Analysis of Saturated Intersection towards Volume Capacity in the section of Road Traffic Joglo Raya of Mercubuana University Jakarta Indonesia

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ABSTRACT: *The purpose of this study to analyze the saturation level of the intersections, given the level of congestion on the tolerance within 0, 5-1 km, takes 15-30 minutes in the mornings and afternoons .Some suggested recommendations based on observational studies, while the need to get a decision strategic and as the foundation of permanent and long-term nature of 10-20 years. Through the concept of Management of Transport Demand, integrated concept between the infrastructure according to volume ratio and capacity ideal, so avoid the congestion and accidents, also can meet market demand by customers in every segment of transport demand for transportation services of all things: Quality of Service .Also created: their steady flows, are free to choose the speed, ease of access and movement / mobility, free of cost / efficiency in fuel costs due to traffic jams and accident-free facilities and infrastructure reasons not support the Transport network.*

Keywords: Traffic Management, Demand Management, Intersection Management ratio volume and capacity.

I. INTRODUCTION

Root problems of transportation in Indonesia, particularly in Large Cities, the problems are basically very significant imbalance in the ratio of growth in facilities and infrastructure. Especially for the capital Jakarta, as with the City Megapolitan No. 10 of 27 megapolitan City in the World, with a population of 13,7 million . Based on the book Moving Millions (F.Moavenzadeh, M.J. Markow, Moving Millioner) requirements megapolitan City should have Radius Road 50-100 Km, from the city center if the city wants to be free: Flow stable, Free to choose the speed, accessibility and mobility, Zero Marginal Cost and Zero Accident.

According to data released by the Indonesian Transportation Society (MTI) refers to the results of the study Study on Integrated Transportation Master Plan for Jabodetabek (SITRAMP) in 2004 showed a loss due to traffic congestion in Jakarta reached Rp.8,3 trillion, consisting of loss costs for vehicle operation. Rp.3 trillion, a loss of Rp. 2.5 trillion, and the loss of health impacts Rp. 2.8 trillion. So the solution to the tissue level must be a balance or ideal capacity pursued where volume capacity equal to demand capacity.

Identification of Problems in the observation in third Intersection Furthermore, the identification of problems that have been summarized and observations before the survey intersection and Segment performed during peak hour in the morning and afternoon peak hours are known problems encountered as follows :

1) High volume of traffic at the intersection Joglo and H.Saaba road , towards the Univercity Mercu Buana .
2) No pedestrian facilities are available either at an intersection of street Joglo Raya and H.Saaba
3) Road Capacity is not the same width of Joglo Raya direction towards to advanced Joglo Raya an turn right to the university Mercubuana , and turn left to the H.Moehtar .
4) Motorcycle disorderly and messy impression .
5) It is not known the number of vehicles passing through the intersection and the ratio between the volume - existing capacity in the level of Los service

So the solution to the network level must be a balance or ideal capacity pursued where volume capacity equal to demand capacity.However need to know in advance the number of vehicles of each road to the intersection and the volume ratio capacity each junction turn left and straight to turn right within each leg intersection .

II. LITERATURE REVIEW

Conceptual Framework

Traffic management involves purchasing transportation service, and traying to obtain the desired level of service at the lowst cost.Traffic management is complex,detailed, and chalenging aspect of business. Richard Iles,Public Transport in Developing Countries. Argued that:

Traffic management is a specialised branch of higway engineering and traffic management provides a means of optimising the use of existing road space, with minimal construction work, and can often produce considerable benefit in terms of improved traffic flows, at very low cost when compared with alternative mayor road construction .

As for *Peter Hills at all, Roads and Traffic in Urban Area.Considerable that:* The term 'traffic management' is used to describe the process of adjusting or adapting the use of an existing road system to mett specified objectives with resorting to substantial new road construction. While objectives of traffic Management is usually undertaken to achieve some, or all of the follwing objective :a reduction in road accident;environmental improvement; improved access for people and goods and improved traffic flows on primary and disributor roads.

And reaffirmed in Industrial Traffic Management ,Charles A. Cited by Donald V Harper in Transportation in Amerika:*A traffic manager....is responsible for the planning, direction,selection,purchase by company or rganization of all aspects of transportation or transportation service, with the objective of serving the organization... in the most efficient manner possible*.

Transport Demand Management .TDM is a general term for strategys that result in more efficent use of transportation infrastructure by influencing the demand for travel on their infrastructure *F.Moavenzadeh .My Markow" Moving Millions")*

As for the manajemen of intersection ; Road junction are particularly important because of their effect on traffic capacity (because the capacity of a road system is usually constrained by its junction) and also their effect on route choice (because route choice are made at junction and the layout and system of control of junctions can influence route selection). *(Peter Hills at all, Roads and Traffic in Urban Area).*

To get service transport network criteria intersection meets the standards expected by users of transport services in the form of: Flow stable, Free to choose the speed, ease of accessibility and mobility, Zero Marginal Cost and Zero Accident. It is not simple, and very complex, the methods of research carried out, as follows, through:

Performance will be determined by the intersection of the main third factors traffic management , demand management and management intersection.
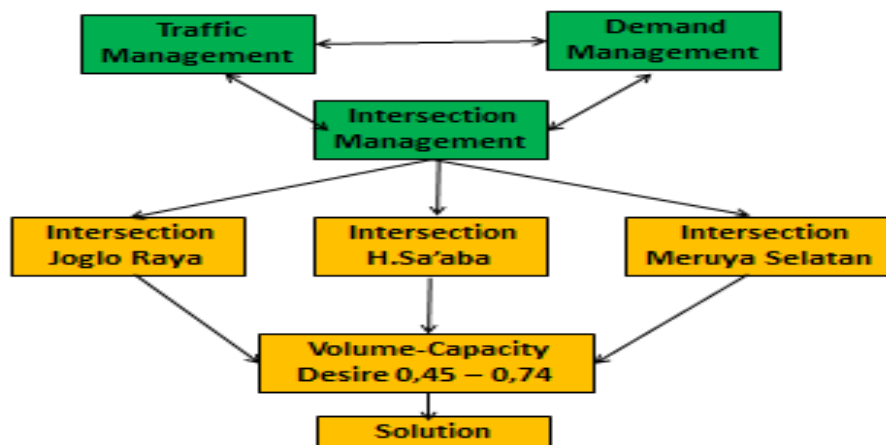

Figure 1: Conceptual Framework

III. RESEARCH METHODE

Research Methode is survey and analysis of statistics discriftive. Definition of research methods by Sugiyono (2008: 4), states that the research methods are as follows: Research Methods is basically a scientific way to get valid data to the destination can be found, proven, and developed into a knowledge that in turn can be used to understand, solve and anticipate problems".

Survey Methods: Survey method is a method of collecting primary data using written questions and this requires. Metode the relationship between researcher and object research, ...acquired mostly descriptive data but data collection can be designed to explain causality or express ideas .

Discriftive Statistics Analysis

While this study the author uses descriptive analysis method with quantitative approach. Understanding descriptive study presented by Husein Umar (2007: 87), states the following: "Descriptive study includes data collection to answer questions about the final status of the study subjects. The most common type of descriptive research includes an assessment of the individual, organization or particular circumstances". It can be concluded that the descriptive method is a method that aims to determine the nature and deeper relationship between the variables, processed, analyzed, and processed data may be drawn to a conclusion.

Table 1: Phase Completion

Phase Completion

Variables	Details of activities	Superficial	Indicator
Traffic Management	Arrangements existing infrastructure , efisen movement, intersections and parking arrangements. • Roads in Raya Joglo and University Mercubuana	Simplify traffic through minimize traffic disruption . • Reduce congestion levels through capacity increase or decrease the volume . • Reduce conflicts points on roads and intersections	• Increase Capacity • Lower Volume • Congestion • Speed • Reduce conflicts at the intersection
Demand Manajemen	Reducing travel delay, reduce total travel, reduce costs and reduce accidents	• Optimal serving demand • Establishing a balance between Rato - volume capacity • Reduce the cost and level of accidents • Improve mobility and movement of people	• Quality • Speed • Vehaicle teknology • Tarif
Intersection Management	Identification straight stream and turn right and left of each arm of the intersection. Observing the movement of vehicles merging of the two currents . Viewing crossover vehicle Viewing a separate vehicle movement	Minimize conflict were in-between . Settings optimized intersection with the availability of the number of intersections and lanes every intersection	The amount of traffic flow at each intersection The number of intersections and lanes. The amount of delay Setting traffic

Existing Conditions Traffic Network

In The survey planning needs to consider the composition of vehicle passing Necessarily also distinguished between motor vehicles or non-motorized vehicles.Geometrik road also needs to be considered in order to be used to determine the capacity of roads or to calculate the intersection capacity. Recapitulation survey can be seen below .

Table 2: Recapitulation result of Intersection Data Survey

Recapitulation of Traffics Data Exsisting 2016				
No	Intersection name	Direction	Volume (smp/j)	
			Morning	Afternoon
1	Joglo Raya Intersection	East-West	853	2.022
		East- North	221	277
		East-South	383	921
		South-East	705	462
		South-North	453	238
		South-West	36	57
		West-East	643	304
		West-North	104	108
		Nort-East	756	710
2	H.Sa'aba Intersection	South-North	924	345
		South-West	141	456
		West-South	419	310
		West-North	141	456
		North-South	344	595
		North-West	169	460
3	Maruya Selatan Intersection	North-West	525	688
		West-North	525	688
		South-West	58	33

Joglo Intersection 2016

      Joglo intersection is signalized intersection, the existing conditions 3 phase. Adverse conditions are not symmetrical between the movement of approach intersecting and turning movement of the traffic flow against (including pedestrians).
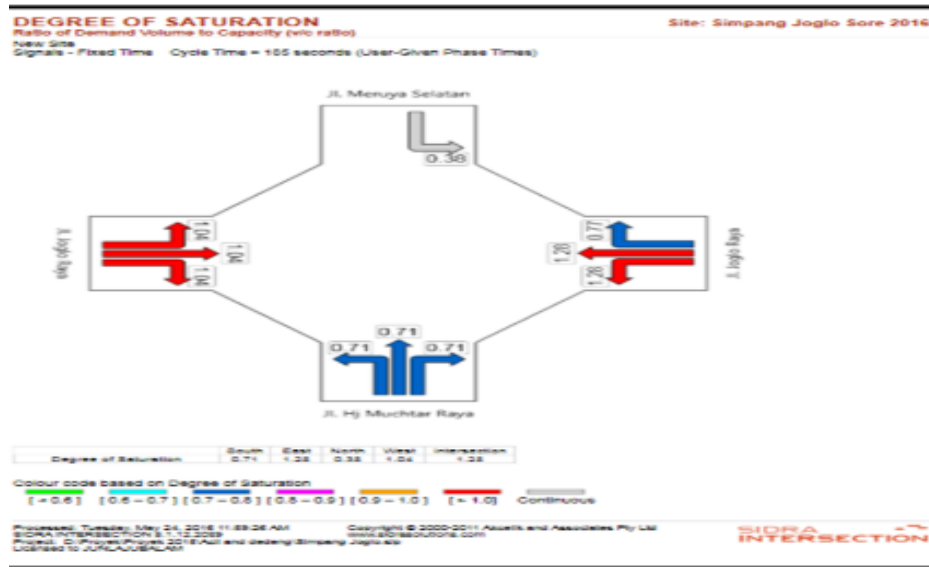

Figure 2. Joglo Raya Intersection
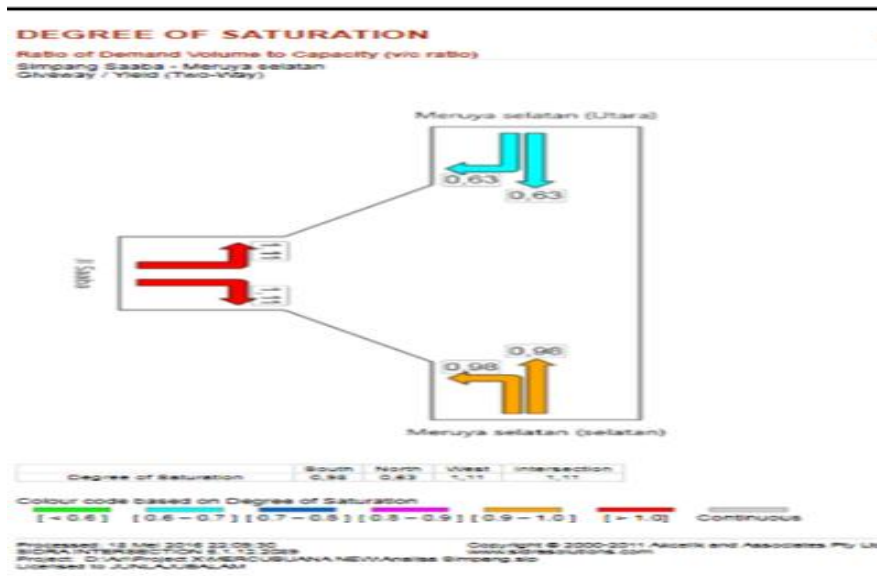

Figure 3. Joglo Raya Intersection in Map

Figure 4. Joglo Raya Intersection 2016 (Morning and Afternoon)

Figure 5. Joglo Raya Intersection 2016 (Morning and Afternoon) in Map

Intersection Jalan H Saaba

Street intersection H Saaba met with South Meruya way that the road is not signalized. This intersection occurs because the queue of vehicles is high enough volume, so can interfere with the movement of vehicles. This road conditions with high enough volume vehicles either in the morning or afternoon. long queue due to the conflict crossroads. This condition can be seen in the following.
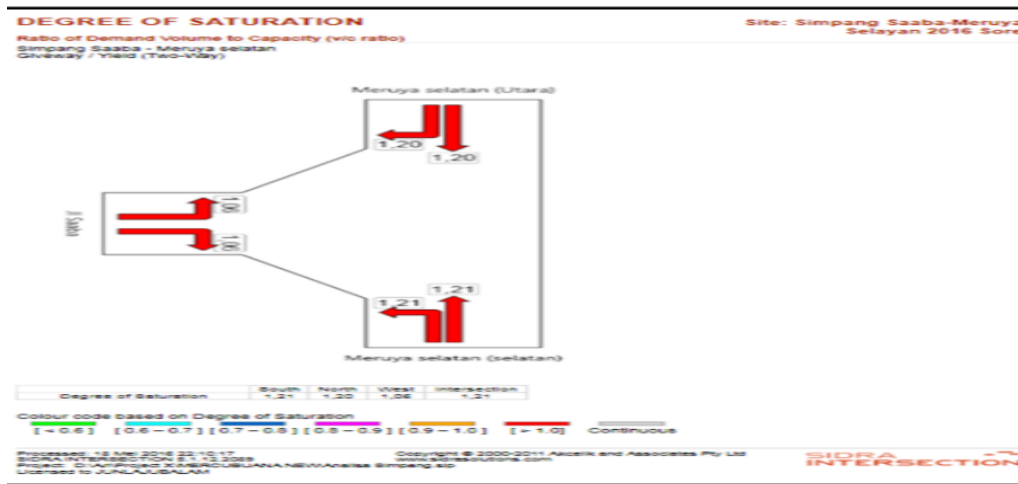

Figure 6. H. Saaba Intersection Exsisting

Intersection Meruya Selatan Years 2016

Meruya south intersection is not signalized road. This intersection can still be said to be free flow conditions at high speed. The driver can select the desired speed without a hitch. This intersection has a volume that is not too high either during rush hour in the morning and afternoon rush hours. Queues also does not occur at this intersection. Events can be seen from the results below.
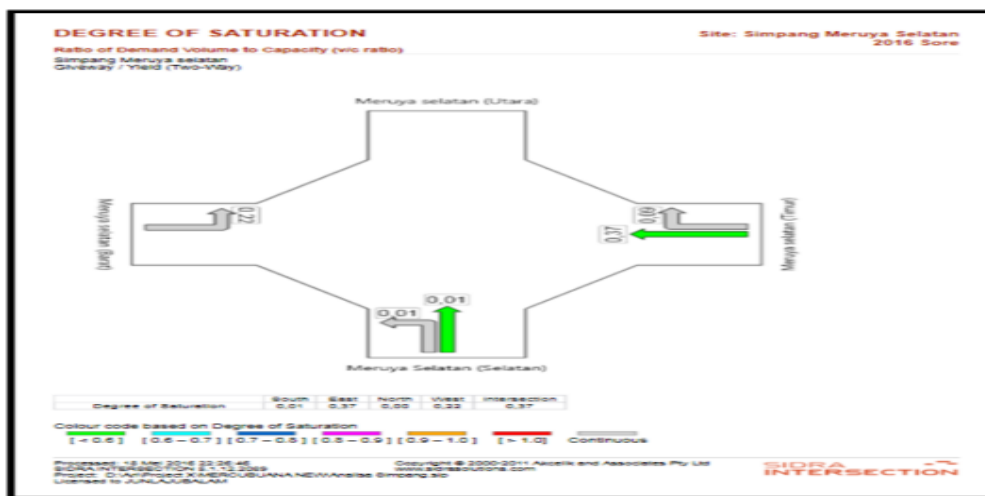

Figure 7. Intersection Meruya Exsisting

Figure 8. Intersection Meruya Exsisting in Map

IV. RESULT AND DISCUSSION

Analysis of Statistics Discriptif

Table 3. Descriptive Statistics

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Simpang Joglo Raya	0				
Volume Kapasitas	12	20,00	170,00	82,5833	50,08440
Simpang H Saaba	0				
Volume Kapasitas 1	12	63,00	121,00	100,1667	23,66368
Simpang Meruya Selatan	0				
Volume Kapasitas	12	,00	37,00	9,9167	12,65959
Valid N (listwise)	0				

Source : Data Processing with SPSS 20.0 under windows

Judging from the average of the mean, minimum and maximum of the volume capacity to:

a. Intersection Joglo Raya above the average mean of > 0.82, while minimum -maximum between > 0.20> 1.7 means the rank of the service network is very problematic.

b. Intersection H. Sa'aba. above the average mean of > 1.0, while the minimum-maximum between > 0.63> 1.2 means that the level of service the network is very problematic in the morning and afternoon rush hours.

c. The intersection of South Meruya above the average mean of> 0.09, while the maximum age between> 0.0> 0.37 means that the level of service the network is not a problem during rush hour in the morning and afternoon.

Survey Analysis and Solutions

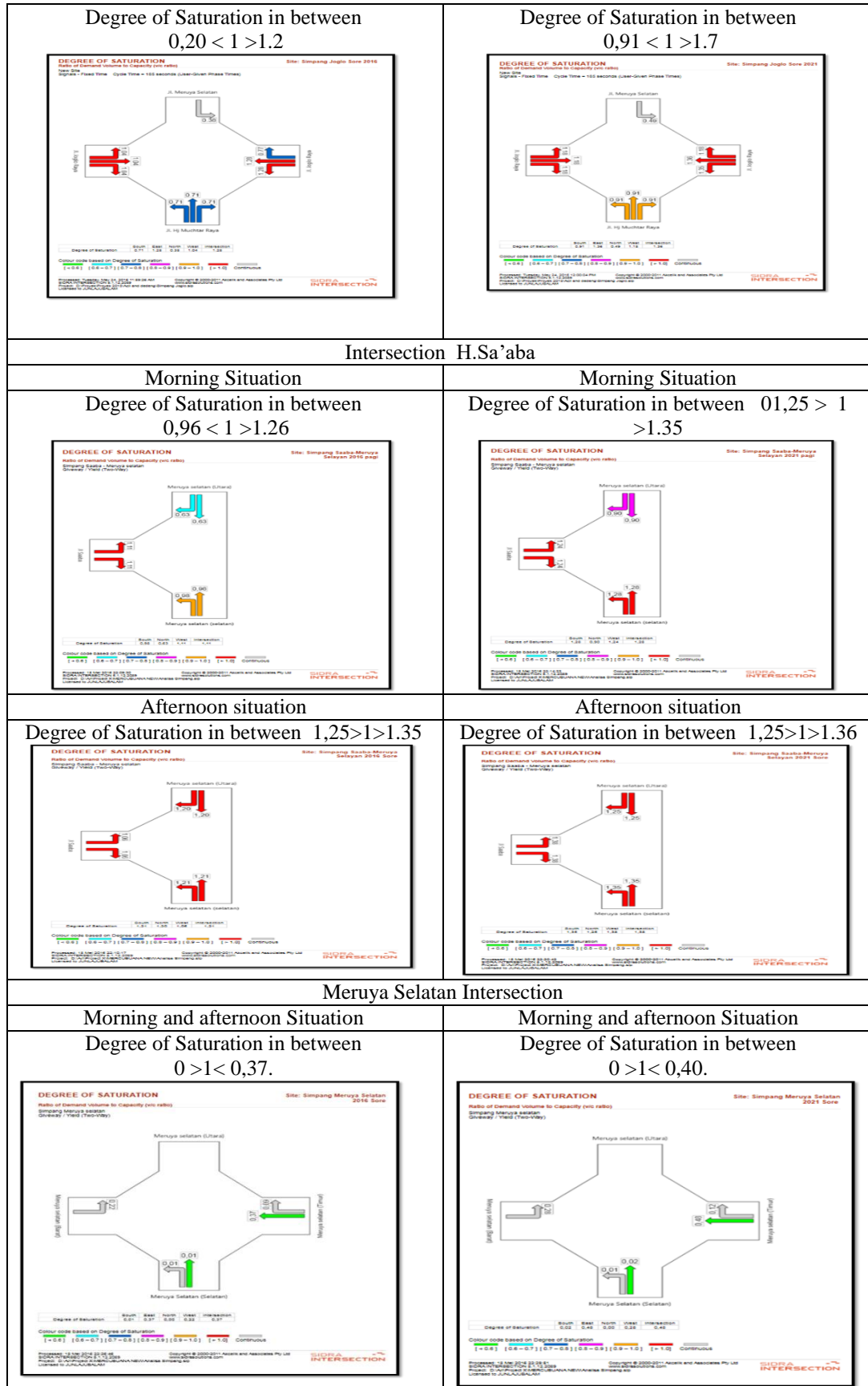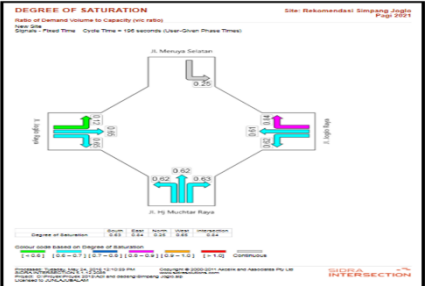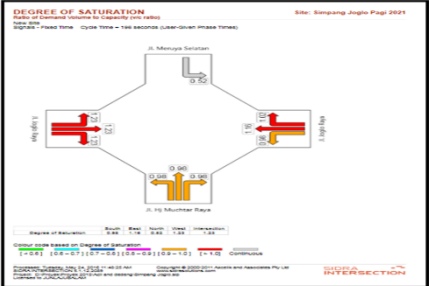| Existing (2016) By field data	Do Nothing (2011-2016) do anything the next 5 years
Intersection Joglo Raya	
Morning situation	Morning situation
Degree of Saturation in between 0,20 < 1 >1.7,	Degree of Saturation in between 0,96 < 1>1.7,
Afternoon situation	Afternoon situation

Degree of Saturation in between 0,20 < 1 >1.2	Degree of Saturation in between 0,91 < 1 >1.7

Intersection H.Sa'aba	
Morning Situation	Morning Situation
Degree of Saturation in between 0,96 < 1 >1.26	Degree of Saturation in between 01,25 > 1 >1.35
Afternoon situation	Afternoon situation
Degree of Saturation in between 1,25>1>1.35	Degree of Saturation in between 1,25>1>1.36

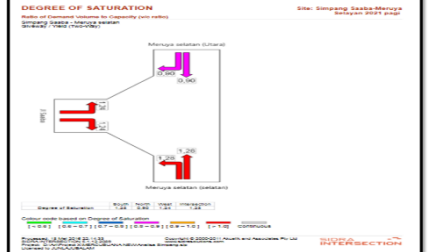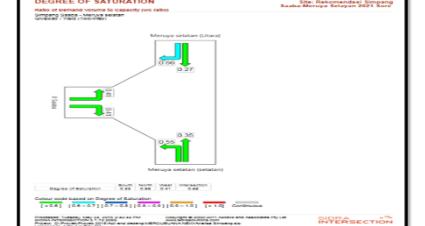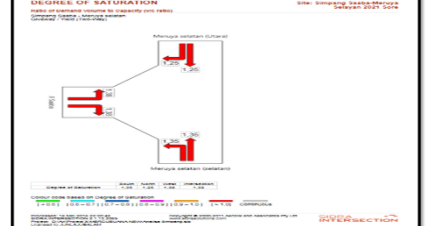| Meruya Selatan Intersection	
Morning and afternoon Situation	Morning and afternoon Situation
Degree of Saturation in between 0 >1< 0,37.	Degree of Saturation in between 0 >1< 0,40.

Figure 9. Intersection Joglo Raya, H.Sa'aba & Meruya Selatan 1

Do Nothing & Recommendations by road expansion.

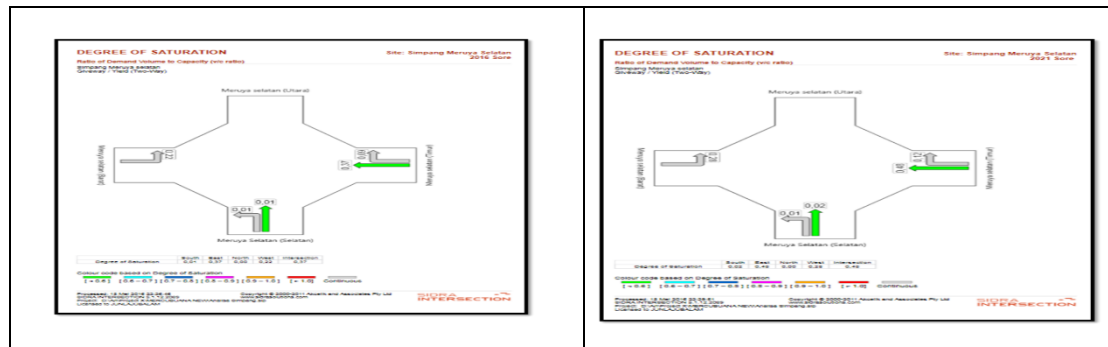| Recommendations by road expansion	Do Nothing (2011-2016) do anything the next 5 years
Intersection Joglo Raya	
Morning situation	Morning Situationi
Degree of Saturation in between 0 >1< 0,37.	Degree of Saturation in between 0>1< 0,37.
Afternoon situation	**Afternoon situation**
Intersection H.Sa'aba	
Morning situation	**Morning Situationi**
Afternoon situation	**Afternoon situation**
Meruya Selatan Intersection	
Morning and Afternoon situation	**Morning and Afternoon situation**

Figure 9. Intersection Joglo Raya, H.Sa'aba & Meruya Selatan 2

V. CONCLUSSION AND RECOMMENDATION

Conclussion:
1. All three intersections based on survey results showed the level of service levels at peak hours in the morning and rush hour the afternoon of the day in the level of service at the level of rank F, meaning that currents forced or jams, low speed, volume under capacity, long queues and going big constraints.
2. 2.The three intersections survey results with no action during the next 5 years showed worse level of service levels. where the speed is lower and the third intersection almost uniformly in level F.
3. All three intersections survey rush hour morning and afternoon rush hours, taking action through the widening of the road. Showed increased levels of service category F> 1, be the level of service in the rank of C <0.45 to 0.7 means that the flow is stable, but the speed and motion controlled vehicles, drivers are limited in choosing speed

Recommendation:
1. Information; Road widening From Joglo Raya to advance Joglo should have the same width 26 m crimped each shoulder and pedestrian 10 m.
2. From Joglo Raya to Mercubuana proposed of 6, 1 m to be 15 M are not included shoulder of the road and pedestrians, 10/7 m
3. Intersection H.Sa'aba. The width of the existing space vehicles just 6.1 m proposed to be 31 m including road shoulder space and pedestrian space.

REFERENCE

[1]   Antony D.May,et all, University Leeds,StrategiTransport TerpaduPublic-Private Interfaces, Hand Book of Transport,Policy and Institutions, Edited by K.J Button and D.A Hensher @2005,Elsevier Ltd.
[2]   Amanda Root, 2003" *Delivering Sustainable Transport*A Sosial Science Perspectif , Pergamon , An Imprint of Elsiever ScienceLondon
[3]   Bardi / Coyle/ Novack , 2006 , *Management of Transportation* , Thomson- Western Coorporation United States of America
[4]   Cynthia Barnhart ang Glibert Lapora, Transportation, Handbooks in Operation Research and Management Science Vol 14, editor North Holand (2007).
[5]   Everette et all, Productions & Operations Management,Bihavior, fifth edition (1992),
[6]   Harper Donal V, Transportation in America, Prentice – Hall, Inc.
[7]   Jay Heizer Barry Render, Operation Management (2008) Pearson International Edition, ninth edition . Penerbit Vangoo65
[8]   Jose.M Vigas' Integreted Transport Sysstems, Public-Private Interfaces, Hand Book of Transport,Policy and Institutions, Edited by K.J Button and D.A Hensher @2005,Elsevier Ltd.
[9]   Joseph Szyliowicz, Patrick Sherry and Piotr Olszewski " ing Transport" Improving National Center for Intermodal Transportation Intermodal Transportation Institute University of Denver:
[10]   Keneth J Button and David A.Henser,2005" *Handbook Of Transport Strategy,Policy and Institutions,* Handbooks in TRANSPORT Volume 6,Elsevier
[11]   Michael G.H. Bell & Yasunori Iida,2005*The Network Reliability of Transport* Proceeding of the 1   International Symposium on Transportation Network Reliability (INSRI), Pergamon
[12]   Moavenzade F and Markow M.J. 2007.*Moving Millions* Transport Strategies for Sustainable Development in Megacitie,Alliance for Global Sustainability Bookseries, Springer.New York
[13]   Hills Peter at All, 1987*, Roads and Traffic in Urban Areas,* University of Newcastle upon Tyne, Produced by the Institution of Highways and Transportation with the Department of Transport.
[14]   Richard Iles, 2005.*Public Transport in Developing Country* Sabre Foundation Elsever British Library. London
[15]   Roger G. Schorde, Operations Management, c ontemporary concept and cases, Fourth edition 2008, Mc Graw-Hill International Edition 2008
[16]   Slack Nigel at al, Operation Management third edition, Financial Times Prentice Hall is an imprint of PEARSON, third edition 2010.
[17]   Slack Nigel at al, Operation Management sixth edition, Financial Times Prentice Hall is an imprint of PEARSON, sixth edition 2010.
[18]   Steven Nahmias, Production and Operations Analysis, sixth edition, Mc.Graw-Hill International Edition 2009.
[19]   YOUNG AP & CROSS WELL, RW, The Urban Future Transport. Conference's Proceeding, The University of Nothingham Conference on The Council Europe's Europen Campaign for Urben Renaisance, Construktion Press, London, 1982;