

## Traffic Jams on Majene Axis Road of Campalagian Market In Polewali Mandar Regency, West Sulawesi, Indonesia

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**Abstract:** Priority Handling Traffic Jams on Majene Axis Road of Campalagian Market in Polewali Mandar. This study aimed to analyze the level of service and the policy directions to the road ahead, knowing factors influence the chaos and traffic jams, using field data, secondary and interview. Data analyzed by Road Service Level Analysis and the AHP. The result showed the level of service at the level of the way C is a steady flow, the speed is controlled by traffic volume with the degree of saturation ( $DS = 0.76$ ), exceeding the threshold of good road performance. Priority handling traffic jam on Majene Axis Road to do with the arrangement of the Market Area.

**Keywords:** Traffic, Service, Management

### I. INTRODUCTION

Transport infrastructure is a factor supporting economic development for the region, seen from the manifold modes of transportation people use for their activities. Traffic volumes exceed the capacity of the road network causing congestion. That problem is exacerbated, with the condition of transportation infrastructure is very limited, making it less efficient function. The parking on the road also contributes to reducing the capacity of the road, causing a decrease in vehicle speed.

It was, occurred at a center for trading in Polewali Mandar Regency located at Campalagian District. The road that serves as a primary arterial road based on *Kepmen Kimpraswil* No. 375/KPTS/M/2004, the road that connects the capital of the province as well as a liaison with the district capital market locations with residential areas and the city center, will bear the burden of traffic flow increases. [1,2,3].

At this location, there is a decrease of the level of service road conditions caused by the geometric and physical damage roads, the emergence terminal and motorcycle shadow side of the road, as well as traditional irregular transport parking. The road capacity is not increased while the traffic volumes continue to grow due to the mixing of local traffic flows constantly. Based on the description of the problem is necessary to study how the handling of traffic jams in policy formulation and Management of Urban Transport. [4,5,6,7].

### II. METHODS OF STUDY

The level of service determined by the speed and capacity and volume Ratio Street, when the volume increases, the level of service is decreasing; as a result of the traffic flow is worse [8]. Indicators Level of Services (ILS) road show overall condition of these roads [9,10]. Measurement of level of service can be seen by reviewing variables, among others; Capacity (C), the degree of saturation (DS), the travel speed (V), free flow speed (FV), travel time (T) [7,8,9]. The volume of traffic is the number of vehicles passing a given point within a specific time interval. Traffic volume of future traffic volume at this time is multiplied by the factor of growth [4,5,11].

Analytical Hierarchy Process (AHP) is a decision support modeling and is used in multi-factor problem parse cause traffic jam, which is a hierarchy. The AHP is defined as a representative of a complex problem in a multi-level structure [12,13,15]. This research is descriptive and qualitative, is a case study by conducting surveys and field observations. The object of research is done on the segments I and II, the Campalagian Market location, Polewali Mandar Regency, West Sulawesi, in Indonesia. The research location as in the image [1].

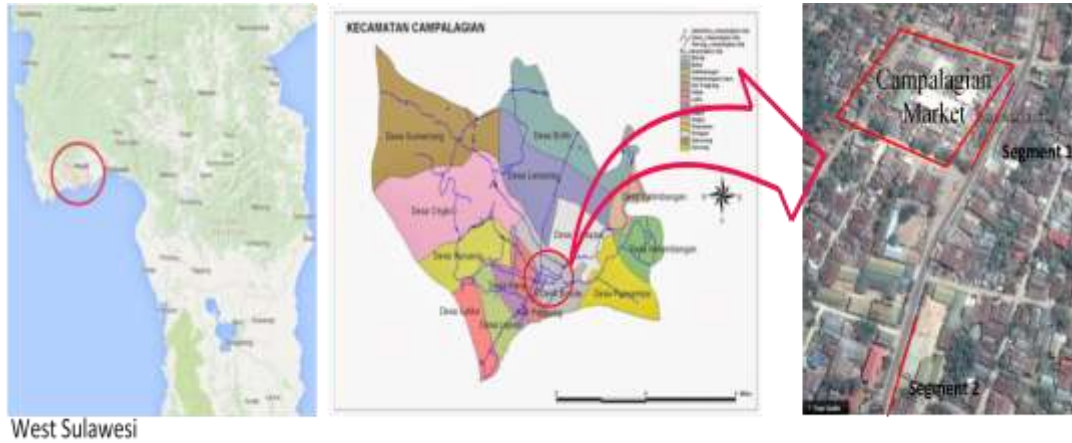
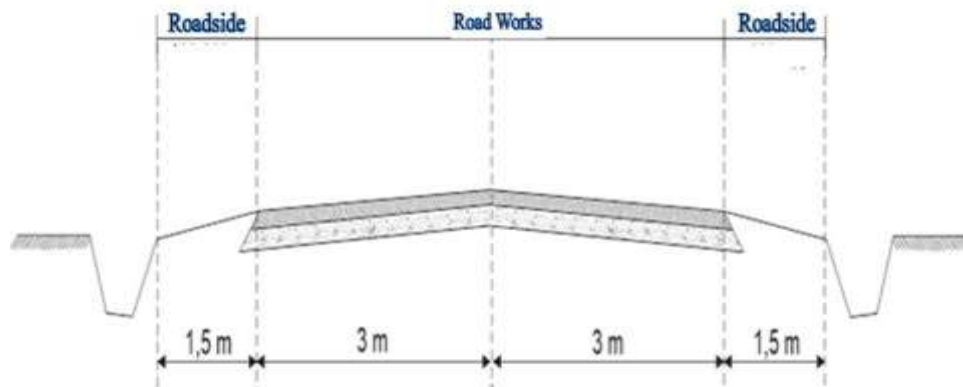


Figure1. Locus of Research

### III. RESULTS AND DISCUSSIONS

#### Road Network Performance

Majene Axis Road serves as a primary arterial road has a type two-lane and two-way road without a median (2/2 Undevided), class III A which can be traversed vehicles include the size of the payload does not exceed 2.5 meters width, length not exceeding 18 meters , and load the heaviest axis allowed 8 tons.



Source: Field Survey Results, 2016

Figure 2. A cross section of Majene Axis Road

Volume / flow of traffic segment 1 The volume of vehicles in units smp / hour can be seen in the following figure:

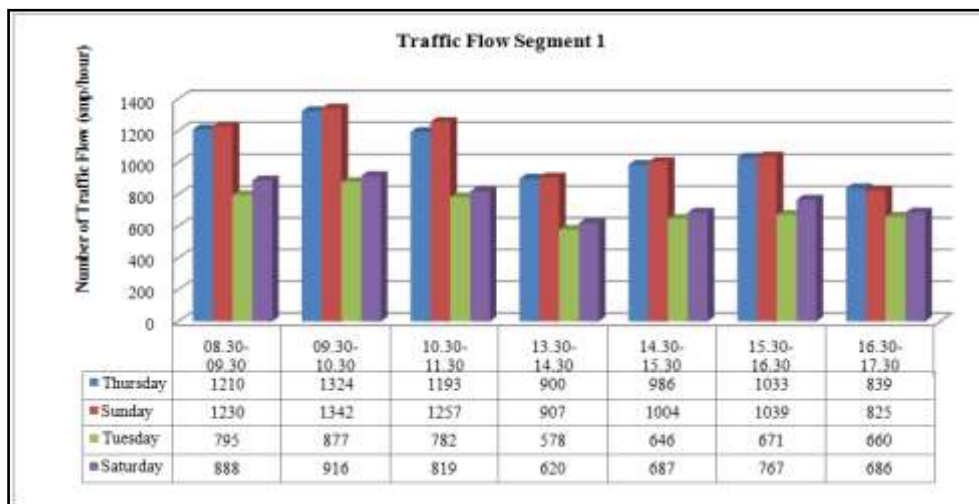


Figure3. Fluctuations in traffic flow segment 1

The volume of peak hour traffic takes place on Sunday 09:30 to 10:30 hours, the lowest on Tuesday's 13.30-14.30. Time peak at 09:30 to 10:30 on Thursday and Sunday occurred as a result of the market generated by the activity of local traffic.



Figure 4. Fluctuations in the flow of traffic segment 2

The highest volume of traffic on the segment II occurred on Sunday 09:30 to 10:30, the lowest on Tuesdays 13:30 to 14:30, as in Figure 4.

The condition on the segment 2 is not much different from those of segments 1, when the peak occurred at 09:30 to 10:30 on Thursday and Sunday. For Tuesday and Saturday traffic flow conditions on segment 1 and segment 2 is relatively the same, there is no surge of traffic that means. This case, due Tuesday and Saturday is not a day trade market so that seizure activity is reduced when compared to traffic on Thursday and Sunday.

### Side Obstacles

The Side obstacle along 200 meters of the observation point showed the highest obstacle on Sunday, 09:30 to 10:30 in the period of peak hours, ie the effect of slower vehicles not motorized (tricycles, hansomcab, carts, bicycles and others), the vehicle and out of the market Campalagian, vehicle parking or stop.

In the table below, based on the class side obstacles for urban roads (MKJI, 1997), the side obstacles to urban roads on Majene Axis Road in front Campalagian market is high (H), which was assessed by the frequency of weight as in the Table 1.

Table 1. The frequency of side obstacle weighs

Type Incident Side Obstacles	Symbol	Wieght Factor	Frequency of Incident	Frequency-weighted
Pedestrian	PED	0.5	341/hour, 200 m	170.5
Parking, Vehicle stop	PSV	1.0	52/hour, 200 m	52.0
Vehicle Entry + Exit	EEV	0.7	215/hour, 200 m	150.5
Slow Vehicles	SMV	0.4	323/hour,200 m	129.2
Total :				502.2

### Speed

The speed of vehicular traffic on the roads was observed for 4 days in the time period 08.30 to 17:30, is as shown in figure 5 below.

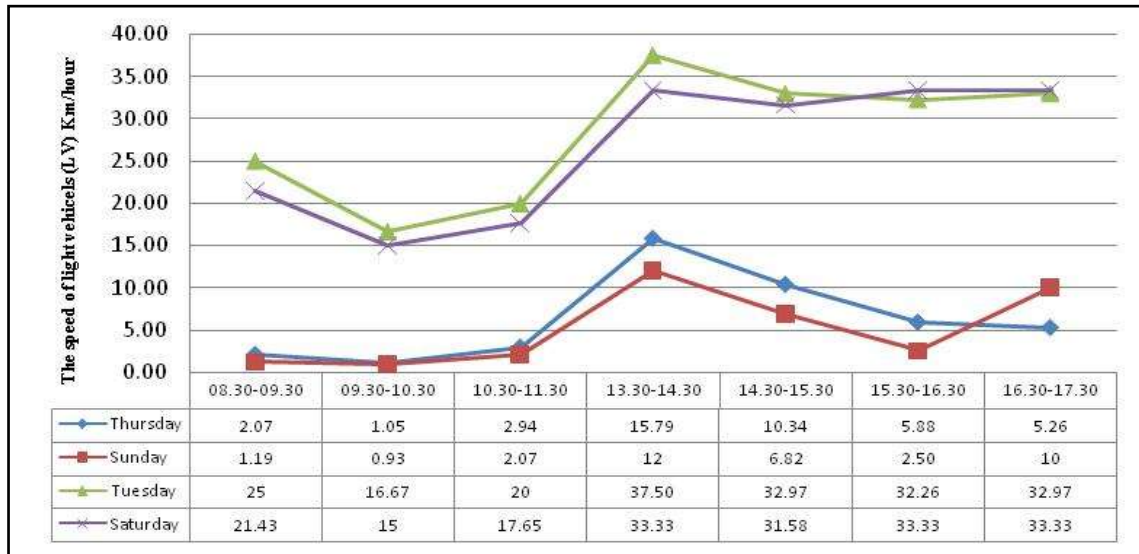


Figure5. Graph Fluctuations on Majene Axis Road speed (km/h)

The highest speeds occur on Tuesdays 13:30 to 14:30 hours are 37.5 km/h. This is due to the lower traffic volume is about 578 smp/hour. The lowest rate occurred on Sunday hours of 09:30 to 10:30 are 0.93 km/h, due to the high traffic volume is 1342 smp/hour. Average speed on Tuesday, Thursday, Saturday and Sunday respectively is 28.19 km/h, 6.19 km/hour, 26.52 km/h and 5.07 km/h, or accumulation of average speed by 16.49 km/hour.

The decrease in speed on roads due to the effect of road width, side friction, wear shoulder of the road as well as the size of the population of the city, where the free flow speed is 44 km/h while connected to free flow speed is equal to 31.37 km/h refer to Table 2.

Table 2. Results of the calculation of free flow

Roads	FV <sub>O</sub>	FV <sub>w</sub>	FV <sub>O</sub> + FV <sub>w</sub>	FFV <sub>SF</sub>	FFV <sub>CS</sub>	FV
	(1)	(2)	(3) = (1) + (2)	(4)	(5)	(6) = (3)x(4)x(5)
Majene Axis segment 1	44	-3	41	0.85	0.90	<b>31.365</b>

Source: The Results of the analysis, 2016

The capacity of Majene Axis Roads in Campalagian market is 1777 smp/hour

Table 3. Capacity roads (smp/hour)

Roads	C <sub>o</sub>	FC <sub>w</sub>	FC <sub>SP</sub>	FC <sub>SF</sub>	FCCS	C
	(1)	(2)	(3)	(4)	(5)	(6) = (1)x(2)x(3)x(4)x(5)
Majene Axis	2900	0.87	0.91	0.86	0.9	<b>1777</b>

Source: The Results of the analysis, 2016

The degree of saturation in the range (DS = 0.76). The ratio of traffic volume and capacity is (0.75). This is the threshold of good road performance. The DS which exceeded 0.75 will have an impact on congestion, road density will be higher and the low speed so it is necessary to take steps to anticipate (MKJI, 1997).

Table 4. The degree of Saturation Roads

Roads	Traffic Flow (Q) (smp/hour)	Capacity (smp/hour)	The Degree of Saturation (DS)	The MKJI's Rule
Majene Axis	1342	1777	0.76	≤ 0,75

Source: The Results of the analysis, 2016

The rated average travel speed of light vehicle (LV) as follows:

Table 5. The average travel speed of light vehicle (LV)

Roads	The free flow speed FV (km/hour)	The Degree of saturation	The average travel speed (km/hour)
Majene Axis	31.37	0.76	<b>23.3</b>

Source: The Results of the analysis, 2016

According to the table above, the Service Level Index MajeneAxis at the level of service C is approaching unstable flow, low speed or flow falters/unstable and low speed.

**Table 6.** Index level of service roads

Roads	Traffic Flow (smp/hour)	Capacity	DS	The free flow speed (km/hour)	The average vehicle speed (km/hour)	Level of Services
Majene Axis	1342	1777	0.76	31.37	23.3	C

**Traffic Growth**

Population growth rate in 2006 to 2014 periods varies between 0.5% to 1.62%, the average growth was 1.1% (CBS, 2015). The rate of growth in the number of vehicles in Polewali Mandar varies between 0.27% and 18.47%, the percentage growth in the average vehicle from 2010 to 2014 was 10.32%. The growth factor vehicle use (IU) based on the average rate of growth of motor vehicles nationwide (2009 to 2013) from year to year with growth of around 9.78%.

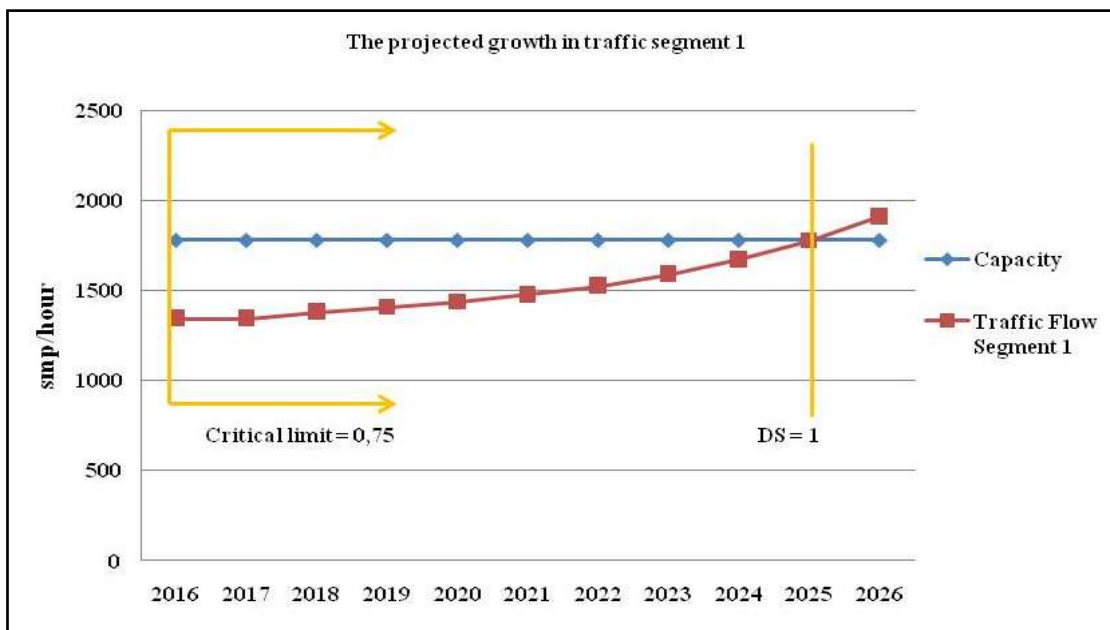
Based on the three factors of the growth, it is predicted that the growth of traffic on Majene Axis Roads of Campalagi Market area is as follows as in the Table 7:

**Table 7.**The traffic Growth on Majene Axis Roads for 10 years

No.	Year	The growth rate F	Traffic FlowQ (smp/hour)		The Degree of Saturation DS		Level of Sevice	
			Segment One	Segment Two	Segment One	Segment Two	Segment One	Segment Two
1	2016	-	1342	1265	0.755	0.646	C	C
2	2017	1.23	1358	1280	0.764	0.654	C	C
3	2018	1.50	1379	1300	0.776	0.664	D	C
4	2019	1.85	1404	1324	0.790	0.676	D	C
5	2020	2.26	1436	1353	0.808	0.691	D	C
6	2021	2.78	1476	1391	0.831	0.710	D	C
7	2022	3.41	1526	1438	0.859	0.735	D	C
8	2023	4.18	1590	1499	0.895	0.765	D	C
9	2024	5.13	1672	1575	0.941	0.804	E	D
10	2025	6.29	1777	1674	1.000	0.855	E	D
11	2026	7.71	1914	1804	1.077	0.921	F	D

**Source:** The results of the analysis of the primary data, 201

**Note:** The capacity (C smp/h) the first segment is 1777 and the second segment of 1,960 smp/hour and growth rate coefficient  $F = (1 + iI)n \times (1 + iM)n \times (1 + iU)n$ .



**Figure 6.** Projected traffic growth segment 1



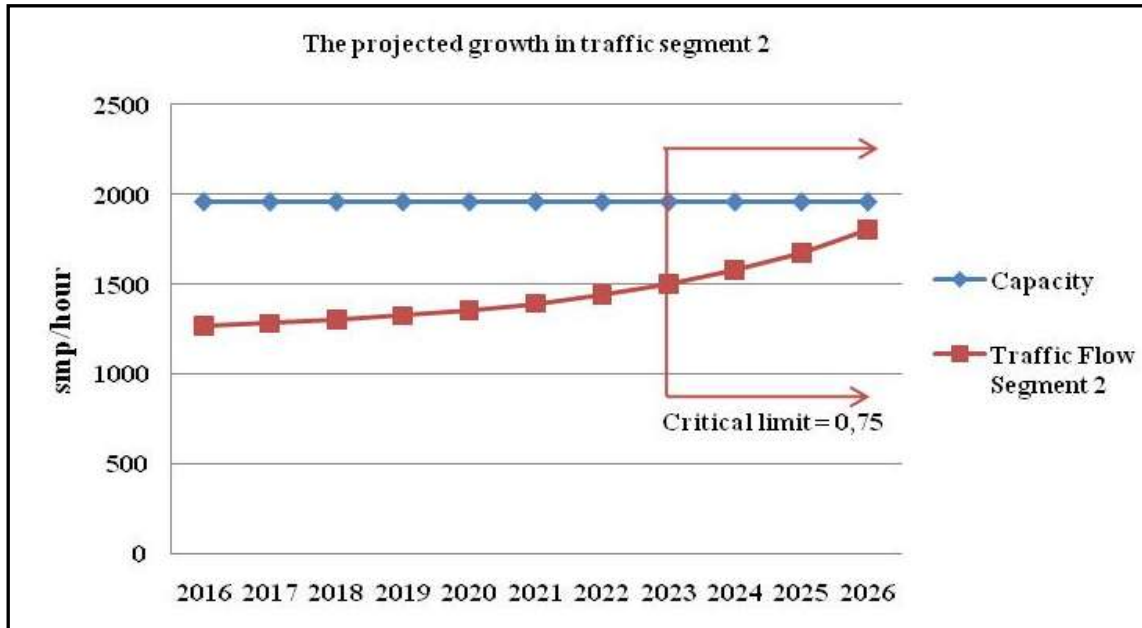


Figure 7. Projected traffic growth segment 2

Based on Table 7, Figure 6 and 7 road conditions first segment is at the level of service C, steady flows, the speed is controlled by traffic, has exceeded the performance threshold. In 2019 the level of service at the level of D ie unstable flow, flow falters and low speed with the degree of saturation reached 0.78. In 2024 the level of service at the level of E is the current unstable, low speed and variable or stuttering, volume approaching capacity with the degree of saturation reached 0.94. It is estimated that in 2025 on Majene Axis Roads at the Campalagian Market Region reached saturation point with the degree of saturation 1.

For road segments 2 service levels are at level C with degree of saturation of 0,646 has not exceeded the threshold of street performance, in 2023 service levels are at level C with degree of saturation reached 0,765, exceeding performance thresholds good roads, a condition where the required treatment to repair street performance, can be done physically widening the road or with engineering or traffic management.

**The handling of traffic jams**

The factors that cause traffic jams is the limited traffic infrastructure, traffic volume of vehicles that exceed the capacity, the development of the shadow terminal and parking irregular. Alternative policies required is cooperation with the government of Polewali Regency, structuring regional markets, improved traffic infrastructure, discipline, parking provision. The main source of congestion is growing shadow terminal and parking irregular transport modes. This case can occur due to the year the vehicle is increasing, further demonstrated the value of AHP analysis results in the following table:

**Table 8. The Cause of Jams**

No.	The cause of Jams	Value
1	Growing shadow terminal and parking irregular transport modes	0.595
2	The number of vehicle that exceed the capacity	0.220
3	Limitation of traffic infrastructure	0.185

Source: The results of data processed, 2016

The perceptions of respondents in the alternative policies for addressing traffic congestion, as a first priority to do is Structuring Market Region, with the order of priority shown in the following table:

**Table 9.** Priority Handling Traffic Jams

No.	Priority Policy	Value
1	The structuring of the market area	0.326
2	Parking provision	0.229
3	Cooperation with the Government of Polewali Mandar	0.180
4	Dicipline Enforcement	0.175
5	Increase Traffic Infrastructure	0.107

**Source:** The results of data processed, 2016

The structuring of the market area becomes a policy priority in handling congestion on Majene Axis Roads. The location of the market is already very narrow to accommodate the buyer and seller, packed with traders pavement with the number of visitors  $\pm$  200 people/hour at peak hours on the day of the market leads to high obstacles next to the road shoulder is used as vehicle parking, terminal shadows and stalls of street vendors, the Campalagian Market Relocation is one of the solutions to solve traffic congestion on Majene Axis Roads.

#### IV. CONCLUSION

Road service levels are at a level of service C is a steady flow, the speed is controlled by traffic, saturation reached 0.76 this condition is critical. In 2019 the level of service at the level D is approaching unstable flow or flow falters and low speed with the degree of saturation reached 0.78, and in 2024 the level of service at the level of E is the current unstable, low speed and different, volume approaching capacity with the degree of saturation reached 0.94.

The main factors affecting the chaos and traffic congestion is growing shadow terminal and parking of vehicles that are not regularly is a causative factor that is necessary, the relocation of the market, has been very limited to accommodate the activities of the seller and the buyer, the high side friction due to the use of road shoulders as vehicle parking need to be laid or managed so it does not affect traffic as resistance.

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