(2024), 2 (12): 454–466 **Scientica** 3021-8209

Jurnal Ilmiah Sain dan Teknologi

Shopping Center Design With a Responsive Architectural Approach To The Tropical Climate In The Medan City

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Abstrak
The design of this shopping center is located on Mongonsidi street, Medan City, North Sumatra, Indonesia. The area on the site is in the center of Medan City, where the surrounding buildings are commercial building areas and densely populated residential areas with the population of Medan City being 2,460,858 people this year. The area on the site has the potential to be used as a place for shopping and recreation. However, this area has limited facilities and infrastructure that is not well organized, especially the lack of greenery in the form of plant vegetation. For the need for activity generators in the site location area, namely on Mongonsidi street, the design that will be created is a mall building in the form of a public business building and as a place for shopping and recreation. The design of the shopping center building uses a Tropical Architecture approach as a green open space and provides adequate lighting so that building users feel more comfortable when carrying out activities inside the building.

History Artikel
Submitted: 23 Agustus 2024
Accepted: 22 Agustus 2024
Published: 23 Agustus 2024

Keywords:
shopping centers, recreation, Tropical architecture

1. Introduction

Indonesia is a country with a very large population, namely 275.773 million people (BPS 2022) [1]. The majority of the Indonesian population has a consumptive nature of goods or services to meet their daily needs. Therefore, to fulfill these needs, space is needed. These spaces can be traditional markets, supermarkets, mini markets and malls (shopping centers). A shopping center is a building where shops gather to buy and sell goods that can meet primary (main) needs as well as secondary and tertiary needs [2].

1.1. Condition Of Malls In Medan City

Medan City is a city with a very rapid economic growth rate as evidenced by the large number of business and commercial activities in Medan. Economic activity in Medan is of course influenced by several businesses, including manufacturing companies, apartments, restaurants and others. The role of trade is very important in the economy, so that the development of shopping center buildings can make the economic growth of Medan City more rapid [3].

1.2. Lack Of Green Open Space

In accordance with Law No. 26/2007 concerning Spatial Planning, it is stated that the proportion of green open space in the city area is at least 30 percent of the area of Medan City," said Bobby when receiving the North Sumatra REI DPD in Medan . This is a challenge for the Medan City Government considering the rate of urbanization in this area. one of the highest in Indonesia, and has an impact on the availability of urban land. Therefore, based on the Medan City Regional Regulations regarding the Regional Spatial Planning (RTRW) of Medan City, it has been revised, so that the City of Medan only has 16 percent of its green open space The city area is around 26,510 hectares, so it still requires 15 percent or 2,916 hectares according to the Medan City RTRW. "The allocation of green open space is quite limited, the City Government is trying as much as possible to

provide public green open space in accordance with the Medan City Regional Regulation regarding RTRW [4].

1.3. Hot Weather

The sun can emit light rays, and at the same time the sun produces heat. The heat of the sun must be responded to in designing buildings with tropical architecture, because in tropical countries, sunlight will always be there all year round . Mitigation efforts can be made by installing sunscreens in the form of blind curtains horizontally or vertically in the room, which can reduce solar radiation by 60% to 70%. Blinds can be installed permanently or can be moved, according to needs [5].

1.4. Condition Of Mall In Indonesia

In general, malls in several big cities such as Medan, Surabaya and others only focus on their function, namely as shopping centers without considering the comfort level of mall visitors [6]. In fact, with the climatic conditions in Indonesia which is a tropical climate, it can be used to integrate natural elements such as plants, water and wind to create buildings that save construction costs, are easy to maintain and are also environmentally friendly buildings . To make this happen, knowledge of the Tropical Architecture approach is really needed so that it can be applied to every building [7].

1.5. Tropical Architecture

The definition of tropical architecture according to Tri Harso Karyo is a building that is related to climatic conditions during building design which will lead to overcoming problems caused by tropical climates such as hot sun, high temperatures, rain and high humidity [8].

The use of the Tropical Architecture approach aims to create building designs that can provide benefits in terms of comfort, energy efficiency, sustainability and integration with the environment. This approach helps create building designs that suit the tropical climate in the city of Medan and provide an optimal experience for visitors. Therefore, the shopping center will be designed using a responsive architectural approach to the tropical climate. And will make maximum use of the climate conditions in the area in terms of rainfall, sunlight, temperature and so on in order to create a sustainable and environmentally friendly building.Illustrations

2. Literature Study

2.1 Shopping Center Definition

A shopping center is a systematic group of shops managed by a central management that rents or sells retail units with traders and the supervision is carried out by a manager who is fully responsible for the shopping center.

According to the International Council of Shopping Centers (ICSC) a shopping center is a collection of retail units and other commercial businesses that are planned, owned, managed and developed as a single ownership. So we can conclude that a shopping center is a container or special area that is built to contain a group of retail businesses that are visited to buy or see the economic needs of the community [9].

2.2 Tropical Architecture

Tropical architecture is all about implementation architecture that exists in tropical climates meet comfort standards, so that humans comfortable living in it, included into tropical architectural products.

In tropical climates the results of application architecture that meets comfort standards, humans are comfortable living in it, including to in the category of tropical architectural applications. There are several factors that must be taken into account building planning, namely: Orientation, Orientation building against the direction of wind and sunlight affects building placement and direction building.

In building orientation planning can minimize incoming sunlight into buildings and can be used as natural lighting. The orientation of the building can also be affects the size of the air flow enter [10]. In a tropical climate that is dominated by the heat of the sun, rainfall and wind, insulation or blocking entry into the building is required. The sunlight that enters the building can be blocked and a shading process occurs so that the sun's heat is not carried away directly. In construction planning, good air flow can neutralize air humidity, besides that the air in the building flows well making users comfortable and cool. Building vegetation can function to filter dust, act as a barrier to strong wind currents and noise around the site. Placing the right vegetation will provide many benefits, the area around the site will also be shady and comfortable. The application of roof ventilation on the roof must be good, so that the sun's heat enters through the roof of the building. To reduce this, use a roof ventilation system where the air in the room is directed and channeled to the roof of the building so that the flow of hot air in the room is not large [11].
So tropical architecture is the science of designing buildings in areas with hot (tropical) climates. In the design and planning process leading to the analysis of tropical climate problems. Apart from that, it also adapts to the surrounding environmental conditions and tries to utilize the existing environmental potential, both solving the climate and everything related to it [12].
Tropical architecture is the theme choice in the design to pay attention to the surrounding nature, apart from that, Indonesia also has a lot of natural resources (SDA), with the application of this theme it is hoped that it can maintain the sustainability of natural resources which are increasingly depleting and apart from that, it also adapts to scientific and natural conditions. which has potential in shopping center design [13].

2.3 Classification of Tropical Climate Factors

In simple terms, the meaning of tropical architecture is an architectural design that leads in solving tropical climate problems. While the tropical climate itself is characterized by several climatic factors such as high rainfall around 2000-3000 mm/year (Jakarta + 2000 mm/year or average + 160 mm/month), solar radiation relatively high around 1500 to 2500 kWh/m2/year (Jakarta + 1800 kWh/m2 /year), Relatively high air temperatures for cities and regions coast or lowlands (Jakarta between 23o up to 33oC), high humidity (Jakarta between 60 up to 95%), wind speed is relatively low (in Jakarta city average below 5 m/s) [14].

2. Methodology

3.

The methodology used in the process of selecting suitable sites involves collecting data derived from the results of field surveys. The research methodology used is the descriptive method, which is data collection that includes primary and secondary sources. The data collection stage includes information regarding the background, objectives, and problems related to the project. Furthermore, design analysis is carried outwhich produces research results based on direct observations in the field. The final step in this process is the formulation of the design concept. This conceptualization is derived from an examination of the user's needs, the surrounding environment, the analysis conducted, the findings from the research, the problems encountered identified, and the resulting solution.

4. Result and Discussion

4.1 Project Description

Based on the results of the analysis carried out by the author, this location is the most appropriate location because it meets the location selection criteria in this design. The location of the selected project is in Medan Polonia District, Medan City, North Sumatra Province. The following is general

data from the project location to be designed:

Table 1. *Location Data*

Location	Mongonsidi Street, Medan District Polonia, Medan City
wide	± 22.500m^2
GSB	4m
KDB	70%
KLB	10 Floor
KDH	20%
Zoning Function	Trade and service zone

Figure 1 *(a) Map of Medan; (b) Site Location*
Source: (Author, 2024)

This site is located in the K-2 Trade and Services Zone which is a sub zone for entertainment business activities, trade and service businesses, catering businesses, service businesses, lodging businesses and certain businesses and their facilities. (Detailed Spatial Plan Zoning Code) [15].
The design location is on Secondary Arterial Road, namely Jalan Mongonsidi, Medan Polonia District, Medan City, North Sumatra. Which has a road width of 26 m and a GSB of 15 m.

4.2 Territory Boundary

Regional boundaries are differentiated between macro and micro. From a macro perspective, it is a design area located in Medan Polonia District.

Figure 2 *(a) Map of Medan Polonia District; (b) Micro Territory Boundary*
Source: (a) RDTR; (b) Author, 2024

From a macro perspective, this site borders directly on other sub-districts such as East Medan, Medan City, Medan Amplas, and also Medan Baru. This condition shows that this location is very strategic because it is located in a sub-district which has a fairly dense population. Meanwhile, on a micro level, this site borders

several commercial buildings such as Vikka Resort Masdulhak Garden, Boloni Hospital, Mosque Taqwa Polonia, and also GBKP Polonia.

4.3 Shape/Mass Concept

The following is the concept of shopping center building mass:

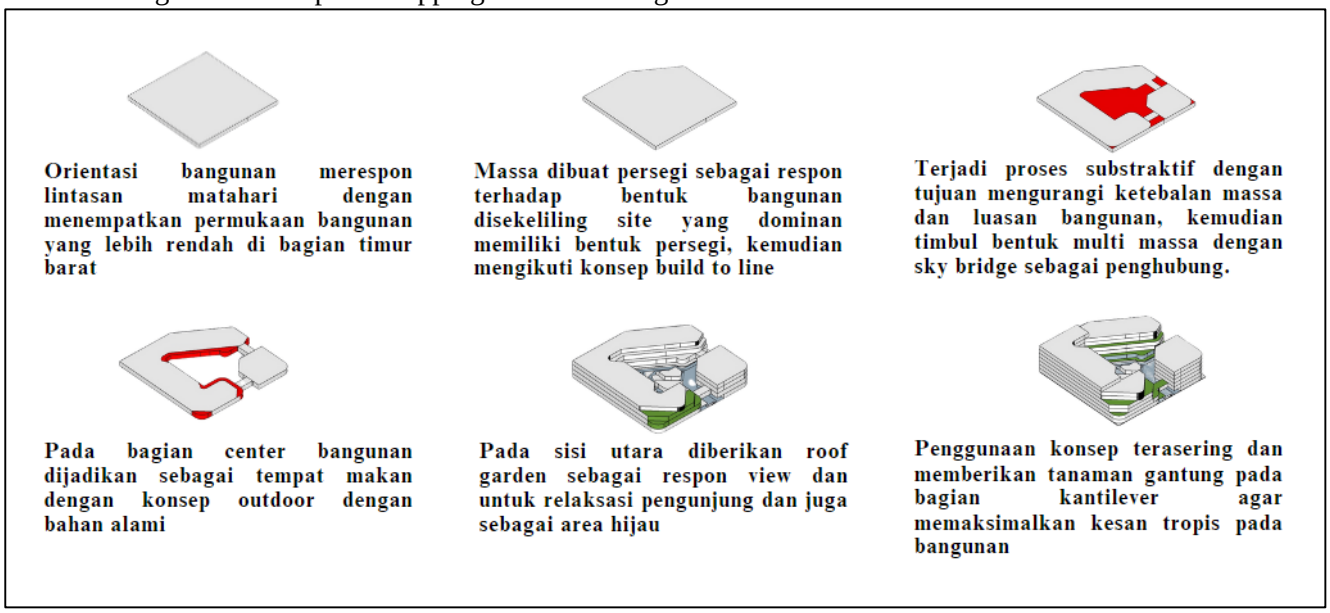

Figure 3 *Mass Concept Of Shopping Center*
Source: (Author, 2024)

4.4 Space Program

4.4.1 Space Requirement

From the analysis that has been done, the space requirements for Shopping Center are as follows

Table 2. *Space Requirement*

GROUP	USERS AND TYPE OF ACTIVITY	ACTIVITY	SPACE REQUIREMENT	ZONE
Main Activity	Visitors	- Shopping - Recreation	Retail Store	Public
			Department Store	Public
			Supermarket	Public
			Restaurant	Public
			Foodcourt	Public
			Café	Public
			Cineplex	Semi-Public

		Bioskop	Semi-Public
		Game Center	Public
		Relax in the garden	Public
Tenant Retail	- Selling goods or services - Serving Buyers - Receive Payments	Retail Store	Public
		casier	Private
		warehouse	Service
Cafe	- Provide Menu - Prepare drinks and ingredients - Receive Payments - Clean Kitchen Equipment - Rest	Material warehouse	Service
		Kitchen	Private
		casier	Private
		Washing room	
		Employee room	Private
Restoran &Foodcourt	- Provide Menu - Prepare drinks and ingredients - Recieve Payments - Clean Kitchen Equipment - Rest	Material warehouse	Service
		kitchen	Private
		casier	Private
		Washing room	
		Employee room	Private
DepartmentStore	- Receive stock of goods - Serve buyers - Receive	Material warehouse	Service
		Loading dock	Service

		payments - rest	warehouse	Service
			Employee room	Private
			casier	Private
	Supermarket	- Receive stock of goods - Serve buyers - Receive payments - Rest	Loading dock	Service
			warehouse	Service
			Employee room	Private
			casier	Private
	Cineplex	- Sell ticket - Rest	Box tiket	Semi-Public
			Employee room	Private
	Game Center	- Buying Ticket - Rest	Box tiket	Semi-Public
			Employee room	Private
Management Activity	General Manager	- Administrative management - Mall center management - Management coordination - Rest - Lavatory	Work room	Private
			Meeting room	Private
			Sitting room	Semi-Public
			Lavatory	Service
	Manager	- Maintanance	Work room	Private
	Head of Division	- Maintenance - Carry out division coordination	Work room	Private
			Meeting room	Private

	Section Chief	- Maintenance - Carry out division coordination and staff	Work room	Private
	Staff	- Maintenance - Save file	work room	Private
Service Activity	Service Activities Visitors	- Service Activity - Security Activity - Safety Activity	Musholla	Service
			Ablution room	Service
			PPPK Room	Service
			Security room	Service
Support Activity	Security Guard	- Security Activity - Checking incoming goods and get out - lavatory	Security room	Service
			Loading dock	Service
			Lavatory	Service
	Technician Of Mechanikal- Electrikal	- Maintenance - M.E - Storage and maintenance - Maintenance Utility of Building	Utility room	Service
			Tools warehouse	Service
			Material warehouse	Service
	Parking	- Visitiors Parking - Management Parking - Service Parking	Public parking	Service
			Management parking	Service
			Service parking	Service
Complementary Activity	Banking	providing ATM machine services	ATM	Public

4.5 Theme Implementation

The elements of a tropical architectural theme that are applied to shopping center design to attract visitors and adapt to the surrounding climate are:

4.5.1 Application of the concept to shopping center buildings

The semi-outdoor mall design offered in this design can be a feast for the eyes. Apart from the fresh effect of the many existing vegetation elements, this combination of natural and modern concepts also does not forget about aesthetics, so that overall it creates a comfortable interaction space for humans.

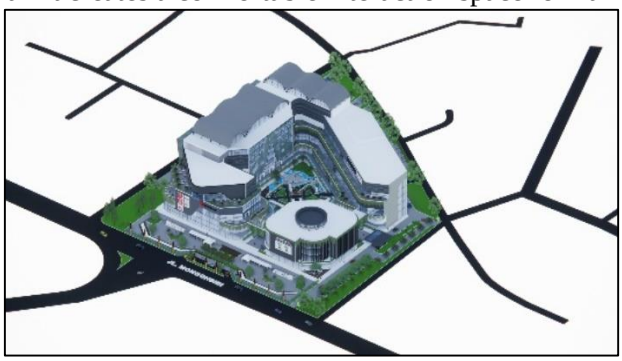

Figure 4 *Perspective View Of Shopping Center*
Source: (Author, 2024)

If you look at the site plan, this mall is designed with open space in the middle so that the building corridor becomes semi-outdoor. In this open space in the middle, a kind of pool with islands was created. This area is a building designated as a cafe, restaurant and plaza. This is of course interesting for visitors, because they can feel the tropical natural feel even though they are in a mall.

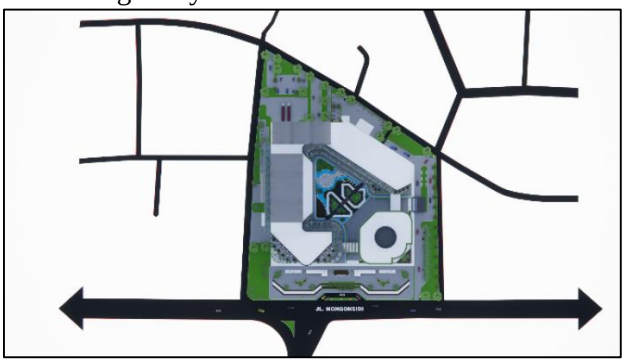

Figure 5 *Site Plan Of Shopping Center*
Source: (Author, 2024)

Use of eaves/oversteaks to avoid leaks, direct light, and protect water from entering the building.

Figure 6 *Innercourt View*
Source: (Author, 2024)

4.5.2 Shopping center building orientation

Light enters the middle of the building so that the mall gets sufficient lighting, but the middle of the building is not exposed to the maximum at certain times

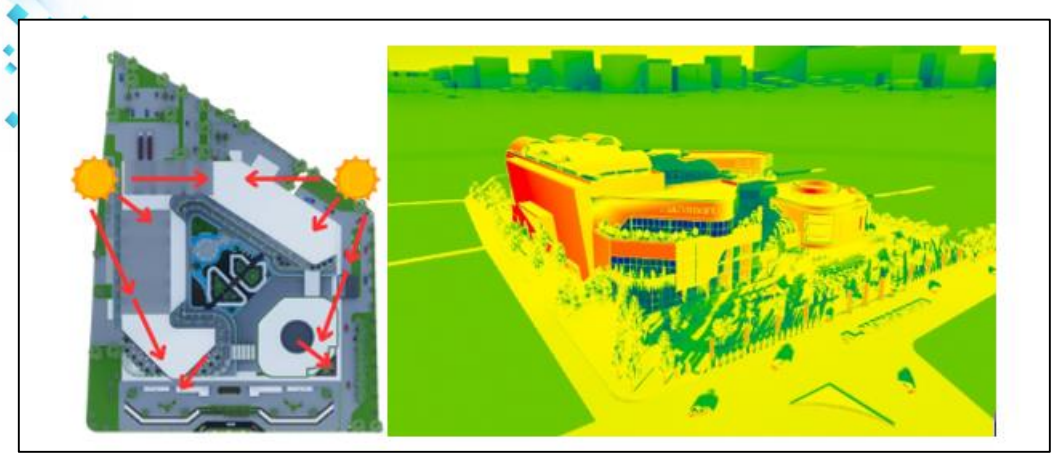

Figure 7 *(a) Sun Reach; (b) Sun Simulation*
Source: (Author, 2024)

4.5.3 Air Sirculation

The semi-outdoor concept which allows for many openings of course makes this mall more energy efficient, such as for lighting. The abundance of vegetation and the presence of ponds will also create a microclimate, so that the air inside the building feels cooler and reduces the use of air conditioning. The building arrangement also follows the orientation of the sun, so that there is no significant glare when the sun is low in the West or East direction. So on the west side, the side with the smallest area is placed.

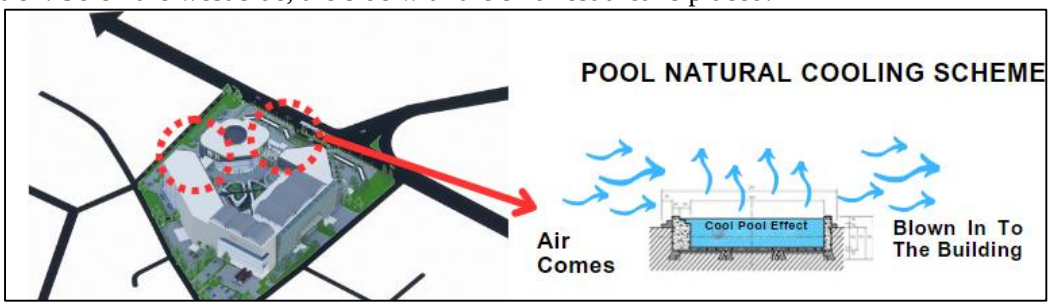

Figure 8 *Pool Natural Cooling Scheme*
Source: (Author, 2024)

4.5.4 Application Of Materials In Accordance With The Design Theme

The application in building design lies in the building facade which uses Aluminum Composite Panel (ACP) material. The ACP used also functions as sun protection to anticipate thermal comfort in the building. Apart from that, the unique facade selection and dynamic shape follow the flow so that it attracts the attention of visitors and the public who pass through the shopping center.

Figure 9 *Use Of ACP Materials on Facade*
Source: (Author, 2024)

Using secondary skin on parts exposed to excessive sunlight, such as using a vertical garden on the front facade of a building. The function of using a vertical garden is to reduce the surface temperature of the walls, including aspects of comfort and energy savings.

Figure 10 *Use of ACP Materials as Secondary Skin*
Source: (Author, 2024)

5. Conclusion

The design of the shopping center in Mongonsidi is necessary to be able to meet the daily needs of visitors. Apart from that, this shopping place is expected to have its own advantages compared to existing shopping places so that it can become a new attraction for the people of Medan City which in the end can help the development of the economy and tourism of Medan City.
Apart from being able to meet the needs and provision of aspects of human life, this design can also reduce environmental destruction and can also help balance nature. In choosing this tropical architectural theme, it leads to harmony between humans and nature. Several principles of the tropical architectural theme used in designing shopping centers in Medan City are building orientation, application of roof ventilation in buildings, high cross ventilation to create good air flow in the building, and also application of materials in accordance with the tropical architectural theme. Then the application is analyzed and applied to the design and applied to the building design.

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