AREA DEVELOPMENT PLAN TOD/TRANSIT ORIENTED DEVELOPMENT AT LRT CIBUBUR STATION

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ABSTRACT

Cibubur LRT Station is an LRT Station in Depok City which is located on Taman Bunga street, Harjamukti, Cimanggis district, Depok City, West Java 16454, to be precise next to the Jagorawi toll road. The concept of Transit Oriented Development (TOD) is a spatial engineering approach that focuses its development around transit points. The space developed in a transit-oriented area has the characteristics of high density, various mixes (updates) and a design area that is friendly to pedestrians and bicycle users. The purpose of this study was to analyze the designation of mixed land according to the roles and functions of the TOD and to predict the amount of generated traffic pull from and to the TOD area development location. In knowing the land use of the TOD transit area at the Cibubur LRT station, it was carried out by means of an analysis of the designation of the main and supporting functions of the TOD, after data output was already there compared to the standard transit node, with standard pedestrian facilities, TOD standard from ITDP and to analyze the generation and pulls in the TOD Cibubur area using the ITE-9th table. The results of the KDB value obtained throughout the building are 70% of the maximum land cover TOD of the city service sub-center of 70% which is contained in the technical criteria for TOD development based on the type of TOD and the total KDB figure is 5.00 from a maximum number of 3.0 to 5.0. and for the generated value obtained in the land use of the TOD Cibubur area of 20,987 trips/hour in the morning (AM), and at night of 38,498 trips / hour.

Keywords: transit oriented development (TOD); land use suitability; generation of traction.

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INTRODUCTION

Depok City is a city in West Java Province, Indonesia. The city is located just south of Jakarta which is between Jakarta and Bogor. One of the concepts that we can apply is to use the concept of Transit Oriented Development (TOD) which aims to create an environment that reduces high dependence on private vehicles and encourages the use of public transportation (buses, LRT, trains, etc.) through good accessibility and mobility. To the transit point (station, terminal, bus stop). Cibubur LRT Station is an LRT Station in Depok City which is located on Taman Bunga street, Harjamukti, Cimanggis district, Depok City, West Java 16454, to be precise next to the Jagorawi toll road. This station is a station around which there are shopping centers such as Cibubur Junction, and school areas and others.

The purpose of this study is to analyze land use according to the role and function in the Cibubur TOD area and to obtain a trip generation and attraction pattern to and from the TOD Kasawan.
The problem limitation includes Transit Oriented Development (TOD) planning carried out in the Cibubur LRT station area; In the north, Wiladatika Recreational Park; East side, Jagorawi Toll; South side, Amarta Residence Cibubur; West Side. Villa Mutiara Cibubur.

Transit Oriented Development (TOD) is the concept of developing areas within and around transit nodes so that added value focuses on the integration between mass public transport networks and non-motorized transportation mode networks, reducing the use of motorized vehicles accompanied by the development of mixed, dense, intensive use areas. medium to high room. (Permen ATR/BPN

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No. 16 of 2017). In more detail, the TOD structure and the area around it are divided into the following areas:

1. Public Uses
2. core commercial area
3. residential area
4. Secondary area

As a strategic step to achieve the goal of the TOD concept, provide an alternative growth for urban development, urban sub-areas, and the surrounding ecological environment, eight urban design principles were formulated in Transit Oriented Development, quoted from (ITDP, 2017).

1. Walk
2. Cycle
3. Connect
4. Transit
5. Mix
6. Densify
7. Compact
8. Shift

Potholes and passing vehicles result in road conditions that will age less and less. The planned life of the road is influenced by the quality of the road itself (M.Mubarak, et.al, 2020). Roads that go through heavy bends will be better if planned carefully, according to the ground conditions. Motorized vehicle traffic is also influenced by the density of traffic at that location (Syaiful, L. Akbar, 2015); (Syaiful, 2015). Heavy traffic will result in vehicles piling up in one lane, resulting in congestion, high traffic jams will result in high vehicle sounds, resulting in noise (S.Syaiful, A.Fadly, 2020); S.Syaiful, S.WMudjanark, 2019); (S.Syaiful, N.Wahid, 2020); (S.Syaiful, Y.Elvira, 2017); (Thamrin, Syaiful, 2016).

RESEARCH METHOD

The research location is located in the Cibubur LRT Station area, Harjamukti Village, Cimanggis District, Depok City. The consideration of choosing this location is because the area will be built with a transient orientation (TOD), so that the area can be used as a research location.

Figure 1. Map of research location

The stages of this research are shown in the form of a flow chart as follows figure 2 below.

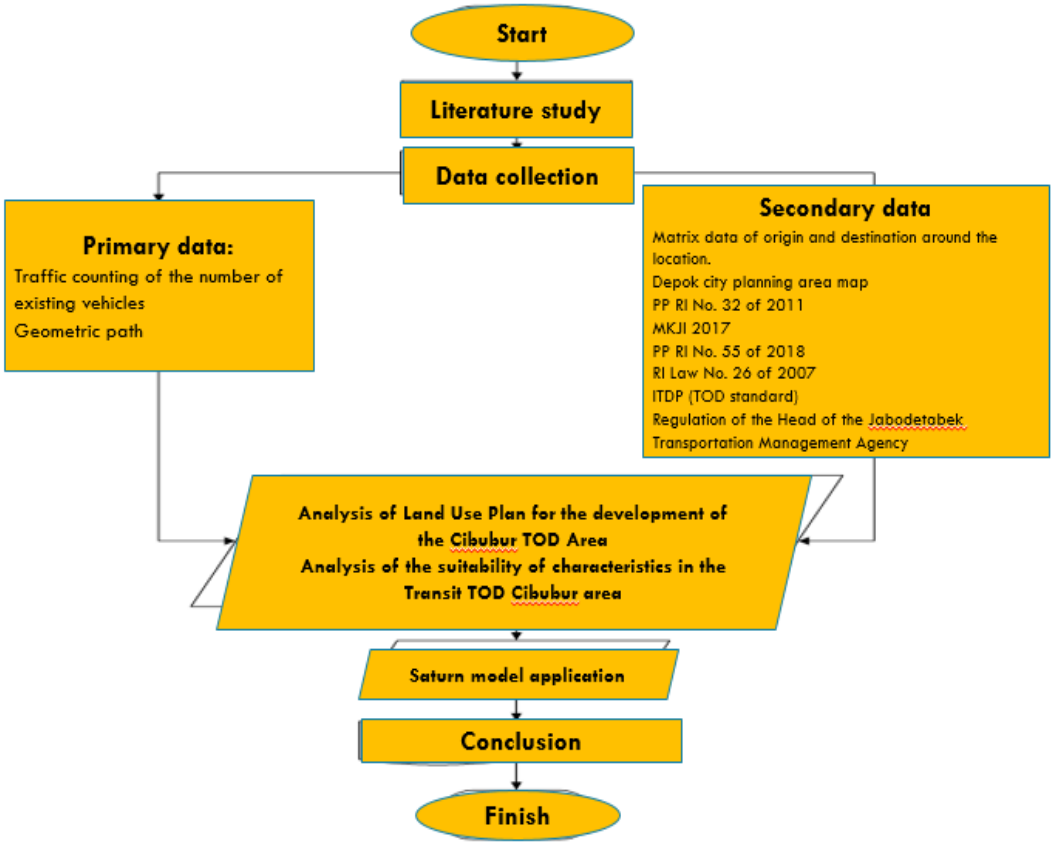

Figure 2. Research flow diagram

RESULTS AND DISCUSSION

Data Analysis

he geometric size of the road greatly affects the performance of the road. This depends on the size of the road and the number of vehicles passing through the road. Based on direct observations and measurements that have been made on traffic infrastructure in the form of geometric roads, the geometric results of the roads are shown in Table 1 below.

Table 1. Geometric road sections

No	Name road	Type	The width of the road (m)
1	JL. Bunga	4/1 UD	16
2	JL. Pusdika	4/2 D	14
3	JL. Cibubur Junction	5/1 UD	15
4	JL. Buperta	6/1 UD	24
5	JL. Trans Yogi	4/2 D	14

(Source: Analysis Results)

The results of the capacity survey for each road section are obtained based on the Indonesian Highway Capacity Manual Method (MKJI, 1997).

Furthermore, the calculation of road capacity is shown in Table 2 below.

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Table 2. Road Section Capacity

Road name	Road type	Co	Correction factor FCw	FCsp	FCsf	FCcs	Total capacity
JL. Bunga	4/1 UD	6.000	1,09	1,00	0,94	1,00	6.148
JL. Pusdika	4/2 D	6.600	1,00	1,00	0,88	1,00	5.808
JL. Cibubur Junction	4/1 UD	6.000	1,05	1,00	0,92	1,00	5.796
JL. Buperta	6/1 UD	9.000	1,09	1,00	0,94	1,00	9.221
JL. Trans Yogi	4/2 D	6.600	1,00	1,00	0,92	1,00	6.072

(Source: Analysis Results)

A recapitulation of vehicle volume flows in the Cibubur TOD area is shown in Table 3 below.

Table 3. Flow of vehicle volume St. Flower Park - St. Pusdika

No	Road name	Degree of saturation	LOS
1	Jln. Taman Bunga – Jln. Pusdika	0,25	A
2	Jalan Kosasiah	0,83	D
3	Jalan Pabuaran	0,21	A
4	Jalan Kapten Yusuf	0,41	B

(Source: Analysis Results)

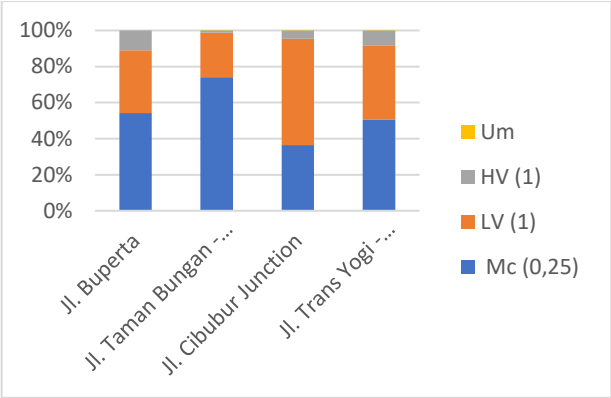

Figure 3. Vehicle Volume in the Cibubur TOD Area (Source: Analysis Results)

MAT is a two-dimensional matrix that contains information about the amount of movement between zones within a certain area. The row represents the origin zone and the column represents the destination zone, so that each matrix cell represents the magnitude of the movement flow moving from the origin zone I to the destination zone D. The Origin Destination matrix in the study area is shown in Figure 4.

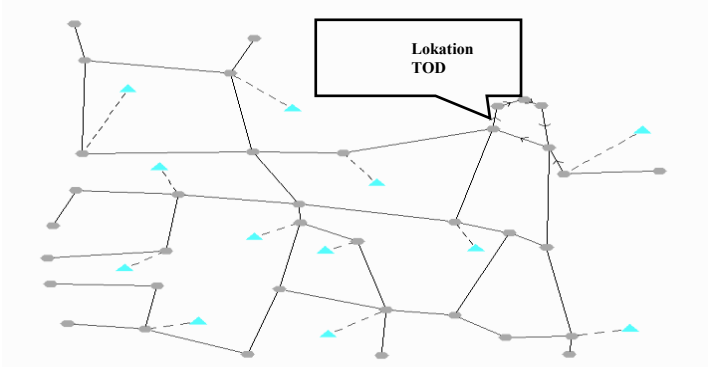

Figure 4. The road network for the study location (Source: Saturn program output results)

Table 4. Origin destination matrix

Zone	Matriks OD	Tugu	Baktijaya	Cisalak	Abadijaya	Sukamaju	Sukamaju Baru	Leuwinanggung	Sukatani	Curug	Cisalak Pasar	Mekarsari	Harjamukti	**Total Dd**
1	Tugu	0	71	3	4	18	683	37	4	10	40	51	55	975
2	Baktijaya	202	0	49	30	45	1.702	124	8	89	185	814	185	3.434
3	Cisalak	181	114	0	14	30	826	112	10	44	123	213	123	1.788
4	Abadijaya	66	196	8	0	128	4.828	189	8	54	152	106	385	6.122
5	Sukamaju	88	56	30	44	0	11.922	136	8	133	203	356	278	13.253
6	Sukamaju Baru	35	106	17	10	38	0	30	4	30	83	106	152	611
7	Leuwinanggung	42	37	25	21	110	2.240	0	20	34	244	168	614	3.556
8	Sukatani	97	32	17	14	30	2.805	80	0	42	165	155	305	3.744
9	Curug	27	44	6	7	28	789	106	13	0	160	203	117	1.499
10	Cisalak Pasar	37	17	4	6	28	774	76	3	30	0	147	62	1.183
11	Mekarsari	62	40	11	13	89	2.460	96	6	95	144	0	364	3.379
12	Harjamukti	196	37	14	40	61	3.067	89	8	34	97	124	0	3.768
	Total Oi	1.033	750	185	202	606	32.097	1.074	93	593	1.596	2.443	2.641	1

(Source: Analysis Results)

The Desire line or the line of desire to travel in the Cibubur TOD study area uses the origin-destination matrix that has been charged and is then modeled on the SATURN application shown in Figure 5 below.

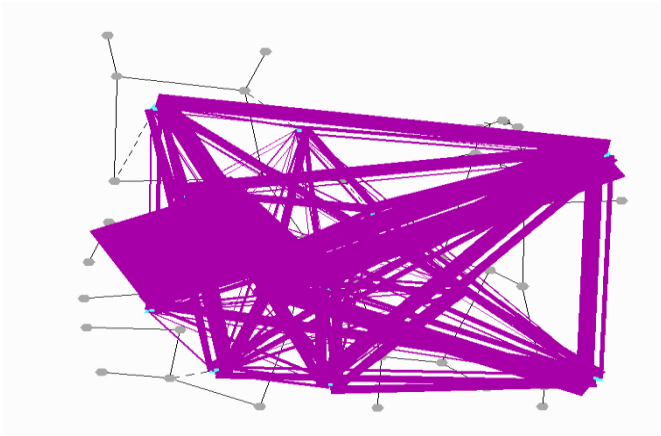

Figure 5. Desain line or MAT wish line, year 2020 (Source: Saturn program output results)

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After carrying out the MAT modeling in Saturn, the results of the traffic counting survey data are assigned to all road network models on each road section in the study area, so that the traffic volume on the entire road network studied is known. The results of traffic counting on the road network in the study area are shown in Figure 6 below.

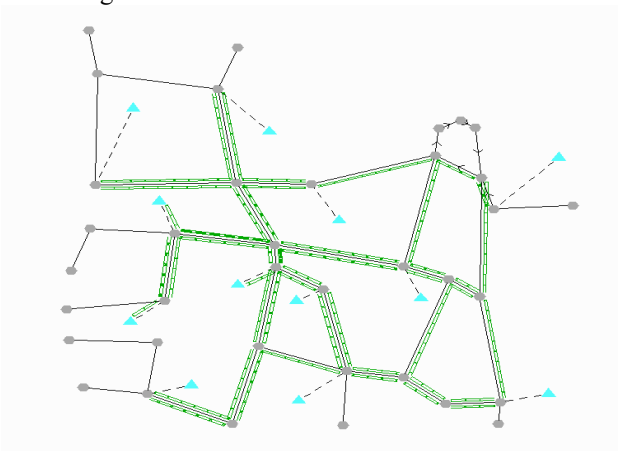

Figure 6. The results of the traffic count assignment in the study area (Source: Saturn program output results)

Land Use Allocation Analysis

The component of mixed use designation. This is applied to the Cibubur TOD site where there is a mix of land use between residential land uses such as residential and non-residential such as commercial. Analysis of the site area and floor area with the results of the KDB and KLB percentage figures is shown in the following table 5 below.

Table 5. Analysis of site area and percentage of KDB

Block	Building Use	Area site (sqm)		Large area	KDB
1	Medium Apartment	4.950,00	sqm		5%
2	Medium Apartment	4.950,00	sqm		5%
3	Medium Apartment	4.950,00	sqm		5%
4	Out Door Footstret	3.500	sqm		4%
5	Mosque	3.570	sqm		4%
6	Hospital	8.500	sqm		9%
7	School/College	5.750	sqm	10 Ha	6%
8	Hotel	8.860	sqm		9%
9	Office	10.390	sqm		10%
10	Office				
11	Park and Ride	12.300	sqm		12%
12	Shoping Center				
13	Retail	2.260	sqm		2%
Total		**69.980**	**sqm**		**0,70**

(Source: Analysis Results)

Table 6. Analysis of floor area and percentage of KLB

Blok	Building Use	Foot print (sqm)		Level floor (ft)		GFA (sqm)		Large area	KLB
1	Medium Apartment	3.169,67	sqm	25	ft	79.241,75	sqm		0,79
2	Medium Apartment	3.169,67	sqm	25	ft	79.241,75	sqm		0,79
3	Medium Apartment	3.169,67	sqm	25	ft	79.241,75	sqm		0,79
4	Out Door Footstret	2.185,00	sqm	1	ft	2.185,00	sqm		0,02
5	Mosque	2.199,00	sqm	1	ft	2.199,00	sqm		0,02
6	Hospital	6.000,00	sqm	5	ft	30.000,00	sqm		0,30
7	School/College	4.075,00	sqm	3	ft	12.225,00	sqm	10 Ha	0,12
8	Hotel	6.582,00	sqm	12	ft	78.984,00	sqm		0,79
9	Office	107.745	sqm	15	ft	107.745	sqm		1,08
10	Office			15	ft				
11	Park and Ride	25.098	sqm	3	ft	25.098	sqm		0,25
12	Shoping Center			4	ft				
13	Retail	2.564	sqm	2	ft	2.564,00	sqm		0,03
Total		**165.957**	**sqm**	**136**	**ft**	**498.725**	**sqm**		**5,0**

(Source: Analysis Results)

Table 7. Recapitulation of space utilization intensity

Space utilization intensity		Footprint Wide footprint	KDB Total	Number of floor	Building floor Total floor area (m²)	KLB Total
			Closed space			
1	Residensial	32.210		5-25	22.091	
2	Non-Residensial	37.770	70%	1-15	25.290	5,0
Sub-total		**69.980**			**47.381**	
			Open space			
1	RTH	10000		**Total land area m²**		
2	Jalan	20020		**Closed space + Open space**		
Sub-total		**30020**		**10 Ha**		

(Source: Analysis Results)

The results of the analysis of space utilization from a land area of 10 hectares which is divided into two areas, namely open areas and closed areas with the total site area for closed areas is 69,980 m², while for the total area of footprint open areas is 30,020 m². The calculation of the basic building coefficient (KDB) and the calculation of the building floor coefficient (KLB) which adjusts the provisions of the technical criteria for the TOD area based on the type of TOD in the framework of compiling the RTRW in which the Cibubur TOD is categorized into Sub-city TOD with a maximum KDB of 70% and KLB 3-5. Then the percentage of KDB obtained for residential and non-residential areas is 70%, while the KLB rate obtained is 5.0 from the analysis. With the percentage results obtained, the KDB and KLB are in accordance with the provisions which do not exceed the numbers specified in the RTRW for Depok City.

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Prediction of TOD Area Generation Calculation Using the Institute Transport Engineers (ITE) Calculation Method

As for the results. The calculation of the generation in the Cibubur TOD development area (trip/hour) is shown in Table 8 below.

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Table 8. Calculation of Generation of TOD Cibubur Area (trip/hour)

No	Facilities	Total	ITE Generation and Attraction (trip/hour)				
			in AM	out	Total	in PM	out
	Commercial						
1	Park and Ride	7.810	6.170	1.640	6.820	1.705	5.115
2	Shoping Canter	3.360	2.083	1.277	12.985	6.233	6.752
3	Variete Store	762	-	-	1.364	-	-
4	Mosque	1.630	-	-	11.020	7.383	3.637
5	School	1.836	1.304	532	582	314	268
6	Office	3.588	3.157	431	3.427	583	2.844
7	Outdoor Footstreet	0,149	0,085	0,064	0,198	0,089	0,109
	Total	18.986	12.714	3.880	36.198	16.218	18.616
	Residential						
8	Apartment Medium	1.058	222	836	1.334	867	467
9	Hotel	278	164	114	315	161	154
10	Hospital	665	419	246	651	247	404
	Total	2.001	805	1.196	2.300	1.275	1.025
	Total amount	20.987	13.519	5.076	38.498	17.493	19.641

(Source: Analysis Results)

Based on the table above, it is found that the generated number of land use movements in Kasawan TOD Cibubur generated is 20,987 trips/hour (AM) in the morning and for the evening (PM) is 38,498 trips/hour.

CONCLUSION

The results of the KDB value obtained throughout the building are 70% of the maximum land cover TOD of the city service sub-center of 70% which is contained in the technical criteria for TOD development based on the type of TOD and the total KDB figure is 5.00 from a maximum number of 3.0 to 5.0, and for the generated value obtained in the land use of the TOD Cibubur area of 20,987 trips/hour in the morning (AM), and at night of 38,498 trips/hour.

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