Grand Scenario
of Surabaya Metropolitan Public Transport Development

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Abstract: Surabaya City and the 6 surrounding regencies have developed into big metropolitan area, with total population is 9.1 million people and turned into regional and national economic activity center. As the second biggest metropolitan area of national scale, Surabaya Metropolitan Area (SMA) has to challenge the very complicated problem of high degree of traffic density.

In solving the bottleneck, it is important to perform integrated mass public transport development, for both cross-mode and inter-mode. Train is highly potential to develop as mass public transportation, since it is supported with adequate network and reaches all areas. In addition to train, another mass public transport potentially to develop will be city bus (accommodating 50 passengers) for main link integrated with Train mode, connecting Train station and main bus station to urban activity centers. Furthermore, public transportation mode connecting main activity center to other areas will be minibus (accommodating 20 passengers). With this hierarchical, integrated mass public transport, the expectation will be that the society will find facilitation in making trip, and reducing pollution as the result of traffic density.

Keyword: Urban public transport, integrated mass public transport, Surabaya Metropolitan Area, bottleneck, multimode hierarchy system, commuter, economic concentration.

1. INTRODUCTION

Surabaya Metropolitan Area comprises of 7 regencies and cities; they are Surabaya City, Gresik Regency, Sidoarjo Regency, Lamongan Regency, Mojokerto Regency, Mojokerto City, and Bangkalan Regency, with total area of 6,176 km2, and total population of 9,119,044 people (population census of 2010). Surabaya City is the capital of East Java Province, and Surabaya Metropolitan Area (SMA) refers to metropolitan area developed from the growth of Surabaya City, spatially spreading to other six administrative areas which, in socio-economic activity context, have turned into the integral part of urban activity. Therefore, based on function and role of Surabaya Metropolitan Area (SMA) in the scope of East Java Province and National, Surabaya Metropolitan Area (SMA) undergoes relatively important socio-economic role. This area has contributed 35% of Gross Regional Domestic Product (GRDP) of East Java comprising of 38 regencies and cities with total population of 37.47 million.
Supported with very strategic geographic position, Surabaya Metropolitan Area (SMA) also grows to be the center of goods and service distribution for East Area of Indonesia populated with approximately 45.08 million people and brings contribution to national economy of 17.9%. The function of Surabaya Metropolitan Area (SMA) is assisted by adequate land, sea, and air transportation network with Surabaya City as main node.

Playing very strategic role in provincial and national scale, Surabaya Metropolitan Area (SMA) has dynamically grown, owning rapidly growing regional and national-scaled socio-economic activities, including industry, banking, trading and service supported with ports, airports and land transportation. In 2010, total population of Surabaya City is 2.76 million, while total population of all Surabaya Metropolitan Areas (SMAs) is 9.12 million. Such high economic concentration in the center of Surabaya City and great number of population are very potential to bear commuter flow to Surabaya City, from south (Sidoarjo and Pasuruan), southeast (Mojokerto and the surrounding), west (Lamongan and the surrounding), and north (Madura Island).
2. EXISTING CONDITION OF TRANSPORTATION SYSTEM IN SURABAYA METROPOLITAN AREA

The urban activities in Surabaya Metropolitan Area (SMA) are centered in Surabaya City; accordingly, the orientation of traffic movement of Surabaya Metropolitan Area (SMA) also takes a place in the same city. Hence, in Surabaya Metropolitan Area (SMA) analysis context, 2 zones can eventually be made; they are Surabaya City Zone and outside Surabaya City Zone.

Essentially, there are two kinds of traffic movement in Surabaya Metropolitan Area (SMA); internal traffic of Surabaya City and traffic from out of Surabaya City. External traffic of Surabaya City comprise of traffic from Surabaya Metropolitan Area (SMA) and from out of Surabaya Metropolitan Area (SMA). Traffic from out of Surabaya City taking a place in Surabaya Metropolitan Area (SMA) may be categorized into commuter. Such high commuter volume is the result of great number of people working in Surabaya City but residing outside Surabaya City, including in Sidoarjo, Mojokerto, Gresik, Lamongan and Bangkalan.

Commuter volume in Surabaya Metropolitan Area (SMA) is approximately 1,750,000 peoples, spreading widely from south (Sidoarjo, 800,000 peoples), southeast (Sidoarjo and Mojokerto, 500,000 peoples), west (Lamongan and Gresik, 300,000 peoples) and from north (Bangkalan relatively small number of commuter, 150,000 peoples).
Most of population mobility is largely performed using personal car and motorcycle and the rests benefit public transportation. The public transportation includes city bus, microbus, and train, with proportion of each mode as provided in the following table.

The high proportion of personal car and vehicle has brought about high degree of traffic density, since load factor of personal car is very low.
The motorcyclist gives a great number of contributions on traffic volume, reaching to 54%. This is due to the fact that motorcycle costs inexpensive, can purchased on credit without advance payment, high accessibility, capable of avoiding traffic jam and very flexible since it can pass through tight street and the most importantly, it can be used door to door. In whatever way, safety level of motorcycle user is relatively poor since the awareness of obeying traffic regulations and signs and discipline of motorcycle user is extremely insufficient. The use of motorcycle is considered the cheapest, easiest option, achieving high accessibility. Until recently, the government has not made controlling effort in relation to the rapid growth of motorcycle volume, despite the great number of motorcycle accidents. The data shows that the highest volume of traffic accident and dead victim occurs in motorcycle mode.

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Average Accident per Month</th>
<th>Total Average Victim per Month</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>MC</td>
</tr>
<tr>
<td>2009</td>
<td>119</td>
<td>99</td>
</tr>
<tr>
<td>2008</td>
<td>99</td>
<td>82</td>
</tr>
<tr>
<td>2007</td>
<td>119</td>
<td>101</td>
</tr>
</tbody>
</table>

Note: MC = motor cycle.

High degree of traffic density takes a place in all main road of Surabaya City, and in certain hours, especially in the morning, day, and afternoon, traffic jam regularly occurs. Moreover, traffic jam in Surabaya Metropolitan Area (SMA) continuously takes a place in all entrances of Surabaya City because bottle neck happens in all entrance accesses to Surabaya City from hinterland area. In addition, traffic jam mostly occurs in main roads; thus, the average speed in Surabaya City at peak hours is only 18 km/hour.

The role of public transport is very low, approximately 10% of total population mobility, consisting of 8% road way public transportation, including city bus, microbus, and pre transit (taxi), and 2% public transportation of train mode (rail way mode).

As a matter of fact, commuter train has served Sidoarjo-Surabaya route since 2004, Lamongan-Surabaya route by the early 2008, and Mojokerto-Surabaya by the early 2009. However, the commuter train has not contributed optimum service due to low headway, approximately 30 minutes for Sidoarjo-Surabaya route, 60 minutes for Lamongan-Surabaya route, and only 4 times a day for Mojokerto-Surabaya. On top of that, the train could not offer optimum service since it is not supported with feeder and the unavailability of adequate parking area in each station. In addition, the service quality offered by commuter train is very low, particularly in several aspects, including comfort, cleanliness, facility completeness, and security. The data shows, volume of commuter train passenger, year by year, could not grow significantly, in other word, stagnant.

Some important problems concerning public transportation service are:

1. Almost all public transportation armadas have been aged, more than 10 years, and thus safety and comfort level is low.
b) Service quality is low. For example, most of city buses are not equipped with AC. Meanwhile, all microbuses have the same condition.

c) Headway is low, unscheduled. City bus will only leave bus station, if it is full of passenger; moreover, total passenger of city bus is more than 100%.

d) Nonintegrated inter-mode and cross mode, making the society difficult to utilize public transportation.

e) Low society’s interest in using public transportation due to low service quality. In addition, by riding motorcycle, the society may have high mobility, even door to door.

3. SURABAYA’S ECONOMIC DEVELOPMENT POLICY IN SURABAYA METROPOLITAN AREA

Surabaya Metropolitan Area (SMA) economic development policy is stipulated in Regional development policy of East Java Province Goverment, which is further described in development policy of each regency and city. Based on Mid-Term Development Plan of East Java Province, the economic growth of Surabaya Metropolitan Area (SMA) is predicted to reach 7.0% per year in the following five years. The economic growth is particularly supported by the growth of industrial, trading, and financial service sector. Meanwhile, East Java Province is targeted to reach 6.5% per year and national economic growth is targeted to reach 6.2% for the same period. This economic development policy of Surabaya Metropolitan Area (SMA) is supported with regional spatial planning policy as stipulated in Regional Regulation of East Java Province No.2/2006 concerning Regional Spatial Planning of East Java Province.

With reference to this Regional Spatial Planning, land usage on Surabaya Metropolitan Area (SMA) is allocated for settlement, industry, trading and financial service supported by agricultural activity in hinterland area. Upon the establishment of Suramadu bridge, connecting Surabaya City to Madura Island, the expectation will be that it could eventually encourage more rapid economic activity growth in Madura Island, particularly in Bangkalan Regency, since, in geographic point of view, this regency consists of competitive value greater than that in other areas.

In addition, port construction planning in Bangkalan, Container construction in Teluk Lamong and extreme rapid industrial development in Northern Coast area (Regencies of Gresik, Lamongan and Tuban) will evoke significant movement in the future. Meanwhile, the recently performed construction of Surabaya-Mojokerto toll road and rapid settlement development in Sidoarjo Regency will also bring about high degree of movement in the future.

Total population by 2020 in Surabaya Metropolitan Area (SMA) is projected to grow approximately 0.52% per year, partially influenced by in-migration factor due the existence of population mobility flow undergoing urbanization from rural area. Based on the projection result, total population in the following ten years in area of Surabaya Metropolitan Area (SMA) is predicted to be 9.62 million. Population distribution in each area is projected to bring about significant change as the rate of population growth in each area is slightly different.
Economic growth, changes in land use and population growth in each area are included into primary factors that will substantially determine the growth of total vehicles, volume, and traffic density.

In the essence, economic growth and population growth by 2020 will have insignificant difference if compared with the growth in the last five years; thus, the growth of total vehicle and traffic density through the next ten years may be projected based on the last five years tendency.

4. MOBILITY VOLUME PROJECTION

As socio-economic activity, total population and population density increase, total motor vehicle will undergo the same, and as might be expected, this will reveal implication on traffic density.

Assuming that population growth and economic growth by 2020 may run as projected, about 0.52% per year for population growth and 7% per year for economic growth, then the growth of vehicle population will also increase in line with the ongoing progress, wherein the growth of total motorcycle reaches 12% per year, 7% of personal vehicle, and 4% of goods vehicle. This projection of total vehicle growth is also established upon the assumption that service offered by public transportation is just as stagnant as recent condition, thus societal preference for benefiting public transportation is still low and the society prefers riding personal vehicle and motorcycle. Based on the aforementioned formulation, the projection of total vehicle in Surabaya Metropolitan Area (SMA) through 2020 is described in the following table.

<table>
<thead>
<tr>
<th>No</th>
<th>Type of Vehicle</th>
<th>2010</th>
<th>2015</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Passenger-Carrying Vehicle (PCV)</td>
<td>342,376</td>
<td>480,201</td>
<td>673,506</td>
</tr>
<tr>
<td>2</td>
<td>Bus</td>
<td>30,674</td>
<td>37,319</td>
<td>45,405</td>
</tr>
<tr>
<td>3</td>
<td>Goods Vehicle</td>
<td>162,738</td>
<td>188,657</td>
<td>229,531</td>
</tr>
<tr>
<td>4</td>
<td>Truck (6 wheeled and more)</td>
<td>61,027</td>
<td>70,747</td>
<td>82,015</td>
</tr>
<tr>
<td>5</td>
<td>Motorcycle/Motorbike</td>
<td>2,638,771</td>
<td>4,249,767</td>
<td>6,844,292</td>
</tr>
</tbody>
</table>

As population and economic activity grow in Surabaya Metropolitan Area (SMA), the very important consequence will be that the increased volume of commuter will definitely enlarge traffic volume burden on entrance corridors of Surabaya City. This commuter will keep on increasing as economic activity grows in Surabaya City as the National and Regional economic activity center. High land cost in city center will not definitely allow having occupancy in this area; meanwhile, economic activity in city center keeps on developing into the primary factor of the increased number of commuters.
Thus far, adequately representative public transport has not been available to satisfy commuter mobility, most of whom take advantage of personal vehicle, by either car or motorbike. City bus, luckily, running on Sidoarjo-Surabaya and Mojokerto-Surabaya routes, has only contributed approximately 5% of total mobility of each link. On the other hand, the role of commuter train has only reached 0.5% in approximation. As the result of high rate of commuter flow, bottleneck potential on entrance link of Surabaya City grows even greater. Accordingly, the necessity of public transportation development in serving society performing commuter is highly required and urgent, otherwise, such bottleneck in main links will even get worse. As expressed by Chamber of Commerce and Industry (KADIN), this bottleneck has bring about economic interference of about 5% of production cost, as transportation cost serves as essential section of production cost. If this bottleneck continues to increase, the production cost will increase and this indicates that competitive value of economic activity in this area will result in considerably significant decline.

5. PUBLIC TRANSPORTATION NECESSITY

The extreme increased vehicle volume inequality, on one hand, and delayed road network construction, on the other hand, of course, will eventually bring about bottleneck. The most realistic solution to diminish the bottleneck will be by means of providing mass public transportation, therefore.
By providing mass public transport, it is expected to be capable of reducing personal vehicle and motorcycle volume. With high degree of load factor, the mass public transport will effectively diminish the volume of on-road vehicles.

On account of inadequate condition of mass public transport, public transport development will be in need of grand scenario and relatively long stage.

The concept of mass public transport provisioning in Surabaya Metropolitan Area (SMA) is provided below:
1. The use of mode for mass transport is by utilizing multimode hierarchic system that is taking the advantage of rail network transportation mode and road transport mode in integrative manner.
2. Rail transportation is for long-distance and mid-distance based main network service (10 – 100 km), road-based public transportation is used for short-distance (< 20 km). Get-on and get-off locations in all modes should be integrated, in other word, main train station should be integrated with main bus station, and so forth, thus facilitating passenger to make trip and change mode.

Hierarchic concept of mass transport system is provided in the following figure.

Figure 6. Chart of public transportation service hierarchy

3. Commuter transport employs rail network; for links of Sidoarjo-Surabaya, Mojokerto-Surabaya, Gresik-Surabaya, and Lamongan-Surabaya. Meanwhile, road based network is applied for Bangkalan-Surabaya, supported by Surabaya-Madura bridge and Ferry.
4. The trip from train station to the center of city/activity will be served by city bus with capacity of 40-50 passengers.
5. Next, minibus with capacity of approximately 20 passengers will serve transportation from center of city and activity centers to areas.
6. The purpose of public transport development of train-based mode is to allow main service of all commuters mobility being capable of taking the advantage of the existing train network, thus cutting back the development cost. Similarly, the development of city bus and minibus may take the advantage of the existing road-based network with adequately managed road hierarchy.

In this concept, the mass public transport provisioning shall be implemented for the next 10 years; thus, in 2020, the service of mass public transportation will have been realized as stipulated in this planning concept.

The implementation stage will include:
The first 5 years:
1) Road facility construction, road design, road mark, signs and bus-stop especially designed for city bus and minibus.
2) City bus and minibus provisioning
3) The construction of double track train network in Surabaya Metropolitan Area (SMA) to support train provisioning as main mode of commuter transportation. For internal Surabaya City, elevated double track railway is constructed.

The second 5 years:
1) The construction of station integrated with city bus station.
2) The provisioning of city bus, minibus and train armada.
3) More intensive operation of Commuter train with headway interval of 15 minutes at rush hours and 20 minutes at normal hours.
4) Train mode synchronization with city bus and minibus.

6. CLOSING

The development of mass public transport in Surabaya Metropolitan Area (SMA) is the most realistic solution in diminishing traffic density, since it is impossible to perform continuous road broadening to compensating the rate of vehicle volume growth. The data obviously shows that the development of new road construction can only reach 2% per year, meanwhile, the growth of vehicle volume may reach 7.5% per year.

It is necessary of Central Government and Regional Government to perform mass transport development with the support of other parties in assisting budgetary and operational concerns. Non-governmental parties shall also take a part in this effort to achieve more competitive management.

Environmentally, the development of mass public transport service will be able to reduce pollution. Assuming that one city bus can accommodate 40 passengers, in the same meaning, one city bus will have capability of reducing pollution of 40 motorbikes. Certainly, pollution reduction resulted from personal vehicle will be more significant if 40 personal vehicles can be substituted with one city bus. To improve urban environmental quality, city bus and minibus should consume fuel. On the other hand, commuter train takes advantage of electric energy, thus diminishing more significant pollution rate.
Funding aspect is also considered important thing to take into account, since transpiration cost of public transport should be lower than that of personal vehicle and motorcycle. To make the transport cost cheaper, subsidiary is necessary. Subsidiary may be allocated in two ways: (1) governmental subsidiary, in this concept, the government directly allocates operational cost subsidiary, thus making ticket fare inexpensive; (2) developing economic activity, for example, shops, offices, hotels on the land owned by Train Managing Government (the Department of Transportation), whose financial gain is used to subsidize train operational cost, thus making ticket fare inexpensive.

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