ANALYSIS VISIBILITY PARK AND RIDE TANGERANG DISTRICT
(case study Cisauk Station)

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ABSTRACT

Tangerang Regency is an area located in Tatar Pasundan, Banten Province, Indonesia. This area is located 30 km west of Jakarta and 90 km southeast of Serang. With an annual population growth rate of ± 2.15 percent, the total population of Tangerang Regency in 2020 is ± 2,838,621 according to the Central Statistics Agency (BPS) of South Tangerang Regency. South Tangerang Regency which has an area of 959.6 kilometers. This research was conducted to determine the feasibility level of the Park and Ride development plan in Tangerang Regency. Traffic counting surveys and interviews were carried out on main road sections which were then processed using Microsoft Excel to determine the parking accumulation until the fluctuation of motorbikes and cars was known. Furthermore, the interview data is processed to determine the amount of public interest in the development of Park and Ride which is reviewed based on gender, age, trip duration, trip intent, parking duration, monthly fuel expenditures, desired parking rates and those who agree to use Park and Ride when the survey was conducted. at 06.00-21.00 BBWI on the road in the Cisauk Station area. From the results of processing this data using Microsoft Excel, it was found that the characteristics of Park and Ride facilities users and also the number of users of Park and Ride facilities for motorbikes were 2349, while for cars of 272 with a plan age until 2021, this proves there is a need for increased interest in motorbikes. Park and Ride development at Cisauk Station, Tangerang Regency.

Key word: park and ride; cisauk station; transportation; facilities.

INTRODUCTION

Tangerang Regency is an area located in Tatar Pasundan, Banten Province, Indonesia. This area is located 30 km west of Jakarta and 90 km southeast of Serang, the capital of Banten Province. In Tangerang Regency, it is a suitable area for the construction of Park and Ride, precisely at Cisauk Station with a strategic position and close to the city center, rice fields, etc.). According to Olaru (2013), Park and Ride is influenced by several times, namely departure time, congestion, public transportation services, modes of access, socio-economic characteristics, and Transit Oriented Development (TOD). There are two things to choose a Park and Ride location, first, it is necessary to identify a general area that can support one or more Park and Ride facilities (the use of standards will help determine the feasibility of the area), second, a specific location is chosen by assessing its characteristics such as road property space, atmosphere, location size, visibility, access, transit services, access road congestion, transit design forms, traffic circulation, bicycle access, and development potential(Chu, 2001).

As an industrial center area, most of the people involved in the economic sector in Tangerang Regency work in the industrial sector. In fact, the industrial sector absorbs more jobs than other sectors.

Paved roads will result in very stable vehicle traffic. Surface conditions using reinforced concrete will affect the collision between the tires and the road surface. The road surface will be smooth and comfortable, there will be no noise. while the bumpy road surface and lots of holes will affect the sound condition caused by both the exhaust, rough engine and friction between the vehicle body and the uneven surface (Akbardin.J.et.al, 2020; Syaiful.S, 2020; Syaiful.S, Akbardin.J, 2020; Syaiful.S, Andana,R, 2021). Seeing the existing parking conditions at a station will affect the parking pattern. If a large and comfortable parking area is provided, then the traffic around it will be orderly and

orderly. So that it can be said that the conditions that allow for maneuvering so that the parking vehicle is in accordance with the actual conditions. This condition is supported by parking arrangements and heavy, medium or quiet traffic will look regular. Did not see the traffic conditions around it (Syaiful.S, Hariyadi.D, 2019; Syaiful.S, Lasmana.L, 2020; Saiful.S.et.al, 2020; Syaiful.S, Pratama.Y, 2019; Syaiful.S, Yuliantino.M, 2017).

RESEARCH METHODS

This research was conducted at Cisauk Station, Tangerang Regency. The implementation of this research was started in May 2020.

Figure 1. Map of the research location Source: Analysis results

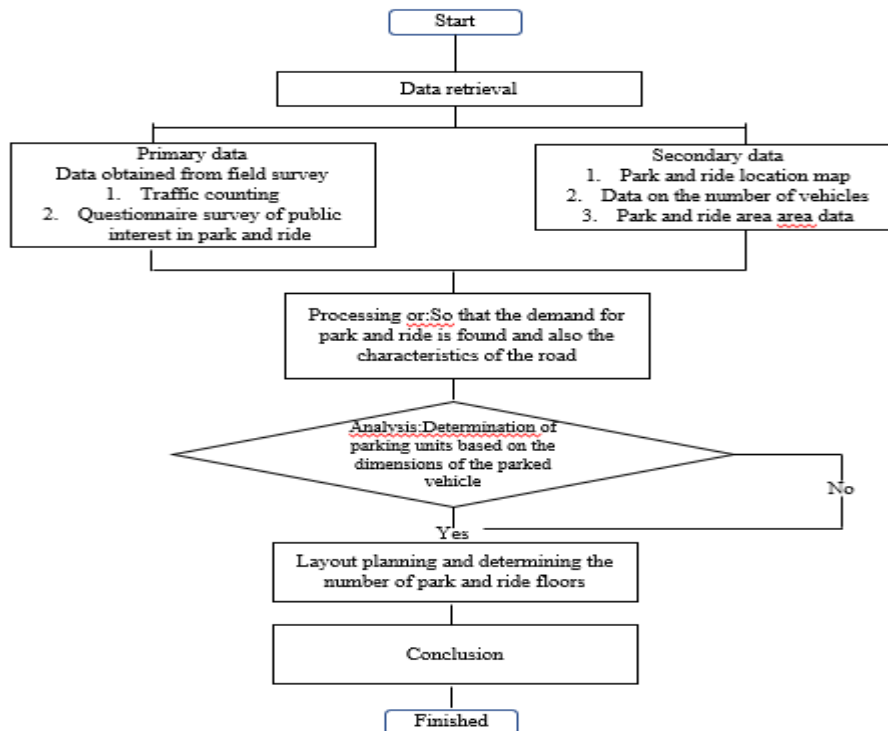The stages of this research are shown in the form of a flow chart as follows:

Figure 2. Research flow diagram

RESULTS AND DISCUSSION

Parking Characteristics

The parking area at Cisauk Station consists of 2 zones, namely the northern and southern zones. The characteristics of the vehicles parked at Cisauk Station consist of two-wheeled and four-wheeled vehicles. The busiest parking location is in the parking lot north of the station.

The parking survey at Cisauk station was conducted for 12 hours (06:00 - 21:00) for four-wheeled and 2-wheeled vehicles. The following are the results of the parking survey for each zone in the Cisauk Station parking lot:

Table 1. Parking Survey of Cisauk Station

Activity times	South zona						North zona						Motorbike total	
	Car			Motorcycle			Car			Motorcycle				
	Accumulation	In	Out	Accumulation	In	Out	Accumulation	In	Out	Accumulation	In	Out	Car total	Motorcycle total
06.00-07.00	15	20	5	115	120	5	15	17	2	166	178	12	30	281
07.00-08.00	23	15	7	199	89	5	27	16	4	287	131	10	50	486
08.00-09.00	34	18	7	248	58	9	45	23	5	403	134	18	79	651
09.00-10.00	43	17	8	290	50	8	55	13	3	505	116	14	98	795
10.00-11.00	53	15	5	326	40	4	68	20	7	603	113	15	121	929
11.00-12.00	70	20	3	360	42	8	74	19	13	666	99	36	144	1026
12.00-13.00	69	7	8	339	13	34	75	18	17	722	87	31	144	1061
13.00-14.00	85	18	2	446	110	3	73	16	18	724	42	40	158	1170
14.00-15.00	91	11	5	539	98	5	71	15	17	759	66	31	162	1298
15.00-1600	105	22	8	615	85	9	73	12	10	692	32	99	178	1307
16.00-17.00	111	15	9	666	64	13	78	18	13	600	38	130	189	1266
17.00-18.00	123	17	5	704	89	5	70	10	18	633	40	7	193	1383
18.00-19.00	135	17	5	624	9	51	62	6	22	440	20	180	189	1181
19.00-20.00	137	12	10	646	34	12	53	10	19	316	21	145	182	1079
20.00-21.00	139	7	5	608	5	43	47	5	11	235	9	90	178	960

Total	1233	231	92	6725	906	214	886	218	179	7751	1126	858	2095	14873

Total Fluktuation	16595

Source: Survey and analysis results

Parking Capacity

Cisauk Station has the characteristics of using a parking area that is mixed between two-wheeled vehicles (motorbikes) and four-wheeled vehicles (private cars). So it is unclear the distribution of capacity for two-wheeled and four-wheeled vehicles. To calculate the parking capacity of Cisauk Station, it is done during peak hours, namely 15:00 to 16:00. Because at that hour the parking lot is used optimally.

The highest parking accumulation is at 17: 00-18: 00 as many as 193 vehicles parked at Cisauk Station. That way the parking index or parking turnover rate can be calculated as follows:

Level of Use of Parking Areas

Turn over

Turn Over or the level of parking land use is obtained by comparing the number of parking vehicles with the parking capacity provided. Based on equation 2.4, the turnover for cars is 449 / 238.1 = 1.885 and for motorbikes 3023 / 1570.016 = 1.294

Parking Indeks

The highest parking accumulation is at 17: 00-18: 00 as many as 193 vehicles parked at Cisauk Station, Tangerang Regency. Based on equation 2.5, the parking index or parking turnover rate for cars is 449/193 = 2.326 and for motorbikes is 1.469

Analysis of the Traffic Impact of Park and Ride Development

The capacity of each road section is obtained by calculating the data based on the manual method of Indonesian Highway Capacity (MKJI, 2017)

Table 2. Inventory Data and Calculation of Road Capacity).

No	Path of Study	Road Width	Type	Types of side barriers	Capacity (pcu/hour)
1	Jl. Raya Cisauk Lapan	12	4/2 UD	High	5404,08
2	Jl. Raya Cisauk	9	2/2 UD	Moderate	3190
3	Jl. Cisauk-Serpong	12	4/2 UD	Moderate	5343,36

Source: Survey and analysis results

Road Section Performance Analysis

As previously explained, the road performance assessment is carried out to see an overview of the existing traffic flow conditions that will be compared with the scenario of park and ride development. The performance assessment is carried out based on the results of the traffic counting

survey and the geometric condition inventory data of the roads. The method used in assessing the performance of the road network is the 2017 MKJI which is generally carried out in traffic impact analysis studies in Indonesia. The VCR parameters in relation to road network performance are shown in the table below. These values will be used as VCR parameters determining the performance of the surveyed road network.

The performance of the Cisauk Station road section will decline during peak hours, when many vehicles are parked and in and out of the parking lot. The parking arrangement at Cisauk Station is less regular so that it often exceeds the predetermined parking limit.

Land Use Survey

In addition to the Traffic Counting survey, a land use survey was also carried out to determine the level of arrival and departure of vehicles after the construction of the Cisauk Station Park and Ride building. The generation and attractiveness of a development is largely determined by the land use that is being planned or established. To find out and predict the generation with the development of the area, a uniform land use survey was carried out with the plan to build the Cisauk Station Park and Ride building. The results of the land use survey are represented by the number of motorbikes, cars and other vehicles entering the area. The amount is compared with the existing area which is then calculated the ratio of expansion or per-unit generation

Characteristics Of Road Service Level

Service level LOS (Level Off Service) is a measure of the performance of a road or intersection which is calculated based on the level of road use, speed, density and obstacles that occur. In a mathematical form, the level of road service is indicated by the V-C ratio versus the speed. The level of service is categorized from the best (A) - (F). Service level is the different operating conditions that occur on road lanes when accommodating various traffic volumes. And is a measure of the quality of the influence of traffic flow factors such as speed, travel time, obstacles, freedom of maneuver, driver comfort and indirectly operating costs and comfort (MKJI 1997, Urban Roads).

Table 3. Service level index (ITP) based on free flow speed

Service Level	% Of free speed	Traffic saturation level	Information
A	≥ 90	≤ 0,35	Free traffic
B	≥ 70	≤ 0,54	Stable
C	≥ 50	≤ 0,77	Still Limits Stable
D	≥ 40	≤ 0,93	Unstable
E	≥ 33	≤ 1,0	Sometimes it gets stuck
F	<33	> 1	Forced / Bad

Source: MKJI Manual of Indonesian Road Capacity

Table 4. Categories of service levels before park and ride construction and after park and ride construction at Cisauk Station

No	Path of study	Before Development				Setelah Dibagun			
		Amount	Capacity	VCR	LOS	Amount	Capacity	VCR	LOS
1	Jl. Raya Cisauk Lapan	2,310	5,303	0.44	B	2,380	5,303	0.45	B

2	Jl. Raya Cisauk	1,458	4,190	0.35	B	1,502	4,190	0.36	B
3	Jl. Cisauk-Serpong	2,160	4,232	0.51	C	2,225	4,232	0.53	C

Source: Results of survey and analysis

Interview

An interview survey was conducted to determine the number of demands and also to determine the characteristics of park and ride users at Cisauk Station. The survey was conducted by conducting direct interviews with parking users who were carrying out activities in the station environment in the northern and southern zones of the station area. Interviews were conducted between 6:00 am and 8:00 am within a few working days.

Determination of the Number of Samples

The number of samples was determined before conducting the interview survey. In this study, respondents are road users in the Cisauk station area, to get the number of respondents who will be able to represent the existing population. Therefore, the correct sample size is required.

The analysis uses the Slovin formula to calculate the percentage error of this interview survey. The Slovin formula is a formula or formula for calculating the minimum number of samples if the behavior of a population is not known with certainty. Therefore it requires the total volume of vehicles on motorbikes and cars.

Here is the Slovin formula:

$$n = \frac{N}{N.d^2 + 1}$$

with:

N = Total volume of vehicles that cross the station area

n = Number of samples

d = Prediction error

Total vehicle volume is the total number of vehicles passing through the surveyed roads in the traffic counting. Meanwhile, the Estimation Error in this study was determined at 13%. After that it was calculated to determine the number of samples needed for the interview.

For the total volume of motorcycle vehicles, the traffic counting results were 27465 vehicles. Meanwhile, the total volume of cars was 13713 vehicles.

Based on the total volume of vehicles obtained from the traffic counting results, it can be calculated with the formula Slovin n = 27465 / 27465x0.13 + 1 = 59 for motorbikes and n = 13713 / 13713x0.13 + 1 = 58 for cars.

Survey results on the number of potential park and ride users
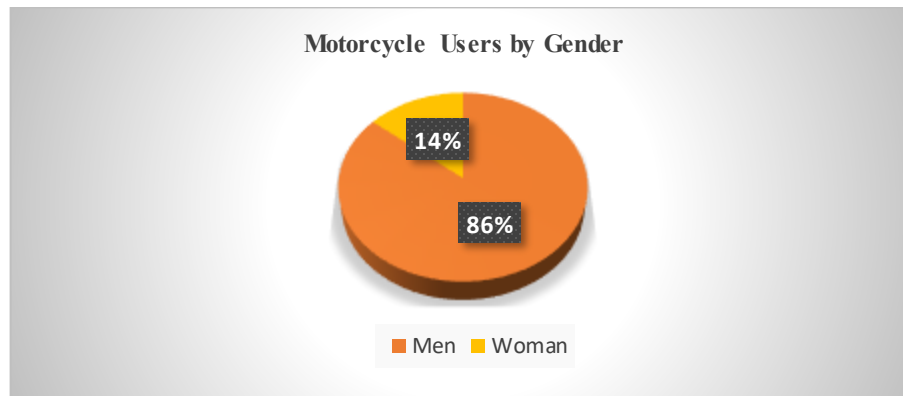
Based on gender

Figure 2. Diagram of motorcycle users by gender Source: Results of survey and analysis
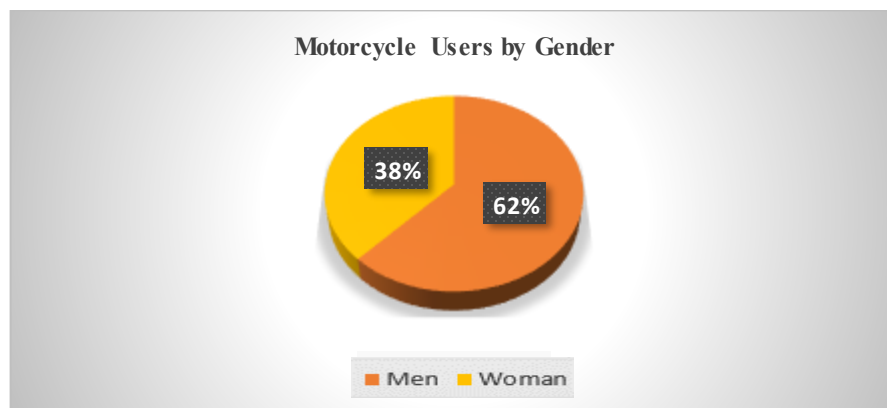

Figure 3. Diagram of motorcycle users by gender Source: Results of survey and analysis
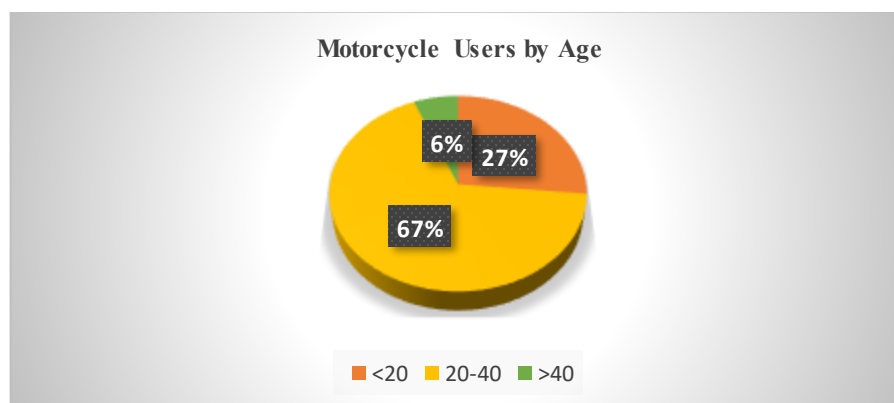
Based on age

Figure 4. Diagram of motorcycle users by age Source: Results of survey and analysis
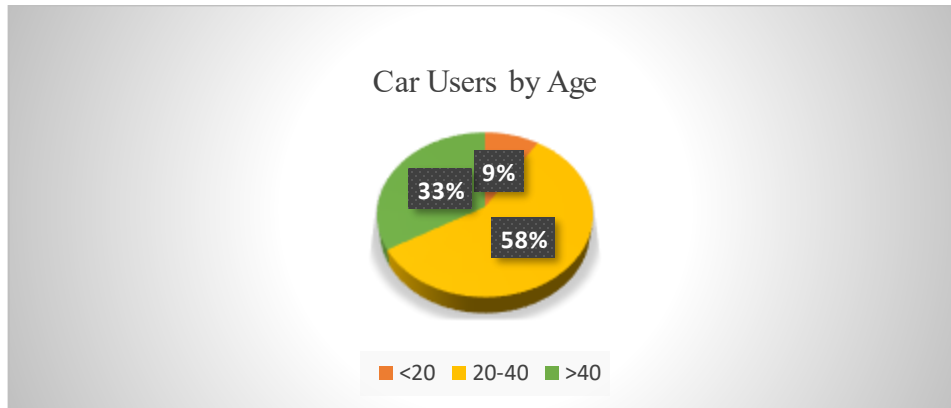
Figure 5. Diagram of car users by age Source: Results of survey and analysis
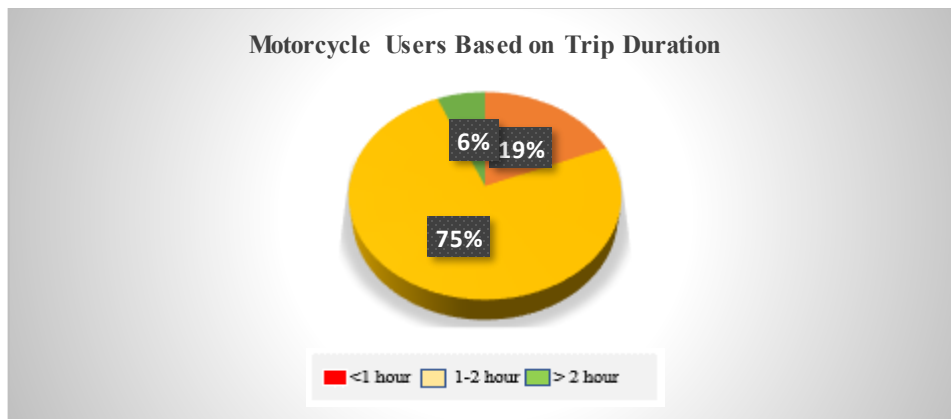
Based on the duration of the trip

Figure 6. Diagram of motorcycle users based on trip duration Source: Results of survey and analysis
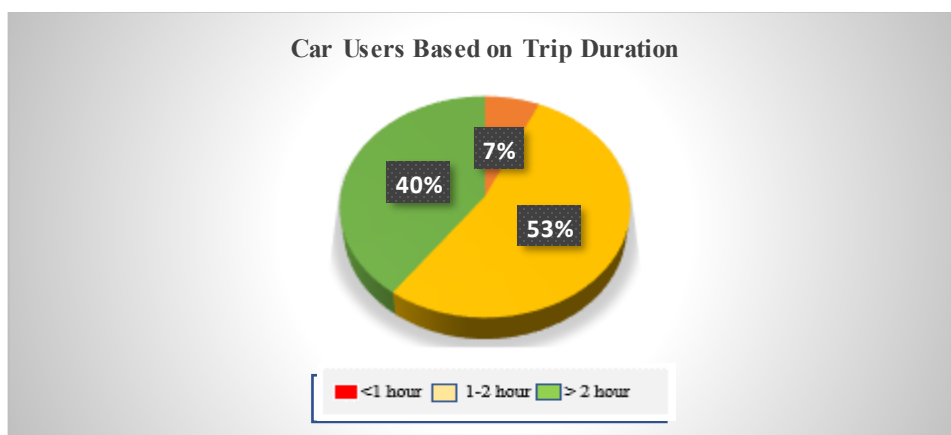

Figure 7. Diagram of car users based on trip duration Source: Results of survey and analysis
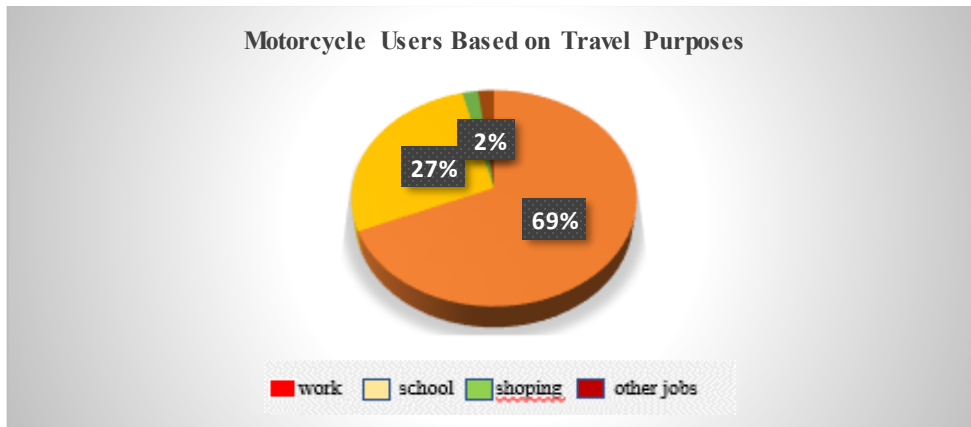
Based on the purpose of travel

Figure 8. Diagram of motorcycle users based on travel purposes Source: Results of survey and analysis
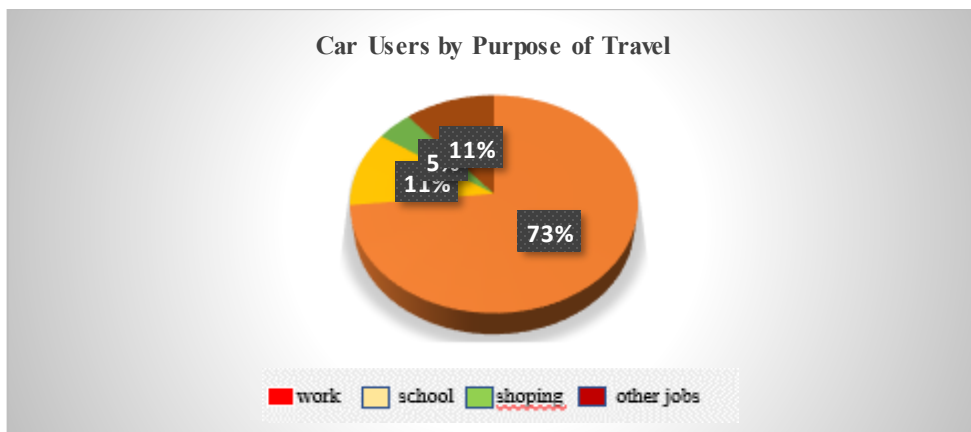

Figure 9. Diagram of car users based on travel intent Source: Results of survey and analysis

Demand *park and ride*

In the interview results for motorcycles, it was found that the number of people who wanted to use the park and ride facilities was 74%. Meanwhile, for cars, it was found that people who wanted to use park and ride facilities were 62%.

Estimated vehicle growth

The growth of vehicles in this final project is planned for the next 5 years. The method used is the linear regression method. In this method, a deviation line is generated that can minimize the number of deviations from existing data. The data was processed using Microsoft Excel to produce linear regression equations in the form of mathematical equations.

The number of motorized vehicles in Tangerang is shown in table 9 in below.

Table 5. Number of motor vehicles in Tangerang

Year	Motorcycle	Car
2012	850256	401456
2013	903746	424689

2014	956578	436297
2015	1056753	446779
2016	1137542	464245

Source: Samsat 2016

Motorcycle growth

The data on the growth of motorcycles in South Tangerang Regency is processed using Microsoft Excel to produce graphs. From the graph, a mathematical equation is obtained. After that, the equation is used to get the value of the number of motorbikes until 2022. The following is a graph of the growth of motorbikes in Tangerang Regency.
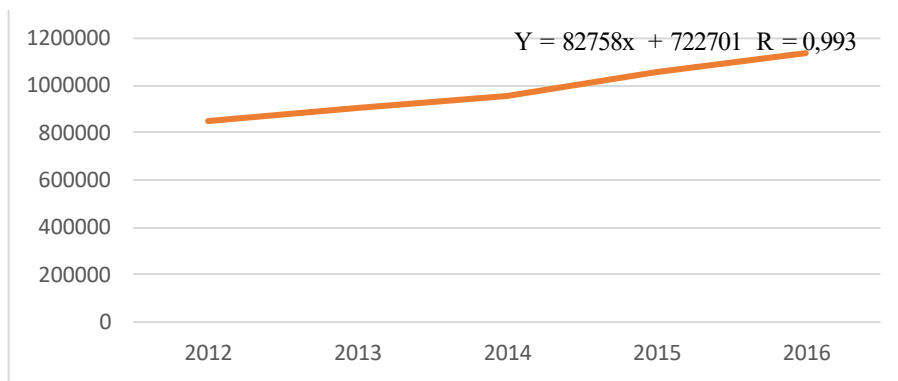

Figure 10. Regression graph of motorcycle growth Source: Survey and analysis results

Car growth

It's the same with motorbikes. Data on the growth of car vehicles in South Tangerang Regency are also processed using Microsoft Excel to produce graphs. The following is a graph of car growth in Tangerang Regency.
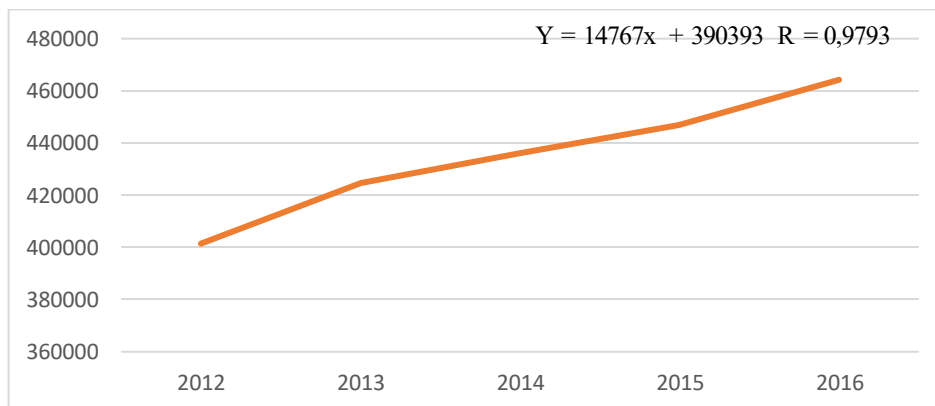

Figure 11. Growth regression graph for motorcycles Source: Survey and analysis results

Estimated scenario revenue

It is known that the first scenario is taken from the data from the highest preference survey data for car users with a maximum rate of 15 thousand rupiah, namely with a percentage of 63% and the highest preference for motor vehicle users with a maximum rate of 5 thousand rupiah, namely with a percentage of 68% . As for the second scenario, parking rates are taken from the lowest rates.

Estimated operating costs

In the operation of the parking building, only a few main expense variables are estimated, namely the cost of employee salaries, electricity costs and maintenance costs.

The number of employees needed is twelve people with a system of dividing two working hours, namely 08: 00-15: 00 and 15: 00-22: 00 hours. Each shift requires 6 employees, for the cost of electric power it is assumed to use 20watt lamps.

CONCLUSION

Based on the results and discussion that have been described, the following conclusions can be drawn: Based on VCR analysis on roads that become accessibility for vehicles to and from the park and ride construction, if the park and ride construction is built, the lowest service level occurs on the Cisauk-Serpong road, with a service level of C. The results of the analysis using stated preference, it was found that the percentage of motorcyclists: 74% and the percentage of motorists: 62%. The projection results of the increase in vehicles in Tangerang Regency, namely motorcycles by 5% and cars by 3% as well as data on potential park and ride users from the interview survey results in the maximum demand for motorcycles of 2,349 units and cars of 272 units.

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