



Sustainable Urban Public Transport Planning in Indonesia, Case Studies in Yogyakarta and Jakarta

Ahmad Munawar

Department of Civil and Environmental Engineering, Gadjah Mada University

Abstract— Traffic congestion has existed in urban areas since many years ago. Transport infrastructure and congestion issues are high on the agenda of such urban problems and reinforce the need of broader view in tackling urban transport problems than hitherto generally employed. Road widening and new road constructions are very difficult to be implemented in urban area. The most possible solution is, therefore, by reforming public transport to be a sustainable urban public transport system.

The Public transport reform is, therefore, very important to increase the use of public transport mode and to maintain the sustainability. Public transport problems include: an overall lack of capacity, lack of quality and choice, severe traffic congestions and insufficient fund to renew and repair vehicles. Traffic surveys were carried out in Yogyakarta by counting public transport vehicles and occupancies, interviewing the public transport passengers and non public transport users, drivers and institutional staffs, who involve in public transport management.

This paper then analyses the plan to reform the urban public transport system in Yogyakarta, i.e. The Trans Jogja Bus Reformation, the implementation of the plan, which started in February 2008, and the comparison to the public transport reformation in Jakarta, which has been implemented since four years ago, i.e. the Trans Jakarta Busway. The problems for implementing the new public transport system in Yogyakarta and Jakarta were analysed. Recommendations have been given to reduce the negative impacts in implementing this new public transport system.

Index term — urban public transport, sustainable, traffic congestion

I. INTRODUCTION

Traffic congestion has existed in urban areas since many years ago. Transport infrastructure and congestion issues are high on the agenda of such urban problems and reinforce the need of broader view in tackling urban transport problems than hitherto generally employed [1]. According to the Indonesian Development Plan, traffic management strategies should be implemented as follows:

- a. Development mass transportation system which should be well-run with reasonable price, efficient and safe,
- b. development the road network which has the least negative environmental and social impact,
- c. development integrated public transport system, and
- d. development traffic management strategies to achieve high efficiency and high quality of service.

It is, therefore, to maintain the sustainability, important that public transport should offer a range of choice and quality to meet the aspirations of the riders. Generally, the comfort and quality of the existing public transport fleet is poor, and many of the vehicles are dilapidated and dirty. Whereas those who can least afford to travel may be prepared to suffer such indignities. People who can pay to travel by their own vehicles, or by taxi, would seldom find any temptation to use buses. Increasingly, patronage will be confined to the poorest members of society, thereby further eroding service levels and comfort.

Chaotic traffic and a dilapidated public transport system cannot enhance the reputation of Indonesian big cities. A further factor is the use of heavily polluting low-grade fuel: the resultant plumes of black exhaust fumes gravely compromise the appeal of the streets as places to walk, work or enjoy.

Needless to say, congestion is a problem, especially at peak periods. Public transport vehicles become snared in traffic jams, further weakening public transport's competitive edge by prolonging journey times and reducing the system's effective capacity.

Clearly, a particular factor in some Indonesian cities is the small size and low capacity of most public transport vehicles. Viewed from the perspective of making better use of the road system, it may be preferable to use many fewer, but much larger, buses.

Some bus routes obey fixed stops, some of which have shelters. However, access can be difficult, especially when street traders monopolise bus shelters and illegal parking prevents buses from pulling into stopping places. As a result, stopping activity is haphazard, thereby reducing the value and reliability of the bus system. As an example, on one-way streets, buses loading and unloading from the far-side lane, with the result those passengers had to cross several hazardous lanes of moving traffic. Furthermore, those stops without shelters are rarely signified by a stop pole, which means that non-routine passengers have no indication as to where buses may stop.

In big cities, such as Jakarta, terminals are controlled by preman (self-appointed protection-racketeers). Some public transport routes suffer from the attention of calo, or people who endeavour to induce passengers to use a particular

vehicle. Calo activities variously take place at terminals and along the route.

Indonesia's recent financial and monetary crisis has adversely affected the bus operations. Hence ridership has fallen, and operators have reduced services. The ability to repay bank loans has been impaired, and devaluation of the Rupiah has increased the costs of spare parts and new vehicles alike.

Deferring maintenance, cannibalising fleets, reducing service frequencies and holding down fares may represent short-term solutions to the financial crisis, but they are not sustainable in the longer term. Fare increases are inevitable if the public transport operation is to meet its longer-term costs.

Bus route plan should be renewed periodically. When changes are made, they generally involve the lengthening of existing routes, although if these cross the municipal boundary they consequently fall within the jurisdiction of the Provincial DISHUB (provincial road transport and traffic unit). The procedure for bus route development relies strongly on negotiation and consensus between the DISHUB and the route association leaders. It is understood that public requests for new routes are seldom made or accommodated, which must be seen as a serious limitation on the development of satisfactory public transport services.

There is no systematic network planning process. Additional demands are generally met by extending routes rather than creating new ones.

The consensus culture both pervades and thwarts bus network development. Indeed, requests to provide new bus routes are rarely made because it is well known that nothing can be done without the agreement of vested interests. Proposed changes would most likely be opposed by anybody whose well-being would be adversely affected.

The provincial and municipal DISHUBs do not systematically monitor the supply of public transport services, nor do they collect data on the demands of transport users. It is understood that they largely protect the interests of the bus companies and angkot route associations. Hence their role is passive and reactive, and inconsistent with national or municipal public transport policy.

It can be compared to the Bus Priority System which has been widely used in Europe [2]. Bus priority system has been widely implemented in Europe for many years. One of the benefits is reducing travel time.

II. TRANS JAKARTA BUSWAY

Public transit trips in Jakarta are mostly by bus, but there is a limited commuter rail system. Of motorised trips, in 1998 49.3% of total trips were made by public transport, 24.5% by private car, and 26.2% by motorcycle. For the past several decades, many studies and plans for Jakarta mass transit systems have been developed [3]. However, none of these planned systems have progressed towards implementation. Prior to the economic crisis and the transition to democracy, major investment decisions tended to be made by the central government, often with little regard to the views of local

governments and even national level ministries. Information was treated in a proprietary manner, so it was very difficult for one government department to know what the other was doing.

Most of these plans for a transit system focused on the main North-South corridor through the city connecting the Blok M bus terminal and shopping district in South Jakarta (Jakarta Selatan) to the Kota (city) railway station in North Jakarta. The focus on this corridor was less due to the high number of public transit trips, and more due to the concentration of important government and business offices, and major hotels. There were fairly advanced plans for a metro in this corridor, various consortiums were involved at different times. There was also a conflicting plan for a 'triple-decker' elevated toll road and light rail line proposed by a private consortium. The idea was that the revenues from the toll road would cross subsidise the light rail line. Conflicting lobbies supporting these two projects ensured that nothing was built prior to the economic crisis in 1998. With the economic crisis and the transition to democracy, neither the national government nor the municipal government nor the private toll road company had the funds to pursue either of these grandiose plans. Underground metro systems in Jakarta are made more expensive by the high water table.

It has, therefore, been decided to develop Trans Jakarta bus way in Jakarta. **TransJakarta** is a bus rapid transit system, which is less expensive than metro. It started on January 15, 2004 and currently has 7 corridors (or lines) with 32 new corridors under construction. TransJakarta was designed to provide the citizens of Jakarta a fast public transportation system to help reduce rush hour traffic. The Indonesian Government provided TransJakarta buses their own private lanes. The private lanes are provided by reducing the existing lane. Although the roads in Jakarta are wide, there are still also some problems with traffic congestion for private vehicles because of the lane reduction. TransJakarta's ticket prices are subsidised by the state government.

III. TRANS JOGJA

The city bus network in Yogyakarta comprises 19 licensed routes, although only 16 routes are operated with a total vehicle allocation of 591 [4]. Three routes were closed because of the low demand. It is the driver who decided whether to depart from the route. There is no systematic network planning process. The number of buses licensed to serve urban bus routes has likewise remained static throughout, although there has been a substantial fall in the number of vehicles actually deployed on the services.

The route length varies from 25 km to 62 km. Bus frequencies are extremely high. The average headway is 12 seconds. Load factor is very low. The average load factor is 27 %. It is lower than that five years ago, i.e. 36 %. It means that the demand has decreased sharply. The other problem is the security problems. There are many pick pockets in the bus. Most of the passengers are students and school children. They are captive passengers. They have no preference, because they do not have any private vehicles. The fare is flat fare, it does

not depend on the distance and time. There is only single trip ticketing system. There is no weekly or monthly ticket.

Every owner of bus vehicle operating in Yogyakarta must be a member of one of the five cooperatives, and each cooperative maintains an effective monopoly on access to the routes it controls. Because of their route monopolies, cohesive organization and management structure, links to the political institutions and the large numbers of people they represent, the cooperatives have considerable power relative to the regulatory agencies. They are able to mobilize large groups to resist any development in urban transport that they perceive to be against their interests. This unfavorable 'balance of power' between the regulatory agencies and the cooperatives, means that government cannot impose changes or innovations, even where these are clearly in the interests of the traveling public and, in the longer term, of the operators themselves. Government must negotiate any change in with the cooperatives. The protective stance of the industry is a major reason why public transport in Yogyakarta remains in a low-cost low-quality equilibrium. It represents the biggest constraint on change and development. The large cooperatives are forces for maintaining the status quo in the industry, not for service improvement. They stifle competition by restricting access to the routes they control. They impose joining fees, monthly and daily fees, adding to operating costs. Their interests lie in perpetuating their monopoly control and the income from their routes.

An important measure of the performance of the public transport system is the extent to which it meets the needs and preferences of its citizens. Interview surveys have been carried out [5], therefore, in the business centres. The number of respondents was 300. They were public transport users and non public transport users.

The journey purpose can be divided into 4 categories, i.e. to work, to school, to visit relatives and other purposes. Most of journey purpose for public transport users is going to school/university.

For non public transport user, most of them (75.6 %) use motorcycle. For public transport users, most of them use the public transport because they do not have private vehicle. For non public transport users, the reasons why they use private vehicles are: more flexible, faster, cheaper, more efficient and more comfortable. For public transport users, most of them need to change to other bus before they reach their destination.

For non public transport users, the reasons why they do not use the public transport are too slow (31,3 %), safety (16,9 %), no time table (15,9 %), low bus quality (14,4 %), security (11,3 %) and others (10,3 %).

Most of the respondents, public transport users and non public transport users, agree that the quality of public transport should be increased, although they have to pay more. For non public transport users, they will use the public transport if public transport quality is better than now. However, it should be defined clearly the quality that they need.

The existing ticketing system is flat fare. Respondents have been asked if the ticketing system is changed to time based

ticketing system, i.e. daily ticket, weekly ticket and monthly ticket. Most of them agree that the ticketing system should be changed to time based ticketing system.

More than 60 % of the existing public transport users are students/school children (see figure 2). Most of the public transport users (71.5 %) agree that the public transport service should be improved, although the fare could be increased. For non public transport users, most of them (54.5 %) would change to use public transport if the public transport services were improved

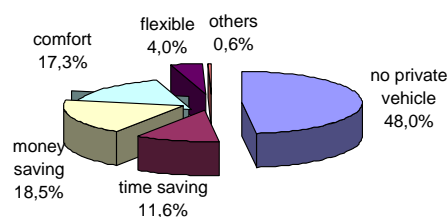


Figure 1
Reasons for using Public Transport

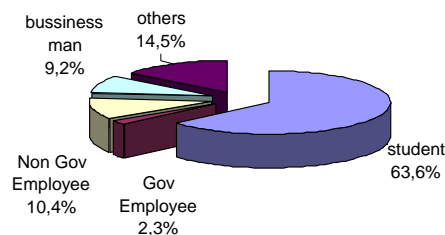


Figure 2.
Public Transport User Occupation

The existing ticketing system is flat fare, which has no differentiation between the short and the long distances. Most of them (63.0 % for public transport users and 54.3 % for non public transport users) preferred to use new ticketing system, i.e. a flexible automatic ticketing system, which can differentiate the distance and the journey time (e.g. daily, weekly and monthly tickets).

It has, therefore, been planned to reform the urban city bus system in Yogyakarta. It also reforms the existing regulatory policies and operational practices. The bus management system will be changed to the new system, called *buy the service system*. This system will change the existing system. The management will be organized by a joint organization among the government, cooperatives and bus operators. The existing bus operators will be included in the new system, but they have to improve the service and also bus quality according to the minimum standard. The cost of the improvement will be subsidised by the government.

The bus is much more comfortable than the existing one. It is also air conditioned bus. There is no exclusive lane for buses such as Trans Jakarta, because of the limited space available for traffic. The comparisons of Trans Jakarta lane and Trans Jogja lane are shown in figure 3 and 4.

However, the bus can only stop at a shelter, because the bus floor is 80 centimeters higher than the road pavement (see figure 5). The bus shelter floor is also 80 centimeters higher than the road pavement (see figure 6). The passengers, therefore, can only enter the bus at the bus shelter. Bus lanes are also constructed in some places to reduce the journey time. The drivers and the crews will be paid monthly by this new organization, but they have to follow the regulations, i.e. bus time table, safety and security



Figure 5. Trans Jogja Bus



Figure 3. Trans Jakarta lane



Figure 4. Trans Jogja lane



Figure 6. Bus Shelter and the ticketing machine inside

There are two ticketing systems:

- a. **Single Trip Ticket.** All passengers using single trip ticket must enter the ticket to the motorised reader. Afterward, the reader will swallow the ticket and throw the ticket to the card container and then the turnstile lock will be opened.
- b. **Multi Entry Ticket.** The ticket can be used for many times, e.g. 10 times or 20 times.

Smartcard has been employed for the ticketing system. Smartcard based electronic ticketing has been a common one in many countries. The local government has stated that the reformation of public transportation system should be achieved without overburdening the local government budget. As an empirical comparison, investment cost based on a

similar electronic ticketing system (from overseas vendor) would require a minimum of US \$ 1 million, while the local government budget is only US \$ 0.3 million. However, it is much more powerful than the ticketing system in Jakarta. It can be single trip ticket or multi entry ticket and it can be monitored by wireless system from the central ticketing system.

For rapid commuters, it is required a type of device to control and also to collect the ticket automatically. There are some types of gate available in the market, but the price and also the cost for buying the device will be very expensive. It has been decided to build the gate locally, using local components for the mechanical parts and some of the electrical parts. This approach also gives benefits to the local home and small industry by promoting their products to higher level.

In the Fig. 7 below, it is shown the design of the *Gate Access* turnstile device. This design built by local manufacturer based on the project requirements.

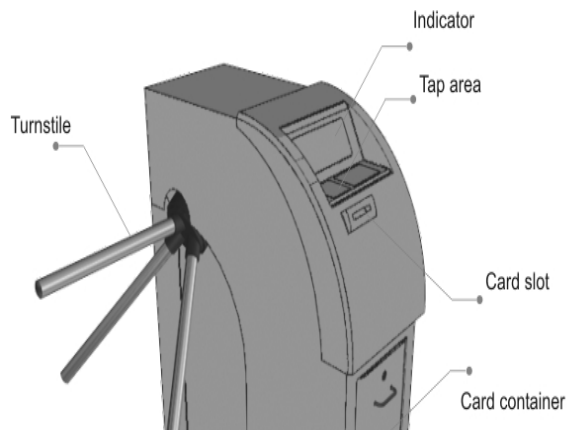


Figure 7. Ticketing machine and gate access

The implementation started in February 2008. Interview surveys were carried out again shortly after the implementation of Trans Jogja with the number of respondents are 360 peoples (60 peoples x 6 routes). Survey results show that the private vehicle users also use the bus, namely Trans Jogja. From the analysis can be concluded as follow:

- a. 40% of Trans Jogja passengers are existing daily bus passengers, 51% are motorcyclists, and 3% are private car users.
- b. 7% of Trans Jogja passengers clarify that they will always use this new public transport in the future,

24% are often, 66% are sometimes, and 3% are never use this bus in the future (after the test drive).

- c. From the motorcyclist respondents, 16% clarify that they will always use this bus in the future and 79% respondent sometime use this bus in the future. Even 3% of the motorcyclists will change to use this bus. This result is better than previous survey, before this bus in operation, only 1.7% of the respondents will change the transport mode to Trans Jogja passenger. Hopefully, after this bus operates with normal tariff, it will be more than 50 % of the existing passengers remain using this public transport.
- d. For a customer ticket, passengers are interested in daily ticket (49%), monthly ticket (19%), and weekly ticket (14%).
- e. 65% respondents say cheap for the promotion tariff (Rp. 1000,-). But for the normal tariff (Rp. 3000,- for general passenger and Rp. 2000,- for student), 14% respondent says cheap, 50% say normal, and 36% say expensive.
- f. For the shelter, most people say that the type, facility, and service are enough or good, but the size and amount of the shelter should be increased. The respondent gave recommendation about new shelter locations. For services in the bus (bus crews), 94% respondent feels good.
- g. The respondents also do not have any problem with ticketing usage. It is shown by the survey results that they have not any problem when they use their ticket.
- h. To compare with the existing bus service, respondents say that the advantages of Trans Jogja buses are: convenient, safe, reliable, tariff, and on time.
- i. They knew this new system from newspaper (37%), street banner (29 %) and others. Therefore, newspaper is the most effective one to campaign this new system.

There were some problems with the ticketing machine during the operation. These ticketing machines were not well protected from weather. During the heavy rain and because of the sun radiation, some ticketing machines did not work properly. There was also a problem because of the reactivation of the smart card. Some improvements are still in progress, i.e.: protecting the sensitive components from water and replacing some parts to the more reliable components. It is also a plan to build more bus shelters and to improve the shelter design to become more accessible for difable.

IV. CONCLUSIONS

Trans Jakarta is suitable for big city such Jakarta, which has wide roads. Therefore, it is enough space for special bus way. However, there are still problems for private vehicles, because of the lane reduction, which can give more traffic congestion for them. Trans Jogja has nearly the same principal as Trans Jakarta, except Trans Jogja has no exclusive lane. There is not enough space to provide a special lane. However, this new public transport system has been accepted as an alternative

public transport, which can reduce the use of private vehicle, because of its comfortability, safety and punctuality, although the last one still has a small problem because of the mix traffic.

However, in the long term, for big and medium cities, such as Jakarta, Bandung, Surabaya, Medan, Semarang and Yogyakarta mass transit should be the alternative public transport mode. Mass transit system such as railway system can transport much more passengers than buses.

ACKNOWLEDGMENT

The author would like to give sincerely thanks to Yogyakarta Provincial Government and the HiLink Project, Gadjah Mada University for the support of this study to improve the public transport system in Yogyakarta.

REFERENCES

- [1] I. Abubakar, *Mass Transit as a Possible Mode for Sustainable City Development*, Paper at Sured 1st Seminar UGM, Yogyakarta, March 2000.
- [2] NATO Committee on the Challenge of Modern Society, *CCMS REPORT NO 45, BUS PRIORITY SYSTEM*, Transport and Road Research Laboratory U.K., 1976
- [3] Institute for Transportation & Development Policy, *Trans-Jakarta Bus Rapid Transit System Technical Review*, Jakarta, December 2003
- [4] A. Munawar, Public Transport Reform in Indonesia, A Case Study in the City of Yogyakarta in Proc. WASET, Prague, Czech, July 2007
- [5] A. Munawar, S. Malkhamah, S. Priyanto, A. Budiono, S. Haryanto, R. B. Utomo and H. B. Trisnanto, "Improving Bus Ticketing System in Yogyakarta Province", HiLink research report, Gadjah Mada University, Yogyakarta, Indonesia, 2007