadequate, so resort hotels are chosen to facilitate tourists.
 2. The design idea was obtained from the idea of a building that can function as a tourist facility but by utilizing the natural potential around Lake Singkarak for tourist attraction. Thus, an idea was created about the application of ecotourism in the design of the Lake Singkarak Resort Hotel.
 3. Maturation of design ideas obtained from information data about Architectural and Non-Architectural from various journals, literature, and media that functioned as comparisons
 4. The process of developing ideas/ideas is then poured in the form of a concept. From these stages resulted in an application of the concept to the design in the form of a mass form, and a visualization perspective on the design.

- b. The observation method is carried out by making direct observations in the field, the documentation method is taking pictures to strengthen and clarify theoretical data by taking photos directly to the object.
- c. Data processing method of data compilation is data sorting which is then presented in the form of descriptions, tables, graphs, sketches, pictures and photos.
- d. The discussion method used is the comparative method, which is to compare the data obtained in the field to the existing theory in accordance with the object of discussion. Analysis method, namely data that has been

In this design, a descriptive research approach is used to analyze the understanding of Green Architecture, and its application to buildings designed.

The secondary data source is a source that does not directly provide data to the data collector. Using secondary data is when researchers collect information from data that has been processed by other parties (Sugiyono, 2016).

Secondary data that has been obtained include:

- Data on the Number of Tourists at Lake Singkarak Pier per Year. (Table 1) (Regency, 2019)

Table 1. Data on the number of tourists at lakesingkarak pier per year

No	Year	Vishnus	Foreign Tourists	Amount
1	2013	110.704	518	111.222
2	2014	108.603	395	108,998
3	2015	157,976	374	158,350
4	2019	509,747	450	510.197
Total		887,030	1,737	888,767

Source: Solok Regency Central Statistics Agency, 2020, Tanah Datar Regency Tourism Office, 2020

- Regional Regulation of West Sumatra Province Number 6 of 2011 concerning Buildings Article 26 Paragraphs 1 and 2 (Government, 2014).
 - 1) The allotment of location in the zone asreferred to in Article 25 includes:
 - a. Zone I is for limited fishing

housing, rural housing is limited to agricultural cultivation areas, as well as buildings that support production forest activities, mining, coastal tourism, coastal protected areas, ports, fishing industry, and cultural heritage which are strictly and selectively restricted to be expanded and/or increase the amount;

- b. Zone II for limited housing for fishermen and farmers which is limited to be expanded and/or increased in number;
 - c. Zone III for housing, commercial buildings, educational facilities, health facilities, worship, trade, social, culture, and government;
 - d. Others for housing, commercial buildings, public, and government facilities.
- 2) The building intensity in each zone is determined to include:
- a. In zone I, the KDB is less than 15%, and the KLB for residential houses is a maximum of 0.3 while for other buildings it is adjusted to its function;
 - b. In zone II, KDB is 15% to 30%, KLB for residential houses is a maximum of 0.6 while for other buildings it is adjusted to its function;
 - c. In zone III, the KDB for residential houses is 30% to 50% and for other buildings a maximum of 60%, while the KLB for residential houses is a maximum of 1.5 and for other buildings a maximum of 2.4; and
 - d. All free distances and/or demarcation lines follow the provisions of the regency/city RTRW.

DISCUSSION

According to Jimmy Priatman analyzing a series of data, the design and location alternatives are obtained. One of these design alternatives will be maintained or combined to obtain the basic concepts that serve as design guidelines by linking the theme, namely Green Architecture. The basic concepts obtained will be applied in the concept of space, the concept of the site,

the concept of form, the concept of structure, and the concept of utility.

Activity System/Space Program Concept

Circulation in 3-star hotels includes visitor circulation, management and service circulation, and goods and food circulation.

- a. Circulation of visitors
What is considered in the circulation of visitors is in terms of convenience, comfort, and privacy of visitors in carrying out activities.
- b. Management and service circulation
Circulation to hotel management and employees.
- c. Goods and Food Circulation
This process is a process from receiving goods to distributing goods to spaces that need them. The circulation consists of:
 - Food and beverage circulation
 - Guest goods circulation (Figure 4)



Figure 4. Lake Singkarak Resort Hotel Circulation Concept
Source: Personal Analysis

Outdoor/Site Design Concept

The concept of the site was obtained by the theme of Green Architecture, namely:

- Maintaining the initial condition of the site by creating a design that follows the shape of the existing site (Figure 5).

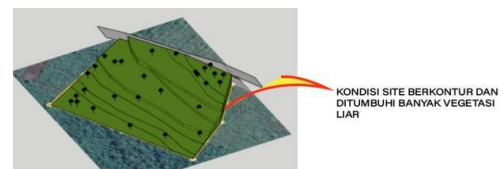


Figure 5. Initial Site Condition Tap
Source: Personal Analysis

- Since the site is contoured, a bit of digging was done to create a stepped space (Figure 6).

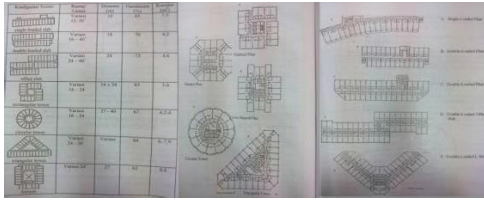


Figure 9. Commercial Building Form and Source: Commercial Building Design Guide

The concept of mass is by Green Architecture, namely:

- The building is made elongated and thin to maximize lighting and save electrical energy.
- Utilizing solar energy that radiates in the form of thermal energy as a source of electricity by using a photovoltaic device that is placed on the roof.
- The roof is tilted from top to bottom towards the east-west wall or in line with the direction of the sun's circulation to get maximum sunlight.
- Install electric lights only in low-intensity areas.
- Using sunscreen on windows that can automatically regulate the intensity of light and excessive heat energy entering the room.
- Painting the interior of the building with a bright but not dazzling color, which aims to increase the intensity of light.
- The building does not use artificial heating, all heating is generated by residents and sunlight enters through ventilation holes.
- Minimizing energy use for refrigeration (AC) and elevators.
- Using an air pump system and cross ventilation to distribute clean and cool air into the room.
- Using windows and roofs that can be partially opened and closed to get the light and ventilation as needed (Figure 10).



Figure 10. Mass Concept Source: Personal Analysis

Environmentally sound and based on concern for the conservation of the natural global environment with an emphasis on energy efficiency, sustainable patterns, and a holistic approach. Starting from ecological design thinking which emphasizes the interdependence and interrelationships between all systems with their local environment and the biosphere (Anisa, 2014). Green Architecture can be interpreted as "an architectural concept that seeks to minimize adverse effects on the natural and human environment and produce a better and healthier place to live, which is done by utilizing energy and natural resources efficiently and optimally"

1. Conserving Energy (Energy Utilization)
 - Application of natural lighting in Resort Hotel design. This is achieved by creating multiple openings. Thus, it is hoped that sunlight can enter the room. While the outside of the opening is given a canopy, one of the benefits is to reflect light to the ceiling of the room (Figure 11).



Figure 11. Application of Energy Conservation by Creating Multiple Apertures Source: Personal Analysis

- The next method applied in this design to achieve a sustainable design is by saving the use of fossil energy as the main energy of the building. Currently, the main source of electrical energy is PLN, where PLN uses fossil energy as an energy generator. In this design, the building is expected to produce its energy. Abundant sunlight on the land is used as a source of energy for generating electricity using photovoltaic/solar

panels.

2. Working With Climate

- Natural ventilation is designed by reducing the room temperature in the residential block. This is attempted through a rainwater reservoir that is left open on the roof garden to reduce the air temperature and minimize the surrounding pavement which is then replaced with greenery so as not to cause heat islands around residential blocks, especially in the hottest months in Indonesia (Figure 12).



Figure 12. Application of Working with Climate by Making a Roof Garden

Source: Personal Analysis

- The facade also plays an important role. Besides being part of the building that separates the inside and the outside of the building. The facade can also reduce solar heat that enters the building. The contribution of the facade to lowering the room temperature is hereby achieved with the use of a vertical garden (Figure 13).



Figure 13. Application of Working with Climate by Making a Vertical Garden

Source: Personal Analysis

3. Minimizing New Resources (Use of Recycled Resources)

The building is designed to minimize

the use of resources, namely by making a waste sorting place and waste that can be recycled can be used for other architectural matters in this building.

4. Respect for users (The Role of the Building Can Be Optimal To Fulfill the Needs of the Occupants)

This building is expected to provide more positive impacts. This is achieved by the application of cross ventilation in the room. Cross ventilation allows the exchange of indoor air with outdoor air so that indoor air is always exchanged with new and healthier air, and can also reduce excessive use of air conditioning (Figure 14).



Figure 14. Application of Energy Conservation by Implementing Cross Ventilation

Source: Personal Analysis

5. Respect for site

The condition of the land is still beautiful land located in a hilly area, overgrown with weeds and surrounded by plantations, and trees. In future designs, this condition will be improved with more trees on the site. The benefits of trees in addition to producing oxygen which makes the air fresher are also shaded from sun exposure on the site.

6. Holism (Overall Application)

All of the above principles should be applied as a whole as an approach to the design of this resort hotel.

Utility Concept Concern with Green Architecture

1. Clean Water Network

The main source of clean water used in this design is PDAM water. With the distribution of the down feed pumping system, the water from the PDAM is pumped and then the water is stored in the ground tank and then flowed to each

building. Another source of clean water is a rainwater reservoir in the roof garden, and it can be used for plant care and klosetflusher.

2. Electric Network

The main source of electricity comes from PLN with a generator set as a source of backup electricity, which uses an automatic switch system that automatically turns on when the main source is disconnected. Another source of electricity comes from solar panels, which can save PLN's electricity usage.

3. Communication System

The communication system used in this building is a telecommunications system that uses telephone and facsimile networks that are used for management communication purposes. The network used is a PABX.

4. Sewerage Network

There are 3 types of sewage and sanitation systems in this resort hotel building, namely:

- Dirty water with soap: includes bathroom water, and washing residue, this water will be discharged into infiltration wells
- Dirty water that comes from the kitchen: for example, cooking water, this type of water before being discharged is collected in the control tank before being channeled into infiltration wells.
- Dirty water from the toilet: dirty water from the toilet will be discharged directly into the septic tank.

5. AC system

The air conditioner used is central air conditioning. This building also uses natural ventilation by making many openings with a cross-ventilation system so that it can suppress excessive use of air conditioning

6. Building Safety System

Namely a fire protection system, in the form of an active protection system and a passive protection system.

CONCLUSION

Green Architecture has a broad meaning and various forms of design that are certainly environmentally friendly. Green Architecture aims to design future natural potentials that can be utilized more without

damaging the surrounding environment, as well as the need for a design process to reduce unfavorable environmental impacts, increase human comfort by increasing efficiency, reducing energy resource use, land use, and waste processing effective at the architectural level.

The architect's own goal in designing eco-friendly dwellings is not to create a perfect eco-friendly dwelling, but to create better eco-friendly buildings, because designing is a process. Currently, the status of environmentally friendly architectural designs is still at the ethical level rather than at the scientific level. Changing lifestyles and attitudes towards the environment is important, but the development of knowledge-based skills is equally important. The development of this expertise will in turn produce skills, techniques, and methods in the practice of environmentally friendly building design.

Acknowledgement

This research study is expected to be a recommendation for the government to build a resort hotel that is energy efficient and does not damage the nature around Lake Singkarak which is still beautiful as a solution to accommodate the increasing number of tourists to this area.

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