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An Analysis of Traffic Congestion Due to Railway Crossings on Prof. Dr. Latumenten Road, Grogol, West Jakarta

Wisnu Akbar[1*], Alizar[2]
Department of Civil Engineering, Faculty of Engineering, University Dian Nusantara, Indonesia

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Corresponding author*:
alizar@undira.ac.id

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Abstract: This study aims to analyze the impact of railway crossings on congestion levels, traffic volume, delays on Jalan Prof. Dr. Latumenten Grogol, West Jakarta. The research methods used include collecting traffic data through primary data from direct surveys and analyzing secondary data from related agencies. The parameters analyzed include vehicle volume, queue duration, side barrier performance, delays and frequency of crossing barrier closures. The method used refers to the Indonesian Road Capacity Guidelines (PKJI 2023). The final result of the research writing is to provide recommendations for handling traffic congestion due to railway crossings, such as proposals for the construction of flyovers or underpasses, improving traffic management in affected areas.

Keywords: mobility, Congestion, Railway Crossings, Indonesian Road Capacity Guidelines, Vehicle Volume

INTRODUCTION

As the center of government and economic activity, Jakarta faces a high volume of motorized vehicles. Transportation plays a vital role in supporting economic activities by enabling the movement of people and the distribution of goods. According to data from the Jakarta Statistics Agency (BPS DKI Jakarta), the transportation sector contributes 3.81% to the city's economy. In response, the government has continued to improve transportation services through the development of infrastructure such as underpasses, flyovers, and the restructuring of mass transit systems.

One of the critical points in the urban transportation system is the level crossing between roads and railway tracks. Traffic congestion often occurs due to vehicle delays caused by passing trains, highlighting the need for effective traffic control systems. Based on this issue, this study aims to analyze the impact of level crossings on congestion, including delays, traffic volume, and vehicle queue length—specifically at the level crossing on Prof. Latumenten Street, Grogol, West Jakarta.

RESEARCH METHOD

The data required in this study consist of primary and secondary data. Primary data were obtained through field surveys, including information on traffic volume, side friction, delays, queue length, and the availability of infrastructure at level crossings. Secondary data were collected from literature reviews and documents provided by relevant institutions. These included train frequency data from PT. KAI and road geometry data from the Public Works Department of Jakarta.

The research flowchart is presented in the figure below:

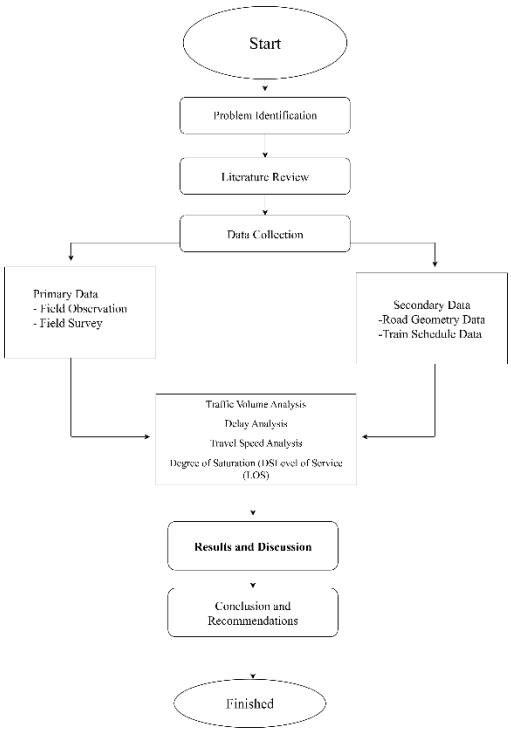

Figure 1. Research Flow Diagram

RESULT AND DISCUSSION

Traffic Volume

The traffic volume on Jalan Prof. Dr. Latumenten, Grogol, West Jakarta, was observed through surveys conducted on three different days representing various traffic conditions:

Sunday, May 11, 2025 (representing a holiday):
A 9-hour traffic survey recorded a total of 28,357 vehicles, resulting in an average hourly volume of 3,151 vehicles/hour. When converted to passenger car units (PCU or SMP) during the peak hour (17:00–18:00 WIB), the traffic volume was 2,653 PCU/hour.

Wednesday, May 14, 2025 (representing a normal weekday):
The 9-hour survey recorded 29,529 vehicles, which translates to an average of 3,281 vehicles/hour. The peak hour volume, converted to passenger car units, was 2,789 PCU/hour, occurring between 17:00 and 18:00 WIB.

Monday, May 19, 2025 (representing a busy weekday):
On this day, a total of 31,576 vehicles were recorded during the 9-hour observation period, with an average of 3,354 vehicles/hour. The peak hour traffic volume (17:00–18:00 WIB), when converted to PCU, reached 2,975 PCU/hour.
The traffic volume was calculated using the following formula:

$$q = \frac{n}{t}$$

Where:

q = traffic volume (vehicles/hour)

n = number of vehicles passing the observation point

t = observation time interval (in hours)

Based on the survey conducted on Monday, May 19, 2025, on Jalan Prof. Dr. Latumenten, West Jakarta, the total number of vehicles recorded during a 9-hour observation period was 31,576 vehicles. Thus, the traffic volume can be calculated as follows:

q = 31,576 / 9 = 3,508.4 vehicles/hour,
rounded to 3,509 vehicles/hour.

However, based on the standard calculation method according to the Indonesian Highway Capacity Manual (PKJI), the traffic volume on Monday, May 19, 2025, is determined to be 3,344 vehicles/hour.
To calculate the daily peak hour traffic volume, vehicle counts in vehicles per hour (veh/h) were converted to passenger car units per hour (PCU/h) using Passenger Car Equivalents (PCE). This conversion was based on the vehicle classification and equivalence values defined in the urban road classification type 4/2-T, where the one-way traffic flow is ≥ 1,050 veh/h.

According to the traffic survey, the peak hour occurred on Monday, May 19, 2025, between 17:00 and 18:00 WIB. Therefore, data from this specific time period were used for the following analysis.

Table 1. Table EMP

Vehicle Type	Peak Hour Volume (veh/h)	Passenger Car Equivalent (PCE)	Volume × PCE (PCU/h)
Light Vehicles (SM)	4,508	0.25	1,127
Medium Vehicles (MP)	2,724	0.40	1,089.6
Heavy Vehicles (KS)	632	1.20	758.4
Total	7,864		2,975 PCU/h

To analyze the capacity (C**)** of Jalan Prof. Dr. Latumenten, West Jakarta, the formula adopted follows the Indonesian Road Capacity Guidelines (PKJI 2023**)**, which is expressed as:
$C=C0\times FCLJ\times FCPA\times FCHS\times FCUK$
$C=1700\times 1.8\times 1.0\times 0.96\times 1.04=3055.1 PCU/hour$
Where:
C = adjusted capacity (in PCU/hour)

C = base capacity (1,700 PCU/hour for 1-lane, 1-direction)
FCLJ = adjustment factor for lane width = 1.8
FCPA= adjustment factor for side obstacles = 1.0
FCHS= adjustment factor for shoulder width = 0.96
FCUK= adjustment factor for road environment = 1.0

The Degree of Saturation (DS) is the ratio between actual traffic flow and the road capacity. It serves as a key indicator for evaluating the performance of an intersection or road segment. The DS value is calculated by comparing the actual traffic volume (Q) with the road capacity (C). The value ranges between 0 and 1, where a value closer to 1 indicates more congested conditions, approaching saturation.

The following formula is used:

$$Ds = \frac{Q}{C} = \frac{2.975}{3.506} = 0.97$$

In this case, C = 3,056 PCU/hour is the calculated capacity of the urban road segment on Jalan Prof. Dr. Latumenten, based on PKJI 2023.

To calculate the free-flow speed (VB) for Jalan Prof. Dr. Latumenten, Grogol, West Jakarta, the formula used follows the guidelines from PKJI 2023, as shown below:

VB=(VBD+VBL) ×FVBHS×FVBUKVB

Where:

VB = free-flow speed (km/h)
VBDV = base speed due to road type = 61 km/h
VBL = adjustment for lane width = 2 km/h
FVBHS = adjustment factor for shoulder width = 1.02
FVBUK = adjustment factor for surrounding environment = 1.03

VB=(61+2)×1.02×1.03=66.18 km/hVB = (61 + 2) times 1.02 times 1.03 = 66.18
VB=(61+2)×1.02×1.03=66.18km/h

Thus, the estimated free-flow speed for the road segment is 66.18 km/h

Traffic delay is defined as the difference between the actual travel time experienced by a vehicle and the ideal travel time under free-flow conditions**.** The average traffic delay (TLL) for Jalan Prof. Dr. Latumenten, Grogol, West Jakarta **is** calculated using the following equation based on PKJI 2023

TLL = 1.0504 / ((0.2742 - 0.2042) × Dj) - (1 - Dj)²
Given: Dj = 0.97 (Degree of Saturation)
TLL = 1.0504 / ((0.2742 - 0.2042) × 0.97) - (1 - 0.97)²
TLL = 1.0504 / (0.07 × 0.97) - (0.03)²
TLL = 1.0504 / 0.0679 - 0.0009
TLL = 15.47 - 0.0009 = 15.31 seconds/vehicle

To analyze the Level of Service (LOS) on Jalan Prof. Dr. Latumenten, Grogol, West Jakarta, the method refers to the Indonesian Highway Capacity Manual (PKJI 1997). The LOS is determined using the following formula:

LOS = Q / C

Where:

Q = Traffic volume during peak hour (PCU/hour) = 2,975
C = Road capacity (PCU/hour) = 3,056
LOS = 2,975 / 3,056 = 0.97

value of 0.97, which falls within LOS F, indicating that the road segment is experiencing severe congestion and is operating beyond its capacity.

CONCLUSION

Based on the analysis conducted on Jalan Prof. Dr. Latumenten, Grogol, West Jakarta, the following conclusions can be drawn:

1. The peak hour traffic volume on Monday, May 19, 2025, was 2,975 PCU/hour**,** indicating a high level of traffic intensity.
2. The calculated road capacity is 3,056 PCU/hour, based on the characteristics of the road and surrounding environment.
3. The degree of saturation reached 0.97, which reflects a condition of heavy congestion and poor traffic performance.
4. The free-flow speed on the road segment was estimated at 66.18 km/h, representing ideal conditions without traffic interference.
5. The average traffic delay per vehicle during the peak hour was 15.31 seconds, showing a moderate to high level of delay.
6. Overall, the road segment is operating at or near its capacity, categorized as Level of Service (LOS) F**,** which indicates very poor service quality and the need for traffic management improvements.

REFERENCES

Aswad. (2010). Transportation Engineering Management. Makassar: Hasanuddin University.

Department of Public Works. (1997). Indonesian Highway Capacity Manual (MKJI 1997). Jakarta: Directorate General of Highways, Department of Public Works.

Department of Public Works. (2005). Regulations for Calculating Fuel Consumption of Motor Vehicles on National Roads. Jakarta: Directorate General of Highways, Department of Public Works.

Ministry of Transportation of the Republic of Indonesia. (2018). Minister of Transportation Regulation No. 94 of 2018 on the Improvement of Level Crossing Safety between Railway Lines and Roads. Jakarta: Ministry of Transportation.

PT Kereta Api Indonesia. (2023). PT KAI Annual Report. Bandung: PT Kereta Api Indonesia (Persero).

PKJI. (2023). Indonesian Highway Capacity Guidelines. Jakarta: Directorate General of Highways, Ministry of Public Works and Public Housing.

Yulisetianto. (2008). Transportation Safety Management. Jakarta: Erlangga Publishing