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Important Factors in Urban Public Mass Transport Railway-Based

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Abstract

Increasing urbanization in developing countries, causing the urban population is rapidly increasing. Today more than 50% of the world population live in cities, including in Indonesia. Increased economic activity and business in urban areas impact on the increased demand for the transportation services. Public transport is currently not able to fulfil demand for the transport services (23%). Based on the guidelines of the Ministry of Transportation in 2002 about the type of transport based on the size of the city, the metropolis with a population more than 1 million peoples are required to have the urban mass transport can serve the movement of the citizens. Urban mass transport can based on road and rail-based (railways). The performance of mass transport in Indonesia is declined, such as the number of passengers decreased due to several things, i.e. the absence of priority at the crossroads, travel time is longer than private vehicles. Public transport services are not well triggered an increase in the use of private vehicles is believed to be one of the causes of traffic jams and pollution. However, until now all of the city-scale population of more than 1 million have mass public transport, either bus or rail-based. Learning from the experience of countries that already have urban mass transportation railway-based, there are important factors that must be taken into account in building a railway-based urban public transport, except the total population. By using Analytical Hierarchy Process (AHP) obtained five important factors in building a rail-based mass public transport, namely: fiscal or economic capacity of the region and the community, land use, integration with other public transport, infrastructure, and transport policy. In the cities with a population of more than 1 million people, but there are some factors that have not been fulfilled, need assistance from the central government so that rail-based mass public transport can be realized.

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Keywords:mass public transport railway-based

1. Introduction

As the population growth and urban economies in developing countries, including Indonesia, then the number of travels will increase, which also means an increase in mobility in the urban areas. This condition demand the readiness to support the provision of transport movement (mobility) of citizens in activity and support economic mobility of the city (urban economic mobility). Noted that the role of public transport in Indonesia on average by 23%, while in developed countries the role of public transport more than 50%, even public transport to reach 60% in Singapore and Hong Kong reached 90%. Public transport is available today in some big cities in Indonesia tend not developed, even the worse performance seen by the increasing dominance of private vehicles dominate the road, especially motorcycles. Public transport is still not optimal in terms of capacity, level of service, the provision of infrastructures inadequate, as well as the lack of integration between freight transports. Disruption of the mobility of citizens may result in disruption of urban economic growth.

Related to the statement, an increase in the number of requests transport services in urban areas is one indicator of the growth of the urban economy. It is undeniable that the metropolitan Jakarta

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and Surabaya is still a strong magnet urban economic activity on a national scale. Currently Jakarta commuter train transport about 600 thousand passengers per day and is projected in 2018 to transport about 1.2 million passengers per day, so need to additional facilities and supporting infrastructure mass public transport railway-based. Surabaya as the second largest city in Indonesia with a density of 10 721 persons per km2 in 2006, have high activity and economic growth above 6% per year. Surabaya is dominated by trade sector, hotels and restaurants (36.97%) required transportation urban mass transportation that is efficient and effective way to maintain the momentum of economic growth. To anticipate, cities in Europe such as : Amsterdam, The Hague, Rotterdam in the Netherlands, Paris in France, also in Germany, Sweden, England, Spain, Turkey, and even in the United States use the Light Rail Transit (LRT) and Tram as urban mass transportation that operates is well until now. In the case in Asia, some countries such as : Japan, Singapore, Hong Kong, China, Taiwan, and Korea has been seeking urban mass transport railway-based to anticipate similar conditions. The international experience, can be used as learning materials for the Indonesian government to consider railway-based freight transport as mass transit in urban areas. In addition to the large haulage, cheap, saving fuel, also environmentally friendly. Fuel consumption for trains per km per person is only 0.002 liters compared to 0.0125 litersfor bus, 0.08 liters for aircraft, or 0,006 litersfor ship per km per person. Be expected to support policies that encourage the use of mass transport railway-based in urban areas will be an alternative solution that have positives multiplier effect not only for the reduction of urban transport problems but also improve the quality of life urban areas of citizens. At this time there are many metropolitan cities with a population of more than 1 million people who do not have in urban areas mass transport, especially those railway-based.

2. Literature review (urban public transport)

Urban public transport has an important role as the pulse of urban economic growth. Community activities that increase causes movement of people also increased,therefore needed the transportation to support their activities. Many types of freight transport are used to support community activities.

Fricker and uchic have a statement according to the operation and their use, types of freight transport can be divided into: 1) Private vehicle, which is vehicles owned and operated his own for personal gain and most abundant and has species such as cars, bicycles, motorcycles; 2) Rental vehicle, which is freight transport provided by the operator, there is no specific route as the user desires (demand responsive), anyone can use it to pay some money (as agreed), convenience and privacy become one of the offered on the freight transport of this type although the rent is high, for example is taxi; 3) Public transport, also known transit, mass transit or mass transportation. This is the type of freight transport that has certain route, certain time, be used together with pay fee (ticket). Freight transport are used according to the conditions and development of the city, among others:bus, minibus, electric trains, monorails, trams and etc.

Overall, urban public transport can be divided into two, which is highway-based and railway-based, as illustrated in Fig. 1.

Urban transport in Indonesia today are mostly based on urban transport highways and conventional (taxi, public transportation), are also in environment of motorized transport and non-motorized.Some cities are already implementing mass transport highway-based (BRT) such as, Jakarta, Jogjakarta, Pekanbaru, Manado etc. This transport apparently not as expected, example Transjogja, when viewed from the number of buses should plan now has reached 150 pieces,but the reality is still 54 pieces with load factor of less than 50%.Transjakarta passengers since 2012 also declined,the problem is not the priority at bus stop and not the sterility of busway lanes so the speed is low. Land transportation department release a directive on the types of freight transport that used for public transport based on the size of the case in cities as table 1. The larger the size of the city and the area, the more population,more and more also activities carried. It needs appropriate freight transport.

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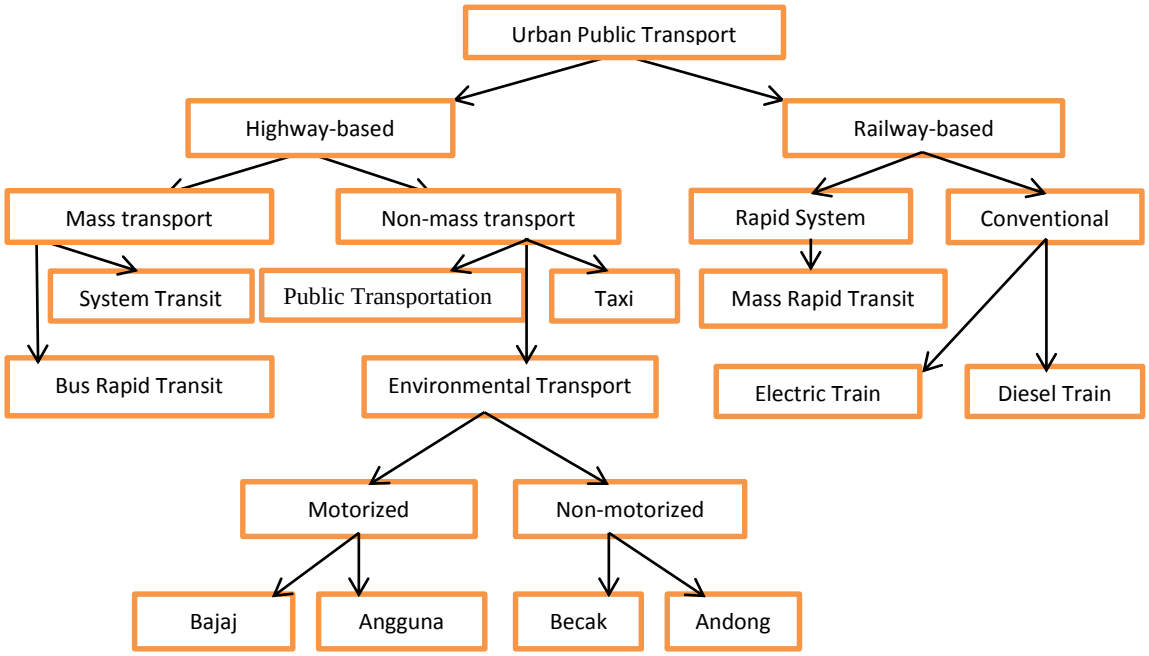

Fig. 1. Urban Public Transport (Nanang, 2014)

Table 1. The types of freight transport appropriate size of the city

Ukuran kota / Klasifikasi	Metropolitan (> 1 juta penduduk)	Kota besar (500 rb – 1 juta)	Kota sedang (250 ribu- 500 ribu)	Kota kecil (< 250 ribu)
Trayek Utama	-KA/LRT -Bus besar	-Bus besar	-Bus besar/ sedang	-Bus sedang
Cabang	-Bus besar / sedang	-Bus Sedang	-Bus sedang/ kecil	-Bus kecil
Ranting	-Bus kecil	-Bus kecil	-MPU	-MPU
Langsung	-Bus besar	-Bus besar	-Bus sedang	-Bus sedang

Sumber : Hubdar,2002

Freight transport that are used as main freight transport, can be train, light train, tram, monorail, bus, articulated buses, etc; depends on the condition/demandin the urban areas, whereas for feedercan use the vehicle / bus small or medium size, this integration is important for public transport becomes interesting, because the urban public transport should ensure the movement of people/door to door, because talking about urban public transport means talking about intermodal transportwhich is part of an ongoing movement.

3. Urban Mass Transport Railway-based

Urban mass transport railway-based by Munawar and Haring there are several kinds, among others:

1. HRT (Heavy Rail Transit), trains operated in a special way and does not intersect with the highway.
2. LRT (Light Rail Transit), electric trams that operate in the city, generally operate on the highway along with other vehicles (mix traffic), but it can also be operated in the basement or on the highway.
3. Metro, similar HRT, is urban railway with separate line and not a piece of the highway.
4. Commuter train, a kind of train that operated in urban areas.

LRT / Tram has some advantages compared to the others,because it can operate together with other vehicles on the highway (follow the pattern of the highway),then Tram has the ability to swing sharply as other vehicles and the brakes better than the Metro or HRT.Tram is also very good to be operated in the old towns with relatively narrow streets and old buildings.Infrastructure for LRT / Tram cheaper than HRT and had a high level of comfort for passengers.Trams and LRT have a large enough capacity,for Tram can carry 173 passengers (77 seated, 96 standing) whereas LRT 230 passengers (100 seated, 130 standing), this capacity is much larger than the capacity of BRT that is only capable of carrying 70 passengers (30 seated, 40 standing).

LRT and tram does not need a wide space so it can be operated in various conditions of the city, such as: a) together with other vehicles on the highway; b) together with the bus, the tram and bus lane; c) pedestrians; d) the green line on the wide road. If there is no place in the road surface, can be operated in the underground (tunnel) or on the ground. Public transport that railway-based can carry many passengers,so can be reduce the traffic density/congestion on the highway. On the tram network, can also be used together with metro,like the one in Amsterdam that regional RandstadRail tram with the Metro or in Stuugart Germany,are shared between StadtBahn and tram. Tram can operate together other traffic (mix traffic) on the highway or separately. Indonesian government through the department of transportationalready planning the construction of urban public transport that railway-based to 2030 as seen in Table 2.

Table 2. Urban Railway plans until 2030

No.	PROGRAM	TAHAP I (2011-2015)	TAHAP II (2016-2020)	TAHAP III (2021-2025)	TAHAP IV (2026-2030)
3.	Pengembangan jaringan dan layanan kereta api perkotaan				
	• Medan				
	• Pekanbaru				
	• Padang				
	• Palembang				
	• Bandar Lampung				
	• Batam				
	• Jakarta (Monorel dan MRT)				
	• Bandung Raya				
	• Surabaya				
	• Semarang				
	• Yogyakarta				

Courtesy :Kemenhub (Ripnas, 2011)

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The use of this rail-based urban transport has some advantages, among others, can carry many passengers,environmentally friendly and fuel-efficient than others freight transport. With used rail-based urban mass transport is expected to increase the feasibility the city as a shelter (liveable city).

However, from the cities with population more than 1 million,there are still many cities who do not operate urban mass transport.Whereas according to Moichi 2014, if it's late, will be difficult to achieve the expected performance. Fig. 2 shows when the public transport should be implemented.

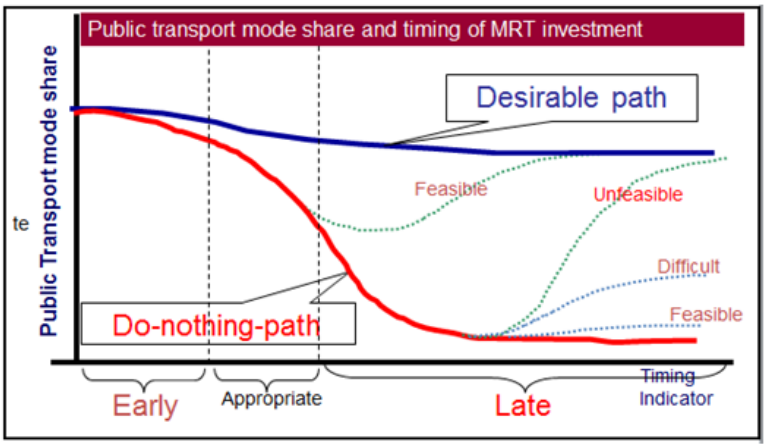

Fig. 2 Public Transport Mode Share and Timing of MRT Investment

4. Important factors in the urban mass transportation based railway

Results of the analysis of data compiled from a variety of literature and on field observations of the cities that already implementing transit-based city railways in Europe (Amsterdam, the Hague, Utrecht, Paris, Prague, London) representing the state already established and in Asia (Beijing , Dhaka, Singapore, Hongkong, Tokyo),representing a developing country,representing a developing country,there are important factors that affect the decent or not be applied railway-based mass public transport. These factors include:

- Size of the city/ the total population
- Functions of the city
- System of the land use
- Ticket and the travel time
- Integration with public transportation
- The technology used
- The ability of local economy and the region
- Transport Policy
- Availability of the infrastructure

5. Priority selection method.

Important factors aforesaid, and then made the order of priority by usingAnalytical Hierarchie Process (AHP).Analytical Hierarchy Process (AHP) was first introduced by Thomas L. Saaty in 1971-1975 at Wharton School and is used for planning the US military.AHP is one of the methods for making decisions with diverse criteria and considering the complexity of the problems in a simple way,but still ensure the consistency of the decisions taken. AHP is a method of making decisions by exploiting the perception of respondents considered experts as the main input. Criteria experts here does not mean that person must be a genius, smart, etc, but are more refers to

a person who understood the problems posed, feeling the effects of a problem, or have an interest in the issue (Oktariadi), Interim results today order of priority is as below.

- The ability of local economy and the region
- Transport Policy
- Availability of the infrastructure
- System of the land use
- Integration with public transportation
- Ticket and the travel time
- Size of the city
- Functions of the city
- The technology used

Results order more, including weight, when analyzed by AHP as in Table 3.

Table 3. Results of analysis AHP

	Criterion	Comment	Weights	Rk
1	ukuran kota	tergantung jumlah penduduk, lebih besar lebih penti	6.9%	7
2	Fungsi kota	Niaga, pendidikan , wisata	6.6%	8
3	tata guna lahan	kompak, sprawl, satelit	10.9%	4
4	Biaya dan waktu	Biaya (tiket) dan waktu perjalanan	8.6%	6
5	Angkutan umum	koordinasi/ integrasi dengan AU yang ada	9.9%	5
6	Teknologi	HRT, LRT, monorel	4.7%	9
7	Fiskal	Kemampuan fiskal daerah dan ekonomi masyaraka	24.3%	1
8	Kebijakan	Kebijakan transportasi a.i ; park n ride	16.8%	2
9	Infrastruktur	kesulitan pengadaan infrastruktur transportasi	11.2%	3
#			0.0%	

The interim results of analysis by AHP method shows that the first order of important factors that determine the appropriateness of urban mass transportation railway-based economy is the ability of the community and region. While the factors on which to base the size of the city transportation department to determine the type of freight transport is used, fact there are in seventh. It can be understood that see cities in Europe that the average number of population under 1 million but its urban-based mass transit railway.Metropolitan cities with a population greater than 1 million people but there are still some factors that have not been fulfilled,need assistance as soon as possible in order to have an urban-based mass transit railway.

6. Conclusion

Cities with a population of more than 1 million people already require mass public transport. Urban mass transportation can be highway-based or railway-based. Rail-based mass transportation to reduce air pollution and improve the condition of the city as livable*(liveable city).* Urban mass transportation railway-based need the significant factors other than the size of the city. The ability of the local economy and the area becomes the most important factor, while the technology to be used is not so important. Metropolis who do not meet the criteria of these factors, need assistance in order to immediately hold a public transport rail-based mass.

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