



# Student Rental Apartment with Green Architecture Application in Medan City

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**Abstract.** Medan city has become the economic, political, educational, and socio-cultural center in North Sumatra Province. Medan has a variety of religions, cultures, and tribes. The development of education, especially universities, makes Medan one of the goals for students who have completed their education at the high school level. The college will bring students from out of town and within the city. In addition, clothing and residential food become one of the needs of students. Students from out of town will need temporary housing that can be rented during their college education. Accommodation must be tailored to the needs and culture of students. The apartment has become one of the alternative housing for students. Green Architecture is one of the alternatives in designing buildings, where this concept can minimize damage to the environment and building users. The application of energy-saving to structures will positively impact users of the building and the building itself.

**Keywords:** apartment, green architecture, Medan city

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## 1 Introduction

The provision of housing, especially in urban areas, is one of the basic human needs. Environment and accessibility become the attraction of a location to determine the quality of life that is safe and comfortable from a dwelling [1]. The results of the 2020 population census (SP2020) released by the Central Bureau of Statistics (BPS) showed the population spread in North Sumatra was concentrated in Medan, with a population of 2.43 million people or 16.46% of the entire population of North Sumatra [2]. Education in Medan can be seen from relatively large universities, including the University of North Sumatra, Methodist University of Medan, Nomensen University, etc. Human beings have a level of need where, if the primary needs are met, it will continue on secondary conditions below the immediate needs [3]. Students have

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needs that will be used during the lecture period, ranging from primary and secondary to tertiary markets. Supporting facilities such as temporary housing will be able to meet the needs of students during the lecture period. A person who rents must decide whether to own or rent a property considering the location and sound rental system [4]. The price of the leased property will be by the facilities that will be received. Comfortable, clean, safe, cheap, and fast access to campus is an essential point for students who want to rent a temporary residence during the study period. Famous flats in Indonesia are flats. Apartments and condominiums where all three belong to the type of flats, vertical buildings, and have the same function [5]. An apartment is a place consisting of a sitting room, bedroom, toilet, kitchen, dining room, tv room, living room, and supporting room such as foyer and balcony; which is on one floor of a multi-story building with various facilities such as swimming pool, fitness center, shops, library, mini market, etc. [6].

The apartment has several functions as follows: the primary function is as a vertical settlement with relatively the same activities as settlements in general; the secondary function is a function that adds to the comfort of residents such as sports services, health, commercial, and child services; Tertiary function, is a complementary function related to management activities such as administration, marketing, maintenance, cleanliness, building maintenance, and security [7]. Principles and considerations in designing commercial buildings such as apartments need to pay attention to the target users and the activities contained in them [8]. Actions in this building are generally the same as activities in a settlement. The design of an apartment requires consideration because of the demands of residents who have different cultural, social, and economic backgrounds.

## **2 Literature Reviews**

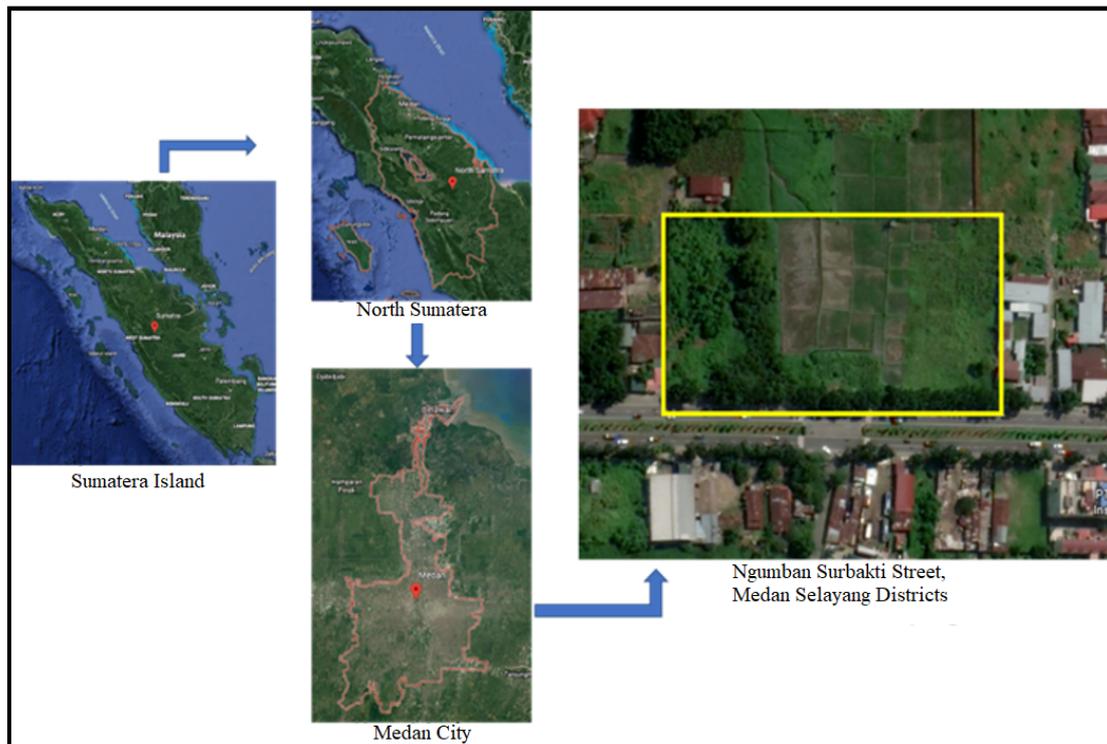
Green Architecture provides an understanding of environmentally friendly architecture based on classification and already has universal approval (Burcu, 2015). Green Architecture is a building with little impact on the environment, facilities that use environmentally friendly materials, low-cost energy, renewable energy, and are cheap in its operations and construction. The description of the principles of Green Architecture, among others: conserving energy is minimizing the use of electrical power and energy optimization in buildings; working with climate is utilizing natural energy conditions and sources; making the most of the land; minimizing the use of natural resources; particular meaning all principles should be used as an approach in building an environment [9].

The National Library of Singapore was designed by applying the green and intelligent building concept. The use of advanced technology is combined with the utilization of natural resources as well as the automatic sensors and tools that will turn on when needed, such as sensor light bulbs that will turn off when needed as well as motion sensors that will activate the escalator

when it will be used, and rain sensors that will automatically die when it rains and live 8 hours later to be used as irrigation for crop needs. The Malaysian Energy Commission Headquarters building uses photovoltaic panels to absorb sunlight as a source of electrical energy. From the same roof, rainwater is piped into four tanks. Wastewater is recycled without purification. At night, the water temperature of 18°C is channeled into plates that cool the temperature to 21°C. During the day, the system is turned off, and the floor passively absorbs the sun's internal heat and heat loads.

The atrium of the building is used as an entry point for natural light, so the building uses light 50% naturally. The principle of energy-efficient buildings can be applied to the design, namely by using solar panels on the roof of the building through the use of sunlight entering through large openings to reduce electricity consumption, utilizing rainwater by applying a drain on the edge of the top of the podium so that the water can be used for toilet purposes. And the landscape and building orientation are based in north and south directions. Commercial areas are suitable for development in the city center [10]. Strategic location and easy access to the building affect the retail space in the city center. In determining the location of settlements, the distance to the place of work, the city center, trade, education, health, security, and municipal service facilities. In general, there are several things to consider in the selection of the location of an apartment, namely: it takes at least 30 minutes to reach work and urban service centers; there is already a complete infrastructure network; Good accessibility, including the availability of transportation facilities and infrastructure with good quality; provide opportunities to be able to foster individuals and families and be assured of all dangers [11].

Location at Ngumban Surbakti Street, Medan Selayang District, Medan City, North Sumatera. In Figure 1, the site area is 18,668 m<sup>2</sup>, the surrounding facilities are a college area, and the topography is relatively flat. Location development is carried out in regions that are not prone to disasters and allows interaction between residents and various resource development services such as educational, social, commercial, and other facilities. The land potential is in the city area and close to universities and land allocation for the economy and education. The location is on Ngumban Surbakti Street, Medan Selayang District, Medan City, North Sumatera. In figure 1, the site area is 18,668 m<sup>2</sup>. The facilities around the site are college areas and the topography is relatively flat. The relatively flat topography makes it easy to design tall buildings. Location development is carried out in areas that are not prone to disasters and allows interaction between residents and various resource development services. Development of resources to be provided such as educational, social, commercial, and other facilities. The land potential is in the city area and close to the university so the design of the building can be supported by the surrounding environment. Land use is for the economy and education. This will facilitate the design of rental apartment buildings that can be used by students.



**Figure 1** Map of The Site Location

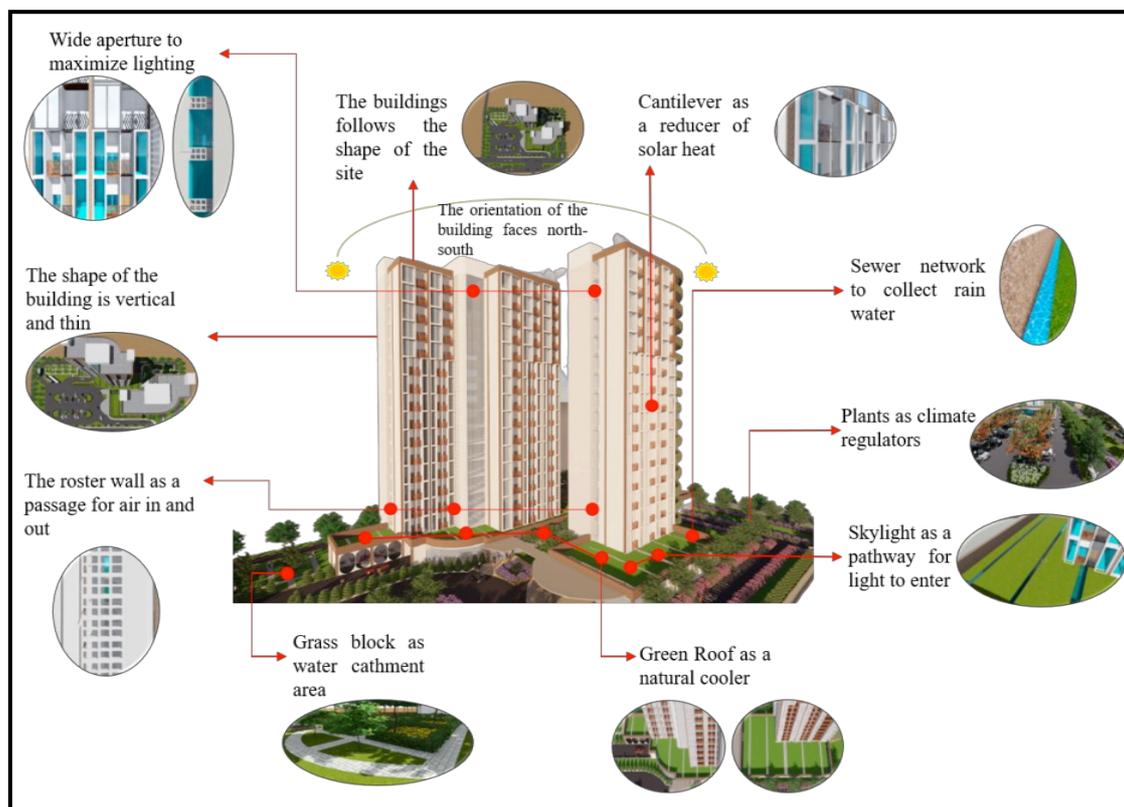
### 3 Methodology

The research method used is a qualitative method in which the research procedure that produces descriptive data in the form of written or oral words from people is observed [12]. Descriptive data were obtained from locations, surveys, interviews, and documentation. The design method is taken from several literature studies such as journals, theses, and articles related to the theme of green architecture and the function of the building as an apartment. Collecting data through the observation stage to find out the concrete facts in the field. [13]. Observations are made to systematically find data and information from events or events based on the purpose of research that has been formulated [14]. Interviews are data collection techniques by asking questions to respondents and recording or recording respondents' answers. The researchers will collect several documents to get an in-depth description and understanding or focus of the study [15]. Green architecture has five principles, one of which is energy saving. This study took samples by looking for literature or comparative studies of buildings with the theme of Green Architecture. Structures that have the same theme are then analyzed based on the principles of Green Architecture. The analysis obtained is then reviewed to apply to the design of apartment buildings.

### 4 Result and Discussion

The application of Green Architecture in figure 2, principles to building design includes: conserving energy; using wide glass in residential units and hallways to maximize lighting to save electricity, using skylights on podiums to reduce electric power usage, using the roster wall

on the residential lobby like an air ingress, so the hallway does not use air conditioning, use green Roof as a natural coolant temperature in the room, making sewer tissues on the side of the podium roof to make use of rainwater as water needs plants, use grass block to maintain the water catchment area. Working with climate, the orientation of the building faces north and south, so that heat from the west and east does not enter the room, using plants as climate regulators and O<sub>2</sub> supplies and shade in surface parking areas. Respect for site: designing buildings according to the shape and condition of the tread but still paying attention to the function of the building, that is, an apartment, reducing the primary surface area of the building by designing the building vertically and maximizing the green open space around the building. Respect for a user; saving electricity, water, and air conditioning energy, and maximizing green open space, can provide comfort and reduce the cost of electricity and water bills for users. It is limiting new resources; using concrete material as the main structure and construction on the building can support the function of tall buildings, and concrete is more durable and resistant to fire.



**Figure 2** Green Architecture Concept

## 5 Conclusion

In designing an apartment, it takes: the appropriate tread, analysis of the site, study literature and comparative study by the function of the building and the theme of the building is green architecture, observation of activity patterns in an apartment, observation of the way of space in the apartment. This apartment uses the energy-saving principle of Green Architecture related to the site, building resilience, space formation, circulation inside and outside the area, and

consideration of green architectural themes through climate and weather. Conditions in Medan. It aims to ensure that buildings can respond to global warming conditions and reduce the use of non-renewable natural resources to a minimum. The design of this apartment is expected to answer the needs of students in choosing a residence during the study period. In addition to being a place to rest, the apartment can accommodate various other student activities such as studying and exercising. On the podium floor of the apartment is a shared facility that students can use. This is expected to make students interact more with others than just staying in the room.

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