

Traffic Performance Analysis and Road Safety Facilities in Bojonegoro District 2021-2026 (Case Study: S. Panglima Sudirman – S. Teuku Umar)

M. Sendy Saputra, Adhi Muhtadi

Civil Engineering Departments, Faculty of Engineering, Narotama University
Surabaya, Indonesia

sendysaputram@gmail.com , adhi.muhtadi@narotama.ac.id

Abstract

Bojonegoro is one of the regencies in East Java with a population of 1 million more. This makes Bojonegoro Regency as a center of trade, business, and education in east Java, therefore many people who make some of its areas into crowded centers by accident, one of which is what happened to Jl. Teuku Umar- Jl. Panglima Sudirman (Ttraffic). Based on these conditions, studies need to be conducted in the analysis of traffic performance and road accident facilities in the next 5 years precisely in 2026. The methods used are surveys of morning, afternoon, afternoon rush hours conducted 3 days, namely 2 normal days and 1 holiday (Tuesday, Wednesday and Saturday), geometric data analysis using the 1997 MKJI method and Road Safety Facilities using Road Equipment Planning (Ministry of PUPR Human Resources Development Agency). In this study, traffic flow in Jl. Panglima Sudirman in 2026 amounted to 1224.99 smp / hour, LOS B. While the traffic flow on Jl. Teuku Umar in 2026 amounted to 1518.04 smp / hour, LOS B. The results of the calculation of traffic in 2026 had a traffic flow of 679.05 smp / h, LOS C, and traffic flow delays of 77.70 det / smp. From the results of calculations that have been done and existing observations with the acquisition of LOS C at the intersection, it is necessary to widen the road by 2 meters, for the proposed road safety facilities in 2026 there needs to be the addition of signs, signs, and APILL at a certain point.

Keywords

LOS, MKJI 1997, Road Safety Facility, Traffic Performance

1. Introduction

Roads play an important role in transportation activities and population mobility. The population growth rate and economic growth rate greatly affect traffic growth and the increasing need for transportation facilities and infrastructure in the city of Bojonegoro, especially in several sections of Jl. Teuku Umar is considered very important because it is the center of the city and there are several related agencies, schools and offices including: the Department of Tourism and Culture, the National Land Agency of Bojonegoro Regency, the Bojonegoro Regency Primary Tax Service Office, SDN Kadipaten 1 and PLN Bojonegoro and several clothing shops. On Jl. Panglima Sudirman is also considered very important because there are areas of economic activity, related service offices and schools such as: Bojonegoro District Health Office, Bojonegoro District Social Service, SMAN 1 Bojonegoro.(PUSDIKLAT Roads, Housing, Settlements, 2017)

Road safety facilities are needed for the functioning of roads to meet certain safety standards or safety, road use safety includes, among others, guard rails, glare absorbers, rest areas, road islands, and road user information equipment, including directional signs, delineators, guide fence etc. Road safety facilities are needed so that users are more relaxed, not tired and bored during the trip.

1.1 Research Objectives

This research related to the analysis of traffic performance and road safety facilities has the following objectives:

- Knowing the traffic conditions on Jl. Teuku Umar, Jl. Panglima Sudirman and the intersection between the 2 roads at peak hours in the morning, afternoon and evening in June 2021.
- Knowing the performance and level of service on the 2 roads and intersections in the next 5 years.
- Knowing the existing condition of road safety facilities on these 2 roads and intersections, so that they can find out what needs to be improved in the next 5 years.

2. Methodology

The method used in this study is a quantitative method, planning is used for traffic analysis is planned based on (General Bina Marga, 1997) and planning is used for road safety facilities based on road equipment planning of the Ministry of Public Works and Public Housing.

The data obtained, both primary and secondary data, were analyzed to look for geometric conditions, traffic volume and road safety facility conditions. The stages of data analysis are as follows:

- Geometric condition Jl. Panglima Sudirman - Jl. Teuku Umar and the intersection
- Average daily traffic volume to determine speed and LOS
- The existing condition of road safety facilities on Jl. Panglima Sudirman - Jl. Teuku Umar and the intersection

2.1. Workflow

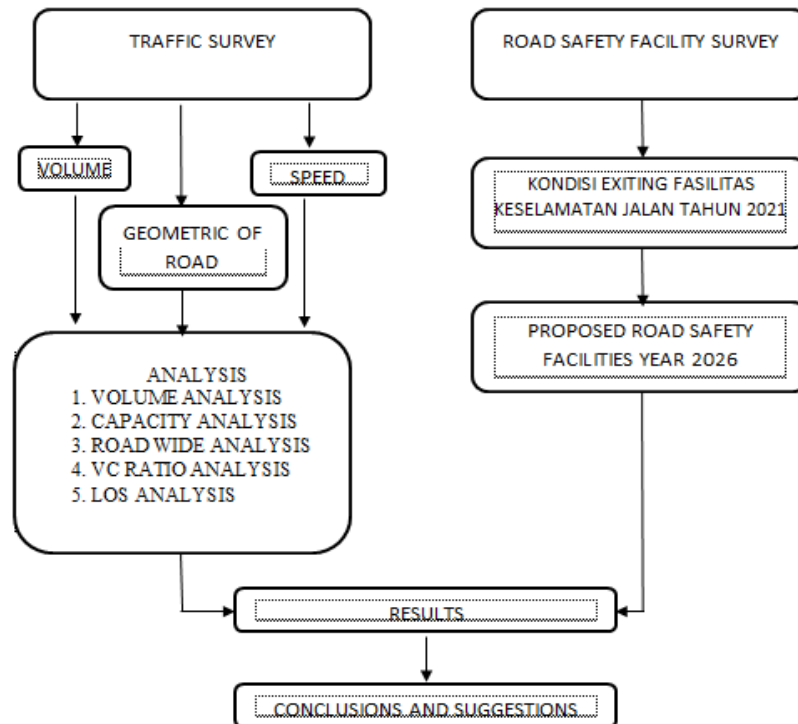


Figure 1.

3. Result and Discussion

3.1. Volume Lalu lintas Tahun 2021

Traffic volume is the number of vehicles that pass a certain point or line on a cross section of the road. Traffic volume enumeration data is information needed for the planning, design, management and road operation phases (Sukirman, 1999).

Table 1. Description of Urban Street Middle School Values

Transportation Type	Passenger Car Unit Value (smo/h)
Heavy Vehicle (HV)	1,20
Light Vehicle (LV)	1,00
Motorcycle (Mc)	0,25

Table 2. Description of the EMP Value of Urban Roads

Transportation Type	Emp	
	Shielded Approach	Opposite Approach
LV	1,00	1,0
HV	1,30	1,3
MC	0,20	0,4

Table 3. Adjustment factors for side resistance and shoulder width FC_{SF}

Road Type	Class Resistance Side	Adjustment factor for resistance side and shoulder width FC_{SF} Shoulder Width W_s			
		$\leq 0,5$	1,0	1,5	$\geq 2,0$
4/2D	VL	0,95	0,97	0,99	1,01
	L	0,94	0,96	0,98	1,0
	M	0,91	0,93	0,95	0,98
	H	0,86	0,89	0,92	0,95
	VH	0,81	0,85	0,88	0,92
4/2 UD	VL	0,95	0,97	0,99	1,01
	L	0,93	0,95	0,97	1,0
	M	0,9	0,92	0,95	1,0
	H	0,84	0,87	0,9	0,93
	VH	0,77	0,81	0,85	0,9
2/2 UD	VL	0,93	0,96	0,97	0,99
Or walk	L	0,9	0,92	0,95	0,97
One way	M	0,86	0,88	0,91	0,94
	H	0,78	0,81	0,84	0,88
	VH	0,68	0,72	0,77	0,82

 Table 4. Basic Free Flow Rate (F_{V0})

Transportation Type	Vehicle Light LV	Current Speed	Bicycle Motorcycle MC	All Vehicle (average)
		Vehicle Weight HV		
Six – lane Divided (6/2D)	62	52	48	57
Four – lane Divided (4/2D)	57	50	47	55
Four – lane – tak Divided (4/2D)	53	46	43	51
Four – lane – not Divided (2/2UD)	44	40	40	42

Table 5. Side Barrier Classes for urban roads

Kelas Hambatan Samping (SFC)	Kode	Weighted amount event per 200 m Hour (Two Side)	Special Conditions
Very Low	VL	< 100	Evacuation : Side Road Availabe
Low	L	100 - 299	Evacuation : Some Transportation etc
Medium	M	300 – 499	Industry : Several Street Side Shope
High	H	500 – 899	Commercial : High Street Side Activity
Very High	VH	> 900	Commercial : Activity of Market Two Side

1) Calculation Analysis

- a. Street of Panglima Sudirman = Peak hours Tuesday at 11.00 – 12.00 WIB, which is 873.70 smp/hour
- b. Street of Teuku Umar = Peak hours Tuesday at 16.00 – 17.00 WIB 1092.1 smp/hour
- c. intersection = Peak hours Tuesday 16.00 – 17.00 WIB, namely:
 1. Protected U = 410.9 pcu/hour, Countered U = 579.7 pcu/hour
 2. S Protected = 493.7 pcu/hour, S Against = 673.7 pcu/hour
 3. T Protected = 408 pcu/hour, T Against = 583.2 pcu/hour
 4. B Protected = 542.3 pcu/hour, B Against = 744.9 pcu/hour

Table 6. Capacity adjustment factor for Jalan Panglima Sudirman 2021

About/ Direction	Traffic Flow Q	Level Saturation	Speed VLv	Segmen Length Street	Traveling Time TT
(20)	Formulir UR-2	DS	Gbr.D-2:1 or 2	L	(24)/(23)
	Smp/h	(21)/(16)	Km/h	km	Hour
	(21)	(22)	(23)	(24)	(25)
	785,50	0,210	35,0	0,985	0,028

Table 7. Factors for adjusting the capacity of street Teuku Umar 2021

About/ Direction	Traffic Flow Q	Level Saturation	Speed VLv	Segmen Length Street	Traveling Time TT
(20)	Formulir UR-2	DS	Gbr.D-2:1 or 2	L	(24)/(23)
	Smp/h	(21)/(16)	Km/h	km	Hour
	(21)	(22)	(23)	(24)	(25)
	1089,70	0,291	29,0	0,758	0,026

Table 8. Adjustment factor for signalized intersection 2021

Code Approach	Traffic Flow	Capacity Smp/jam	Level Saturation	Green Ratio
	Smp/h		DS	GR
	Q	C	=	=
(1)	(2)	(3)	Q/C	g/c
Utara	410,9	582,04	0,71	0,21
Selatan	493,7	582,04	0,85	0,21
Timur	408	674,37	0,61	0,20
Barat	542,3	722,54	0,75	0,21

3.2. Traffic Volume in 2026

Table 9. Data on Increase in Growth in Bojonegoro Regency

No	Transportation Type	2017	2018	2019	2020	Average Percentage Increase
1	LV	5971	7431	8891	7431	4%
2	HV	2958	3688	4418	3688	5%
3	MC	14954	22254	29554	22254	13%

Table 10. Capacity adjustment factor for Jalan Panglima Sudirman 2026

About/ Direction	Traffic Flow Q	Level Saturation	Speed VLv	Segmen Length Street	Traveling Time TT
(20)	Formulir UR-2	DS	Gbr.D-2:1 or 2	L	(24)/(23)
	Smp/h	(21)/(16)	Km/h	km	Hour
	(21)	(22)	(23)	(24)	(25)
	1224,99	0,327	35,0	0,985	0,028

Table 11. Capacity adjustment factor for Jalan Panglima Sudirman 2026

About/ Direction	Traffic Flow Q	Level Saturation	Speed VLv	Segmen Length Street	Traveling Time TT
	Formulir UR-2	DS	Gbr.D-2:1 or 2	L	(24)/(23)
	Smp/h	(21)/(16)	Km/h	km	Hour
(20)	(21)	(22)	(23)	(24)	(25)
	1518,04	0,406	29,0	0,758	0,026

1) Geometric Change of signalized intersection 2026

Table 12. Changes in Field Conditions at the signalized intersection 2026

Approach WA	Enter W ENTER	Turn Left Directky W LTROR	Exit W EXIT
(8)	(9)	(10)	(11)
7,5	7,5	0	7,5
7,5	7,5	0	7,5
8	8	0	8
8	8	0	8

Table 13. Adjustment factor for signalized intersection 2026

Code Approach	Traffic Flow	Capacity Smp/jam	Level Saturation	Green Ratio
	Smp/h		DS	GR
	Q	C	=	=
(1)	(2)	(3)	Q/C	g/c
Utara	606,87	863,03	0,70	0,21
Selatan	714,78	983,45	0,73	0,21
Timur	606,50	992,82	0,61	0,20
Barat	788,05	1063,73	0,74	0,21

4. Conclusion and Suggestions

4.1 Conclusion

Based on the results of research and analysis of the results of field data collection at the location of the Jl. Panglima Sudirman, Jl Teuku Umar and signaled intersections, the following conclusions can be drawn:

- Traffic flow on the Jl. Panglima Sudirman in 2021 is 785.5 pcu/hour, the degree of saturation is 0.21, the average speed is 35 km/hour and has a capacity of 3741 pcu/hour. Meanwhile, the traffic flow on the Jl. Teuku Umar in 2021 is 1089.70 pcu/hour, the degree of saturation is 0.291, the average speed is 29 km/hour and has a capacity of 3741 pcu/hour. The signaled signal in 2021 has an average traffic flow of 463.72 pcu/hour, an average capacity of 640.25 pcu/hour, has an average saturation degree of 0.73, and an average traffic delay of 77, 70 sec/pcu. (Mehun Regulation 2018 concerning Roads, 2018)
- Traffic flow on the Jl. Panglima Sudirman in 2026 is 1224.99 pcu/hour, the degree of saturation is 0.327, and has a capacity of 3741 pcu/hour. Meanwhile, the traffic flow on the Jl. Teuku Umar in 2026 is 1518.04 pcu/hour, the degree of saturation is 0.406, and has a capacity of 3741 pcu/hour. Signaled signals in 2026 have an average traffic flow of 679.05 pcu/hour, an average capacity of 975.76 pcu/hour, an average saturation degree of 0.70, and an average traffic delay of 77. 70 sec/pcu, with the addition of the U, S, T, B approaches of 2 meters.
- Road safety facilities on Jl Panglima Sudirman and Jl Teuku Umar based on exiting conditions on Signs, Marka, APILL, and Public Street Lighting are good but there are some points that need to be added and also need maintenance.

4.2 Suggestions

- It is necessary to provide and maintain public transportation facilities so that people in Bojonegoro Regency prefer public transportation to private vehicles so that in the next 10 years traffic jams at intersections can be avoided without having to widen the road.
- It is necessary to add W in the approach U=7.5 S=7.5 T=8 B=8 which will have an impact on the basic value of green junior high school/hour (So), so that the degree of saturation changes to U=0.7 S=0.73 T=0.61 B=0.74 and all approaches belong to LOS C and D.

- c. Add road safety facilities, namely Signs, Marka and APILL at certain points that are considered important.
- d. Clarify the existence of existing signs, because there are several other obstacles that cover the signs.
- e. It is necessary to conduct further research on the condition of the intersection in the next 10 years

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Biography / Biographies

M. Sedy Saputra is a student of the civil engineering faculty of Narotama University, Surabaya, with a history of study from MIN Kepatihan Bojonegoro then continued to Junior High School 5 Bojonegoro and continued to Vocation High School 2 Bojonegoro by majoring in architecture. That's why while in college the author majored in civil engineering, the author was born and lived and settled in Bojonegoro, East Java.