

# Capacity Analysis of Jalan Sabar Jaya in Inland Water and Ferries Transport Polytechnic of Palembang

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**Abstract:-** Jalan Sabar Jaya is one of the roads in the Desa Perajin, Banyuasin I District, Banyuasin Regency, South Sumatra. Various activities on Jalan Sabar Jaya, ranging from industrial, residential and educational activities make the road condition congested during heavy traffic. Inland Water and Ferries Transport Polytechnic of Palembang is one of the educational institutions under the Ministry of Transportation that educates cadets with a boarding school system and there are office activities located on Jalan Patient Jaya No 116. At certain conditions traffic will become jammed. This research aims to evaluate the performance of Jalan Sabar Jaya and find out when the congestion occurs and the steps to overcome the congestion. During normal conditions, Jalan Sabar Jaya's performance is still able to serve the number of passing vehicles with  $DS = 0.46$  but congestion will occur if there is an increase in traffic volume by 65% with  $DS = 0.752$ . Anticipating congestion prevention in the event of an increase in traffic volume by 65%, namely by reducing side barriers, among others, by repairing roads and reducing parking vehicle activities on the side of the road

**Keywords:-** component; traffic, congestion, side barriers.

## I. INTRODUCTION

The current development growth in Banyuasin Regency is running rapidly, this affects the increase in the flow of human and goods movement which has a negative impact, namely increasing the level of traffic congestion in the Banyuasin area. Banyuasin Regency is bordered by Palembang City which is the capital city of South Sumatra Province, this has resulted in the emergence of quite high transportation movements. Banyuasin Regency has 21 sub-districts spread over the Banyuasin area, both land and water areas. Banyuasin I District is one of the sub-districts in the Banyuasin area, which is located on the border of Palembang City.

Orderly and regular traffic will be able to prevent various accidents so as to create safe, safe and comfortable traffic (Kariyana, 2020). According to C. Utary, et al (2017) identification of the availability of road equipment is needed in order to support the smooth flow of traffic in an area. According to Anggun Dwi Ermawati (2019) Road equipment facilities are a serious problem with a high risk value related to traffic safety. Inland Water and Ferries Transport Polytechnic of Palembang is an educational institution under the Transportation Human Resources Development Agency that educates cadets in the LLASDP field. In addition, the Palembang SDP Transportation Polytechnic is an office space

that has a large number of offices and an education system with a dormitory system. Inland Water and Ferries Transport Polytechnic of Palembang is located on the edge of the highway in the Banyuasin I District, Banyuasin Regency. Traffic conditions are quite congested and there are many industries around the Transportation Polytechnic, making this area during certain conditions such as when the cadets are allowed to stay overnight, there are many traders and activities with many people's activities, congestion occurs in front of the Inland Water and Ferries Transport Polytechnic of Palembang.

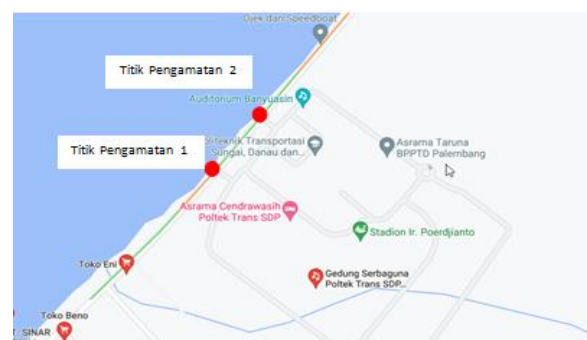
## II. METHODOLOGY

The methodology used is to calculate the road capacitance based on the 1997 MKJI. The research steps include the following:

- Conduct a two-way traffic volume and instantaneous speed survey on Jalan Sabar Jaya
- Identification of obstacles in front of the Inland Water and Ferries Transport Polytechnic of Palembang.
- Conduct a survey of incoming and outgoing vehicles at the Palembang SDP Transportation Polytechnic.
- Conduct a survey of pedestrians crossing at Inland Water and Ferries Transport Polytechnic of Palembang.
- Looking for road segment capacity analysis based on traffic volume during the survey, traffic volume increase and scenarios for overcoming traffic jams.

## III. RESULTS AND DISCUSSION

Inland Water and Ferries Transport Polytechnic of Palembang. is located at Jalan Sabar Jaya Number 116 Craftsman Village, Banyuasin I District, Banyuasin Regency. In the Crafts Village, there are various industries, including palm oil processing factories, shipbuilding, asphalt management and food management.



Picture 1. Research Site

A. *Vehicle Volume*

Observation of the volume of vehicles carried out for 12 hours is done by counting the number of vehicles that pass at an hourly interval that has been carried out for 12 hours from 05.00 - 17.00. Recapitulation of vehicle volume at the observation point on Jalan Sabar Jaya. namely light vehicles (LV), heavy vehicles (HV), motorcycles (motor vehicles/MV) and non-motorized vehicles (un-automated/UM).

Tabel 1. Number of Passing Vehicles at Jalan Sabar Jaya (from Palembang- Perajin)

Time	Vehicles (unit)				Vehicles (unit)			
	Friday 13 Agust 2021				Saturday/14 Agust 2021			
	L	H	M	U	L	H	M	UM
	V	V	V	M	V	V	V	
05.00-	46	42	42	0	32	32	43	0
06.00	8	42	3	0	5	32	2	0
06.00-	42	62	62	8	34	48	54	0
07.00	4	48	5	8	5	48	3	0
07.00-	34	10	95	6	36	56	98	6
08.00	2	4	7	6	5	56	4	6
08.00-	26	46	63	3	24	35	61	2
09.00	5	46	2	3	7	35	4	2
09.00-	12	38	61	3	14	32	24	2
10.00	5	38	6	3	6	32	5	2
10.00-	94	46	24	0	86	35	26	0
11.00		5	5	0	86	35	7	0
11.00-	92	37	27	0	78	22	21	0
12.00		6	6	0	78	22	2	0
12.00-	74	35	32	0	75	23	24	1
13.00		4	4	0	75	23	2	1
13.00-	62	48	34	0	68	26	34	2
14.00		5	5	0	68	26	5	2
14.00-	74	74	53	2	15	32	66	2
15.00		1	1	2	6	32	7	2
15.00-	13	67	86	3	21	54	83	3
16.00		5	5	3	8	54	5	3
16.00-	15	64	87	5	23	32	84	4
17.00		8	8	5	4	32	5	4

From the table above, the highest number of passing vehicles is on weekdays from 05.00 WIB to 06.00 WIB this is due to the selection of prospective cadets at Inland Water and Ferries Transport Polytechnic of Palembang.

The following is the result of a survey of traffic volume on Jalan Sabar Jaya at the Perajin Directions to Palembang observation point

Tabel 2. Number of Passing Vehicles at Jalan Sabar Jaya (From Perajin- Palembang)

Time	Vehicles (unit)				Vehicles (unit)			
	Friday 13 Agust 2021				Saturday/14 Agust 2021			
	L	H	M	U	L	H	M	U
	V	V	V	M	V	V	V	M
05.00-	12	56	93	0	12	46	83	0
06.00	8	56	93	0	8	46	83	0
06.00-	24	72	325	0	25	43	225	0
07.00	4	72	325	0	4	43	225	0
07.00-	26	13	122	2	22	48	112	2
08.00	3	5	1	2	3	48	5	2
08.00-	22	63	932	0	24	36	946	0
09.00	8	63	932	0	8	36	946	0
09.00-	21	48	716	0	24	38	605	0
10.00	5	48	716	0	5	38	605	0
10.00-	10	36	245	1	22	46	225	0
11.00	4	36	245	1	4	46	225	0
11.00-	32	57	226	1	23	55	220	0
12.00	2	57	226	1	2	55	220	0
12.00-	11	45	224	2	21	35	204	3
13.00	4	45	224	2	2	35	204	3
13.00-	13	68	215	2	12	54	244	3
14.00	2	68	215	2	2	54	244	3
14.00-	12	64	631	2	10	33	646	2
15.00	4	64	631	2	4	33	646	2
15.00-	13	57	665	3	10	37	735	3
16.00	6	57	665	3	6	37	735	3
16.00-	13	54	678	5	13	44	623	2
17.00	8	54	678	5	8	44	623	2

From the table above, the highest number of passing vehicles is on weekdays from 11.00 WIB to 12.00 WIB this is due to the selection of prospective cadets at Inland Water and Ferries Transport Polytechnic of Palembang.

The following is the result of a survey of the volume of incoming and outgoing vehicle traffic at the Inland Water and Ferries Transport Polytechnic of Palembang.

Tabel 3. Number of Vehicles Entering and Exiting Inland Water and Ferries Transport Polytechnic of Palembang

Time	Number of Vehicles Enter (unit)				Number of Vehicles Exit(unit)			
	Friday/13 Agust 2021		Saturday/1 4 Agust 2021		Friday/1 3 Agust 2021		Saturday/ 14 Agust 2021	
	LV	M V	LV	M V	L V	M V	L V	M V
05.00-06.00	122	57	116	67	34	2	32	1
06.00-07.00	42	68	23	35	5	10	12	15
07.00-08.00	17	76	12	14	6	12	6	16
08.00-09.00	5	26	15	22	5	54	15	52
09.00-10.00	8	12	8	8	8	24	8	20
10.00-11.00	11	14	5	9	12	32	7	12
11.00-12.00	4	15	4	12	11	46	11	56
12.00-13.00	2	4	12	19	2	12	3	17
13.00-14.00	6	12	6	7	6	16	8	7
14.00-15.00	9	15	12	19	9	15	9	19
15.00-16.00	12	16	8	22	12	14	8	22
16.00-17.00	11	12	5	18	25	69	5	16

From the table above, the highest number of incoming vehicles is on weekdays at 05.00 WIB to 06.00 WIB this is due to the selection of prospective cadets at Inland Water and Ferries Transport Polytechnic of Palembang, while the highest number of outgoing vehicles is on weekdays at 11.00 WIB to 12.00 WIB this is due to the completion of the selection of prospective cadets.

B. Instantaneous Vehicle Speed

Observation of vehicle speed is carried out on the speed of passing vehicles at the observed location. Observation of the speed of this vehicle on light vehicles (LV), heavy vehicles (HV) and motorcycles (motor vehicle/MV). The study was conducted at 2 (two) observation points, namely the first location on the bridge in front of the second entrance and the second location is in front of the first door of the Inland Water and Ferries Transport Polytechnic of Palembang.

Tabel 4 Instantaneous Vehicle Speed In First Location

vehicle	Instantaneous Vehicle (km/hour)		
	LV	HV	MV
1	5,1	3,1	10,2
2	4,0	4,2	10,5
3	5,2	3,2	15,2
4	4,5	3,2	13,1
5	4,8	4,1	12,2
6	5,2	3,1	15,1
7	4,1	3,1	12,8
8	4,8	3,7	13,2
9	5,2	3,8	13,5
10	5,3	4,1	14,5
Average	4,8	3,6	13,1

light vehicle (LV) of 4.8 km/hour, heavy vehicle (HV) of 3.6 km/hour and motorcycle (motor vehicle/MV) of 13.1 km/hour. This is caused by the damaged road conditions on the bridge. The instantaneous speed survey at the second location was carried out at the first (main) entrance of the Inland Water and Ferries Transport Polytechnic of Palembang at 08.00 WIB to 09.00 WIB

Tabel 5. Instantaneous Vehicle Speed In Second Location

Vehicle	Instantaneous Vehicle (km/hour)		
	LV	HV	MV
1	45,5	40,5	50,5
2	40,0	38,0	48,0
3	42,5	35,5	48,5
4	41,5	36,5	55,5
5	40,5	30,5	60,5
6	42,5	38,5	60,5
7	40,0	40,0	50,0
8	45,5	35,5	55,5
9	43,5	42,0	52,5
10	42,5	41,0	51,5
Average	42,4	37,8	53,3

C. Determination Volume Capacity Ratio

a. Based on survey results

The highest traffic volume occurs on Friday at 07.00 to 08.00 WIB, from the data it is known that the traffic volume

- Light vehicles (LV) = 605 units
- Heavy Vehicle (HV) = 239 units
- Two-wheeled Vehicle (MV) = 2,178 units
- Number of Vehicles In and Out = 111 units

For calculate Traffic Volume

$$Volume(Q) = 605 (1) + 239 (1,2) + 2178 (0,25)$$

$$Volume(Q) = 1.436 smp / hour / 2ways$$

From the data it is known that

- $C_0 = 2900$  (Jalan Sabar Jaya is a 2-way street)
- $FC_W = 0.87$  (2 non-shared lanes with a road width of 6 meters)
- $FC_{SP} = 0.91$  (2 lanes with a vehicle volume ratio of 65:35)
- $FC_{CS} = 0.94$  (the total population of Banyuasin Regency is 836,914 people)

Based on Table 3, the vehicles that passed at the first location were running slowly due to a damaged road on the bridge near the second entrance of the Inland Water and Ferries Transport Polytechnic of Palembang.

Tabel 6. Side Barriers

No	Side Barriers	Factor	Frequency	Result
1	Pedestrian	0,5	0/hour, 200 m	0
2	Parking and Stop Vehicle	1,0	5/hour, 200 m	5
3	Vehicle in and out	0,7	111/hour,200 m	77,7
4	Slow Vehicle	0,4	3228/hour, 200 m	1.291
Total				1.373,7

$FC_{SF} = 0.73$  (2 lanes, very high side barriers 0.5 m effective shoulder width)

Then the capacity of Jalan Sabar Jaya can be found using the formula

$$C = C_0 \times FC_W \times FC_{SP} \times FC_{SF} \times FC_{CS}$$

$$C = 2900 \times 0.87 \times 0.91 \times 0.73 \times 0.94$$

$$C = 2204 \text{ smp/hour}$$

To find the degree of saturation

$$DS = Q/C$$

$$DS = 718/2.204$$

$$DS = 0.46$$

From the calculation results, it is found that  $DS = 0.46$  ( $DS \leq 0.75$ ), the road is still able to serve the number of vehicles that pass through it but needs to be wary of side obstacles and increased vehicle volume.

So the side barriers in the form of vehicles entering and leaving the Inland Water and Ferries Transport Polytechnic of Palembang and slow vehicles due to damaged road conditions that cross Jalan Sabar Jaya greatly affect traffic conditions on Jalan Sabar Jaya.

b. Traffic volume increase scenario

Things to watch out for if there is an increase in the volume of vehicles on Jalan Sabar Jaya because it can cause congestion. If there is an increase in traffic volume by 65% it will cause congestion.

- Light vehicles (LV) =  $605 + (605 \times 65\%)$
- Light vehicles (LV) = 998 units
- Heavy Vehicle (HV) =  $239 + (239 \times 65\%)$
- Heavy Vehicle (HV) = 473 units
- Two-Wheel Vehicle (MV) =  $2.178 + (2.178 \times 65\%)$
- Two-wheeled Vehicle (MV) = 3.593unit
- Vehicles In and Out (fixed) = 111unit

From the data it is known that

- $C_0 = 2900$  (Jalan Sabar Jaya is a 2-way street)
- $FC_W = 0.87$  (2 non-shared lanes with a road width of 6 meters)
- $FC_{SP} = 0.91$  (2 lanes with a vehicle volume ratio of 65:35)
- $FC_{CS} = 0.94$  (the total population of Banyuasin Regency is 836,914 people)

Tabel 7. Side Barriers

No	Side Barriers	Factor	Frequency	Result
1	Pedestrian	0,5	0/hour, 200 m	0
2	Parking and Stop Vehicle	1,0	5/hour, 200 m	5
3	Vehicle in and out	0,7	111/hour,200 m	77,7
4	Slow Vehicle	0,4	3228/hour, 200 m	1.994,5
Total				2.077,2

$FC_{SF} = 0.73$  (2 lanes, very high side barriers 0.5 m effective shoulder width)

Then the capacity of Jalan Sabar Jaya can be found using the formula

$$C = C_0 \times FC_W \times FC_{SP} \times FC_{SF} \times FC_{CS}$$

$$C = 2900 \times 0.87 \times 0.91 \times 0.73 \times 0.94$$

$$C = 2204 \text{ smp/hour}$$

To find the degree of saturation

$$DS = Q/C$$

$$DS = 1.185/2.204$$

$$DS = 0.752$$

From the calculation results, it is obtained that  $DS = 0.752$  ( $DS \geq 0.75$ ) then the road is still not able to serve the number of vehicles that pass through it, it is necessary to improve the traffic flow

c. Scenarios against traffic jam prevention

Congestion prevention scenario if there is an increase in vehicle volume by 65%

- Light vehicles (LV) =  $605 + (605 \times 65\%)$
- Light vehicles (LV) = 998 units
- Heavy Vehicle (HV) =  $239 + (239 \times 65\%)$
- Heavy Vehicle (HV) = 473 units
- Two-Wheel Vehicle (MV) =  $2.178 + (2.178 \times 65\%)$
- Two-wheeled Vehicle (MV) = 3.593unit
- Number of Exit and Incoming Vehicles (fixed) = 111units

From the data it is known that

- $C_0 = 2900$  (Jalan Sabar Jaya is a 2-way street)
- $FC_W = 0.87$  (2 non-shared lanes with a road width of 6 meters)
- $FC_{SP} = 0.91$  (2 lanes with a vehicle volume ratio of 65:35)
- $FC_{CS} = 0.94$  (the total population of Banyuasin Regency is 836,914 people)

Tabel 8. Side Barriers

No	Side Barriers	Factor	Frequency	Result
1	Pedestrian	0,5	0/hour, 200 m	0
2	Parking and Stop Vehicle	1,0	5/hour, 200 m	5
3	Vehicle in and out	0,7	111/hour,200 m	77,7
4	Slow Vehicle	0,4	0/hour, 200 m	0
Total				77,7

$FC_{SF} = 0.92$  (2 lanes, very high side barriers 0.5 m effective shoulder width)

Then the capacity of Jalan Sabar Jaya can be found by using the formula

$$C = C_0 \times FC_W \times FC_{SP} \times FC_{SF} \times FC_{CS}$$

$$C = 2900 \times 0.87 \times 0.91 \times 0.92 \times 0.94$$

$$C = 1,986 \text{ smp/hour}$$

To find the degree of saturation

$$DS = Q/C$$

$$DS = 1.185/1.986$$

$$DS = 0.60$$

From the calculation results, it is obtained that  $DS = 0.60$  ( $DS \leq 0.75$ ) then the road is still able to serve the number of vehicles that pass through it. Based on the calculation results, the scenarios for the plan to prevent congestion are:

Reducing side barriers in the form of parking/stopping vehicles before there were 5 (five) vehicles parked so that there were no parked vehicles.

Reducing side barriers in the form of slow vehicles due to damaged roads previously there were 4,986 vehicles that were running slowly. So there were no vehicles that were running slowly.

For side barriers in the form of vehicles going in and out cannot be eliminated because of office and educational activities as well as public facilities at Inland Water and Ferries Transport Polytechnic of Palembang, but it is necessary to have officers regulate the entry and exit of the vehicle so that it runs smoothly

#### IV. CONCLUSION

Based on the results of the analysis obtained the following conclusions:

- Traffic conditions in front of Inland Water and Ferries Transport Polytechnic of Palembang . At the time of the survey the traffic conditions were smooth, this was based on the results of the calculation of  $DS = 0.46$  ( $DS \leq 0.75$ ), the road was still able to serve the number of vehicles passing through it, but it was necessary to watch out for side obstacles and increased vehicle volume.
- If there is an increase in traffic volume by 65% it will cause congestion based on the calculation results get  $DS = 0.752$  ( $DS \geq 0.75$ ) then the road is still not able to serve the number of vehicles that pass through it, it is necessary to improve the traffic flow.

- If there is congestion at the time of increasing traffic volume, it is necessary to reduce the side obstacle factor, namely in the form of parking/stopping vehicles and vehicles running slowly due to damaged roads.

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