

## ANALYSIS OF THE TRAFFIC IMPACT OF DEVELOPMENT SEKOLAH MARDI WALUYA KOTA BOGOR

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### ABSTRACT

The construction of a certain area will have an impact on the performance of the surrounding traffic, this is due to the new movements caused, one of which is the expansion of the Mardi Waluya School building located in the city of South Bogor, referring to the regulation of the minister of transportation no. 75 of 2015, then the activity must be carried out a Traffic Impact Analysis, this analysis is carried out to find out how much impact caused by the generation and attraction by the new activity center. With standard calculations based on the Indonesian Road Capacity Manual (MKJI 2017). From the analysis obtained, the average value of the Existing VCR on the Jalan Pahlawan section is 0.55, Jl. Dreded 0,17, Jl. Aut 0,68, Jl. R Saleh Bustaman 0.58, Jl. Empty 0.98. There was no significant effect on traffic performance during construction. But it is predicted that in the period 2021-2025 it will change with a VCR value of: Jl. Pahlawan 0.57 - 0.63 Jl. Dreded 0,18 - 0,20 Jl. Aut 0,69 - 0,77, Jl. R Saleh Bustaman 0.59 - 0.65, Jl. Empty 1.00 - 1.10. An impact handling simulation was conducted to improve traffic performance, indicated by the VCR value on the Jl. Pahlawan 0.53 - 0.58 Jl. Dreded 0,17 - 0,19 Jl. Aut 0,39 - 0,43, Jl. R Saleh Bustaman 0.54 - 0.60, Jl. Empty 0.76 - 0.84.

**Keywords:** traffic impact analysis; awakening and pulling; MKJI 2017.

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### INTRODUCTION

The development of an area must be supported by infrastructure, facilities and transportation arrangements that are effective, efficient, comfortable and safe. Transportation is a supporting sector for a region in order to develop. An area can have more selling value if it has good regional accessibility. With good accessibility, the area can be connected by a network of infrastructure and transportation facilities to the main city network.

Mardi Waluya School intends to play a role in advancing education in the city of Bogor, one of which is by building a school building for the office to be used as a teaching facility for Mardi Waluya School, with an area of 10,583 m<sup>2</sup> this is expected to increase generation and attraction to the surrounding area, if not. conducted traffic management arrangements for the flow of vehicles around the school. This is because the Mardi Waluya School area will generate movement on the Jl. Pahlawan, Jl. Dreded, Jl. Aut, Jl. Raden Saleh Bustaman which is a road that has a fairly high level of vehicle volume.

Traffic impact analysis is a study that analyzes the effect of traffic generated by an area development on the surrounding transportation network. This study includes a study of the traffic circulation in the inner part of the area to the roads surrounding the area which are the access roads to the area. In other words, a traffic study study is a study that includes the study of transportation equipment that is affected by the development of an area, within a certain radius.

A land use development will generate or attract movement towards that land use. Generation and attraction are movements that are contradictory and appear at different times according to the type of land use. As an illustration, housing will generate movement in the morning and attract movement in the afternoon according to the time to go to and from work. Likewise with schools,

in the morning there will be an interested movement and during the day there will be an awakening.

To anticipate the emergence of transportation problems due to development and development, this study will conduct a study of the conditions of existing transportation, predict the impact that may arise on the performance of transportation equipment and recommendations for solving transportation problems to benefit the development of the Mardi Waluya School area.

### **Formulation of the problem**

The problem formulations to be discussed in this study are as follows:

1. How is the existing condition around Mardi Waluya School?
2. How big is the traffic impact caused by the construction of the Mardi Waluya School?

### **Research purposes**

Based on the problem formulation above, the objectives of this study are;

1. Knowing the existing conditions around Mardi Waluya School.
2. To obtain solutions for handling the effects of the Mardi Waluya School.

### **Traffic Impact Analysis**

Dikun and Arif (1993) define traffic impact analysis as a special study of the construction of a building facility and other land uses on the city's transportation system, particularly the road network around the building site. Tamin (2000), traffic impact analysis is basically an analysis of the influence of land use development on the surrounding traffic flow system caused by new traffic generation, shifting traffic, and by vehicles going in and out of the land.

The phenomenon of the traffic impact is caused by the construction and operation of activity centers that have generated quite a large traffic generation, such as office centers, shopping centers, terminals, and others. Furthermore, it is said that the traffic impact occurs in 2 (two) stages, namely:

1. The construction or construction stage. At this stage there will be traffic generation due to material transportation and heavy equipment mobilization that overloads roads on the material route;
2. The post construction or operating stage. At this stage there will be a traffic generation from visitors, employees and sellers of transportation services that will overload certain road sections, as well as the generation of vehicle parking.

Tamin (2000) states that each activity space will "generate" movement and "attract" movement whose intensity depends on the type of land use. If there is development and development of new areas such as shopping centers, superblocs and others, it will certainly cause additional traffic generation and attraction due to additional activities in and around the area. For this reason, the development of a new area and its development will have a direct influence on the surrounding road network system. The reliable study includes an assessment of the road network in the area up to the roads around the activity center area. The criteria for implementing traffic impact analysis are in the minister of transportation regulation number 75 of 2015 concerning the implementation of traffic impact analysis.

Traffic management requires free traffic from the concept of passing people to reduce congestion (Triyanto et al, 2019); Maudiawan et al, 2020); (Syaiful S and Lutfi A, 2015); (Syaiful S, 2015). Motorized vehicle traffic requires quick access to their destination, this is related to conditions that require driver peace of mind in driving their vehicle (Syaiful S, Thamrin T, 2016); (Hana K, Juang A, 2019); Hana Karimah et al, 2019).

### Traffic Flow Calculation

All traffic flow values (per direction and total) are converted into light vehicle units (cur) using the empirically derived light vehicle equivalent (ekr) for the following vehicle types:

1. Light vehicles (KR) (including passenger cars, minibuses, pickups, small trucks and jeeps).
2. Heavy vehicles (KB) (including trucks and buses).
3. Motorcycle (SM).

The light vehicle equivalent (ekr) for each type of vehicle depends on the type of road and the total traffic flow expressed in vehicles / hour. Traffic volume shows the number of vehicles that cross one point of observation in one time unit (days, hours, minutes) (Sukirman, 1999). The amount of traffic volume is shown in equations (1) and (2).

$$V \text{ (vehicle/hour)} = KR + KB + MC \quad (1)$$

$$V \text{ (skr/jam)} = (KR \times ekr) + (KB \times ekr) + (MC \times ekr) \quad (2)$$

with :

V = traffic volume

KR = light vehicle

KB = heavy vehicles, motorized vehicles with more than 4 wheels (includes buses, 2as trucks, 3 axles trucks, and combination trucks)

MC = motorbikes, motorized vehicles with 2 or 3 wheels (including motorbikes and 3-wheeled vehicles).

### Free Flow Speed

The equation for determining the speed of free flow has a general form, shown in the following equation:

$$V_B = (V_{BD} + V_{BL}) \times FV_{BHS} \times FV_{BUK} \quad (3)$$

Information:

$V_B$  is the free flow velocity for KR under field conditions (km / hr).

$V_{BD}$  is the basic free current velocity for KR.

$V_{BL}$  is the speed adjustment value due to the road width.

$FV_{BHS}$  is a factor for adjusting the free speed due to side obstacles on a road that has shoulders or a road equipped with curves / sidewalks with a curb distance to the nearest barrier.

$FV_{BUK}$  is the free speed adjustment factor for the city size.

### Road capacity

Road Capacity is the maximum number of vehicles that can move / pass on a certain road section within a certain period of time. The calculation of the capacity of a road segment can use the formula according to the Indonesian Road Capacity Manual (2017) as follows:

$$C = C_0 \cdot FC_{LJ} \cdot FC_{PA} \cdot FC_{HS} \cdot FC_{UK} \quad (4)$$

With:

C : road capacity

- $C_0$  : low capacity  
 $FC_{LJ}$  : Traffic lane width adjustment factor  
 $FC_{PA}$  : direction separator adjustment factor  
 $FC_{HS}$  : side drag adjustment factor  
 $FC_{UK}$  : city size adjustment factor

### Road service rate

The Service Level Indicator on a road shows the overall condition of the road segment. Service level is determined based on quantitative values such as: VCR, travel speed, and based on qualitative values such as the driver's freedom to move / choose the speed, the degree of traffic resistance, and comfort. In general, service levels can be distinguished as follows:

**Table 1.** Road service rate

No	Vc Ratio	Level of service (LOS)	Information
1	0,00 - 0,20	A	smooth current, low vlume, high speed
2	0,21 – 0,44	B	steady flow, volume suitable for out of town roads, high speed.
3	0,45 – 0,74	C	steady flow, volume suitable for road outside the city, speed is affected by traffic.
4	0,75 – 0,84	D	approaching unstable current
5	0,85 – 1,00	E	approaching unstable current, solid volume approaching capacity, low speed.
6	➤ 1,00	F	flow is obstructed, volume is above capacity, many stops

(Source: MKJI 1997)

### Generation and Withdrawal

Generation is the number of movements originating from a land use (zone), while attraction is the amount of movement towards a zone.

This traffic generation includes:

1. Traffic leaving the location
2. Traffic to or from a location

The generation and attraction of the movement is shown in the diagram below (Tamin 2000).

### Four-Stage Transport Modeling

In general, this model is a combination of several submodel series, each of which must be carried out sequentially, namely: trip generation, trip distribution, mode selection, and route selection. The

general structure of this four-stage transportation planning model concept is presented in the following Figure:

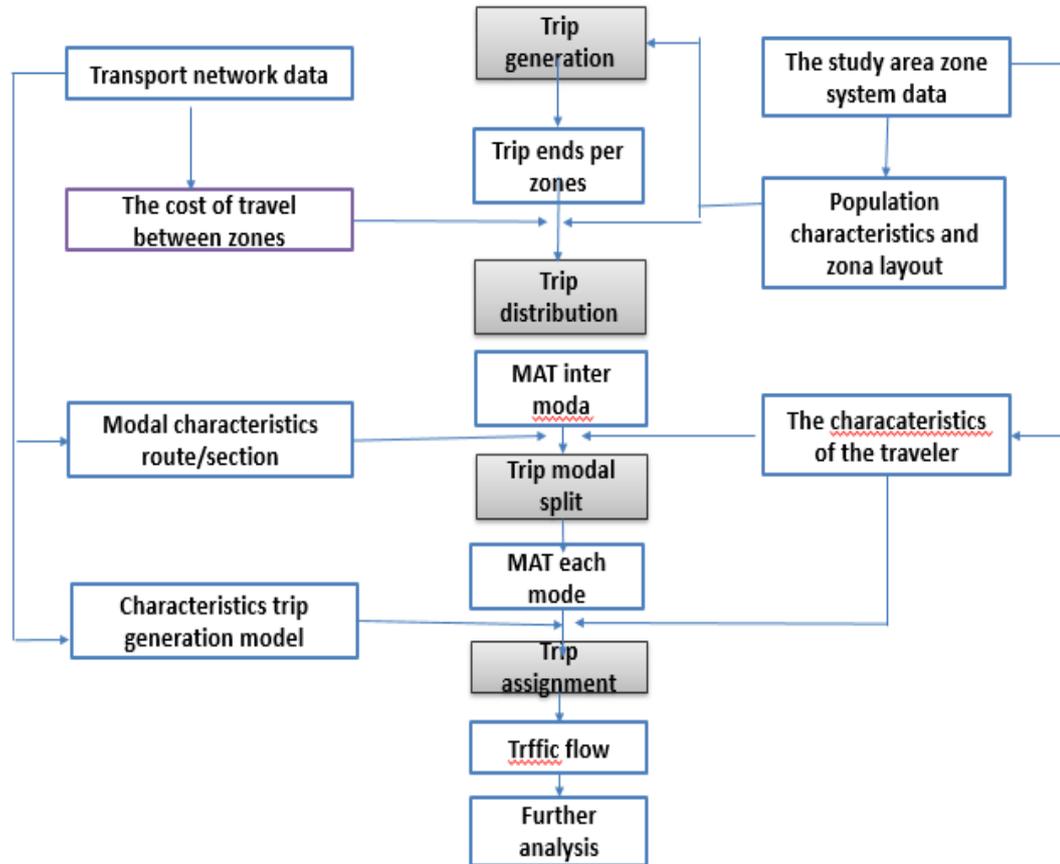


Figure 1 Four-Stage Transport Modeling Flowchart (Source: Ortuzar, J. De D. Willumsen, L. G, 1990)

**Projection Method MAT**

The projection method can be carried out by obtaining in advance the population growth rate of the study area. Then the growth will be correlated with the Origin Destination Matrix in order to obtain the MAT for the plan year.

In modeling for a certain period of time there will be a change in the Origin Destination Matrix (MAT). Growth prediction for the present and the future is very important in modeling, especially if the modeling uses secondary data

The total population is shown in equation (5).

$$P_n = P_0 (1 + r)^n \tag{5}$$

with :

- P<sub>n</sub> = Total population after the next n years,
- P<sub>0</sub> = total population in the initial year,
- r = population growth rate, and
- n = Time period in years.

## RESEARCH METHODS

### Time and Place of Research

Research time

The time for implementing data processing, reporting and designing was carried out for four months, starting from July 2019 to October 2019.

Research Place

The area of review in the study is in the City of South Bogor, namely Jl. Pahlawan, Jl. Dreded, Jl. Raden Raden Shaleh Bustaman, Gang Aut, Jl Empang. The location of Mardi Waluya School activities is on Jalan Pahlawan No.96 RT.01 / RW. 06 Empang Village, South Bogor District, Bogor City.

The Study Research Location is Shown in Figure 2.

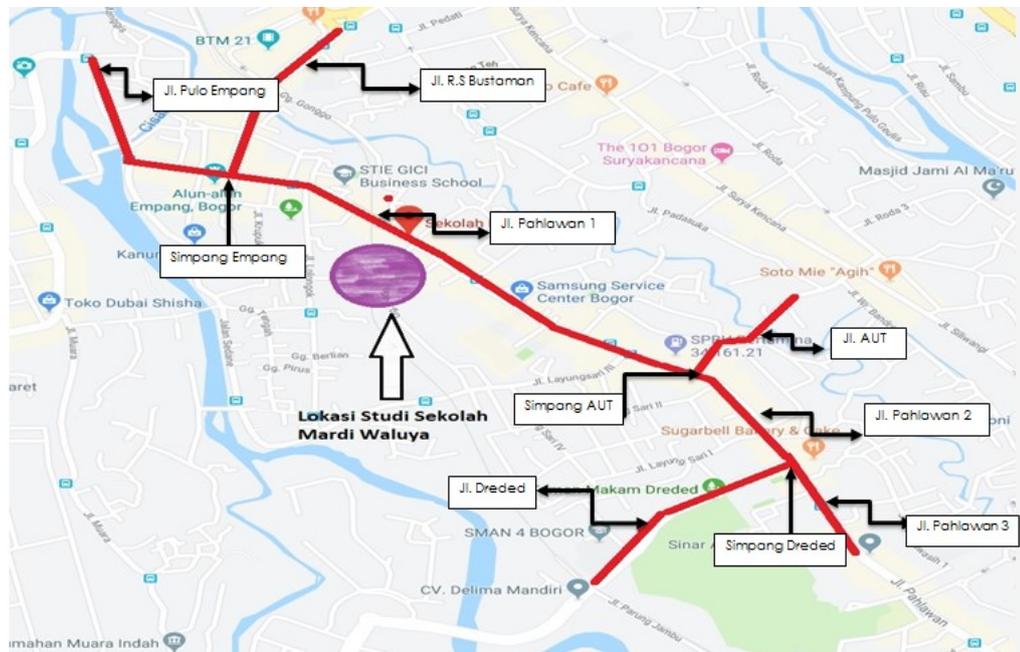


Figure 2. Plan of Research Location Source: Google Earth 2019

### Materials and Tools

Material

The materials needed in this study are primary and secondary data obtained from the analysis and related agencies in the form of Bogor city growth data, Bogor city existing conditions, and Bogor RTRW map data.

Tool

The tools needed consist of:

- (1) Stationery,
- (2) Counting,
- (3) Computers for data processing, and

(4) Printer, A4 paper as a print out of the planning results

**Research Stages**

The stages of this research are described in the stages shown in the traffic impact analysis flow chart below::

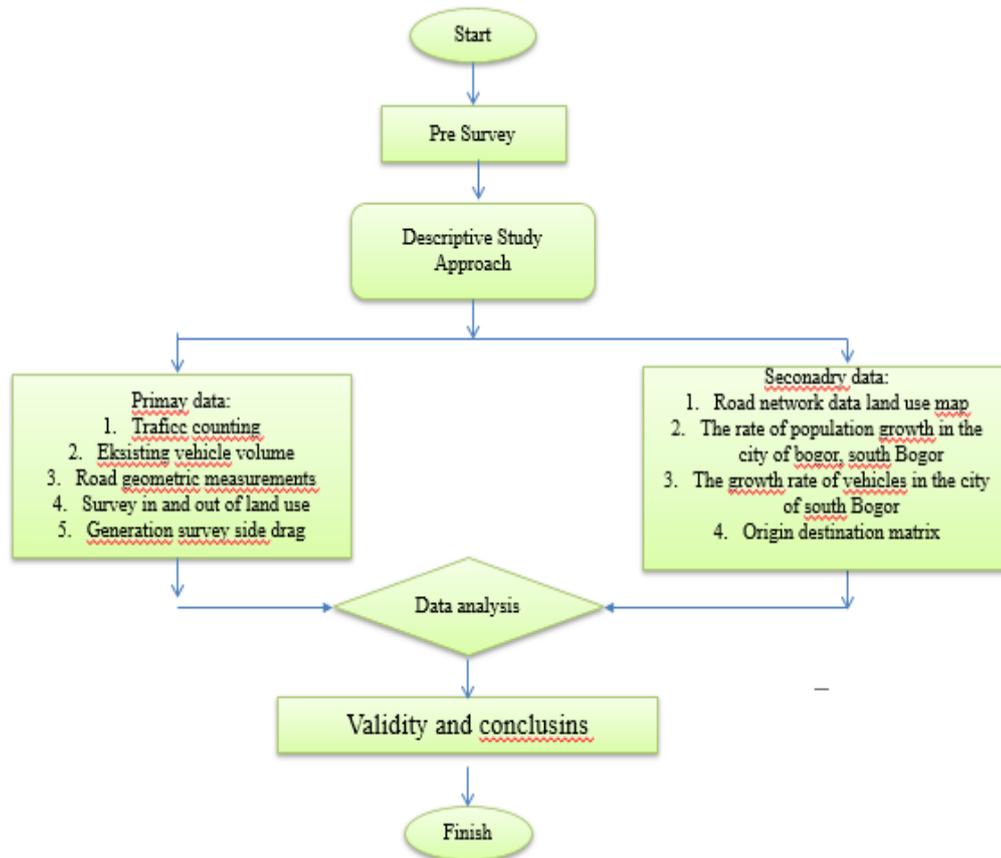


Figure 3. Research Flowchart

**RESULTS AND DISCUSSION**

**Traffic Count data**

To be able to find out the peak hours of working peak hours, traffic count data is needed from various roads around the Mardi Waluya School development area which includes Jl. Pahlawan, Jl. Dreded, Jl. Raden Shaleh Bustaman, Jl. Aut, and Jl. Empang to obtain the volume of vehicles around the study area.

**Road Segment Inventory**

The traffic survey carried out on these road sections has been divided into segments.

**Speed Calculation**

After getting the volume and flow of vehicles for each road segment, the next step is to find the average speed for each road based on the 2017 MKJI calculations:

$$V_B = (V_{BD} + V_{BL}) \times FV_{BHS} \times FV_{BUK}$$

### Capacity Calculation

The calculation of road capacity based on MKJI 2017.

$$C = C_0 \times FC_{Lj} \times FC_{PA} \times FC_{HS} \times FC_{UK}$$

### Existing Service Level

VCR (Volume Capacity Ratio) calculation based on MKJI 2017.

$$VCR = V / C$$

### Variable Intensity VCR, Existing Matrix

The results of the loading on the existing road network.



**Figure 4.** VCR Variable Intensity and MAT 2019 (Source: Analysis Results)

### Calculation of the Generation and Attraction of Mardi Waluya School

This trip generation is a calculation process to determine the magnitude of the generation caused by the expansion of the Mardi Waluya School building.

In calculating the generation, an assumption is made of the number of units based on the area at this early stage until an agreement is reached on the parking area, apartment units and retail area. Furthermore, to get the total number of pcu / hour pulls, the assumption is that the proportion of vehicles is uniform with the traffic counting data which is changed based on the vehicle coefficient on the MKJI. Estimation of generation and pull while using Trip Generation Manual, analysis of generation with a comparison of generation at a particular land use will further complement this analysis. From the results of the analysis, it is found that the magnitude of the generation and pull is 190 trips / hour.

### Service level during construction

The traffic conditions at the time of construction, with a project time of 10 months, were estimated to use 4 trucks and 2 pick-ups for the project, so that it would affect Jalan Hero 1.

Significant influence on traffic performance around the roads in the study area during the construction of Mardi Waluya School.

In order to assist the performance of road sections with the construction, there are sufficient measures taken to anticipate traffic disruptions

1. Coordinate with related parties to assist traffic management.
2. Provide WaterTrap to clean project tires so as not to disturb road safety due to the large amount of dirt on the project vehicle tires.

### Post-construction service level

Post-development prediction in the coming year, with the condition of existing roads and additional volume in line with the growth rate of the city of Bogor.

Post-development service level with impact handling

Several policy recommendations were made to anticipate a negative impact on traffic performance.

1. Arrangements with officers during morning rush hours or school entry and school hours so that the drop off in the parking lot provided is predicted to reduce side obstacles.
2. Installation of pelican crossing for crossing.
3. Appeal to use a pickup car.
4. Provision of a place to wait for online motorcycle taxis.
5. Doing road widening in several roads.

### CONCLUSION

Based on the results of the study that has been carried out, there are several conclusions as follows, the Mardi Waluya School Building Expansion Development with an area of 11529 Sqm (square meters) has a generating and pulling value of 190 cur / hour. Traffic problems on Jl. Pulo Empang is a high level of travel which is indicated by the high value of VCR that occurs throughout the day, especially during the morning peak hours (07.00-08.00) for the direction of Bogor City and Jakarta and the afternoon peak hours (16.00-18.00) for directions to Ciapus and Bondongan. This is because Jl. these are located in densely populated settlements and have high enough side barriers such as the number of public transportation that stop carelessly and street vendors. The results of

the study showed that the construction of the Mardi Waluya School Building was identified as not having a significant impact on existing traffic.

These results are indicated by the results of the modeling scenario from the development of the study location. Based on the analysis, it is necessary to increase the road capacity and proper traffic management, including: Arrangement and control at Jl. Empang which has a low level of service quality in order to achieve a better smooth traffic flow. The need for placing traffic signs in front of the Mardi Waluya school to maintain the safety of Mardi Waluya students when entering and leaving school. Arrangements with officers during morning rush hour or school entry and school return hours so that the drop off in the parking lot provided is thus predicted to reduce side obstacles. Pelican crossing installation for crossing. Appeals to pick-up cars, provision of places to wait for online motorcycle taxis. Doing road widening in several roads.

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