

Conference Paper

Analysis Peak Hour Time of Highest Vehicle Volume on Several Roads in The East Surabaya Roads Area

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ABSTRACT

The East Surabaya area is one of the industrial and office centers. The high activity of the people in the city of Surabaya will affect transportation mobility which is marked by the growth of road traffic volume which continues to increase rapidly. This area has a lot of community mobility to and from the East Surabaya area. This caused congestion on several roads. Congestion is the main problem of transportation in urban areas. At certain hours there is often a spike in traffic volume that exceeds the capacity of existing roads. This is related to the starting hours of activities in East Surabaya and the ending hours of activities from East Surabaya which coincide, causing traffic jams. The East Surabaya area is divided into two times when the traffic volume increases, namely morning and evening. Based on this, this study aims to determine when there is a spike in traffic volume. The method used is a traffic volume survey, looking for peak hour volume based on cur/hour units and determining when peak hours occur. The results showed that the highest volume in direction 1 during peak hour occurred on Friday in Jalan Panjang Jiwo with a volume of 5947 cur/hour and direction 2 occurred on Friday on Jalan Jemursari. The average time for an increase in traffic volume in the East Surabaya area in the morning is 07.00 to 08.35 and in the afternoon is 15.35-18.00.

Keywords: Peak hour, traffic volume, East Surabaya, congestion

Introduction

Surabaya is the second largest city after Jakarta. Surabaya is the center of community activities both in terms of economy, industry, education, social, culture and politics. Within the urban transportation system, the Surabaya area is one of the areas experiencing a high level of vehicle density, which in turn causes traffic jams. The high activity of the people in the city of Surabaya will affect transportation mobility which is marked by the growth of road traffic volume which continues to increase rapidly. One area that is the center of industry and offices is the East Surabaya area. In this area there is a lot of community mobility to and from the East Surabaya area. This caused congestion on several roads. Congestion is the main problem of transportation in urban areas Downs, 2004; Aftabuzzaman, 2007). The congestion has a negative impact on the economic aspect, resulting in losses in the form of wasted time due to the length of the trip and an increase in vehicle operating expenses such as fuel and engine maintenance due to frequent vehicle stops (Susanto et al., 2014). This congestion situation can be exacerbated by additional obstacles, such as the flow of vehicles in and out, vehicles stopping for a moment, parking on the side of the road, pedestrians, and road crossings (Mudiyono & Anindyawati, 2017).

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At certain hours, there is often a spike in traffic volume that exceeds the capacity of existing roads. This is related to the starting hours of activities in East Surabaya and the ending hours of activities from East Surabaya, which coincide, causing traffic jams. Congestion is characterized by an imbalance between demand (traffic volume) and existing troops (road capacity) (Hensher, 2018; Katjo et al., 2021). Congestion is also characterized by a comparison value between traffic volume and capacity reaching more than 0.75 (PKJI, 2014). Level of Service (LOS) is a concept for evaluating the quality of road service felt by drivers who pass through these roads (Kita, 2018). The performance of a road section can be seen from the level of service (LOS) of traffic, which can be assumed to be the quality of the road and traffic conditions (Fatikasari & Puspitasari, 2021; Dong et al., 2009).

Based on the problem description above, further steps are needed to overcome the congestion problem. This step involves identifying peak hours on various roads in the East Surabaya area experiencing increased traffic volume. This study will measure traffic volume in six sections of Jalan Surabaya Timur to obtain information about peak hours on several streets. The data collected will draw conclusions regarding the peak times and traffic volume on each road section. Through this research, it is hoped that it can provide benefits by providing information that helps monitor traffic conditions in the East Surabaya road section.

Material and Methods

Selection of research locations

This research was conducted in the East Surabaya Region and more precisely on six roads. The road sections are "Jemursari Street, Raya Prapen Street, Panjang Jiwo Street, Kali Rungkut Street, Rungkut Industri Street, and Jemur Andayani Street". The research location map can be seen in Figure 1.

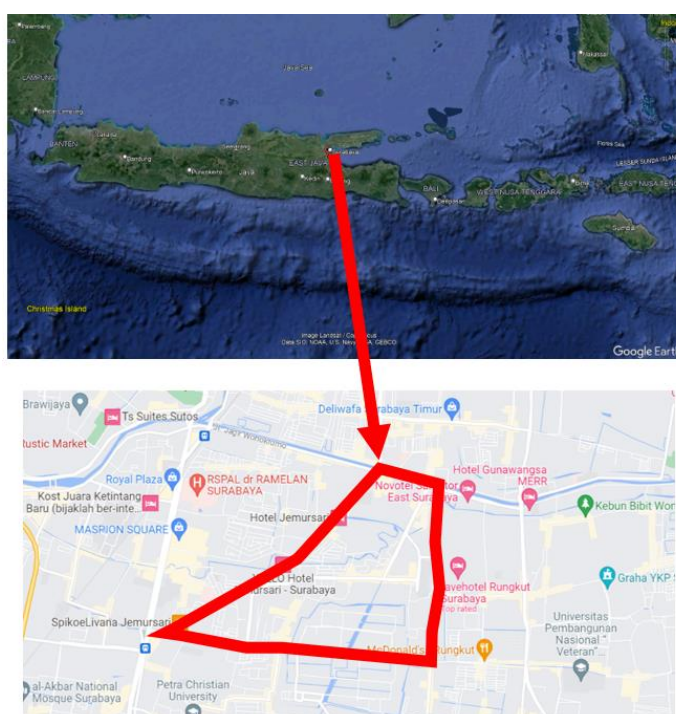


Figure 1. Maps study

Data collection

The data used in this study are Primary Data and Secondary Data. The primary data is in the form of Traffic Volume data. Primary data collection is by conducting direct surveys on roads in East

Surabaya. Traffic volume is recorded every 5 minutes and is carried out at 06.00-10.00 on Monday and 15.00-19.00 on Friday.

Peak hour time analysis

Traffic volume data from the survey results are grouped into three types of vehicles: light vehicles, heavy vehicles, and motorcycles. This division determines the Passenger cars Equivalents (PCE) according to every kind of vehicle following the 2014 PKJI. The traffic volume recorded every 5 minutes, classified according to the type of vehicle, is then multiplied by the equivalent value of the room vehicle and then the sum of each one hour. From these cumulative results, the highest value is selected, which indicates the peak hour volume and the peak hour is established when the volume spike occurs.

Results and Discussion

Traffic Volume

Data on the number of vehicles passing at a certain point is measured at 5-minute intervals through a survey. After that, the number of cars is converted into light vehicle units (cur) using the Passenger cars Equivalents (PCE) for each type of vehicle. The highest traffic volume shows when an increase in traffic volume occurred. Calculation of traffic volume into units of light vehicles (cur) is carried out using equation (1):

$$Q = [(pceLV \times qLV) + (pceHV \times qHV) + (pceMC \times qMC)] \quad (1)$$

With:

PCE LV	= PCE value for light vehicle,
qLV	= number of light vehicle,
PCE HV	= PCE value for heavy vehicle,
qHV	= number of heavy vehicle,
PCE MC	= PCE value for motorcycle, and
qMC	= number of motorcycle,

The results of the traffic volume analysis can be seen in Table 1 which shows the highest volume on the East Surabaya Road sections.

Table 1. Recapitulation the highest volume is in east surabaya road sections

No.	Road Name	On Monday		On Friday	
		Dirction 1 (cur/hour)	Direction 2 (cur/hour)	Dirction 1 (cur/hour)	Direction 2 (cur/hour)
1	Prapen St.	3138	2256	2311	2778
2	Jemursari St.	2048	1945	1721	3025
3	Jemur andayani St.	1805	1769	1434	1638
4	Panjang Jiwo St.	2724	1568	5947	2012
5	Kali Rungkut St.	930	2004	1513	1554
6	Rungkut Industri Raya St.	858	1761	1001	1581

Based on the analysis results in Table 1, it shows that the highest volume during peak hours is on Jalan Panjang Jiwo direction 1 with a volume of 5947 cur/hour.

Peak hour time analysis

Traffic volume data from the survey were analyzed by multiplying the number of vehicles by the passenger car equivalent (pce) and then cumulative every hour. From the traffic volume analysis results, you will see the time when the highest volume occurred. Graph results of traffic volume against survey time for each road section can be seen in Figure 2 to Figure 5.

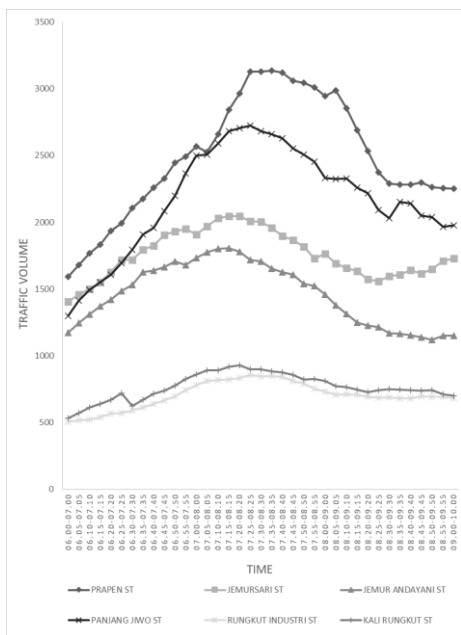


Figure 2. Traffic Volume (Direction 1 - On Monday)

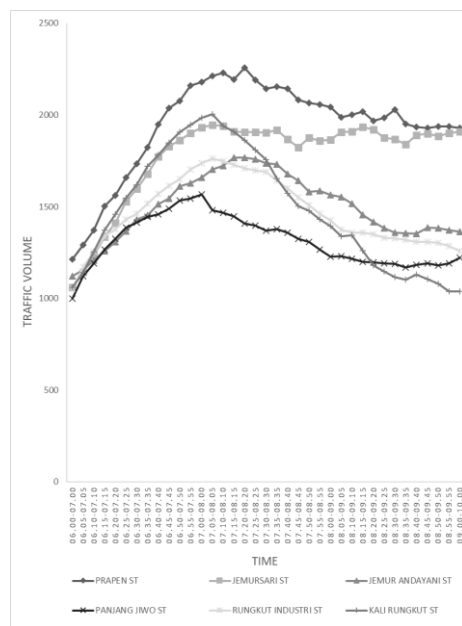


Figure 3. Traffic Volume (Direction 2 - On Monday)

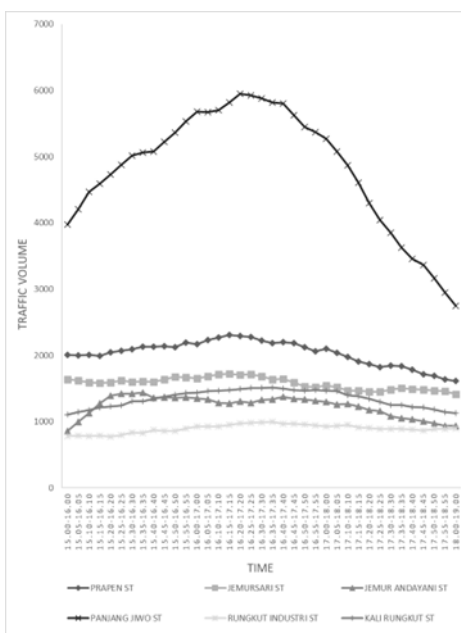


Figure 4. Traffic Volume (Direction 1 - On Friday)

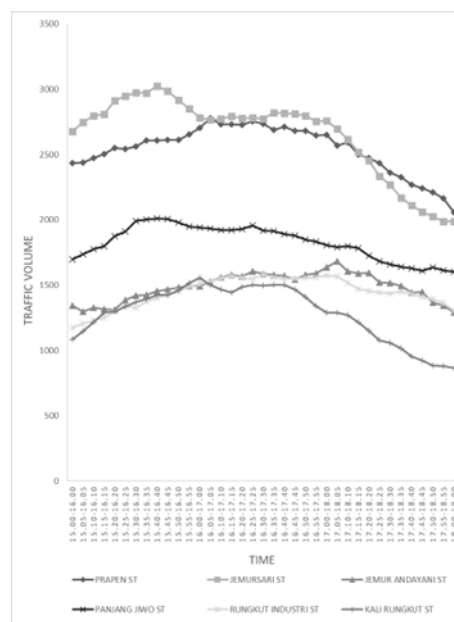


Figure 5. Traffic Volume (Direction 2 - On Friday)

From the analysis results in the graphs in Figure 2 to Figure 5, it is obtained that the highest volume occurs on each Direction 1, namely Prapen Street occurs at 07.35 - 08.35 on Mondays, Jemursari Street appears at 07.20 - 08.20, Jemur Andayani Street occurs 07.15 - 08.15 on Monday, Panjang Jiwo Street occurs at 16.20 - 17.20 on Friday, Kali Rungkut Street occurs at 16.35 - 17.35 on Friday, and Rungkut Industri Raya Street occurs at 16.30 - 17.30 on Friday. When the highest volume occurs on each Direction 2, namely Raya Prapen appears at 16.05 - 17.05 on Friday, Jalan Raya Jemursari occurs at 15.40 - 16.40 on Friday, Jalan Panjang Jiwo Street occurs at 15.40 - 16.40 on Friday, Jemur Andayani Street occurred at 07.15 - 08.15 on Monday, Kali Rungkut Street occurred at 07.05 - 08.05 on Monday, Rungkut Industri Raya Street occurred at 07.05 - 08.05 on Monday. Overall, roads in East Surabaya will

experience an increase in traffic volume on Monday from 07.00 to 08.35 and on Friday from 15.35 to 18.00.

Conclusion

The conclusion of this study is obtained from the analysis of traffic volume and peak hours. Based on the results of the research, it was found that the highest traffic volume in the East Suarabay Region was on Jalan Panjang Jiwo Direction 1 with a volume of 5947 cur/hour on Friday at 16.20-17.20. Overall, the average time for an increase in traffic volume in the East Surabaya area in the morning is 07.00 to 08.35 and in the afternoon is 15.35-18.00.

References

- Aftabuzzaman, M. (2007). Measuring traffic congestion- A critical review. *30th Australasian Transport Research Forum*, 1–16.
- Dong, H., Jia, L., Sun, X., Qin, Y., & Li, C. (2009). An experiment study on level of service for the regional road traffic. *5th International Conference on Natural Computation, ICNC 2009*, 5, 233–235. doi: 10.1109/ICNC.2009.715
- Downs, A. (2004). *Still Stuck in Traffic: Coping with Peak-Hour Traffic Congestion*. Brookings Institution Press. Retrieved from <https://www.jstor.org/stable/10.7864/j.ctt1vjqrpt>
- Fatikasari, A. D., & Puspitasari, N. D. (2021). *Road performance analysis using PKJI 2014 Method (Cse Study : Trosobo - Kletek Road, Sidoarjo District)*. 02(02), 23–29.
- Hensher, D. A. (2018). Tackling road congestion – What might it look like in the future under a collaborative and connected mobility model? *Transport Policy*, 66(December 2017), A1–A8. doi: 10.1016/j.tranpol.2018.02.007
- Katjo, S., Harum, M., & Magfirah, R. (2021). *Analisis kinerja jalan arteri ruas jalan Jendral Sudirman Di Era Covid 19 Di Kota Majene*. 3(2), 2–3. Retrieved from <https://ojs.unsulbar.ac.id/index.php/bjce/article/view/1167>
- Kita, H. (2018). Level-of-service measure of road traffic based on the driver's perception. *Transportation Research Circular E-C018: 4th International Symposium on Highway Capacity*, 53–62. Retrieved from http://ntl.bts.gov/lib/8000/8600/8612/05_22.pdf
- Mudiyono, R., & Anindyawati, N. (2017). *Analisi Kinerja Ruas Jalan Majapahir Kota SEmarang (Study Kasus: Segemen Jalan Depan Kantor Pegdaian Sampai Jembatan Tol Gayamsari)*. 345–354.
- PKJI. (2014). *Pedoman kapasitas jalan perkotaan*. Kementerian Pekerjaan Umum.
- Susanto, A., Siahaan, Z. B., Setiadji, B. H., & Supriyono. (2014). Analisis kinerja lalu lintas jalan urip Sumoharjo Yogyakarta. *JURNAL KARYA TEKNIK SIPIL*, 3(2), 456–464.