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Transportation Model in the Revitalization of Segiri Stadium, Samarinda City

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Abstract

Samarinda Segiri Stadium area is one of the landmarks of Samarinda City. The condition of the Segiri Stadium area over time is getting shabby and unkempt. As one of the strategic areas of the city, the Samarinda City Government plans to revitalize the Segiri Stadium area. With the revitalization of the Segiri Stadium area, it will have an impact on existing transportation conditions. This study will model the transportation conditions in the area. The method used in this analysis is the MKJI 1997 method and modeling with Vissim software. The results of the analysis of the need for Parking Space Units (SRP) based on the Decree of the Director General of Land Transportation Number: 272/HK.105/DRJD/96 required as many as 2,148 SRP passenger car units. Analysis of unsignalized intersections in existing conditions (year 2022) LOS conditions are in the range of A to C which means the conditions are still safe. Modeling in 2030 the signalized intersection conditions are at LOS between A and D, which means there is already the potential for congestion. Analysis of signalized intersections in existing conditions (year 2022) the LOS conditions of the intersection are in the range of D to F, which means that congestion occurs in existing conditions. Modeling in 2030, LOS conditions are in the E to F range, which means that congestion is getting worse with a queue length value of more than 100 meters. Severe congestion occurs at the Dishub intersection and the Abul Hasan intersection. The results of the road section performance analysis show the LOS value between D to F, which means that it has experienced congestion. Modeling in 2030 shows LOS conditions in D to F conditions, which means that conditions are increasingly congested. Recommendations for these problems are to rearrange the traffic light phase cycle, remove side obstacles to improve the performance of sections and intersections, conduct traffic engineering and utilize Internet of Thing (IoT) technology.

Keywords: transportation model; revitalization; Segiri Sports Hall; Samarinda.

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1. Introduction

Segiri Stadium is a sports center located in the center of Samarinda City, East Kalimantan Province, and is one of the representative stadiums owned by Samarinda City besides Palaran Main Stadium and Gelora Kadri Oening Stadium. This stadium has been verified to hold AFC matches and is the homebase for the Borneo FC Samarinda club. The capacity of Segiri stadium is 18 thousand spectators consisting of 4 stands. The north stand can accommodate 2,700 people, the east stand 5,000 people, the south stand 2,700 people and the west stand 7,600 people (Sudirman et al., 2021)

Apart from being the center of sports activities, GOR Segiri Samarinda is a gathering place for people to relea[i]se fatigue by visiting coffee shops and commercial areas around the Segiri Stadium area. Because of its existence in the middle of the city, the Segiri stadium is a landmark of the city of Samarinda which needs serious attention from the Samarinda City Government. For this reason, revitalization of the existing condition of GOR Segiri is needed to provide attractiveness in terms of aesthetics, services, security and comfort in the GOR Segiri area (Gazali, 2017).

Given that GOR Segiri is in an area surrounded by 4 main roads, namely Jalan Kusuma Bangsa, Jalan Bhayangkara, Jalan Abdul Rasyid and Jalan Agus Salim, it is necessary to get a study of the impact that will be caused by the revitalization of the GOR Segiri area. The studies that will be modeled in this research include parking demand studies,

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intersection studies and road segment studies in the GOR Segiri area of Samarinda City. (F.D, 1995; McShane & Roess, 1990; Tukimun & Eswan, 2017)

Fig. 1. GOR Segiri area in Samarinda City

The purpose of this study was to obtain a transportation model due to the revitalization of the Segiri Stadium area in Samarinda City under existing and future conditions (year 2030). There are 3 studies that will be discussed in this study, namely parking studies in general, intersection studies both signalized and unsignalized intersections and segment studies on roads that have an impact on the area around the Samarinda Segiri Stadium.

2. Literature Review

Gelanggang Olah Raga (GOR) or as known as sports arena Segiri is an area that provides sports facilities for the people of Samarinda City and its surroundings. Various sports facilities are available, but with the development of Samarinda City, the area has turned into a multifunctional area due to activities carried out by the community. The change into multifunction has caused the GOR Segiri area to look rundown. Efforts to restore the main function while accommodating activities need to be done immediately. The study of the redesign of GOR Segiri is one of the best efforts that can be done, with an approach to the landmarks of Samarinda City (Ramadiansyah & Antaryama, 2019). The parameters used are landmarks and characteristics of the GOR building. The results of this study can be input to the city government to be able to improve and accommodate the various functions of the sports area, and can present a new city landmark for Samarinda City. This Samarinda City Landmark brings elements of the distinctive character of Samarinda City in the form of its buildings (Musthafa Adham Putra et al., 2022)

Based on the Regulation of the Minister of Transportation Number PM 96 of 2015 concerning Guidelines for the Implementation of Traffic Management and Engineering article 1 paragraph (1) states the definition of traffic management and engineering is a series of efforts and activities that include planning, procurement, installation, arrangement, and maintenance of road equipment facilities in order to realize, support and maintain security, safety, order, and smooth traffic.

3. Methods

The method used in the analysis of transportation modeling in the Segiri Samarinda Stadium area is to use the MKJI 1997 method and modeling with Vissim software to model the intersection study and segment study in the area. Indonesian Road Capacity Manual (MKJI) is a method that is compiled as a very effective method commonly used in planning, analyzing traffic operations (Angkoso et al., 2021) While Vissim is a software that simulates microscopic traffic, public transportation and pedestrians in an area (Fellendorf & Vortisch, 2010).

Data collection is divided into 2 pieces of data, namely primary data and secondary data. Primary data is data taken directly in the field by conducting surveys. Primary data taken in the field includes parking data, traffic data, road geometric data and documentation data. While secondary data includes data taken from related agencies such as traffic statistics, city spatial data, land use data and previous studies that have been conducted (Sinaga & Magdalena, 2015).

4. Results and Discussion

4.1. Parking Analysis

Parking is an immobile state of a vehicle that is not temporary (long) and the condition is abandoned by the driver. The purpose of parking is to provide a resting place for vehicles and support smooth traffic. Given that the Segiri Stadium area is a sports area, it is necessary to study the need for Parking Space Units (SRP). Based on the Decree of the Directorate General of Land Transportation Number 272/HK.105/DRJD/96 of 1996 concerning Technical Guidelines for the Implementation of Parking Facilities, the standards for parking facilities in sports areas shown on Table 1.

Table 1. An example of a table.

Number of Seats	4000	5000	6000	7000	8000	9000	10000	15000	10000
SRP Requirement	235	290	340	390	440	490	540	790	230

Source: Decree of the Director General of Land No. 272/HK.105/DRJD/96 in 1996

The capacity of Segiri Stadium is 18,000 seats. Based on the calculation in Table 1 regarding the SRP standard in the sports venue area, it requires 942 SRP in the condition of 100% seating is fulfilled.

In addition to Segiri Stadium, there are several buildings that are used as public service areas and other sports need to get services for vehicle parking needs. Based on the area of the building in the Segiri Stadium area intended for public services, the requirements for the provision of parking per 100 m2 of floor area required 1.5-3.5 SRP. In this calculation, the largest SRP value is taken, namely 3.5 SRP/100 m2 of building area and the results are obtained shown on Table 2.

Table 2. Calculation of Total SRP Needs in Segiri Stadium Area, Samarinda City

No	Building Area GOR	Area (M2)	SRP/100m2	Total SRP
1	Stadium building	26918	269	942
2	Existing Parking Lot	5050	51	177
3	Existing GOR Building 2 lt	2663	27	93
4	Koni Building	797	8	28
5	Mosque	2005	20	70
6	Tennis Area	3000	30	105
7	Softball Area	5300	53	186
8	Swimming Area	14469	145	506
9	Pencak Silat Area	1172	12	41
		Total SRP		2148

Source: Calculation results based on Decree of the Director General of Land No. 272/HK.105/DRJD/96 of 1996

So the parking area needed to meet the needs of the parking area in the Segiri GOR area of Samarinda City is 2,148 SRP based on passenger car units.

4.2. Analysis of Unsignalized Intersections

There are 5 unsignalized intersections located in the Segiri Samarinda stadium area, namely the City Hall intersection, the West Stadium intersection, the East Stadium intersection, the Seruni intersection and the Dahlia intersection. The following is a map of unsignalized intersections in the Segiri GOR area in Samarinda City.

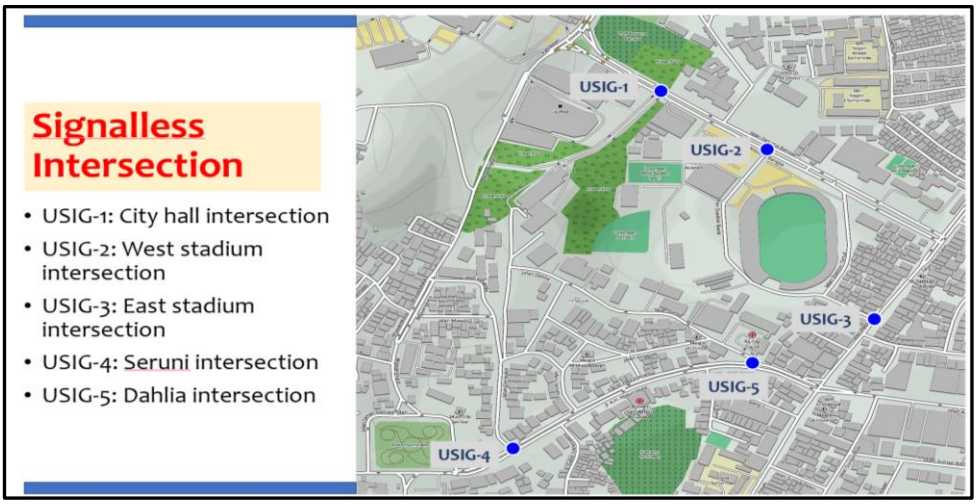

Fig. 2. Unsignalized Intersection (USIG) at GOR Segiri Area, Samarinda City

From the results of calculations using the 1997 MKJI Method and simulations using Vissim Software, the results of the analysis on existing conditions in 2022 shown on Table 3.

Table 3. Unsignalized intersection performance analysis of existing conditions (year 2022)

Intersection Name	Street Name	Delay (sec/kend)	Queue (m)	LOS
SIMPANG BALAIKOTA	ENTRANCE (from dishub intersection)	0.10	0.80	A
	ENTRANCE (from mesra intersection)	8.91	8.58	B
	EXIT CITY HALL	0.25	0.03	A
SIMPANG STADION BARAT	ENTER (from dishub intersection)	0.49	0.09	A
	ENTER (from mesra intersection)	4.97	13.45	A
	STADION EXIT	0.25	0.09	A
SIMPANG STADION TIMUR	ENTER (abul hasan intersection)	0.33	7.27	A
	ENTER (from dishub intersection)	0.82	15.97	A
	STADION EXIT	297.22	43.27	F
SIMPANG SERUNI	ENTER (abul hasan intersection)	17.09	0.17	C
	ENTER (from tmn samarinda)	0.05	0.21	A
	EXIT SERUNI INTERSECTION	0.57	0.02	A
SIMPANG DAHLIA	ENTER (from seruni)	2.46	0	A
	ENTER (from city hall)	0.07	0	A

The existing conditions in 2022 for the analysis of unsignalized intersections around the Segiri Samarinda GOR area as many as 5 intersections were analyzed showing good intersection conditions only with LOS values are A to C. Only at the East Stadium intersection on the stadium exit section is the LOS condition F, which means that there is severe congestion.

From the modeling results in 2030 (Table 4), there is congestion at the east stadium intersection on the stadium exit section with a LOS value of F and at the Dahlia intersection for the entry section of the LOS Seruni road is D. As for the intersection conditions on other sections, the conditions still show good LOS conditions.

4.3. Signalized Intersection Analysis

There are 3 signalized intersections located in the Segiri stadium area in Samarinda City which include the Dishub Intersection, Mesra Hotel Intersection and Abul Hasan Intersection (Figure 3).

Table 4. Unsignalized intersection performance analysis of 2030 conditions

Intersection Name	Street Name	Delay (sec/kend)	Queue (m)	LOS
SIMPANG BALAIKOTA	ENTRANCE (from dishub intersection)	0.62	18.05	A
	ENTRANCE (from mesra intersection)	13.34	49.57	B
	EXIT CITY HALL	4.83	2.13	A
SIMPANG STADION BARAT	ENTER (from dishub intersection)	0.93	1.32	A
	ENTER (from mesra intersection)	4.70	33.17	A
	STADION EXIT	0.14	1.64	A
SIMPANG STADION TIMUR	ENTER (abul hasan intersection)	0.50	9.83	A
	ENTER (from dishub intersection)	1.22	19.21	A
	STADION EXIT	475.52	176.94	F
SIMPANG SERUNI	ENTER (abul hasan intersection)	14.72	3.24	B
	ENTER (from tmn samarinda)	0.08	2.14	A
	EXIT SERUNI INTERSECTION	2.85	2.19	A
SIMPANG DAHLIA	ENTER (from seruni)	37.36	9.62	D
	ENTER (from city hall)	0.77	2.14	A

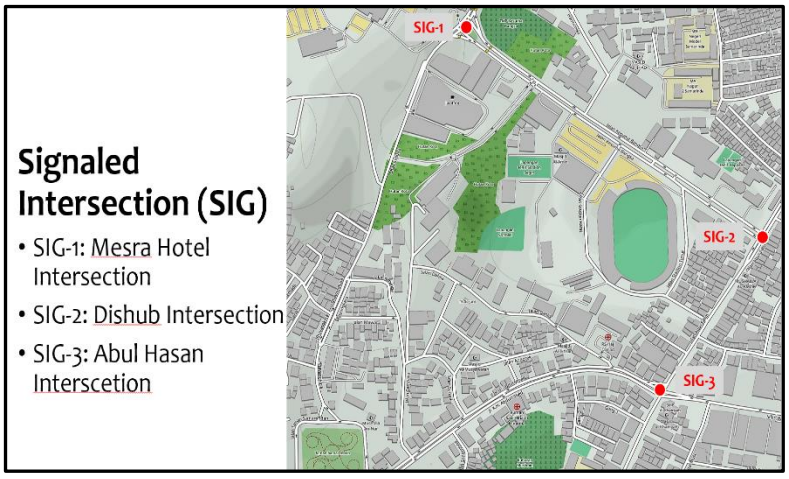

Fig. 3. Signalized Intersections (SIG) in the Segiri GOR Area, Samarinda City

The modeling results in the existing conditions in 2022 resulted in signalized intersection performance at 3 intersections in the area around GOR Segiri Samarinda City as shown on Table 5.

The existing conditions in 2022 conditions for the 3 signalized intersections in the Segiri GOR area in Samarinda City show quite congested conditions, namely at LOS values D to F with queue lengths of more than 50 meters, and a small portion of the section with queues of less than 50 meters.

Conditions in 2030 (Table 6), the modeling results show increasingly severe LOS values, namely with LOS E and F values with vehicle queue lengths on all sections at intersections of more than 30 meters. Severe congestion occurs at the Dishub and Abul Hasan intersections with vehicle queue lengths of more than 100 meters, which means congestion at existing intersections.

Table 5. Analysis of signalized intersection performance (SIG) Existing conditions (year 2022)

Intersection Name	Street Name	Delay (sec/kend)	Queue (m)	LOS
SIMPANG DISHUB	JL. AGUS SALIM (UTARA)	176.86	181.02	F
	JL. KUSUMA BANGSA	134.17	60.44	F
	JL. AGUS SALIM (SELATAN)	120.53	83.16	F
SIMPANG HOTEL MESRA	JL. PAHLAWAN	25.99	8.19	D
	JL. BHAYANGKARA	64.32	23.89	F
	JL. KUSUMA BANGSA	51.62	137.54	E
SIMPANG ABUL HASAN	JL. BASUKI RAHMAD	219.76	438.01	F
	JL. ABUL HASAN	124.45	146.59	F
	JL. ABDURRASYID	190.06	18.53	F
	JL. AGUS SALIM	341.88	129.74	F

Table 6. Analysis of signalized intersection performance (SIG) conditions in 2030

Intersection Name	Street Name	Delay (sec/kend)	Queue (m)	LOS
SIMPANG DISHUB	JL. AGUS SALIM (UTARA)	223.85	189.34	F
	JL. KUSUMA BANGSA	157.13	137.04	F
	JL. AGUS SALIM (SELATAN)	223.85	176.19	F
SIMPANG HOTEL MESRA	JL. PAHLAWAN	46.39	45.26	E
	JL. BHAYANGKARA	82.59	34.72	F
	JL. KUSUMA BANGSA	291.22	163.77	F
SIMPANG ABUL HASAN	JL. BASUKI RAHMAD	340.78	447.71	F
	JL. ABUL HASAN	188.34	158.29	F
	JL. ABDURRASYID	236.06	69.87	F
	JL. AGUS SALIM	455.03	134.40	F

4.4. Road Section Analysis

The study of road sections in the area around GOR Segiri Samarinda City that are affected due to the revitalization plan activities must be carried out considering that it will have an impact on the traffic conditions on these sections. There are as many as 11 roads that are studied in the revitalization of the Samarinda Segiri Stadium area. The roads include: Jalan Kusuma Bangsa, Jalan Agus Salim, Jalan Pahlawan, Jalan Bhayangkara, Jalan Basuki Rahmad, Jalan Abul Hasan, Jalan Abdul Rashid, Jalan Balaikota, Jalan Stadion Barat, Jalan Cempaka and Jalan Dahlian. The map of the road sections that were studied shown on Figure 4.

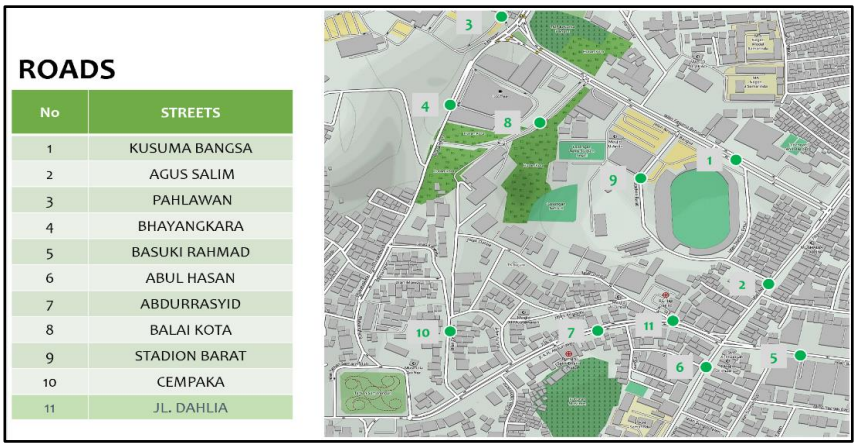

Figure 4. Road Sections in the Segiri GOR Area, Samarinda City

The results of the analysis of the existing conditions of the performance of road sections around the revitalization area of GOR Segiri Samarinda City, as many as 11 road sections show on Table 7.

Table 7. Analysis of the performance of road sections in existing conditions (year 2022)

STREET NAME	SPEED	TEMPLE TIME (minute)	DENSITY (km/kend)	LOS
JL. KUSUMA BANGSA	18	8.99	156	E
JL. AGUS SALIM	20	4.78	247	E
JL. PAHLAWAN	27	1.24	55	E
JL. BHAYANGKARA	19	2.10	15	E
JL. BASUKI RAHMAD	20	14.52	526	E
JL. ABUL HASAN	19	5.61	247	E
JL. ABDURRASYID	24	4.25	243	E
JL. BALAIKOTA	31	1.79	8	D
JL. STADION BARAT	35	2.24	1	D
JL. CEMPAKA	27	2.10	13	E
JL. DAHLIA	31	0.79	5	D

The results of the analysis show that under existing conditions, certain road sections experience congestion with a LOS value of E, such as on Kusuma Bangsa Road, Agus Salim Road, Pahlawan Road and others.

Table 8. Performance analysis of road sections under 2030 conditions

STREET NAME	SPEED	TEMPLE TIME (minute)	DENSITY (km/kend)	LOS
JL. KUSUMA BANGSA	17	13.05	120	E
JL. AGUS SALIM	16	6.12	278	E
JL. PAHLAWAN	24	2.55	126	E
JL. BHAYANGKARA	19	3.23	33	E
JL. BASUKI RAHMAD	15	15.40	553	E
JL. ABUL HASAN	15	5.67	253	F
JL. ABDURRASYID	15	5.02	320	E
JL. BALAIKOTA	26	2.71	26	E
JL. STADION BARAT	36	3.16	1	D
JL. CEMPAKA	5	2.61	117	F
JL. DAHLIA	26	1.37	12	E

Modeling results in 2030, LOS conditions are at letter grades D to F, which means that conditions are increasingly experiencing congestion problems. Congestion with LOS - F occurs on Abul Hasan Road and Cempaka Road.

5. Conclusions

Transportation analysis of the impact caused by the revitalization of GOR Segiri must be carried out to anticipate traffic problems in the future. From the results of the study of transportation modeling carried out, it can be concluded that the following are:

a. Analysis of vehicle parking SRP needs based on the Decree of the Directorate General of Land Transportation Number 272/HK.105/DRJD/96 of 1996 concerning Technical Guidelines for the Implementation of Parking Facilities as much as 2,148 SRP based on passenger car units.

b. Analysis of 5 unsignalized intersections under existing conditions (year 2022) the LOS conditions of unsignalized intersections are at grades A to C, which means the conditions are still safe. While the results of the modeling analysis in 2030 the signalized intersection conditions are at LOS between A and D, which means that there is already the potential for congestion at LOS value D. The problem occurs at the east stadium intersection with a LOS value of F, which means that there is severe congestion with a queue length of 176.94 meters.

c. Analysis of 3 signalized intersections under existing conditions (year 2022) the LOS condition of the intersection is in the range of D to F, which means that severe congestion occurs under existing conditions. After simulation in 2030, the LOS conditions are in the E to F range, which means that the congestion is getting worse with a queue length value of more than 100 meters. Severe congestion occurs at the Dishub intersection and the Abul Hasan intersection.

d. Analysis of 11 road sections located in the Segiri Samarinda GOR area shows the performance of road sections in LOS conditions between D and F, which means that they have experienced congestion. Vissim modeling simulation results of road section performance conditions in 2030 show LOS conditions are at values D to F, which means the condition is increasingly experiencing congestion problems. Congestion with LOS at level F occurs on Abul Hasan Road and Cempaka Road.

Recommendations from the results of transportation modeling carried out on the revitalization plan for the Segiri GOR area in Samarinda City are as follows:

a. Prepare a parking lot or parking building in the GOR Segiri area of Samarinda City to anticipate the parking of visitor vehicles according to the required SRP, especially to anticipate peak conditions at national and international match events.

b. Pay attention to the condition of the road around the location of the Samarinda Segiri GOR area by restoring its capacity conditions by eliminating side obstacles such as roadside parking, utilization of pedestrians as a place to sell / Commerce and reduce the maneuvering of vehicles that do loading and unloading in the Commercial area such as on Jalan Agus Salim.

c. Regulate the time phase cycle of traffic lights to avoid congestion on certain sections. It is also possible to upgrade the light phase by utilizing technology with automatic sensors, so that when in certain conditions the light phase can change automatically according to the length of the vehicle queue set in the program / Internet of Thing (IoT).

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