

SUSTAINABLE PUBLIC TRANSPORT PLANNING IN INDONESIA, CASE STUDY IN YOGYAKARTA AND BANDUNG

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Abstract: - The Public transport reform is very important to increase the use of public transport mode. 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. Generally, the comfort and quality of the 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 public. Increasingly, patronage will be confined to the poorest members of society, thereby further eroding service levels and comfort. Most of the public transport users are captive passengers, who use the public transport because they have no choice to travel by other modes. Public transport system in Yogyakarta and Bandung were analyzed by counting public transport vehicles and occupancies, interviewing the public transport passengers, drivers and institutional staffs, who involve in public transport management. This paper will then analyze the possible plan to develop the urban public transport system to become more attractive and to improve the public transport management. The short, medium and long term plans are analyzed, to find the best solutions. Some constraints such as social impacts and financial impact are also taken into accounts.

Key-words— public transport, transport management, transport mode, sustainable, traffic congestion

1. 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.

It is 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 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 that 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 [3]. Bus priority system has been widely implemented in Europe for many years. One of the benefits is reducing travel time.

2. Case Study in Yogyakarta

The city bus network in Yogyakarta comprises 19 licensed routes, although only 16 routes are

operated with a total vehicle allocation of 591. 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 [1]. 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 co-operative 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, 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.

3. Case Study in Bandung

Bandung has a high proportion of public transport trips, i.e. 63 %. Bandung's public transport relies mainly on road vehicles, i.e. *angkot* (small bus), although rail commuting represents about four per cent of total public transport travel [2].

Every owner of an *angkot* vehicle operating in kota Bandung must be a member of one of the three cooperatives and each co-operative maintains an effective monopoly on access to the routes it controls. Besides these three cooperatives, there is also another bus operator, called DAMRI, which is subsidized by the Government.

The *angkot* network in Bandung city shows a fairly high density of network coverage. Relatively few areas are more than 300 meters from the nearest *angkot* or medium buses route (operated by

DAMRI). However, the perception of a dense network is misleading. The high route density in the city center partly reflects a large number of one-way links imposed by the one-way traffic circulation.

The *angkot* network comprises only 38 licensed routes although there are many unofficial route variations and deviations. This is a very sparse network for such a large city, even when the 11 DAMRI routes, the unlicensed *angkot* routes and *angkot* route deviations are taken into account.

The practice of *angkots* diverting from the authorised route is well established and apparently condoned. Deviation from the official route was observed on about 80% of the 38 *angkot* routes operating in kota Bandung. It is the driver who decides whether to depart from the route. Sometimes passengers are consulted, sometimes they are not. It is surprising however, that DAMRI bus drivers also have discretion to deviate from the official route. The reasons why route deviations occur are:

- To avoid local traffic congestion, usually during peak hours.
- To increase the passenger catchment area to meet local peaks in demand, especially if there are few passengers on the vehicle.
- Route deviations and short-working result in less capacity and lower, more variable frequencies at the ends of the routes, while passengers waiting on the sections of route from which routes have been diverted will have longer waiting times.

Beside official *angkots*, which have a route license and yellow license plates, there are many unlicensed *angkots*. Most of the vehicles are of the same types as *angkots* but without folding doors.

Angkot frequencies are extremely high. The average headway is 2.2 minutes. Six routes have average headways below 1.0 minute. Twenty-two routes have headways below two minutes. Routes with headways below two minutes contribute significantly to traffic congestion on roads where they operate. Considerable gains to route capacity and service quality, as well as lower costs per passenger, and reduced congestion could be realised if these routes were converted to larger capacity vehicles. The small number of routes reflects three fundamental areas of deficiency that are referred to many times in this report:

- the absence of any systematic monitoring or planning process that enables the efficiency of the network in meeting passengers' demand to be assessed. Establishing such a procedure is an urgent priority for DISHUB.
- the licensing system is generally restrictive. It has inhibited the evolutionary development of

the route network in response to initiatives by operators. With over 4,700 separate *angkot* licensees, any reorganisation of the network would be very complicated and subject to many constraints.

- the complex system of illicit control whereby many groups and individuals have taken control of routes and 'modal territories', has tended to inhibit any network changes.

Considering their frequent stops and the reduction of road capacity by encroachment in many locations, average *angkot* operational speeds are quite high. The average for all routes is 14.4 km/h with a range from 9.5 km/h (Route 33) to 26.5 km/h (Route 38). Round-trip times averaged 105.5 min, with a range of 189.5 mins (Route 32) to 20.0 mins (Route 38). Speed data for individual sections of route revealed locations where traffic congestion is persistent.

Fares for the 38 *angkot* routes and 7 DAMRI routes within Kota Bandung are set by the mayoral decree. The decree specifies the full distance of each *angkot* route and the corresponding maximum fare. Fares for shorter journeys are not specified in the decree, but are at the discretion of the driver. DAMRI fares are flat, irrespective of journey distance and are Rp. 700 for adult and Rp. 500 for a student. Fares were raised most recently on 2 July 2001.

Fifty-three routes were identified with a total vehicle allocation of 6,418. Two of these, routes 8 and 24 have allocations of over 1,000 vehicles. Frequencies are so high that *angkots* on these routes occupy most of the capacity in the nearside lane of the arterial roads on which they operate. Assuming 10% of vehicles allocated are in the terminals, or not operating, on average there are 25 *angkots* on each kilometre of road. *Angkots* are separated by only 40 metres, giving a headway of about 6 seconds. These are extreme cases where small vehicles are inappropriate to the density of demand, and where substantial advantages would be gained by using larger vehicles. One would expect 10 or 12 variants of these routes to have evolved, turning off the main road to serve villages along the corridor. The fact that all the vehicles operate in a procession on a single route on the main road is indicative of the severe constraints on route development. In the light of these constraints, the only option open to DISHUB has been to keep increasing the number of licenses the corridor as demand increases.

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. In July 2001, it was conducted interview surveys of

public transport users to gauge attitudes to the quality, convenience and cost of DAMRI bus and *angkot* services in Bandung. Attitudes of people who do not use public transport were surveyed in 'street polls'.

The survey of bus and *angkot* users in the city revealed a surprisingly high level of satisfaction, or at least a low level of strong dissatisfaction, with the current transport system in Bandung. This is surprising because objective measures of performance show low levels of quality, comfort and convenience.

Students make up over 35% of Bandung's population. Because they have low disposable incomes and few have access to private vehicles, they are heavily represented among *angkot* and bus passengers. Students accounted for 43% of *angkot* passengers interviewed.

About one-third of Bandung's population is over 36 years of age, but relatively few people in this age group use buses or *angkots*. Only 16% of interviewees in *angkots*, and 21% of interviewees on DAMRI buses were 36 or older. Nearly half of bus and *angkot* passengers interviewed were under 25, approximately the same as proportion as in the city's population.

Most *angkot* passengers (69 %) are captive. They have no alternative mode of transport, because they do not have access to a private car or motorcycle. Less women use DAMRI compared with *angkots*, probably due to the prevalence of overcrowding and crush-loading.

There is a significant difference in perceived waiting time between buses and *angkots* which reflects the much lower frequencies of DAMRI services. 60% of DAMRI passengers, but only 19% of *angkot* passengers reported that they waited more than ten minutes. More than half of *angkot* passengers, but only 14% of DAMRI passengers, waited less than 5 minutes.

The results of an interview survey of *angkot* passengers indicate a relatively high level of satisfaction with the travel time and reliability of *angkot* services. The highest levels of dissatisfaction were low levels of comfort, poor conditions in the terminals, the perceived high level of fares, and delays by traffic conditions.

Despite the dissatisfaction expressed with the vehicle comfort, when asked whether they preferred to ride in a 'bigger and better' vehicle, about 70% of *angkot* users responded that they had no preference (33%) or preferred the *angkot* vehicle (37%). Of DAMRI passengers, a smaller majority of 60% said they had no preference for a bigger and better vehicle. However, a high proportion (70%) of

respondents on both angkot and DAMRI services said they were willing to pay more for a better service.

The results must be interpreted in the light of several other factors:

- The majority of angkot users are below 25 and many are students whose low incomes and high threshold of discomfort makes them captive to public transport. Very few angkot passengers are over 40.
- Journeys are short, the average is only 3.4 kms - only a 15-minute trip. However, due to the limited network of only 38 routes, a high percentage of journeys require at least one interchange,
- The characteristics of Bandung's public transport system are similar to those of other large cities in Indonesia. There is little awareness of what kind of organization and systems are feasible in a city of this size and income level.
- The financial crisis has lowered citizen's expectation of the quality and convenience of all aspects of life, including transport.
- There is a widespread perception that the use of small angkot vehicles is both economical and enables the lowest fares
- When local people consider how Bandung's transport might be improved, they usually think of new system, and often new technology such as light rail or trains, rather than organizing existing resources in a more efficient way.
- The income threshold for car use is probably quite low, so that most decision-makers, professionals, and perhaps most adults, never use an angkot.
- People must be persuaded that better organization and management, larger vehicles and less restrictions and illicit control will produce better services at existing or lower fares. This is not evident to most users.

It is evident that conditions on angkots and buses are unacceptable to a high proportion of Bandung's citizens in the higher income categories. Having made the investment in a private car or motorcycle, the owner will tend to use the vehicle for all his journeys. It was found in Denpasar that for the average trip, the generalised cost of using a motorcycle was lower than using an angkot because of the much lower travel time and the low cost of purchasing and operating a motorcycle. In Bandung, the relative cost advantage of a motorcycle will be less than in Denpasar, as Bandung's angkot network

is more dense, so walking and waiting times in the central areas are lower.

Interviews were conducted with about 50 middle and high-income individuals in Bandung. Interviewees were male and female, of all ages; middle to upper class. Interviews were conducted in shopping and business centers in the town center and in hotels. Many said they had not used angkots or buses in the last several years. Others were occasional users, resorting to using public transport when: their private vehicle was unavailable, their origin and destination lay along a single angkot route, with short walking distances, the availability of parking at the destination was limited or expensive and/or severe traffic congestion was likely on the route

Most persons interviewed stated that they owned a car or a motorcycle, and thus rarely needed to use public transport. For non-work trips, most non-car owners preferred to use a taxi. Respondent reasons for not making more use of public transport were: "uncomfortable, overcrowded, no timetable, hassles over fares, unsafe, often have to change from one route or mode of transport to another".

Women tend to make less use of public transport than men because:

- they are less tolerant of the discomfort of crush-loading,
- they are more likely to be encumbered with children or shopping
- more womens' journeys have alternative destinations.

Some respondents said that daily use of public transport from home to work and back (ojeg/becak – angkot –angkot/bus) would be too expensive, amounting to Rp. 8,000 a day, which is about Rp. 225,000 per month, too much for persons with an average monthly income of Rp. 500,000 to 600,000. Every owner of an *angkot* vehicle operating in Bandung must be a member of one of the three cooperatives and each co-operative maintains an effective monopoly on access to the routes it controls. No vehicle may operate on route unless the vehicle owner or driver is a member and has paid membership fees.

Each year an Annual Members Meeting is held which is attended by one representative for every 20 *angkots*. All members are not entitled to attend the annual meeting. According to members interviewed, there has never been any distribution of profit to members. Income and expenditure is always shown to balance.

The cooperatives are essentially external bodies controlling the angkot industry. The biggest

cooperatives are not democratic and there appears dissatisfaction among their members about their accountability, especially for the substantial funds collected.

There is no legal basis for the cooperatives' control of routes since route licenses are awarded to the vehicle owners. They have been able to dominate the industry because the licensing system (a separate route license for each vehicle) is inappropriate. Government finds it necessary to use the cooperatives as intermediaries between the regulatory agencies and the route license-holders who number more than 5,000 in the city and more than 20,000 throughout the study area. It is clearly impossible for a government agency to control the activities of such huge numbers of license holders or coordinate them into a route structure and impose service obligations. However, by using the cooperatives as intermediaries, government has recognized and consolidated their proprietary rights over the routes and enhanced their power and influence.

The cooperatives themselves have become controlled by external groups such as the military, and they may also serve to formalize restrictive regulatory practices and to channel illicit payments.

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 travelling 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 Bandung remains in a low-cost low-quality equilibrium. It represents the biggest constraint on change and development.

4. Analysis

The organization reform will reform the existing regulatory policies and operational practices. The bus management system will be changed to the new system, called *buy the service 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 subsidized by the government. The buses should stop only at the bus shelters. The bus floor is 80 centimeters higher than the road pavement. The new bus stops will be built by the government. The bus shelter floor is also 80

centimeters higher than the road pavement. 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 daily or weekly by this new organization, but they have to follow the regulations, i.e. bus time table, safety and security. This system will be implemented, hopefully, by the end of this year in Yogyakarta.

It is planned to use smartcard system. The ticket could be single trip or time based ticket. 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. The gate system will be built also 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.

5. Conclusion

The policies for the short term are improving operational efficiencies in urban bus services and improving public transport facilities.

For big and medium cities, such as Jakarta, Bandung, Surabaya, Medan, Semarang and Yogyakarta mass transit could be the alternative public transport mode in the medium/long term.

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