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Arrangement of Access to the Religious Tourism Area of The Tomb K.H. Abdurrahman Wahid Jombang Regency

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ABSTRACT

Jombang Regency is one of the regencies in the East Java region that boasts numerous tourist destinations. One of the religious attractions in Jombang Regency is the Tomb of K.H. Abdurrahman Wahid. Suboptimal road traffic conditions occur in the tourism area, particularly on K.H. Hasyim Asyari Street. This road segment frequently experiences high traffic volume due to tourism activities, numerous obstacles such as roadside parking, and non-motorized vehicles moving around the tourism area. This research adheres to the Guidelines for Indonesian Road Capacity (PKJI) 2014 regarding Urban Road Capacity. The primary data required for this study include geometric road data, traffic volume data, and roadside obstacle data. Meanwhile, secondary data in this study comprise road network data and Average Daily Traffic (ADT) data from the relevant authorities, namely the Jombang Regency Transportation Agency. From the traffic performance calculations, the saturation degree values for the existing conditions on K.H. Hasyim Asyari Street towards the south (DJ) = 0.7624 and towards the north (DJ) = 0.7075 were obtained. Based on the survey results, K.H. Hasyim Asyari Street towards the north has a capacity (C) = 2465, and towards the south, it also has a capacity (C) = 2465. The parking space requirements in the Religious Tourism Area of the Tomb of K.H. Abdurrahman Wahid (Gus Dur) are planned to be 171 parking spaces for motorcycles, 54 parking spaces for cars, and 53 parking spaces for buses.

Keywords: *Road Performance; Road Capacity; Access Arrangement; Parking Area; Design Age.*

INTRODUCTION

Jombang Regency is one of the regencies in East Java Province that boasts numerous tourist destinations. One of the religious attractions in Jombang Regency is the Religious Tourism of the Tomb of K.H. Abdurrahman Wahid, located at 10 K.H. Hasyim Asyari Street, Tebuireng, Diwek District, Jombang Regency, East Java Province.

Traffic management is necessary to regulate road traffic in a city to ensure orderliness and prevent congestion. In reality, roads can experience congestion due to activities in the Religious Tourism Area of the Tomb of K.H. Abdurrahman Wahid, such as visits from both local (domestic) and foreign tourists, along with the local community around the Religious Tourism Area of the Abdurrahman Wahid Tomb who engage in business to generate income.

This research is conducted because the traffic management in the Religious Tourism Area of the Tomb of K.H. Abdurrahman Wahid is quite severe, leading to congestion. Traffic density

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often occurs on K.H. Hasyim Asyari Street, which serves as the main access point to the Religious Tourism Area of the Tomb of K.H. Abdurrahman Wahid in Jombang Regency due to roadside obstacles in the tourism area.

Therefore, this study aims to find solutions by calculating and analyzing road segment performance, road capacity, reviewing access arrangements, and parking areas using the methods outlined in the Guidelines for Indonesian Road Capacity (PKJI) 2014. The goal is to minimize congestion and enhance traffic order in the Religious Tourism Area of the Tomb of K.H. Abdurrahman Wahid, Jombang Regency, East Java Province.

MATERIALS AND METHODS

The primary data needed for this research include the results of traffic surveys conducted over 6 days in a week, specifically on Tuesday, Wednesday, Thursday, Friday, Saturday, and Sunday. The surveys were conducted during the following time slots: morning from 06:30 to 08:30 AM, midday from 11:00 AM to 01:00 PM, and afternoon from 04:00 to 06:00 PM. Additionally, the parking area survey was conducted over 6 days in a week on Tuesday, Wednesday, Thursday, Friday, Saturday, and Sunday, starting from 08:00 AM to 03:00 PM. The calculation steps for this research are as follows.

1. Analyzing the road segment performance in the religious tourism area of the Tomb of K.H. Abdurrahman Wahid, Jombang Regency, under existing conditions.
2. Analyzing the road capacity in the religious tourism area of the Tomb of K.H. Abdurrahman Wahid, Jombang Regency, under existing conditions.
3. Analyzing the parking space requirements in the religious tourism area of the Tomb of K.H. Abdurrahman Wahid, Jombang Regency, under existing conditions.
4. Analyzing the arrangement of access points in the religious tourism area of the Tomb of K.H. Abdurrahman Wahid, Jombang Regency.

RESULTS AND DISCUSSION

Road Geometry Data

From the survey results conducted from June 20 to 25, 2023, the road geometry data for K.H. Hasyim Asyari is obtained and presented in the following Table 1:

Table 1. Road Geometry Data for K.H. Hasyim Asyari

Road Type	Data	Jl. Hasyim Asyari Heading South	Jl. Hasyim Asyari Heading North
2/2 TT	Lane Width (meters)	3	4
	Shoulder Width (meters)	1,5	1,5
	Median Width (meters)	0	0

Existing Vehicle Volume Data

Based on the vehicle volume data obtained from direct field surveys, the equivalent of light vehicles (ekr) was then calculated for each observation period with a 2-hour time interval on K.H. Hasyim Asyari Street, both towards the north and south. This was achieved by multiplying the number of vehicles by the coefficient for the equivalent value of light vehicles. As a result, the largest vehicle volume values for each observation period were determined.

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Table 2. The largest vehicle volume for each period

Road	Qmaks
K.H. Hasyim Asyari Heading South	1879 skr/hour
K.H. Hasyim Asyari Heading North	1720 skr/hour

Frequency of Side Obstacles

Activities alongside the road often cause conflicts that influence traffic flow. These activities, from the perspective of road capacity analysis, are referred to as side obstacles. The frequency of side obstacles occurring on K.H. Hasyim Asyari Street can be shown in the following table.

Table 3. The Frequency of Side Obstacle Occurrences

Road	Side Barrier Type	Factor Weight	Frequency of Occurrence	Weighted Frequency	Total
K.H. Hasyim Asyari Heading South	Pedestrian	0.5	571	286	1407
	Stopped/Parked Vehicles	1	329	329	
	Entering/Exiting Vehicles	0.7	373	261	
	Slow-moving/Non-motorized Vehicles	0.4	1329	532	
K.H. Hasyim Asyari Heading North	Pedestrian	0.5	1068	534	1970
	Stopped/Parked Vehicles	1	261	261	
	Entering/Exiting Vehicles	0.7	1023	716	
	Slow-moving/Non-motorized Vehicles	0.4	1148	459	

From Table 3, it can be concluded that K.H. Hasyim Asyari Street has a frequency of side obstacle occurrences > 900, which falls into the category of very high.

Free Flow Speed

To obtain the free flow speed (VB) values for K.H. Hasyim Asyari Street towards the south and north, calculations were conducted to determine the free flow speed (VB) for each type of vehicle.

KR VB = (VBD + VBL) x FVBHS x FVBUK
= (44 + 0) x 0,85 x 1,00
= 37,4 km/hour

The same calculation method was applied to each type of vehicle on K.H. Hasyim Asyari Street in both the north and south directions as follows.

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Table 4. Free Flow Speed

Road	Value	Vehicle Type		
		KR	KB	SM
K.H. Hasyim Asyari Heading South	V_{BD}	44	40	40
	V_{BL}	0	0	0
	FV_{BHS}	0,85	0,85	0,85
	FV_{BUK}	1,00	1,00	1,00
	VB (km/h)	37,4	34	34
K.H. Hasyim Asyari Heading North	V_{BD}	44	40	40
	V_{BL}	0	0	0
	FV_{BHS}	0,85	0,85	0,85
	FV_{BUK}	1,00	1,00	1,00
	VB (km/h)	37,4	34	34

Road Capacity

To obtain the road capacity (C) values for K.H. Hasyim Asyari Street in both the north and south directions, the road capacity (C) is calculated using the following equation

C = C0 x FCLJ x FCPA x FCHS x FCUK
C = 2900 x 1 x 1 x 0,85 x 1
C = 2465 skr/h

The same calculation method is applied to K.H. Hasyim Asyari Street in both the north and south directions as follows.

Table 5. Road Capacity

Value	K.H. Hasyim Asyari Heading South	K.H. Hasyim Asyari Heading North
C0	2900	2900
FCLJ	1,00	1,00
FCPA	1,00	1,00
FCHS	0,85	0,85
FCUK	1,00	1,00
C	2465	2465

Degree of Saturation

To obtain the degree of saturation (DJ) values for K.H. Hasyim Asyari Street, the degree of saturation (DJ) is calculated using the following equation.

$$DJ = \frac{Q}{C}$$

$$DJ = \frac{1879}{2465} = 0,7624$$

Subsequently, the same calculation is used to obtain the degree of saturation (DJ) values on K.H. Hasyim Asyari Street in both the south and north directions as follows.

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Table 6. Degree of Saturation

Road	Qmaks	C	Dj
K.H. Hasyim Asyari Heading South	1879 skr/h	2465	0,7624
K.H. Hasyim Asyari Heading North	1720 skr/h	2465	0,7075

Travel Speed

The average travel speed values for each vehicle crossing K.H. Hasyim Asyari Street are as follows.

Table 7. Travel Speed Values

Road	KR (km/h)	KB (km/h)	SM (km/h)
K.H. Hasyim Asyari Heading South	29,28	26,92	33,02
K.H. Hasyim Asyari Heading North	31,39	26,84	36,19

Parking Space Data Analysis

The parking space requirements for the Religious Tourism Area of the Tomb of K.H. Abdurrahman Wahid (Gus Dur) can be determined using the total area of the tomb tourism site.

Table 8. Tourist Parking Space Requirements

Total Area Size 100 m^2	50	100	150	200	400	800	1600	3200	6400
Requirement (SRP)	103	109	115	122	146	196	295	494	892

The Religious Tourism Area of the Tomb of K.H. Abdurrahman Wahid (Gus Dur) has a total area of 20,000 m2. Therefore, the parking space requirement is 122 motorcycle parking spaces. After conducting a survey for 6 days in the Religious Tourism Area of the Tomb of K.H. Abdurrahman Wahid (Gus Dur), the highest accumulation of motorcycle parking each day was obtained, as shown in the following table:

Table 9. Accumulation of Motorcycle Parking

No	Survey Date	Parking Volume	Peak Hour Highest Accumulation	Highest Parking Accumulation
1	Tuesday, June 20, 2023	211	13.15 - 13.30	65
2	Wednesday, June 21, 2023	239	13.15 - 13.30	65
3	Thursday, June 22, 2023	265	13.15 - 13.30	71
4	Friday, June 23, 2023	299	13.30 - 13.45	81
5	Saturday, June 24, 2023	342	11.15 - 11.30	73
6	Sunday, June 25, 2023	359	11.15 - 11.30	104

Parking Duration

Parking duration is the time span during which a vehicle is parked according to the time and purpose. The percentage of parking duration is calculated to determine the level of parking

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space utilization before seeking the average parking duration. The percentage of accumulated parking can be calculated using the following equation:

$$PR = \frac{Qin}{Qtotal} \times 100\%$$

$$PR = \frac{4}{201} \times 100\% = 1,99\%$$

Next, the calculation of motorcycle parking duration is done in units of vehicles per hour. An example calculation of motorcycle parking duration is performed using the following equation.

$$\text{Parking Duration} = \left(\frac{\text{Total Duration (fx)}}{\text{Total Vehicles}}\right)$$

$$\text{Parking Duration} = \left(\frac{34185}{201}\right)$$

Parking Duration = 170,07 minutes = 2,83 hour

Table 10. Motorcycle Parking Duration

No	Survey Date	Total Vehicles	Total Duration (Σf.x) (minutes)	Parking Duration (Minutes/Vehicle)	Parking Duration (Hours/Vehicle)
1	Tuesday, June 20, 2023	201	34185	170,07	2,83
2	Wednesday, June 21, 2023	228	39435	172,96	2,88
3	Thursday, June 22, 2023	253	44190	174,66	2,91
4	Friday, June 23, 2023	228	43920	192,63	3,21
5	Saturday, June 24, 2023	332	63015	189,80	3,16
6	Sunday, June 25, 2023	353	61463	174,11	2,90

Motorcycle Parking Turnover

The turnover of motorcycle parking in the Religious Tourism Area of the Tomb of K.H. Abdurrahman Wahid (Gus Dur) on Tuesday, June 20, 2023, is determined as follows:

$$\text{Turn over} = \frac{\text{Total Number of Parked Vehicles}}{\text{Available Parking Spaces for X Duration of Study Period}}$$

$$\text{Turn over} = \frac{201}{150 \text{ x } 7}$$

Turn over = 0,19 Vehicles/SRP/hour

Table 11. Motorcycle Parking Turnover

No	Survey Date	Parking Turnover (Vehicles/SRP/hour)
1	Tuesday, June 20, 2023	0,19
2	Wednesday, June 21, 2023	0,22
3	Thursday, June 22, 2023	0,24
4	Friday, June 23, 2023	0,22
5	Saturday, June 24, 2023	0,32
6	Sunday, June 25, 2023	0,34

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Motorcycle Parking Capacity

Given the number of parking spaces is 150 motorcycle parking spaces (SRP) with an average parking duration of 2.83 hours, the motorcycle parking capacity in the Religious Tourism Area of the Tomb of K.H. Abdurrahman Wahid (Gus Dur) can be calculated as follows:

$$KP = \frac{S}{D}$$

$$KP = \frac{150}{2,83}$$

KP = 52,92 vehicles per hour

Table 12. Motorcycle Parking Capacity

No	Survey Date	Parking Capacity (Vehicles/hour)
1	Tuesday, June 20, 2023	52,92
2	Wednesday, June 21, 2023	52,03
3	Thursday, June 22, 2023	51,53
4	Friday, June 23, 2023	46,72
5	Saturday, June 24, 2023	47,42
6	Sunday, June 25, 2023	51,69

Motorcycle Parking Index

Given that the number of occupied parking spaces is 65 out of the available 150 motorcycle parking spaces (SRP), the motorcycle parking index in the Religious Tourism Area of the Tomb of K.H. Abdurrahman Wahid (Gus Dur) can be calculated as follows:

$$IP = \frac{\text{Number of Spaces Occupied}}{\text{Number of Available Spaces}}$$

$$IP = \frac{65}{150}$$

IP = 0,43

Table 13. Motorcycle Parking Index

No	Survey Date	Parking Index
1	Tuesday, June 20, 2023	0,43
2	Wednesday, June 21, 2023	0,43
3	Thursday, June 22, 2023	0,47
4	Friday, June 23, 2023	0,54
5	Saturday, June 24, 2023	0,49
6	Sunday, June 25, 2023	0,69

Provision of Motorcycle Parking

Given the available parking spaces are 150 motorcycle parking spaces (SRP) with a survey duration of 7 hours and an average vehicle parking duration of 2.98 hours. Additionally, the reduction factor due to parking turnover is applied with a mid-range value of 0.9 to prevent the coefficient from being too large or too small. The calculation is as follows:

$$\text{Parking Supply} = \frac{S \times T}{D} \times F$$

$$\text{Parking Supply} = \frac{150 \times 7}{2,98} \times 0,9$$

Parking Supply = 317 vehicles

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Motorcycle Parking Space Requirements

Given the highest parking volume observed is 359 vehicles, and the average parking duration is 2.98 hours. Additionally, the reduction factor due to parking turnover is applied with a mid-range value of 0.9 to prevent the coefficient from being too large or too small. The calculation of motorcycle parking space requirements in the Religious Tourism Area of the Tomb of K.H. Abdurrahman Wahid (Gus Dur) is done using the following equation:

$$S = \frac{Nt \times D}{T \times F}$$

$$S = \frac{359 \times 2,98}{7 \times 0,9}$$

$$S = 170,04 \text{ SRP} \approx 171 \text{ SRP}$$

From the calculations, the result shows a parking space requirement of 171 motorcycle parking spaces (SRP). The same calculation process is used to analyze the parking space requirements for other vehicles, namely cars and tourist buses, in the Religious Tourism Area of the Tomb of K.H. Abdurrahman Wahid (Gus Dur). The calculation results are summarized in the following figure 1.

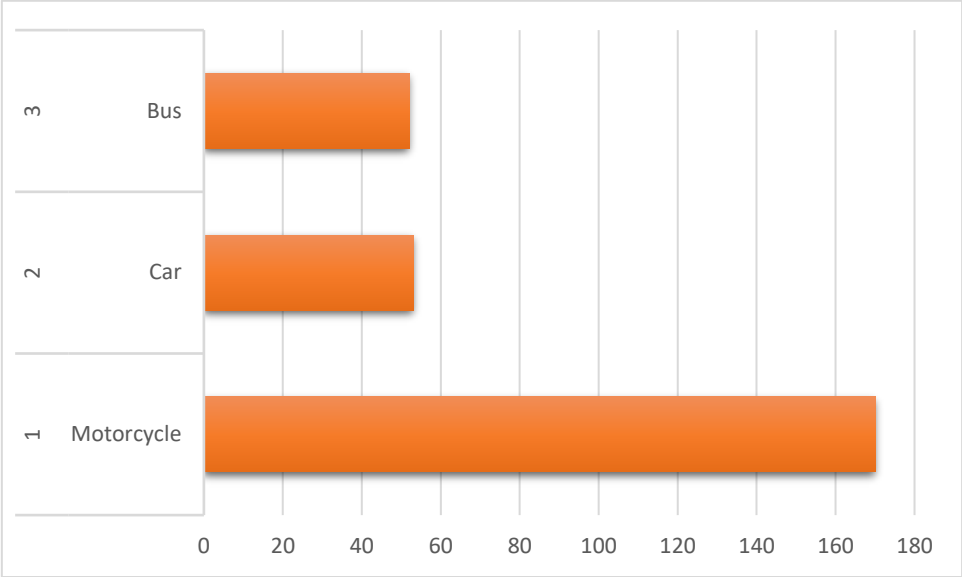

Figure 1. Parking Space Requirements for the Religious Tourism Area of the Tomb of K.H. Abdurrahman Wahid

Based on Table 14, the current parking space requirements for motorcycles and buses are not met because the available capacity is 150 motorcycle parking spaces (SRP) and 50 SRP for buses. Therefore, there is a need for parking space planning in the Religious Tourism Area of the Tomb of K.H. Abdurrahman Wahid (Gus Dur) to meet the parking space requirements, especially on national holidays and significant Islamic holidays.

Discussion

The role of tourist destinations is highly significant in supporting the economy of a region. Traffic management is needed to regulate traffic flow in a city, making it more organized and preventing congestion. The traffic situation in the Religious Tourism Area of the Tomb of K.H. Abdurrahman Wahid, Jombang Regency, is often a particular concern. The main focus is the evaluation of the arrangement of access points to and from the area, which is still considered to experience traffic congestion. The survey results are as follows:

- K.H. Hasyim Asyari Street towards the north has a capacity (C) = 2465.

- K.H. Hasyim Asyari Street towards the south has a capacity (C) = 2465.
- Parking space requirements in the Religious Tourism Area of the Tomb of K.H. Abdurrahman Wahid (Gus Dur) are planned to be 171 motorcycle parking spaces (SRP), 54 SRP for cars, and 53 SRP for buses.

CONCLUSION

In this study, an analysis of road damage conditions was carried out using the PCI method and Traffic performance on K.H. Hasyim Asyari Street under existing conditions in 2023, based on a one-week survey, reveals that for K.H. Hasyim Asyari Street towards the south, the saturation degree (DJ) = 0.7624, and for K.H. Hasyim Asyari Street towards the north, the saturation degree (DJ) = 0.7075. The road capacity of K.H. Hasyim Asyari Street under existing conditions in 2023, based on a one-week survey, for K.H. Hasyim Asyari Street towards the north has a capacity (C) = 2465, and towards the south has a capacity (C) = 2465. The planned parking space requirements in the Religious Tourism Area of the Tomb of K.H. Abdurrahman Wahid (Gus Dur) are 171 motorcycle parking spaces (SRP), 54 SRP for cars, and 53 SRP for buses.

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