



# Zoning Planning Concept and Parking Idea at Manado State Polytechnic Campus

Dwars Soukotta<sup>1</sup>, Teddy Takaendengan<sup>2</sup>, Jeanely Rangkang<sup>3</sup>, Sudarno Sudarno<sup>4</sup>  
<sup>1,2,3,4</sup> Department of Civil Engineering, Manado State Polytechnic, Manado, Indonesia  
[dwars.soukotta@sipil.polimdo.ac.id](mailto:dwars.soukotta@sipil.polimdo.ac.id)<sup>1</sup>

**Abstract.** The increasing number of human populations will also increase the transportation mobility. This case is clearly visible in a higher education where the increasing number of students can affect the number and types of transportation in the campus area which later on could cause the mobility disturbance in the area. The Manado State Polytechnic Campus, as one of the activity centers, is also experiencing problems caused by the increasing number of vehicles used by both students and employees. Regarding this issue, the research team collected data by conducting observations, distributing questionnaires, and using drone equipment to obtain campus site map data. The secondary data used by the research team including the data taken from several sources, such as data from the student affairs department, general affairs department, and civil service. The research results obtained from drone mapping and direct observation showed that the zoning of the parking area was determined by habit patterns, needs, and behaviors of vehicle users in the Manado State Polytechnic. The team then calculated the size of the parking area and designed a design concept using SketchUp Pro 2021 software. The result of this research shows that the red parking zone, with an area of 20264.56 m<sup>2</sup>, is planned as a parking building for two-wheel and four-wheel-vehicles. The purple parking zone, with an area of 5327.04 m<sup>2</sup>, is planned as a private parking area for the head of departments. The blue parking zone, with an area of 5944.72 m<sup>2</sup>, is designated as a parking area for employees and lecturers who use two-wheel-vehicles or motorcycles. The concept of a parking design model for all these zones is to organize a sustainable and ergonomic design. In conclusion, this research certainly makes a big contribution to the idea and concept of parking zone mapping and planning design. Hopefully, this idea will be able to overcome the chaotic parking behavior that are out of place so that they are better organized according to their functions and needs.

**Keywords-component :** transportation mobility; Manado State Polytechnic Campus; vehicles; drone mapping; zoning; parking zone mapping

## 1. INTRODUCTION

An increase in human population would likely increase the number of transportation users. Likewise, the increasing student population in a Higher Education would cause the number of transportation vehicles in the area to increase. That is also the case in Manado State Polytechnic Campus (Polimdo). The Polimdo residents are increasingly using vehicles (two-wheeled and four-wheeled) for mobility for daily activities, namely getting to and/or leaving campus location. This fact certainly shows the greater need for a parking

area. The impact of this limited and inadequate parking areas is that vehicle parking patterns becoming disorganized and chaotic. Furthermore, the road area for pedestrians or even the sidewalks have become illegal parking areas. This situation is certainly causing discomfort to the pedestrians and other people in general.

Many researchers have focused on this issue. Buharuddin et al. have conducted a research on the development of parking arrangements in three faculty areas, namely Engineering, Mathematics, and Pharmacy, at Hasanuddin University due to chaotic behavior in parking the vehicles [9]. Alamsyah et al. have also conducted a similar research. Parking management at Samudra University was not ideal, so vehicle parking problems arise. By using the Cordon Survey method, they predict that in the next 5 years there will be a need for adequate parking spaces [10]. Syaifullah et al., in their research regarding the management of parking space requirements at the Science and Technology Faculty of UIN Suska Riau, utilized open areas around the campus for only 948 motorbikes, or around 75% of the required parking space unit (SRP) for motorbikes [11]. Pedo et al. have done some observations and found that parking space was not yet available and several areas of the site had not been properly utilized as parking facilities. They issued a design for parking building facilities, which will later be used by users at the Faculty of Engineering, Widya Mandira Catholic University in Kupang [12]. Primasworo et al. also have conducted a similar research at Tribhuwana Tungadewi University in Malang. The number of students continues to increase every year, resulting in a lack of parking space in the university area. The arrangement of parking spaces for the estimated next 10 years (2030) needs to be carried out. The result shows that the requirement for parking space unit by the year of 2030 are 65 SRP with current capacity of 39 (SRP) available for cars and 723 SRP with the current available parking capacity of 405 SRP for two-wheeled vehicles [13].

Manado State Polytechnic is one of the state higher education in North Sulawesi Province, located in Buha Village, Manado City. As one of the state higher education that organizes vocational education, Manado State Polytechnic accepts students from various regions in North Sulawesi [2].

Manado State Polytechnic was established in 1985 and began accepting students and carrying out the learning process in 1986 with 5 (five) departments. As the years went by, the existing majors became 6 (six) departments and the number of students attending education at Manado State Polytechnic has increased. The number of lecturers and education staffs is also increasing. Manado State Polytechnic Higher Education as one of the centers of activity is also experiencing problems caused by the increasing number of vehicles both used by students and staffs [3].

Therefore, the issue mentioned above has become the basis of conducting this research that become the concept of zoning planning and vehicle parking ideas on The Manado State Polytechnic Higher Education.

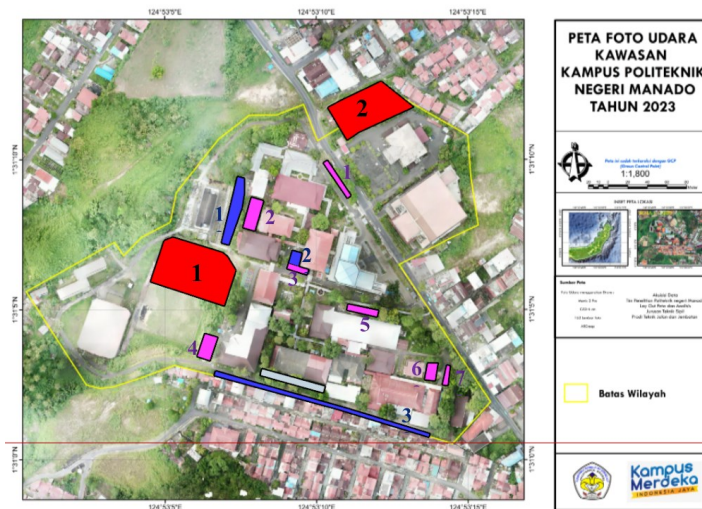
## 2. RESEARCH METHODS

This research was conducted in the complex of the College Building and Head Office of Manado State Polytechnic. Data collection was carried out using observation, questionnaires, and drone equipment for map data.

The secondary data used in this research was taken from several sources, including data on the number and type of vehicles owned by students, lecturers, and educational staff while active at Manado State Polytechnic Higher Education. Furthermore, the research team planned design concepts and broad zoning of parking areas using SketchUp Pro 2021 software. This is a 3D design software designed to help users easily create 3D models that can be used in various fields of work, from architecture to civil engineering.

## 3. RESULTS AND DISCUSSION

The results obtained from aerial photography using drones are as shown in Fig. 1.



**Fig. 1.** Map of the zoning of the parking area at Manado State Polytechnic Higher Education using drone technology (aerial photo map).

The zoning of this parking area is determined based on observations of habitat patterns, needs, and behaviors of vehicle users from the Polimdo academic community in parking private vehicles (two-wheeled and four-wheeled). The purpose of this zone planning is to avoid the chaotic behavior of parking vehicles out of place. The research

team used the sophistication of drone technology in capturing the latest location map (year 2023) and mapping as in Fig. 1, with the following explanation:

- Red parking zone: planned as a parking building (two-wheel and four-wheel).
- Purple parking zone: planned as Department Head Parking.
- Blue parking zone: intended as a parking area for staff and lecturers who use two-wheel vehicles or motorcycles.

The research team, in determining the accuracy of the area of each zoning, uses the sophistication of image technology, namely SketchUp Pro 2021, with the following explanation:

- Red Parking Zone (1): Area 12198.62 m<sup>2</sup>
- Red Parking Zone (2): Area 8065.94 m<sup>2</sup>
- Purple Parking Zone (1): Area 735.17 m<sup>2</sup>
- Purple Parking Zone (2): Area 1361.09 m<sup>2</sup>
- Purple Parking Zone (3): Area 418.94 m<sup>2</sup>
- Purple Parking Zone (4): Area 1134.69 m<sup>2</sup>
- Purple Parking Zone (5): Area 712.61 m<sup>2</sup>
- Purple Parking Zone (6): Area 625.35 m<sup>2</sup>
- Purple Parking Zone (7): Area 339.19 m<sup>2</sup>
- Blue Parking Zone (1): Area 2307.84 m<sup>2</sup>
- Blue Parking Zone (2): Area 477.04 m<sup>2</sup>
- Blue parking zone (3): Area 3159.84 m<sup>2</sup>

## 4. PARKING LOT DESIGN CONCEPT

### 4.1 Red Parking Zone



**Fig. 2.** Visual 3D of the design concept of the parking building at the Manado State Polytechnic Higher Education.

Explanation of Design Concept Fig. 2:

Polimdo Parking Building is a parking building for four-wheeled and two-wheeled vehicles. It has one basement floor specifically for two-wheeled users (students). Four floors are arranged for four-wheeled users (lecturers and guests), and there are several two-wheeled zones (lecturers and guests).

Polimdo Parking Building carries the ergonomic-sustainable building design concept. Ergonomics: the design pays attention to the level of user comfort in parking both two-wheeled and four-wheeled vehicles by paying attention to the level of slope of the ramp, the height between floors, the circulation of natural building control, and natural lighting. Sustainable: roof-top design with the concept of a roof garden and the placement of solar panels as a source of energy intended for electrical buildings.

The Polimdo Parking Building will be equipped with an elevator. This is a consideration of the level of comfort and accessibility for users and the efficiency of travel time from the parking area to the campus location.

#### A. Purple Zone



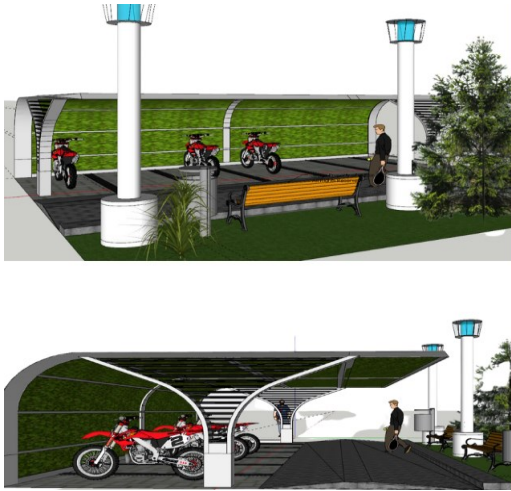
**Fig. 3.** Visual 3D design concept of outdoor car park with cantilever roof.

#### Explanation of Design Concept Fig. 3:

This parking zone is intended for four-wheeled vehicles or cars owned by department leaders.

The design concept is ergonomic and sustainable. This outdoor parking lot uses a cantilever structure with a shade roof. This is considered to be a comfortable parking area. Users do not feel worried about parking vehicles with excessive structural columns. The parking area is also equipped with a garden as an aesthetic element, a barrier, and shade and cooling (green concept—sustainable). The roof of the parking lot will have several solar panels as a source of electrical energy for the lighting needs of the parking area, and they can even be used for other electrical needs.

### B. Blue Zone



**Fig. 4.** Visual 3D design concept of Outdoor Motorcycle Park with a Vine Roof.

#### Explanation of Design Concept Fig. 4:

This parking zone is intended for two-wheeled vehicles or motorcycles belonging to staff and lecturers. The design concept still uses ergonomics and sustainability.

The parking lot roof is made curved using steel by paying attention to the level of sturdiness and length of use and maintenance. The design model is more attractive and not rigid. Later, on some sides of the roof, solar panels are placed as a source of electrical energy for the lighting needs of the parking area and can even be used for other electrical needs.

This outdoor parking lot uses the idea of a shaded roof with vines. This is considered to be a comfortable parking area. Users do not feel excessive heat when parking the vehicle. The parking area is also equipped with a garden as an aesthetic element, a barrier, and shade and cooling (green concept-sustainable).

The design of parking areas on campus should consider several factors, such as the number of vehicles, the size of the parking area, accessibility, and security. The parking area should be designed to be efficient and accommodate a large number of vehicles without disrupting traffic or campus activities [6]. In addition, the design of the parking area must also consider safety factors such as CCTV placement, adequate lighting, and vehicle entry and exit arrangements.

According to [4], the number of even semester students in 2017/2018 was 4041, the number of teaching staff was 294, and the number of education staff was 196. The

vehicles parked are 186 cars, so it requires a parking area of 1387 m<sup>2</sup>. For the current condition, where the number of students is approximately 5000, Assuming that 10% of them use four-wheeled vehicles, the total parking area required is 6250 m<sup>2</sup>.

Vehicle arrangements in the parking area should consider space efficiency and driver comfort. Vehicle arrangements must be done in an orderly and neat manner in order to maximize the capacity of the parking area. In addition, vehicle arrangements must also pay attention to the comfort of motorists by providing easy and safe access [5].

## 5. CONCLUSION

The result of this research shows that the red parking zone, with an area of 20264.56 m<sup>2</sup>, is planned as a parking building for two-wheel and four-wheel-vehicles. The purple parking zone, with an area of 5327.04 m<sup>2</sup>, is planned as a private parking area for the head of departments. The blue parking zone, with an area of 5944.72 m<sup>2</sup>, is designated as a parking area for employees and lecturers who use two-wheel-vehicles or motorcycles. The concept of a parking design model for all these zones is to organize a sustainable and ergonomic design.

In conclusion, this research certainly makes a big contribution to the idea and concept of parking zone mapping and planning design. Hopefully, this idea will be able to overcome the chaotic parking behavior that are out of place so that they are better organized according to their functions and needs.

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