

# THE ROBINSON MALL IMPACT ON FV AND DS IN ZAPA STREET, BANDAR LAMPUNG CITY

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## INTRODUCE

### 1.1. Background

Robinson Mall Development has led to distribution of commercial activities and services in the city of Bandar Lampung. During this time, trading activities and services focused in the downtown area, is in The Tanjung Karang Pusat (TKP). So, centralization of commercial activity in TKP, led of many vehicles heading downtown and that have an impact on traffic congestion in the area of city center<sup>i</sup>.

Centralization of economic activity, such as mall, supermarket, traditional and modern market, etc, has caused problem in traffic in the TKP. Problem solving such as widening of roads and arrangements of parking, is not able to resolve the issue. So, it needed others solution to decrease traffic problem in TKP, one of solution is spread of commercial activity (IB Ilham Malik, 2013)<sup>ii</sup>. That is mean, if there is a new application of permit to build shopping center or mall or modern market, city government will be give the permit if location of project outside of TKP area. For example; at Kemiling area, Way Halim area, Rajabasa area, Teluk Betung area, etc.

Spread of commercial activity in Bandar Lampung relevan with regulation (regional regulation or Perda) on Spatial Planning, that is Perda No. 04 Year of 2004 on Spatial Planning of Bandar Lampung, and updated by Perda No. 10 Year of 2011 on the same thing<sup>iii</sup>. So, in line with the regulation, in some of areas in Bandar Lampung have commercial center too, such as Robinson Mall in the Rajabasa area, Boemi Kedaton Mall in Kedaton Area, Giant Supermarket and Giant Mall in Kemiling area and Antasari area, etc. And that situation, encourage of area growth and in the future will be the commercial activity area.

Table 1. Spread of Comercial Activity in Bandar Lampung City

NO	Object	Area
1	Mall Robinson Lampung	Rajabasa
2	Giant Mall	Antasari
3	Giant Departemen Store	Kemiling
4	Chandra Superstore	Kemiling
5	Mall Bumi Kedaton	Kedaton

Source: survey 2013

Although the spread of shopping centers and malls has do, but the problem of traffic congestion in TKP is not reduced. Thing that happens is congestion also spread (Bandar Lampung Transportation Agency, 2011). This happens because Bandar Lampung economic growth so high, and small of commercial activity increase so fast. And the result of government delay to build a mass transit system, the citizen use private vehicle to facilitate their mobility. Traffic congestion happens in many street on Bandar Lampung.

Tabel 3. Street and DS

NO	Name of street	DS*
1	ZA Pagar Alam	0,76
2	Teuku Umar	0,79
3	Sultan Agung	0,69
4	Raden Intan	0,83
5	RA Kartini	0,85
6	Gatot Subroto	0,68
7	Soedirman	0,73

Source: Transportation Agency, Bandar Lampung (\*from some of Andalalin documents to get development permit of building)

At the location where the new shopping center is located, allegedly an increase in the degree of saturation and changes in flow speed of vehicles along with the emergence of new buildings and large (for the size of the local shopping center). And how big is the improvement? For that study was conducted.

### 1.2. Identify the problem

The problem that arose alongside the shopping center should be completed properly by the owners of shopping centers and government (as the giver of building and operating permits). And one of the main issues to be examined in this study is the problem of interference with the free flow speed and the increase in the degree of saturation (DS) on the road ZA Pagar Alam due to the operation of the shopping center Mall Robinson Lampung.

### 1.3. formulation of the problem

Research to be done on this activity is to examine how much actual influence of the presence of the FV Robinson Mall and DS. Therefore, the decline in FV and increased DS will be the factors that influence the level of traffic service. Control of FV and DS to do to be able to provide guarantees smoothness of traffic on road traffic users ZA Pagar Alam.

### 1.4. Purpose

Knowing the influence of the construction of the Mall of Robinson against the free flow velocity (FV) and the degree of saturation (DS) at Jalan ZA Pagar Alam, Rajabasa, Bandar Lampung.

### 1.5. The boundary of problem

Limitations of this research are:

- Survey on the study conducted in mid-2014 only.
- Not take into account the presence / influence Unila intersection.
- The survey data as comparison material obtained from the Traffic Impact Analysis Document (Andalalin) Robinson Mall.

## LITERATURE

### 2.1. Theory Overview

#### a. Free flow velocity (FV)

Free flow speed is the speed of the vehicle without any major obstacles. The formula used to calculate the free stream velocity is:

$$FV = (FV0 + FVw) \times FFVsf \times FFVcs$$

where:

FV = excl. free flow of veh. light (km / h)

FV0 = excl. Free flow of basic veh. Lightweight (km / h)

FVw width = adjusting traffic (km / h)

FFVsf = side friction factor penyesuan

FFVcs = adjustment factor size city

The free flow speed will be compared with the real kecepatan obtained from the survey. By knowing the ratio between the two, between the free flow speed and the real speed, then the situation will be known flow rates of vehicles on the road, whether impaired or not.

Normality of vehicle speed on a certain road segments monitored by:

1) If the free FV < FV real then the traffic flow smoothly without interruption

2) If the free FV > FV rill the traffic flow have problems / disorders that require treatment to overcome the existing traffic on these roads.

#### b. Degrees of saturation (DS)

The degree of saturation is the ratio between the volume of traffic (pcu / h) with the capacity (pcu / h).

The formula is:

$$DS = V / C$$

Where V is the volume (pcu / h). Traffic volumes are known from direct surveys in the field.

While the value of C can be determined through a calculation using the formula:

$$C = Co \times FCW \times FCsp \times FCsf \times FCCS$$

where:

C = capacity (pcu / h)

Co = the basic capacity (pcu / h)

FCW = adjustment factor width of traffic lanes

FCsp = adjustment factor dividing direction

FCsf = faktor side friction adjustment

FCCS = adjustment factor the size of the city

\*) For the calculation of FV and C, will use an adjustment factor table as stated in the attached Table MKJI 1997.

Knowing DS (degree of saturation) is important as knowing the DS then the service level of a road can be known. The level of service has become a barometer of handling a road so that people will not complain of traffic conditions on the road. Service standards can be seen in Table 2.1.

Table 2.1. Level of Service (MKJI 1997)

LEVEL OF SERVICE	CHARACTERISTICS	SCOPE LIMITS V/C
A	Traffic flow conditions at high speeds and low traffic volumes. The driver can choose the speed of unimpeded	0,00 – 0,19
B	In the zone traffic flow steady. The driver has enough freedom to select speed	0,20 – 0,44
C	In the zone traffic flow steady. Motorists are restricted in choosing speed	0,45 – 0,74
D	Approaching unstable flow in which nearly every driver will be limited. The volume of services related to the capacity that can be tolerated	0,75 – 0,84
E	The volume of traffic approaching or are at capacity. Flow is unstable with frequent stop conditions	0,85 – 1,00
F	Forced or jammed flow at low velocity. The queues were long and there were great obstacles.	Greater than 1,00

Resource: Manual Kapasitas Jalan Indonesia/MKJI 1997

## 2.2. The framework

The framework of this research can be seen in Figure 3.1.

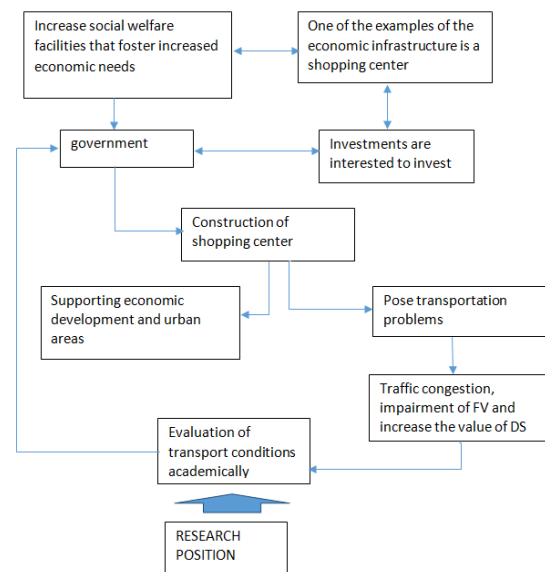


Diagram 3.1. Research framework

Diagram 3.1. Research framework

## METHODOLOGY

Stages of analysis to be performed are:

a. Traffic survey data. These data are presented in a format which is then converted vehicles into passenger car unit (pcu) per hour. The unit, volume (V) is pcu / hour.

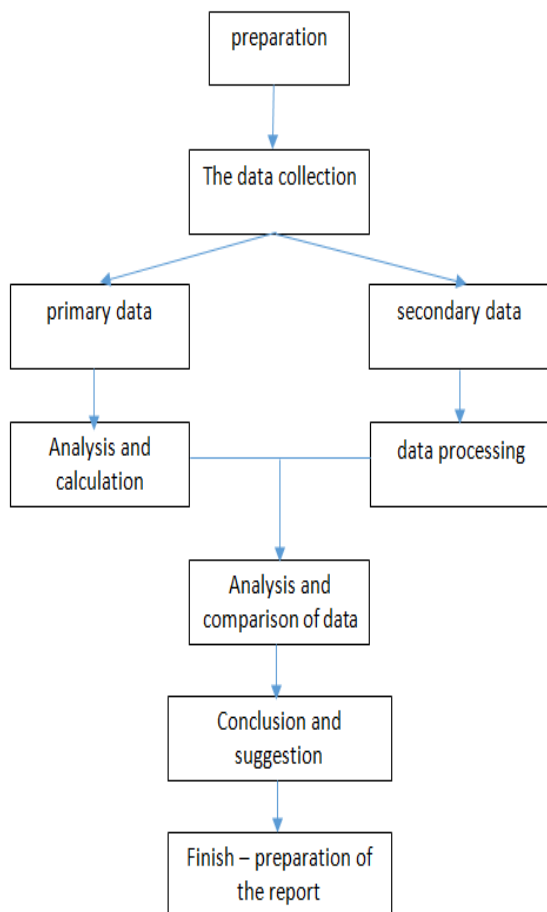
b. Checks and classification of survey data related to the way the object of study. The data includes:

- 1) The width of the lane
- 2) Width Krib
- 3) The width of the median
- 4) The total width of the road

c. Calculating the free flow speed with a formula which is then compared to the real speed obtained in the field. Then if faster than the real speed or vice versa. If faster speed means no real problems and vice versa.

d. Calculating the degree of saturation. But before calculating the capacity of the road in advance with the previous formula. If the capacity is already known, we then compare the capacity of the existing traffic volumes. The results of the comparison will generate numbers from 0.0 to 1.0.

e. Then the number of DS diploting to an explanation of the level of traffic service (A - F).



Picture 3.1.

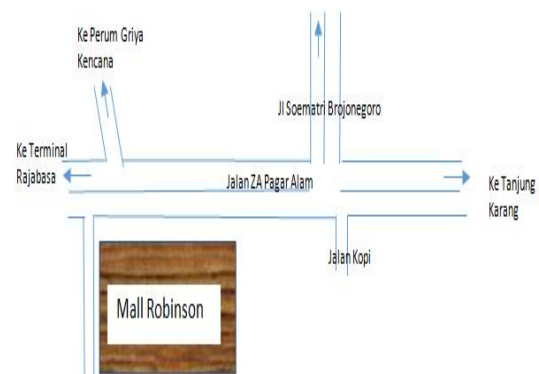
Flowchart of the study

## SECTION 4 RESULTS AND DISCUSSION

### 4.1. Location and Time Survey

Survey conducted in ZA Pagar Alam Road, Rajabasa, Bandar Lampung. The location is in front of the Robinson Mall. The survey was conducted in the two-way movement of the vehicle, the direction and the direction Rajabasa-Tandjungkarang Tandjungkarang-Rajabasa.

Picture 4.1. Location surveys conducted in ZA Pagar Alam



Road, right in front of Robinson's Mall Bandar Lampung

As for the time of the survey, conducted for 7 (seven) days, from 06.00 until 18.00 (12 hours). Today survey is Monday, Tuesday, Wednesday, Thursday, Friday, Saturday and Sunday on April 21, 2014 through 27 April 2014.

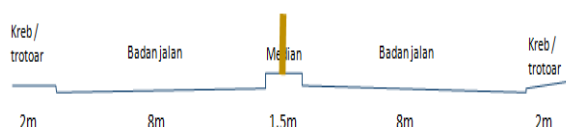
Tabel 4.1. Time of Survey

Day	date	time
Monday	21 april 2014	06.00 – 18.00
Tuesday	22 april 2014	06.00 – 18.00
Wednesday	23 april 2014	06.00 – 18.00
Thursday	24 april 2014	06.00 – 18.00
Friday	25 april 2014	06.00 – 18.00
Saturday	26 april 2014	06.00 – 18.00
Sunday	27 april 2014	06.00 – 18.00

## 4.2. Survey results

### a. Data Path

Through the measurement, it is known that the type of road 4 / 2D with a median width of 1.2 meters, a width of 8 meters per lane road and Kurb 2 meters. As outlined in Figure 4.2.



Picture 4.2. The cross section ZA Pagar Alam Road, Robinson Mall Lampung, Rajabasa, Bandar Lampung

### b. volume Vehicle

The volume of vehicles occurred in the week. The number of motorcycles is the biggest contributor to the volume. Details can be found in appendix. The daily volume of data is shown in Table 4.2. It is seen that the highest volume occurred on the day of the week is 35 446 pcu / day.

Table 4.2. Daily traffic volume during a 1-week survey

Day	DIRECTION S VOLUME TANJUNG KARANG – RAJABASA (smp)	DIRECTION S VOLUME RAJABASA – TANJUNG KARANG (smp)	TOTAL VOLUME TWO-WAY (smp)
Monday	13.559	13.923	27.482
Tuesday	14.107	14.484	28.591
Wednesday	14.651	15.065	29.716
Thursday	14.515	14.923	29.438
Friday	15.828	16.266	32.094
Saturday	16.609	17.058	33.667
Sunday	17.434	18.012	35.446

Data on the number of vehicles on the day of the week, showed that the traffic volume is very dominated by motorcycles and light vehicles. This suggests that the motor vehicle from year to year continue to contribute to

the increase in the number of vehicles used by the public. Meanwhile, for the transport being dominated by BRT buses Trans Belfast, relatively little.

Table 4.3. Daily traffic data direction Rajabasa-Tandjungkarang

Minggu					
Jam	MC	LV	MV	HV	Jumlah
06.00	2.388	530	84	2	3.004
07.00	3.559	930	139	4	4.633
08.00	4.024	925	226	3	5.178
09.00	4.012	898	198	5	5.114
10.00	3.809	696	126	8	4.639
11.00	3.033	672	102	12	3.818
12.00	2.828	533	75	15	3.451
13.00	2.245	627	71	5	2.948
14.00	2.400	462	82	9	2.953
15.00	2.463	538	100	2	3.103
16.00	3.213	686	184	11	4.094
17.00	3.570	659	175	4	4.407
	37.545	8.156	1.562	80	47.342
	7.509	8.156	2.187	160	18.012

Table 4.4. Data daily traffic direction Tanjungkarang – Rajabasa

Sunday					
hour	MC	LV	MV	HV	amount
06.00	2.317	514	81	4	2.916
07.00	3.452	902	135	5	4.495
08.00	3.903	897	220	5	5.025
09.00	3.892	871	192	2	4.957
10.00	3.695	675	122	3	4.495
11.00	2.942	652	99	5	3.697
12.00	2.744	517	72	6	3.339
13.00	2.178	608	69	9	2.864
14.00	2.328	448	80	9	2.865
15.00	2.389	522	97	5	3.013
16.00	3.117	665	178	4	3.964
17.00	3.462	639	170	2	4.273
	36.418	7.911	1.515	59	45.904
	7283,7	7911	2121,4	118	17.434

From the data in Table 4.3. and Table 4.4., data on the number of vehicles passing on the road ZA Pagar Alam (in units and smp) are:

a. Sunday, 08:00 = 5178 units for directionng Rajabasa - Tandjungkara

For his smp is 2,053 pcu / hour. Calculation is:

MC	LV	MV	HV	amount	
4.024	925	226	3	5.178	unit
0,20	1,00	1,40	2,00		
804,8	925,2	317,1	6,0	2.053	smp

a. Sunday, time 08.00 = 5025 units for direction Tandjungkarang-Rajabasa  
For his is 1995.6 smp smp / h. The calculations are:

MC	LV	MV	HV	amount	
3.903	897	220	5	5.025	unit
0,20	1,00	1,40	2,00		
780,6	897,4	307,6	10,0	1.995,6	smp

So the total volume of vehicles in both directions are:

$$= 2053 + 1996.6 = 4049.6 \text{ pcu / hour}$$

#### 4.3. vehicle speed

Speed of the vehicle is identified by a survey by measuring the speed of passing vehicles. At least 20 vehicles in the survey, with 10 vehicles from the division-Rajabasa Tandjungkarang and 10 vehicles from the direction Rajabasa-Tandjungkarang. For a survey point in front of Robinson's Mall, adjacent to the junction with signalized lights. This poses another problem due to vehicle-Tanjunkarang Rajabasa direction, depending on the vehicle speed by the presence of light signals, while the direction Tandjungkarang-Rajabasa depend on conditions in the crossover as well, which if the adverse dense then the vehicle speed becomes faster after the trap queue vehicle in traffic. Speed of the vehicle is usually driven by the rider, causing the vehicle drove quite fast.

Table 4.5. The average speed of passing vehicles

Type of vehicle	TOTAL	average speed (RB-TJK)	average speed (TJK-RB)	average
MC	12	30,67	34,67	32,67
LV	8	29,25	33	31,125
MV	4	22,5	35,25	28,875
HV	2	21	31,5	26,25

\*) RB = Rajabasa, TJK: Tanjungkarang

#### 4.4. calculation

a. the capacity of the road

Calculation formula:

$$C = C_0 \times FCW \times FCsp \times FCsf \times FCCS$$

From Table MKJI 1997, noted that:

$$C_0 = 1650 \times 4 \text{ rows} = 6600$$

$$FCW = 1.08$$

$$FCsp = 1$$

$$FCsf = 0.98$$

$$FCCS = 1$$

then:

$$C = (1650 \times 4) \times 1.08 \times 1 \times 0.98 \times 1$$

$$C = 6985.44$$

b. The volume of traffic

To the volume of traffic, according to the previous explanation, known number:

$$V = 4049.6 \text{ pcu / hour}$$

c. Degree of saturation (DS)

For the degree of saturation, the formula used is:

$$DS = V / C$$

$$V = 4049.6 \text{ pcu / hour}$$

$$C = 6985.44 \text{ pcu / hour}$$

so that:

$$DS = 4049.6 / 6985.44$$

$$DS = 0.58$$

#### d. Free flow speed

Calculation formula:

$$FV = (FV_0 + FV_w) \times FFV_{sf} \times FFV_{cs}$$

From Table MKJI 1997, noted that:

$$FV_0 = 55$$

$$FV_w = 4$$

$$FFV_{sf} = 0.99$$

$$FFV_{cs} = 1$$

then:

$$FV = (55 + 4) \times 0.99 \times 1$$

$$FV = 58.41 \text{ km / h}$$

#### 4.5. analysis

From the calculations, it is known that the data obtained as set out in the table, which was later confirmed through the survey results. By looking at other data sourced from the traffic impact analysis document (andalalin) Robinson Mall development, it will be known whether an increase in DS and decreased FV. The data set associated with it, will be presented in the table .....

Table 4.6. Comparison of data before and after Robinson Mall Operations

COMPARISON OF DATA	MALL BUILT BEFORE * (Andalalin Oktober 2011)	AFTER CONSTRUCTED MALL (April 2014)	
V	3573,1 smp/h	4049,6 smp/h	
C		C = 6985,44	
DS	0,55	0,58	
FV	31,125 km/h		58,41 km/h

From these data, it can be concluded that there is an increase in DS and FV decrease significantly. This happens because it does widen the road and traffic engineering on the front of the Mall of Robinson, such as vehicle parking mall visitors.

conclusion

1. The degree of saturation as the ratio between the V and C (V / C) of 0.58 figures obtained after waking mall. While before the mall awakened (based on data Andalalin), DS number is 0.55. It could be argued that an increase in the DS but still in relatively safe conditions. Level of service C, in the zone traffic flow steady. Motorists are restricted in choosing speed.

2. To speed the flow of vehicles on average, which is used light vehicle, light vehicle (LV). From the survey conducted, the average speed of vehicles in both current is 31.125 km / h. While the count should FV = 58.41 km / h. Can be said that there is a decrease in the speed of the speed it should be.

3. From the data above shows that the improved DS has lowered FV. The existence of the intersection Unila, further strengthening FV downturn.

#### Bibliography

1. Radar Lampung
2. Book of Transportation Policy, IB Ilham Malik, 2013
3. Bappeda Bandar Lampung