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Analysis of Junction Congestion and ITS Handling Efforts on Urban Roads

Gde Ngurah Purnama Jaya[1*], Umar Mansyur[2]
Universitas Pakuan, Indonesia
Email: gdepurnamajaya@unpak.ac.id[1*], umarmansyur@unpak.ac.id[2]

*Correspondence

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ABSTRACT

Congestion is one of the problems that often occurs in several areas, such as the Damage Circle Line Intersection. This research aims to identify the causes of traffic problems, the characteristics of traffic movements, and the level of service in the area. The research method was carried out by collecting related data from the results of literature studies, agency surveys, and observations. There are several transportation problems at the Damage Circle Line Intersection. The Damage Circle Line Intersection has transportation problems because of the road capacity and vehicle and other commonly known as conflict points. In addition, the traffic light is not functioning properly, and the level of road service is quite low, indicating that road service is quite high, while the travel speed is low. This study concludes that the traffic problem at the Dramaga Ring Road Intersection is triggered by several factors, including the intersection between the flow of vehicle traffic and others which is commonly known as a conflict point. In addition, the traffic lights on site are not working properly, and the area is a congested commercial area.

Introduction

Transportation has a very important role in supporting people's economic growth and is the lifeblood of a country's economic development (Iriyena, Naukoko, & Siwu, 2019). The success of the development is greatly influenced by the role of transportation as the lifeblood of political, economic, socio-cultural, and security defense (El Hafizah, Mahendra, Sekartadji, & Firdausi, 2023). Therefore, the success of development must be supported by a good transportation system, by the needs and developments of the times.

In general, transportation is an activity of moving something (goods and/or goods) from one place to another, either with or without means (Zahra, Manalu, Nabillah, & Dewi, 2024). So the definition of transportation means a process, namely the process of moving, moving, transporting, and transferring where this process cannot be separated from the need for supporting equipment to ensure the smooth process of moving according to the desired time (Do Ceu, Pandulu, & Arifianto, 2018).

Indonesia as one of the developing countries experiences more complex problems compared to developed countries, ranging from technical problems and problems that support development itself (Ferdila & Us, 2021). One of the problems that until now has not been able to be handled is congestion.

One of the areas in West Java province that experiences transportation problems is Bogor Regency, where transportation in Bogor Regency is notoriously jammed and unorganized (Razi & Sumberdaya, 2014). The Bogor Regency Government itself has carried out a public transportation arrangement program which is carried out in several stages. Until now, the stage that has been completed by the Bogor Regency Transportation Office is to encourage all city transportation managers to form legal entities by the mandate contained in Law Number 22 of 2009 concerning Road Transportation Traffic (Hidayati, 2017).

Incidents like this also occurred on Jalan Raya Dramaga, Bogor Regency, especially at the intersection of the Dramaga Ring Road (Sholahudin & Hendardi, 2020). Apart from the imbalance between road capacity and vehicle volume, congestion is caused by public transportation (angkot) that stops carelessly on the road, trucks, malls, IPB campuses, Terminals, Markets, and others. Previously, the existence of the Dramaga Ring Road (JLD) was built to relieve congestion on the Dramaga Highway. However, every day the volume of vehicles continues to increase, causing long traffic jams on Jalan Raya Dramaga.

Research Methods

The scope of this research area is located in Dramaga District, Bogor Regency. The location of this research was based on the rapid growth of trade and service activities as well as higher education which resulted in a high volume of traffic that crossed the Dramaga Highway.

To the existing objectives, the method used in this study is the data collection method, namely literature study, agency survey, and observation.

Literature Studies

This literature study is taken from reading books, documents, theses, laws, and regulations as well as thoughts related to the research theme.

Agency Survey

An agency survey is a data collection technique carried out by collecting data from related agencies, such as the Bogor Regency Highway Service, the Bogor Regency Transportation, Communication and Information Service (DISHUBKOMINFO), and the Development Planning Agency.

Observation

Observation is a direct observation in the field of the object of study by observing the existing conditions of congestion on Jalan Raya Dramaga.

Traffic Counting Survey, namely:

The observation carried out is direct observation by way of a survey to calculate the number of vehicle traffic volumes, geometric data is carried out by calculating Traffic

Counting. This calculation is carried out to find out the number of vehicles passing in front of the Traffic control monitoring point (Syaikhu, Widodo, & Arifianto, 2017).

As for the length of the survey time, it is carried out by the predetermined post point for 12 hours, namely at (06.00 – 13.00 – 18.00 WIB) which is intended to find out the volume of vehicle traffic passing through the Dramaga Highway.

Analysis Methods

The method applied in the research process is determined by the research motto used. identifying congestion in Jalan Raya Dramaga consists of quantitative analysis and qualitative analysis.

Results and Discussion

Geographical Conditions of Bogor Regency

Bogor Regency is part of West Java Province with the Regency Capital in Cibinong District. Geographically located between 6°19' North Latitude - 6°47' South Latitude and between 106°01' - 107°103' East Longitude. Administratively, North Bogor Regency borders Depok City; The South is bordered by Sukabumi Regency; To the east, it is bordered by Purwakarta Regency and Bekasi Regency; and to the West it borders Lebak Regency and Province.

Banten. The total area of Bogor Regency is 2,663.81 km2 with 40 sub-districts and 434 villages/sub-districts.

Road Network Pattern

Based on the status of the road, the road network in Dramaga District consists of National Roads and Regency Roads. Meanwhile, based on its function, it is divided into Primary Arterial Roads and Collector Roads (Pujiyono & Subiyakto, 2021). In general, the road network in Dramaga District forms a linear road network pattern.

Table 1
Status, Fungsi, Panjang Ruas dan Kondisi Perkerasan Ruas–Ruas Jalan Pengamatan

Street Name	Length of Section	Pavement Condition	Road Status	Road Function
Dramaga Highway	6	Good	National	Artery
Jalan Lkr. Dramaga	3,3	Good	City	Collectors

Physical Condition of Roads and Intersections

The physical condition and pattern of the road network at the research site consisted of the length and width of the road as well as the geometric condition of the road.

Table 2
Physical Condition and Pattern of the Road Network at the Dramaga Ring Road Intersection

Physical Condition	Dramaga Highway	Jalan Lkr. Dalam
Road Function	Artery	Collectors

Road Type	2/2 UD	2/2 UD
Road Length	1.7 miles	3.6 km
Road Width	8 M	7 M
Lebar Per Lajur	4 M	3.5 M
Side Obstacles:		
a). With Shoulders	0.5 M	0 M
b). With Kerb	0 M	0 M
Physical Condition	Good	Good

Pedestrian Facilities

Based on the results of a field survey of 2 roads located at the intersection of the Dramaga Ring Road which does not have pedestrian facilities, it becomes a problem because pedestrians use the shoulder of the road and the road body.

Vehicle Type

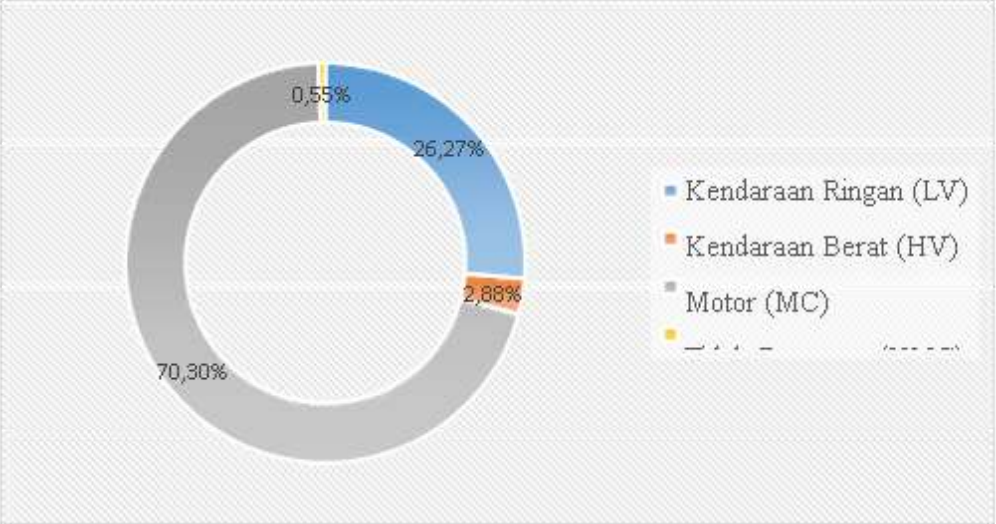
Based on the results of field observations, the Dramaga Ring Road Junction section serves the movement of freight and passenger transportation traffic, including, Types of light vehicles including passenger cars, microbuses, pick-ups, and small trucks; Types of heavy vehicles which include buses, two-way trucks, three-axle trucks and combination trucks.; Types of motorcycle vehicles which include motorcycles and three-wheeled vehicles.; and Types of non-motorized vehicles which include pedicabs, bicycles, horse-drawn carriages, strollers, and others.

Factors Causing Traffic Problems Around the Dramaga Ring Road Intersection

Activities on the Simpang Ringkar Dramaga road section is a commercial area that is used daily to show quite high activity where it is the center of community social activities in the form of trade and services, offices, and there are favorite universities in Bogor Regency. Then there are also many residential activities such as residential housing and office activities. In addition, the Dramaga Ring Road provides access to other areas such as the campus, cinemas, and Leuwiliang areas.

Vehicle Movement Composition Analysis

Based on the results of the analysis of vehicle movements, the dominant vehicle movement in the Dramaga Ring Road intersection area on Sunday was two-wheeled vehicles. The number of two-wheeled vehicle movements in the Dramaga Ring Road intersection area reached 5,622 vehicles/hour or around 70.30%, then light vehicles were 2,101 vehicles/hour or around 26.27%, the lowest was non-motorized as many as 44 vehicles/hour or around 0.55%.


0,55%
26,27%
2,88%
70,30%
Kendaraan Ringan (LV)
Kendaraan Berat (HV)
Motor (MC)

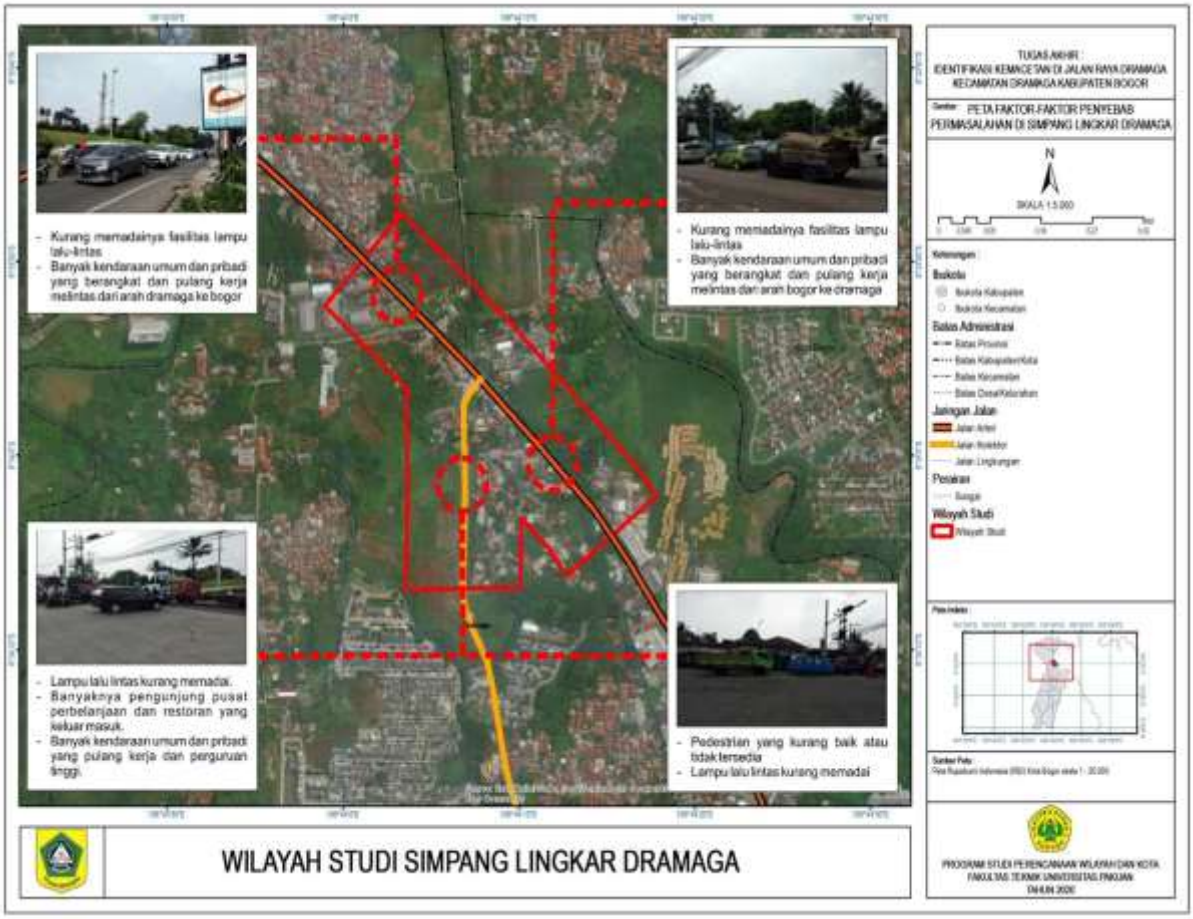


Figure 1

Conclusion

One of the areas in West Java Province that has experienced transportation problems is Bogor Regency, which is famous for being jammed and unorganized, especially at the Dramaga Ring Road Intersection. This problem is caused by an imbalance between the capacity of the road and the volume of vehicles and public transportation that often stops carelessly on the road body.

Traffic problems at the Dramaga Ring Road Junction are triggered by several factors, including the intersection between the traffic flow of vehicles and another, commonly known as conflict points. In addition, the traffic light at the location is not functioning properly, and the area is a dense commercial area. The characteristics of traffic movements at the Dramaga Ring Road Junction show that on holidays and weekdays, there are peak hours, generally in the morning at 07.00 WIB – 08.00 WIB and the afternoon at 17.00 WIB – 18.00 WIB. The results of the traffic volume analysis on Jalan Raya Dramaga show that on holidays, the traffic volume reaches 1,611 SMP/hour, while on weekdays the traffic volume reaches 1,545 SMP/hour.

The level of road service at the Dramaga Ring Road Junction from the results of the analysis shows that the road section is quite low, which indicates that the road service is

quite high but the travel speed is low. This shows that there is a disturbance in the road section.

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