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ANALYSIS OF PARKING CHARACTERISTICS AND CAPACITY AT THE SULTAN AGUNG ISLAMIC HOSPITAL BANJARBARU

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ABSTRACT

The move of the capital city of South Kalimantan province from Banjarmasin City to Banjarbaru City resulted in increasingly rapid population growth over time. Therefore, the need for public services in the form of hospitals is increasing. Sultan Agung Islamic Hospital is a public hospital managed by the private sector in Banjarbaru City, located on Jl. Ahmad Yani KM. 17.5 Citra Graha City Complex, Landasan Ulin Barat Village, Liang Anggang District, Banjarbaru City, South Kalimantan. One of the important things that supports visitor comfort is the existence of a parking area that can accommodate two-wheeled and four-wheeled vehicles in good condition. This study aims to analyze the characteristics of use and needs for parking activities at the Sultan Agung Banjarbaru Islamic Hospital, as well as determining the appropriate parking space requirements at the hospital. During the 3 days of research conducted on Monday, Wednesday and Saturday, the highest existing parking index results were for 4-wheeled vehicles for visitors at 70.45%, for 4-wheeled vehicles for employees at 75.00%, for visitors for 2-wheeled vehicles at 72 .82%, and employee 2-wheeled vehicles at 68.42%.

Keywords: Parking characteristics, parking space requirements, parking capacity.

1. INTRODUCTION

Banjarbaru City is the capital of South Kalimantan Province, replacing Banjarmasin City. This city has an area of 305,242 km2 consisting of five sub-districts and twenty sub-districts with a population of 265,575 people in 2022 (Central Statistics Agency, 2022). By moving the provincial capital to Banjarbaru City, it could result in a faster population increase over time considering that the activities of the capital region are the center of provincial economic activities, provincial government and other activities. Due to population growth, the need for public services, one of which is health services in the form of hospitals, is also increasing. This has an impact on parking problems if population growth and private vehicle ownership are not balanced with an appropriate parking management system (Alkam et al., 2020).

Hospitals are land uses that are used to provide health services that are very useful and needed by the community, therefore the number of visits to this place is very high and this affects the use of parking (S. Purnomo et al., 2017). Parking is a part of the

transportation system and is also a necessity in terms of providing space (Setyawan & Agusdini, 2021). Sultan Agung Islamic Hospital is one of the public hospitals managed by the private sector in Banjarbaru City, located on Jl. Ahmad Yani KM. 17.5 Citra Graha City Complex, Landasan Ulin Barat Village, Liang Anggang District, Banjarbaru City, South Kalimantan. The quality of health services, whether good or bad, can be determined based on the level of utilization of health service infrastructure for the community. One of the things that influences the level of comfort and safety for people who use the hospital is parking facilities (Nando, 2022). Locations that have been determined for vehicles to stop within a certain time frame to carry out an activity are called parking facilities (Asdar et al., 2022).

Sultan Agung Banjarbaru Islamic Hospital is a hospital that is frequently visited by people in Banjarbaru City and outside Banjarbaru City, therefore research needs to be carried out to determine the parking capacity of Sultan Agung Banjarbaru Islamic Hospital. The aim of this research is to analyze parking characteristics and determine the need for parking space at the Sultan Agung Banjarbaru Islamic Hospital. This analysis of parking space capacity is very important to determine the efficiency of land use, manage traffic flow, and prevent congestion (Azizi et al., 2023).

2. THEORETICAL STUDY

Hospitals are business entities that operate in the health sector and provide services in the form of medical services in the short term and long term (Maatisya & Santoso, 2022). To support comfort and safety for hospital visitors, one of the ways is adequate parking facilities. A vehicle that is not moving and is temporarily called parked (E. A. Purnomo et al., 2014). One of the facilities that is inseparable from the overall road transportation system is parking (Wibowo et al., 2021). In order for parking needs to be met, parking facilities are needed as a place for vehicles to stop that have been determined efficiently and optimally (B. Irawan et al., 2013).

What is meant by parking characteristics are the basic characteristics that can be used as a benchmark for assessing parking services (Supriono & Mudjanarko, 2015). Parking characteristics include parking volume, parking accumulation, parking duration, parking turnover rate, parking capacity, parking index, and so on (Akbar & Susilo, 2022). Parking space units (SRP) are useful for measuring parking needs, determining SRP is

influenced by the size of the door opening width which is a function of vehicle users in utilizing parking facilities (Saputra et al., 2023).

Based on research conducted (B. B. Irawan et al., 2021), it is stated that the comparison between parking demand and parking availability where there is a shortage can be optimized by adding new parking lots. In other research, it is known that if the parking index is more than 100%, it indicates that the parking location is unable to accommodate parking needs and alternative solutions to the problem must be implemented (Wahab et al., 2023). And research by (Setyawan & Agusdini, 2021) states that the SRP in hospitals is based on the number of beds which can be seen in the 1998 Directorate General of Land Transportation Regulations.

3. METHOD

The stages in this research are broadly divided into 4 stages, including the identification stage, determining the research location, the data collection stage, and the analysis and discussion stage.

3.1 Data collection

The data used is primary data and secondary data, for primary data in the form of an inventory of parking facilities and a plate number check survey carried out at the Sultan Agung Banjarbaru Islamic Hospital for 3 days, namely Monday 24 July 2023, Wednesday 26 July 2023, and Saturday 2023. July 29 2023 with a duration of 15 hours from 07.00 WITA to 22.00 WITA. Secondary data consists of parking layout, number of workers, and number of inpatients available at the Sultan Agung Banjarbaru Islamic Hospital.

3.2 Data analysis

The data that has been obtained is then analyzed and calculated to determine parking characteristics in the form of parking volume, parking accumulation, average parking duration, parking capacity, parking index, parking turnover, parking usage level, parking demand, as well as forecasting for the Islamic Hospital parking area. Sultan Agung Banjarbaru.

4. RESULTS AND DISCUSSION

4.1 Parking Facility Inventory Survey Data

The total area of the parking area is ± 5034.34 m2 which includes parking areas for visitor 4-wheeled vehicles, employee 4-wheeled vehicles, visitor 2-wheeled vehicles and employee 2-wheeled vehicles. With a total of 524 parking lots and parking angles of 90˚ and 180˚ (parallel).

4.2 Parking Volume

Maximum parking volume data for each type of vehicle and user is presented in Table 1.

Table 1. Maximum Parking Volume

User Type	Survey Day/Date	Volume	Peak Volume Hour (WITA)
4 Wheeled Visitors	Monday, July 24 2023	12	13.30-13.45
4 Wheel Officer	Monday, July 24 2023	7	08.00-08.15
2 Wheeled Visitors	Monday, July 24 2023	22	08.45-09.00
Wheel 2 Officer	Saturday, July 29 2023	26	07.45-08.00

Source: Analysis Results

From Table 1 it is known that the maximum volume of 4-wheeled vehicles for visitors is 12, 4-wheeled vehicles for employees 7, 2-wheeled vehicles for visitors 22, and 2-wheeled vehicles for employees 26.

4.3 Parking Accumulation

Maximum parking accumulation data for each type of vehicle and user is presented in Table 2.

Table 2. Maximum Parking Accumulation

User Type	Survey Day/Date	Accumulation	Peak Accumulation Hours (WITA)
4 Wheeled Visitors	Monday, July 24 2023	62	14.15-14.30
4 Wheel Officer	Saturday, July 29 2023	30	09.30-09.45
2 Wheeled Visitors	Monday, July 24 2023	150	15.15-15.30
Wheel 2 Officer	Wednesday, July 26 2023	130	14.15-14.30

Source: Analysis Results

From Table 2 it is known that the maximum accumulation for 4-wheeled vehicles for visitors is 62, for 4-wheeled vehicles for employees it is 30, for 2-wheeled vehicles for visitors it is 150, and for 2-wheeled vehicles for employees it is 130.

4.4 Maximum Parking Duration

Maximum parking duration data for each type of vehicle and user is presented in Table 3.

Table 3. Maximum Parking Duration

User Type	Survey Day/Date	Duration (Hours)
4 Wheeled Visitors	Monday, July 24 2023	9,550
4 Wheel Officer	Monday, July 24 2023	9,417
2 Wheeled Visitors	Monday, July 24 2023	11,733
Wheel 2 Officer	Saturday, July 29 2023	10,067

Source: Analysis Results

From Table 3 it is known that the maximum parking duration for visitor 4-wheeled vehicles is 9,550 hours, for employee 4-wheeled vehicles is 9,417 hours, for visitor 2-wheeled vehicles is 11,733 hours, and for employee 2-wheeled vehicles is 10,067 hours.

4.5 Parking Capacity

Parking capacity data for each type of vehicle and user is presented in Table 4.

Table 4. Parking Capacity

User Type	Number of Parking Lots	Average Duration	Parking Capacity (cars/hour)
4 Wheeled Visitors	88	1,94	45.352
4 Wheel Officer	40	4,50	8,894
2 Wheeled Visitors	206	2,54	81,068
Wheel 2 Officer	190	5,59	33,988

Source: Analysis Results

From Table 4 it is known that the parking capacity for 4-wheeled vehicles for visitors is 45,352 vehicles/hour, for 4-wheeled vehicles for employees it is 8,894 vehicles/hour, for 2-wheeled vehicles for visitors it is 81,068 vehicles/hour, and for 2-wheeled vehicles for employees it is 33,988 vehicles/hour. O'clock.

4.6 Existing Parking Index

Parking index data under existing conditions for each vehicle and user based on maximum accumulation is presented in Table 5.

Table 5. Existing Parking Index

User Type	Accumulation	Parking Lot	Parking index
4 Wheeled Visitors	62	88	70,45%
4 Wheel Officer	30	40	75,00%
2 Wheeled Visitors	150	206	72,82%
Wheel 2 Officer	130	190	68,42%

Source: Analysis Results

From Table 5 it is known that the existing parking index for visiting 4-wheeled vehicles is 70.45%, for employee 4-wheeled vehicles it is 75.00%, for visitor 2-wheeled vehicles it is 72.82%, and for employee 2-wheeled vehicles it is 68.42 %. The existing parking index value for 4-wheeled vehicles for visitors and employees and 2-wheeled

vehicles for visitors and employees based on the maximum accumulation is less than 100%, meaning that the available parking area can still accommodate vehicles well.

4.7 Maximum Parking Turnover

Parking turnover data for each vehicle and user based on maximum overall volume with an observation period of 15 hours is presented in
Table 6.

Table 6. Maximum Parking Turnover

User Type	Volume	Parking Lot	Parking Turnover Rate (Pant/lot)
4 Wheeled Visitors	221	88	0,167
4 Wheel Officer	50	40	0,077
2 Wheeled Visitors	450	206	0,146
Wheel 2 Officer	217	190	0,076

Source: Analysis Results

From Table 6 it is known that the maximum parking turnover for visitors' 4-wheeled vehicles is 0.167 vehicles/space, for employee 4-wheeled vehicles it is 0.077 vehicles/space, for visitors' 2-wheeled vehicles it is 0.146 vehicles/space, and for employee 2-wheeled vehicles it is 0.076 vehicles. /plot.

4.8 Maximum Parking Usage Rate

Data on maximum parking usage levels for each vehicle and user based on maximum accumulation are presented in Table 7.

Table 7. Maximum Parking Usage Level

User Type	Maximum Accumulation	Parking Lot	Parking Usage Rate
4 Wheeled Visitors	60	88	70,45%
4 Wheel Officer	30	40	75,00%
2 Wheeled Visitors	150	206	72,82%
Wheel 2 Officer	130	190	68,42%

Source: Analysis Results

From Table 7 it is known that the maximum level of parking usage for visitor 4-wheeled vehicles is 70.45%, for employee 4-wheeled vehicles is 75.00%, for visitor 2-wheeled vehicles is 72.82%, and for employee 2-wheeled vehicles is 68 .42%.

4.9 Forecasting

The data used is the number of inpatient beds available at the Sultan Agung Banjarbaru Islamic Hospital. The forecasting analysis is based on when the inpatient beds are fully occupied. It is known that the number of beds in the hospital is 175, the SRP requirements for the hospital are presented in Table 8.

Table 8. Hospital SRP Requirements

Number of Beds (Pieces)	50	75	100	150	200	300	400	500	1000
Requirement (SRP)	97	100	104	111	118	132	146	160	230

Source: Technical Guidelines for Organizing Parking Facilities, 1998

y = Number of SRP with 175 inpatient beds

y0 = 111 SRP x = 175 pieces x1 = 200 pieces

y1 = 118 SRP x0 = 150 pieces

$$y = y0 + \frac{(y1-y0)(x-x0)}{x1-x0}$$

$$y = 111 + \frac{(118-111)(175-150)}{200-155}$$

$$y = 111 + \frac{(118-111)(175-150)}{200-155}$$

$y = 111 + 3.89 = 114.89 \approx 114\ SRP$

Based on the results of calculations using the interpolation formula based on Table 8, it is known that with a total of 175 inpatient places, the required SRP is 114. The number of existing plots available is 526, which means that the current parking conditions can meet the current parking space needs. The inpatient area at the Sultan Agung Banjarbaru Islamic Hospital is full.

4.10 Disability Parking

According to PUPR Government Regulation No.14 of 2017, parking spaces for people with disabilities are provided with the provisions in Table 9.

Table 9. Standard Number of Parking Spaces for Persons with Disabilities

Number of Parking Spaces Available	Number of Disabled Parking Spaces
1 -25	1
26 – 50	2
51 – 75	3
76 – 100	4
101 – 150	5
151 – 200	6
201 – 300	7
301 – 400	8
401 – 500	9
501 – 1000	2% of the total
10001 - dst	20 (+1 for every hundred)

Source: PUPR Government Regulation No.14 of 2017

Disabled parking spaces are 370 cm wide for single parking and 620 cm for double parking. Based on the number of existing parking lots for 4-wheeled vehicles visiting the hospital of 90, it is necessary to provide 4 parking lots for people with disabilities which will be placed in different locations, 2 lots at location A.1 and 2 lots at location A.3.

4.11 Average Wait Time

To calculate the average parking gate performance, data on the maximum volume of 4-wheeled vehicles and 2-wheeled vehicles was used with an observation period of 15 minutes. For 4-wheeled vehicles, the average waiting time was 3.750 seconds and for 2-wheeled vehicles, the average waiting time was 2.495 seconds.

4.12 Treatment Alternatives

Based on the results of the calculation of the existing parking index, it is known that the number of existing parking plots is still able to accommodate existing vehicles, and when forecasting based on the inpatient area at the Sultan Agung Islamic Hospital, Banjarbaru, the number of parking plots that are available is also still capable of accommodating vehicles under conditions. Inpatient beds are full. To maximize the available land, several parking alternatives were created to accommodate more vehicles, alternative 1 was used, presented in Table 10 and Figure 1.

Table 10. Alternatives for Handling Parking at Sultan Agung Banjarbaru Islamic Hospital

Vehicle Type and User	Number of Alternative Parking Lots
Visitors' 4-Wheeled Vehicles	90
Employee 4 Wheeled Vehicle	40
Visitor 2-Wheeled Vehicles	207
Employee 2-Wheeled Vehicle	218

Source: Analysis Results

From Table 10 it is known that the number of parking lots after combining parking patterns for 4-wheeled vehicles for visitors is 90 lots, for 4-wheeled vehicles for employees is 40 lots, for 2-wheeled vehicles for visitors it is 207 lots and for 2-wheeled vehicles for employees it is 218 lots.

Figure 1. Design sketch of the parking lot used by Alternative 1

5. CONCLUSION

Based on the results of forecasting calculations based on when inpatient places are full, the number of available parking lots is still sufficient. The number of inpatients is 175 with an SRP requirement of 114 while the existing SRP number is 526.

After analyzing the parking patterns, the affective design was obtained, namely alternative 1, for 4-wheeled vehicles for visitors, 90 parking lots with patterns of 0° and 90°. 40 employee 4-wheeled vehicles with a 90° pattern, 207 visitor 2-wheeled vehicles with a 90° pattern, and 218 employee 2-wheeled vehicles with a 30° and 90 pattern.

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