Mass Transport Rail Based Study For Sustainable Transportation In Semarang

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Abstract: Transport conditions in Semarang is very alarming, the percentage use of modes of transport in 2014 is a motorcycle (79%), the official car / private (18%), the rest of the other vehicle (3%). To avoid the threat of gridlock, the Government of Semarang city has developed a road-based mass transit, namely BRT, but are still not optimal because the BRT Semarang are not able to meet the standards Permenhub RI NO. 10 In 2012, in particular on special lanes and SK Director General of Land 687 / AJ.206 / DrJD / 2002 in particular about Headway service, downtime and waiting time. Semarang city administration plans to develop a rail-based mass transportation trends, namely the LRT to the TOD concept with a number of Route 9 corridor. Expected later mass transit can be integrated with all types of modes (land, sea,).

Keywords : Mass Transport, BRT, LRT, TOD, Green Transport, Sustainable, Semarang

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1 INTRODUCTION

PRELIMINARY
Semarang city is one of the provincial capitals in Indonesia who continue to improve itself to catch up with more capital, especially in the island of Java. Town with 16 districts is indeed very unique because it is divided into two major regions under development, Semarang and Semarang on. Semarang city population growth is increasing by 1.66% per year which contributed to the various problems of the city, especially the housing needs and bottlenecks. The development of big cities in Indonesia recently led to rampant urbanization resulting in the phenomenon of urban sprawl territorial ie. Urban sprawl is caused by the difficulty of gaining access to land in the city center close to the comprehensive facilities, causing dispersion of population and urban amenities is uneven and there is a problem in service by certain facilities (Siwi, 2014) in the word of (2017).Due to the construction of residential vertically and horizontally in the middle of the city is plagued with more expensive price so that people can not afford the middle to lower income, the housing developers are competing to penetrate the market expansion horizontally up to the suburbs more affordable though distant and the traveling time from the location of the activity. The increase in the residential area causing division in the East, West, South and Semarang.Solution's growing footprint housing on the outskirts of the city of Semarang allegedly come to be one of the causes of congestion problems. Each rush hours in the morning, afternoon and evening, the streets of the city of Semarang filled by private vehicle with all the activities. Although some ways have been made by the city of Semarang including one-way traffic system, and the provision of BRT (Bus Rapid Transit), but the development is so significant that jams still occur due to the growth rate of private vehicles are not comparable to the capacity of the highway.

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Long road Semarang city nearly a decade of no additions or static inversely proportional to the growth of motor vehicles in the range of 12-15% per year. According to the data, the number of private vehicle currently account for 74% of the total number of vehicles. To avoid the threat of gridlock (a condition where the traffic really is not moving) in the future, the Government of Semarang plans to develop the trend of the future of transportation that mass transportation that is safe, convenient, and reliable (capable of delivering passengers to quickly and can be measured latency) so that people can move from one place to another as efficiently and with minimum cost starting from them out of the house to come home.At the FGD (Focus Group Discution) on "Sustainable Transport in Semarang City" organized by the City Government of Semarang and DP2K (Advisory Council for Urban Development) in October 2017 and July 2018, attended by officials, experts, academics, practitioners and communities more , informed that the Semarang city government will build a rail-based mass transit, namely the LRT (Light rail Transit) with 9 corridor, and plans ground breaking will take place in February 2019.To implement a rail-based mass transit in Semarang as one of the solutions to tackle congestion, it is necessary to study the level of compliance, because Semarang is one of the strategic areas and as the center of government in the province of Central Java.The purpose of this study to determine the level of conformity to the LRT construction plan about transport problems of the city so as to promote sustainable development.

2 LITERATURE REVIEW
Mass transit in Semarang
Currently the city of Semarang has a road-based mass transit, namely BRT with name Trans Semarang, which already has seven major corridors and a particular corridor. In SK Director General of Land 687 / AJ.206 / DrJD / 2002 dated August 16, 2002, the Technical Guidelines for the Implementation About Public Transport in Urban Areas in Fixed Route and Organized, in operating a public passenger transport vehicles, carriers must meet two prerequisites minimal services, namely general and specific prerequisites. General prerequisites include waiting time at stops on average 5-10 minutes and a maximum of 10-20 minutes, the distance to reach the city center stops at 300-500 m, to the suburbs of 500-1000 m, replacement

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routes and modes of service, a long journey to and from the destination every day, an average of 1.0 to 1.5 hours, maximum of 2-3 hours and travel expenses ie the percentage of trips on household income. While the special prerequisites include a service factor, the factor of safety of passengers, passenger convenience factor to get the bus and trajectory factors (Imam Basuki, 2007). Wildfire and Heru (2015), examined the BRT based on the standards mentioned above, and the results do not meet the BRT Semarang general requirement that at least three Headway between 52 seconds - 40 minutes (Ideal 5-10 minutes), stopping time between 35 seconds - 68 seconds (Ideal 20-60 seconds), and the waiting time between 52 seconds - 35 minutes (ideal average of 5-10 minutes and a maximum of 10-20 minutes). This can occur because the BRT Semarang not meet the standards of the Republic of Indonesia Regulation of the Minister of Transport NO. 10 Year 2012 About Minimum Service Standards-Based Bulk Transport Road in article 2, paragraph (3b) special lanes and (3d) transport feeder (feeder). To shelter; often over capacity, inadequate facilities, there is no barrier between the passenger transit and nontransit. From these results,

Transport planning

The development of community activities and high population mobility is sometimes not matched with the supporting infrastructure, especially in transportation, so the problem of road congestion always occurs in several major cities. Reduction of congestion can be done through a transportation planning. Transport planning itself can be defined as a process which aims to develop transport systems that enable people and goods to move or migrate safely and inexpensively (Pignataro, 1973) in (Tamin, 2000).There are several concepts of transport planning that has been developed at this time, the most popular are planning model Transportation Stage Four (Four Stages Transport Model) that seizures and pull movement (Trip Generation), Distribution of traffic movement (Trip Distribution), Selection modes (Modal choice / Modal split), and the imposition of traffic (Trip Assignment), which should be done gradually (Tamin, 2000).Transportation planning model four stages can be simplified in order to meet the needs of transportation planning in the area who have limited time and cost. Time is essential, if only a little time is available in the determination of the policy, then do modeling as simple as possible would be better than a thorough modeling. Until recently developed a combination of those steps, which combine stages, then the parameters calibrated with the flow of traffic (road mode, a mode of air, sea modes or abstract mode), the model is called the model simultaneously.Simultaneous Model combining all four phases models into one model that does not directly display the balance between travel destinations, modes and routes are available in the transport network. Models simultaneously generate an estimate of the number of trips antarpasangan-purpose zone of origin which use certain modes and through a specific route (Tamin, 2000).Meanwhile, according to Eddu Pandika (2015), transportation planning is an attempt to estimate the number and location of the need for transportation of the future or in the plan, especially in urban areas. Transportation planning process is done mainly to see is a relationship between transport with land use. The pattern of land development will result in the need for transport, on the contrary forms of transport systems will affect the pattern of land development.

Model Selection Modes

Selection mode is perhaps the most important models in transportation planning. This is due to the key role of public transport in the policies of transport than private transport. This model aims to determine the proportion of people who will use each mode. Selection modes also consider the movements that use more than one mode of the way (multimodal). This is the type of movement that are often found in Indonesia because Indonesia's geography consists of many islands that a fairly high percentage of multimodal movement. Thus, it can be said that the modal choice modeling is the weakest and most difficult part of the four stages modeled transportation planning models.

Factors that may affect the modal choice are:

1. **Characteristics of road users**
   - Availability or ownership of private vehicles; The higher the ownership of private vehicles, the smaller dependence on public transport
   - SIM ownership
   - Household structure (young couples, families with children, retired, single)
   - Income; the higher the income the more likely to use private vehicles
   - Other factors, for example the necessity to use the car to take the kids to work and school purposes

2. **Feature movement**
   - Objective movement
   - The timing of the movement
   - distance traveled

3. **Feature modes of transport facilities**
   - Quantitative factors, such as; travel time, travel expenses, availability of space and parking rates
   - Qualitative factors, such as; comfort and safety, reliability and regularity, and others

Based Bulk Rail transport in Indonesia

Urban mass transportation began to be built in line with the increase in the population of major cities in Indonesia by making mass transit a necessity. Currently, the Government is finalizing several projects of railway construction in the city (Presidential Decree No. 3 of 2016 on Accelerating the Implementation of Strategic Projects National), among others MRT Northern Corridor South MRT Eastern Corridor West Railway Express Soekarno Hatta International Airport, Jabodetabek Circular Line, integrated LRT in Jakarta, Bogor, Depok and Bekasi, General Railway Operation in the area of Jakarta, and the Light Rapid Transit (LRT) South Sumatra (Joseph, 2016),Program development of intermodal integration between the railway to the airport and the harbor as KA airport train access Kualanamu airport train which is the first in Indonesia which will be followed by other airports and railway construction plan liaison with the port. In

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addition, several projects to improve the development of new territories and new economic zones as well as the integration of the region, the Government is building faster trains (High Speed Train / HST) Jakarta-Bandung, medium speed railway Feasibility Study (Medium Speed) Jakarta-Surabaya, Bandung LRT Raya and Tram Surabaya, Batam City LRT. Jabodetabek mass transit network is an example of an integrated area of suburban transport lines towards the city center and vice versa which have already begun to be the integration of all modes (BRT, MRT, LRT, KRL, train service) in a Region TOD (Transit Oriented Development). Policies that can be used as a reference by the local government in building a mass transit is Permenhub RI NO. 54 Year 2013 About the General Plan Mass Transport Network In Urban Area Jakarta, Bogor, Depok, Tangerang, and Bekasi (Jabodetabek) and Candy Minister of Agrarian and Spatial Planning / Head of National Land Agency 16 Year 2017 on Guidelines for Transit Oriented Development of Regions

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Rail-Based Mass transit in Semarang

Semarang city government plans to build a rail-based mass transit, namely the LRT (Light Rail Transit) with 9 corridor. These corridors will be built is a 9 out of service - Madukoro - Fur Market - Tjokroaminoto - Simpang Lima route along 8,1Km. The first phase of the corridor will be built tourist route 9 from Ahmad Yani Airport - Market Feather with path length of 5.9 Km to give access of tourists to the Region Tugu Muda and Lawang Sewu.'
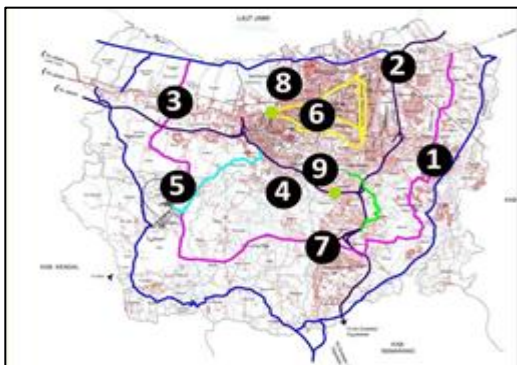

Fig. 1 *Plan LRT These Semarang*

1. LRT corridor, Mangkang-Kalibanteng, double line, length of 12.2 km.
2. LRT corridor, Ahmad Yani Airport-Tawang Station, a double line, 10.1 km long
3. LRT corridor, Simpang Lima-Tawang Cycle Line, Single Line, length of 8 km
4. LRT Corridor, Penggaron-Simpang Lima, Double Line, length of 8.7 km
5. LRT Corridor, Dr.Cipto-Citarum-Fatmawati, Double Line, 9.4 km long
6. LRT corridor, Tawang-Port- Bangetayu, Double Line, 7.3 km long
7. LRT corridor, Fatmawati-Bangetayu, Double line, length 6 , 8 km
8. Corridor LRT, Kalibanteng-Pamularsih-Milo, Double line, length 7.8 km
9. Corridor LRT, service-Madukoro-Market-Tjokroaminoto Fur-Simpang Lima-Double Line, 8.1 km

Priority stages of structuring rail-based public transport in urban areas (ITDP, 2018):
[1] Non Motorized Transport, Increased accessibility and provision of basic needs of urban mobility for pedestrian and bicycle facilities
[2] The public transport reform, Improving urban mobility through the reform of public transport in serving the neighborhood streets (feeder)
[3] Bus Rapid Transit (BRT), the provision of mass transit to serve the major urban movement patterns at the same time the improvement of the city
[4] Based Rail Transitsuch as the MRT, LRT, providing rail-based mass transit to assist in the fulfillment of the high travel demand

3 RESEARCH METHODOLOGY
In general the method used in research studies Rel-Based Bulk Transport For Sustainable Modern Transportation in Semarang is quantitative descriptive approach. Data used in the study is Primary data in the form of reports FGD and secondary data in the form of policies. Data collection techniques in this study include observation and document review. Data analysis techniques used in the form of quantitative descriptive analysis

4 RESULTS AND DISCUSSION
Nugroho (2018) in a study whose results were presented at the FGD mass transport of DP2K Semarang, among others:

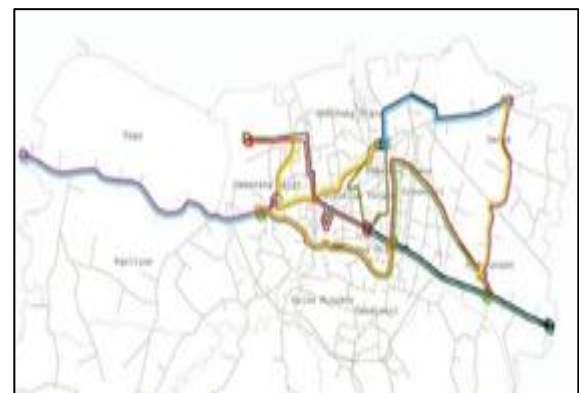1. Evaluation segment; of 8 roads studied Degree of saturation

Fig.2 *Map Evaluation Segment*

Table 1. *Degree of Saturation 9 Jalan Semarang*

No	Nama Jalan	Derajat Kejenuhan (DS) Tahun					
		2016	2017	2018	2019	2021	2026
1	Jalan Brigjend Sudiarto	0,932	1,006	1,087	1,173	1,369	2,011
2	Jalan Kaligawe	0,801	0,865	0,934	1,009	1,177	1,729
3	Jalan Mangkang	0,908	0,980	1,059	1,143	1,334	1,960
4	Jalan Menoreh	0,993	1,072	1,158	1,251	1,459	2,143
5	Jalan Mijen	0,974	1,052	1,137	1,227	1,432	2,104
6	Jalan Pandanaran	0,856	0,925	0,999	1,078	1,258	1,848
7	Jalan Perintis Kemerdekaan	0,899	0,971	1,048	1,132	1,321	1,940
8	Jalan RE Martadinata	0,641	0,693	0,748	0,808	0,943	1,385
9	Jalan Sultan Agung (BPJS)	0,648	0,700	0,756	0,816	0,952	1,399

1. Simpang evaluation; studied the intersection of 5 degrees of saturation
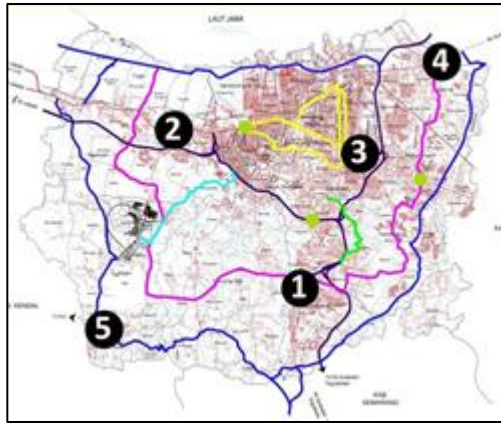

Fig.3 *Map Evaluation Simpang*

Table 2. *Degree of Saturation 5 intersection of Jalan Semarang*

No	Nama Jalan	Derajat Kejenuhan (DS) Tahun					
		2016	2017	2018	2019	2021	2026
1	Simpang Sukun	0,704	0,761	0,821	0,887	1,035	1,520
2	Simpang Jrakah	0,718	0,775	0,837	0,904	1,055	1,550
3	Simpang MILO	0,723	0,781	0,844	0,911	1,063	1,562
4	Simpang Genuk	0,755	0,815	0,880	0,951	1,109	1,629
5	Simpang Cangkiran	0,754	0,815	0,880	0,950	1,108	1,629

2. Downhill road network performance, because it is mixed constantly 26%, towards the city center and towards Hinterland 58% 16%

3. Flow West - East as much as 7024.4 SMP with LV = 23.95%, MHV = 9.2%, LB = 17.46%, LT = 9.47%, MC = 39.92%
Flow North - South as much as 7598.2 SMP with LV = 39.49%, MHV = 1.64%, LB = 14.84%, LT = 5.37%, MC = 38.67%

4. shiftperson in segment StreetCitySemarangmorefrom 250,000,000 passengers / year
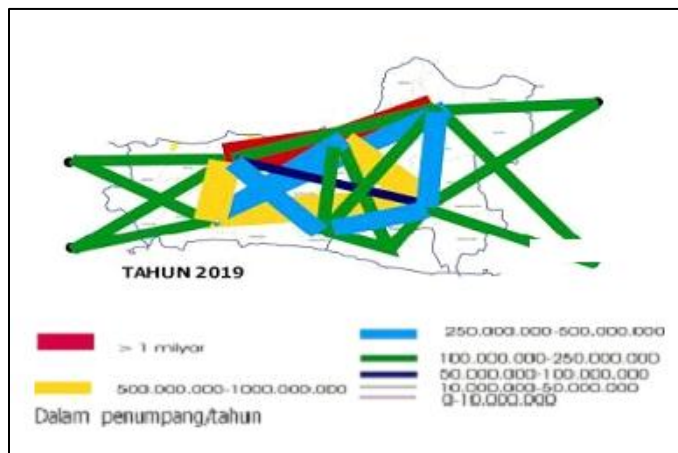

Fig.4 *Map the movement of people*

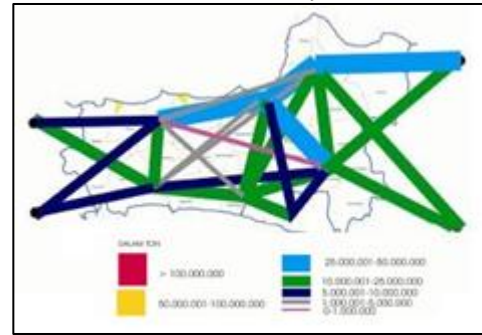5. The movement of goods in streets of Semarang city of more than 10 million tons / year

Fig..5 *Map the movement of goods*

5 CONCLUSION

- 1.The movement of traffic in the city of Semarang influenced External factors named as one of the entrance gates of national activities / international and as a crossing area between two mega cities, namely Jakarta and Surabaya
- 2.The movement of traffic in the city of Semarang is also influenced by internal factors, namely; residential development in the city center and in the suburbs that increasingly congested, uneven population distribution, the development of strategic areas are still minimal, the plan is still concentrated in the city center to city
- 3.Based on the degree of saturation of research results, the performance of the road network, movement of people continues to increase, the city of Semarang in need of transportation to accommodate the rail-based infrastructure through the development of the concept of TOD LRT.
- 4.Permenhub policies RI NO. 54 in 2013 and Candy Minister of Agrarian and Spatial Planning / Head of National Land Agency 16 Year 2017 can be used as a reference for the management of the Transport suistainable in Semarang.

6 SUGGESTION

- Increasing the capacity of the road network, by the way: building infrastructure, encouraging mobility "Unmotorized", setting Simpang, build an integrated public modes in the transport network nodes, the arrangement of additional traffic generation and attraction in the city of Semarang,
- Adjusting the volume of traffic, by: encouraging modal transfer from the private to the public, the setting mode 2 wheel motors
- 3.Build public transport / mass reliably, by the way: integrating all types of modes, cooperation to all parties, especially Organda

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