

Promotion of Bus Rapid Transit (BRT) in a Large City: A Case Study of Yogyakarta

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Abstract

Public transportation such as Bus Rapid Transit (BRT) is a bus-based mass transit system that delivers fast, comfortable, and cost-effective urban mobility. Nowadays, Yogyakarta has set up BRT lines to decrease the use of private vehicles and to promote clean city transport. BRT cannot be operated when there is no cooperation among all the institutions for the rearrangement of transfer lines. Thus, local governments need to take appropriate step that is acceptable for all parties, for example, by using participatory approach. This method involves society and various parties in the city and the result can form the basis of support for the decision making of local governments. Similarly, efforts to change habits of those who are habituated to use private vehicles can be difficult when they have to switch to public transportation modes. However, if the government uses the participatory approach to convince them that the BRT can replace private vehicles by providing convenient and more efficient services, it is expected that lock-in effect will be minimized. Special efforts are needed to change people's perspectives through public campaigns and dissemination programs. We focus on two problems as the cases of study, and propose possible participatory methods for solving the problems. In order to harmonize BRT with other modes of public

transportation such as angkot, ojek, becak that might get displaced by BRT, alternative modes can be operated in the feeder routes for collecting passengers up to BRT route. For this case study, meetings among the institutions, street drama, and workshops have been proposed as the possible tools of participatory approaches. Another case study is how to motivate motorbike users to shift to BRT once it is implemented. This will be possible by organizing public campaigns and information dissemination. For this purpose, use of mass media, face to face interactions, and questionnaire survey have been proposed as the suitable participatory tools. Moreover, we propose to use informal leaders as a medium to address the public in all the participatory approaches in order to convince their followers to adopt BRT as their mode of transportation.

1. Background

Bus Rapid Transit (BRT) is a bus-based mass transit system that delivers fast, comfortable, and cost-effective urban mobility. Through the provision of exclusive right-of-way lanes and excellence in customer service, BRT essentially emulates the performance and amenity characteristics of a modern rail-based transit system but at a fraction of the cost (Wright, 2006).

On the other term, BRT can be explained by a term that applies to a variety of public transportation systems using buses to provide faster, more efficient service than an ordinary bus line. Often this is achieved by making improvements to existing infrastructure, vehicles and scheduling. The goal of this system is to achieve the service quality of a rail transit while still enjoying the cost savings and flexibility of bus transit. The term BRT is mainly used in North America, Europe and Australia. It is often called a Busway while in other places it may be called a quality bus. However, the same concept is also used around the world through different names. These terms include; High-Capacity Bus Systems, High-Quality Bus Systems, Metro-Bus, Surface Subway, Express Bus Systems, and Busway Systems. The decision to select Bus Rapid Transit (BRT) as opposed to other options depends upon many factors. Costs, performance characteristics, and personal preferences will all likely play a role (Wright and Fjellstrom, 2003). BRT is a new and is in accelerating trend in large cities, including developing cities. BRT has started in several cities of many countries as shown in Table 1.

Table 1. BRT Implementation in different developing countries

No	City	Starting Year	Population (Million)	Km of Busway
1	Curitiba (Brazil)	1974	3.2	65
2	Goiania (Brazil)	1976	1.3	35
3	Quito (Ecuador)	1995	1.6	33
4	Bogota (Colombia)	2000	6.7	85
5	Leon (Mexico)	2003	4.1	26
6	Mexico City	2005	8.8	20
7	Jakarta (Indonesia)	2004	9.5	46
8	Beijing (China)	2005	22.0	16
9	Hangzhou (China)	2006	6.8	10

Source: Menckhoff, 2006.

Yogyakarta is one of the important and among the ten biggest cities in Indonesia. The area of Yogyakarta city is 32.5 square km. It is bordered to the north by the Sleman Districts, and to the south, east, and west by the Bantul District. In 2010 census, the population of Yogyakarta city was reported to be 388,088 (Badan Pusat Statistik DIY, 2010). The city is located on one of the two major railway lines across Java between Jakarta / Bandung and Surabaya. It has two passenger railway stations; Tugu Railway Station serves business and executive class trains, while Lempuyangan Station serves economy class trains. Both stations are located in downtown Yogyakarta city. The city has an extensive system of public city buses, and is a major destination for inter-city buses to elsewhere on Java or Bali, as well as taxi, *angkot*, *ojek*, *andong* and *becak*. An increasing number of residents' own automobiles and motorbikes are by far the most commonly used personal transportation. Based on the survey among 2099 samples done by local government of Yogyakarta in 2009, there are many types of transportation vehicles that are used for daily commuting by the residents (Table 2). Those various transportation vehicles are running on the same limited capacity of main roads causing congestion, traffic jam, pollution and increased travel time.

Table 2. Daily vehicles used by citizen

Type of transportation vehicles	Percentage
<i>Becak</i>	2%
Bus	37%
Personal car / automobiles	4%
<i>Ojek</i>	37%
Bicycle	1%
Taxi	2%
By foot	14%
Total	100%

Source: Dinas Perhubungan Yogyakarta, 2011.

Starting from early 2008, the city has operated the BRT system called TransJogja. This system is modeled after TransJakarta. But unlike TransJakarta, there is no particular lane for TransJogja buses; they run on the main streets. TransJogja has 54 medium-sized bus fleets with 34 seats and 67 special stops made at a cost of 70 million Rupiah for each stop, which was done by two contractors (Pemda DIY, 2010). Currently there are six lines of TransJogja service, with routes throughout the main streets of Yogyakarta, while some overlap one another. The lines extend from Jombor bus station in the north as far as Giwangan main bus terminal in the south and Prambanan bus shelter in the east via Adisucipto International Airport. TransJogja has now become a new trademark of Yogyakarta and is frequently used by local citizens and tourists alike. The purpose of this BRT system is to solve some problems of transportation system, such as traffic jam, high pollution; air and sound pollution, many types of transportation vehicles, transportation cost, fuel consumption and uncomfortable condition of the public transportation in the city. But, this system is not without problems; there are many problems, both in decision making and implementation phases. These detailed problems will be explained in the statement of problem part of this paper.

In this paper, various tools of participatory approach are proposed as the methodology to solve the problems (in both decision making and implementation phase) of the BRT system, especially in the context of developing cities. The conceptual framework for understanding these problems, including both global common matters and Indonesian specific matters, will be described in the following section. In addition, this paper also discusses two case studies of problems related to the BRT in detail in the third and fourth sections. The final section concludes the paper.

2. Statement of problem

As population increases, the demand for transportation also increases. In addition, with rising income level of the people and expanding economic activities, demand for private modes of transportation is on the rise. On the other hand, limited road capacity, poor services of urban public transportation (unscheduled trip system and old public vehicles), inadequate traffic signals, parking areas and bus shelters have led to the frequent occurrence of traffic jams in the city. In addition, imbalance in transportation demand and supply of facilities, driving manner and the *Angkots* stopping “wherever-whensoever” on the roads, passengers crossing roads haphazardly, street vendors and traditional market along the streets are typical Indonesian characteristics that have also added to the existing problems. Bus Rapid Transit (BRT) has already been implemented in the Yogyakarta city as an attempt to solve the problem. Other benefits of BRT include cheaper, faster and convenient transportation means to the public, reduction of exhaust gas emissions, certainty of travel time, lower cost, reduction of the number of public transport thereby reducing congestion and several other intangible benefits.

However, BRT also has its own limitations. On the decision making part, harmonizing between BRT and other means of public transportation (e.g. taxis, *angkot*, *ojek*, *becak*) displaced by BRT, reducing the competition for road spaces between BRT and other vehicles, the route of the BRT, sources of finance, determination of reasonable bus fares, fare collection methods and obtaining legislative support for subsidies are some of the issues that need to be addressed. Load factor of TransJogja was 41.79% in 2009 (Dinas Perhubungan Yogyakarta, 2011). Once BRT is implemented, the owners of private vehicles (cars and motorbikes) will have to be motivated to break the “lock-in effect” and shift their mode of commuting to BRT. Another issue is that the most efficient route of BRT implemented may not be the one most preferred by the public. Similarly, the additional cost of operation, repair and maintenance of buses and roads, and proper management of the system also need to be addressed once the BRT is implemented. Among many of these problems, this paper focuses on the case study of two most important problems; one each from decision making and implementation phase as shown in Figure 1.

BRT cannot be operated when there is no cooperation among all the institutions for the rearrangement of transfer lines. Thus, local governments need take appropriate step that is acceptable for all the parties. In this regard, participatory approach involving all the institutions might be one of the most suitable approaches (Wates, 2000; Kubota, 2010) and the result can form the basis of support for the decision making of local governments. Similarly, efforts to change habits of those who are habituated to use private vehicles can be difficult when they have to switch to public transportation modes (BRT). However, if the government uses the participatory approach to convince them that the BRT can replace private vehicles by providing convenient and more efficient services, it is expected that lock-in effect will be minimized. Special efforts are needed to change people's perspectives through public campaigns and dissemination programs. The conceptual framework for this study has been depicted in the form of a diagram in Figure 1.

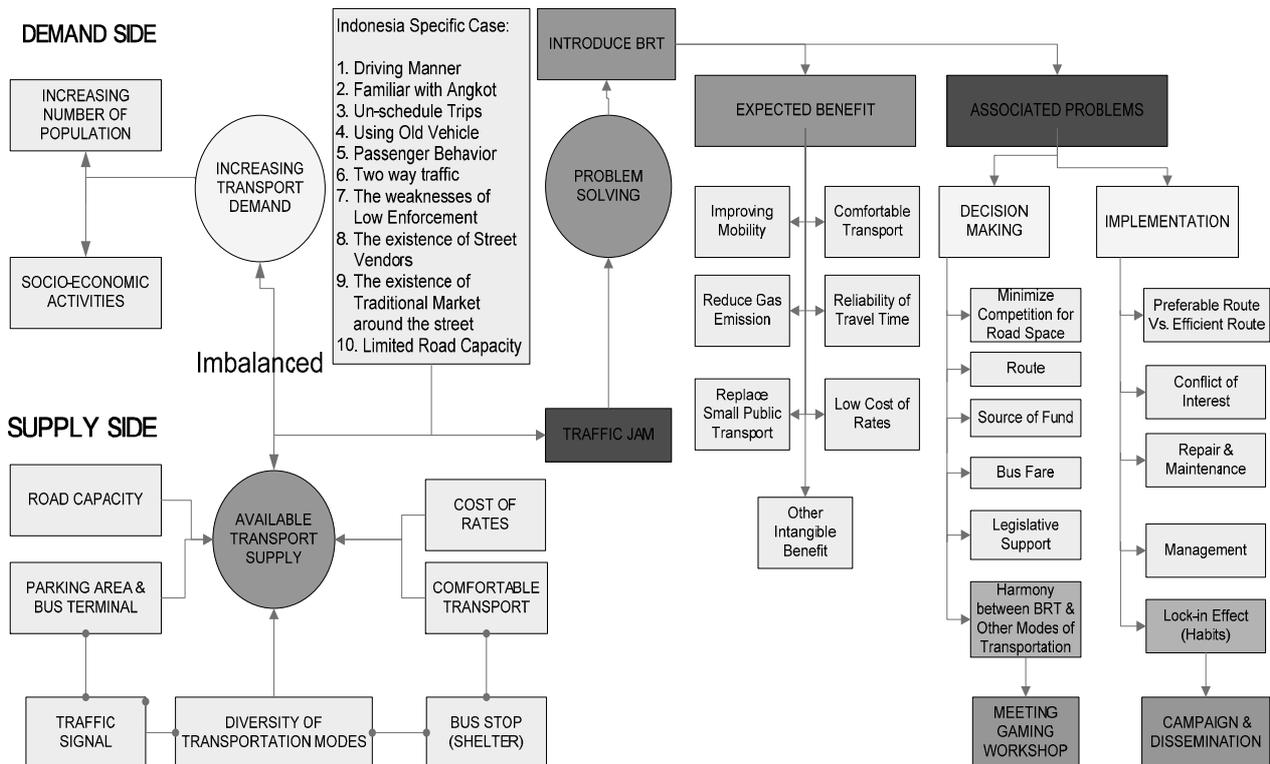


Figure 1. Conceptual Framework of the Study

3. Transportation System in Yogyakarta

There are several modes of transportation used by the citizen of Yogyakarta for daily transportation, which consists of:

- (1) Taxi (including *Ojek*), that are managed and operated by several private sectors (operators).
- (2) *Andong*, traditional horse-pulled carts.
- (3) *Becak*, traditional three-wheeled and pedal-powered cart.
- (4) Cars, including personal car and truck.
- (5) Motorbikes, by far the most commonly used personal transportation.
- (6) Bus Rapid Transport, public transports that are managed and operated by private operator.

In order to increase the quality of public transport and to have an environmentally sustainable transport, the local government of Yogyakarta city applied an extensive system of public city buses. Starting from early 2008, the city has operated a Bus Rapid Transit system called TransJogja, modeled after TransJakarta. But the TransJogja buses run together with other modes of transportation. The main problems of transportation in Yogyakarta are:

- (1) Several modes operate in the same road at the same time. As a result, there is an intensive competition among them for the road space. Severe congestion occurs at the rush hours when people go to work and return home. The local government of Yogyakarta is motivated by congestion, pollution, failure of older transport networks and rising public demand to provide

a cleaner and more efficient transport. Compared to other existing public transportation, BRTs are cheaper, more convenient, and employ more people.

- (2) Road are also used for parking and selling goods by informal sectors (called as *pedagang kaki lima*). Therefore, the width of road lane is decreased dramatically and lead to traffic jam. In this case, the local government must apply law enforcement.
- (3) To deal with the growing threat of air pollution in Yogyakarta, the challenge for the transport sectors is to find and implement a sustainable pathway for transport. Sustainable transport should limit GHG (greenhouse gas) emissions from transport and minimize other negative externalities without compromising economic growth and social inclusion. To successfully address this challenge, the local government of Yogyakarta has to ensure that transport is increasingly integrated in climate policies and that climate becomes a standard and accepted part of transport policies.

3.1 Harmonization of BRT and Other Modes

There are several institutions who are involved in a BRT project as shown in Table 3.

Table 3. Institutions involved in BRT Project

S.No.	Institutions at Yogyakarta City	Responsibility
1	<i>Dinas Perhubungan</i> (Transportation Office)	- Issuing licence for taxi/ <i>angkot</i> , route approval.
2	<i>Dinas Pekerjaan Umum</i> (Office of Public Works)	- Preparing annual budget for road operation and maintenance.
3	<i>Kecamatans and Kelurahan</i> (Subdistricts and Villages)	- Disseminate information to people who live in their administrative division or where the BRT will pass through.
4	Association of taxi owner and taxi drivers Association of Becak Association of Andong Association of Angkot Association of Ojek Representatives of end-users for each village	- Knowing the aim of BRT project within Yogyakarta, assess positive and negative impact of BRT operations. - Preparing alternative solutions after BRT is operated. - Assess customers' need, hope and expectation.
5	Informal leaders (Scholars)	- Knowing the BRT program. - To help local government to resolve problems, perceiving informal dispute-resolution to be quicker, cheaper and easier than using the formal justice system.

Implementation of BRT will not only increase the competition for road spaces, but it will also displace other public modes of transport. Therefore, before implementing BRT, it is necessary to coordinate with other public transports so that the income generation of these alternative public vehicles is still ensured while minimizing the conflict between BRT and other public vehicles. In order to harmonize the relationship between BRT and other public vehicles, the local government of Yogyakarta can apply some tools of participatory approach discussed in the following subsection.

3.2 Participatory Approach to Harmonize the Relationship

The government, both central and local, has overall responsibility for policy formulation in the economic, social and environmental spheres, including the correction of market failures, the provision of public goods, and creation of a favorable enabling environment for the private sector as well as a favorable legal and regulatory framework. It should also encourage effective participation by the private sector and major stakeholders. Participation is an essential component of successful and sustainable development of BRT. It contributes to equity by involving all people who get direct or indirect benefits in planning and operation of BRT. Participatory decision-making, together with the rule of law, democracy, and transparent and accountable governance and administration in all sectors of society is an important requirement for the effectiveness of development policies including implementation of BRT.

In order to harmonize the relationship between BRT and other modes of public transportation, three participatory methods have been suggested, which is presented in Table 4.

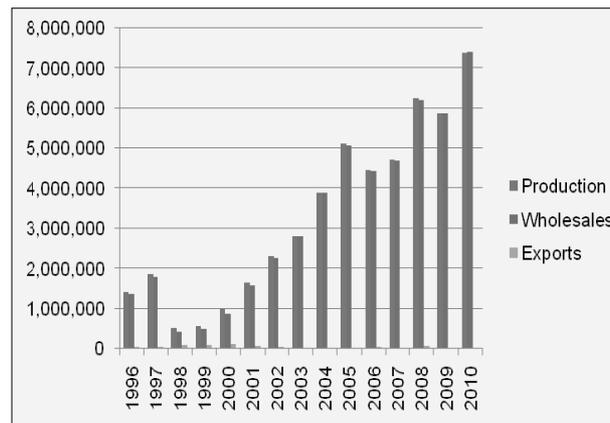
Table 4. Participatory methods for harmonizing BRT and other public modes of transportation

S.No.	Methods	Explanation
1	<p>Meeting among the institutions. Participants:</p> <ul style="list-style-type: none"> ● Association of Taxi owner and taxi drivers ● Association of <i>Becak</i> ● Association of <i>Andong</i> ● Association of <i>Angkot</i> ● Association of <i>Ojek</i> ● Representatives of end-users for each village ● Local Government of Yogyakarta attended by several offices. <p>This meeting will be held weekly or monthly until a consensus is met.</p>	<p><u>Topics of discussion</u></p> <ul style="list-style-type: none"> ● Identify local people needs, in terms of transportation. ● Lesson learnt from transportation system in developed countries, for comfortable and reliable public transport. ● Pollution by transportation, and its mitigation and control. ● Traffic jam and its impacts. ● The objectives of operating BRT in Yogyakarta, advantages and disadvantages. ● How to determine the bus fare and how to buy tickets. ● How to minimize the negative impact of operation of BRT to the income generation of taxi, <i>ojek</i>, <i>angkot</i> and <i>andong</i>. <p><u>Expected outcome of these serial meetings</u></p> <ul style="list-style-type: none"> ● Consensus among all institutions for better public transport. ● Each stakeholder understands the overall objectives of BRT and its impacts for long term development. ● Each participant understands the procedures to use BRT (e.g. How to issue and pay for the tickets). <p>Alternative modes of public vehicles will be operated in the feeder routes for collecting and bringing the passengers up to the BRT shelters. Thus, the conflict between BRT and other modes can be minimized while still ensuring a source of income for all the public modes.</p>
2	<p>Gaming (street drama) By performing street drama at open spaces / public parks, malls, schools, universities, private and government offices, the interrelationship between BRT and other public modes, existing conflicts and its solutions, the advantages of BRT operation, and its procedure can be demonstrated more effectively to the public.</p> <p>Time: weekends</p>	<ul style="list-style-type: none"> ● To visually demonstrate existing condition of public transport in Yogyakarta. ● To simulate the advantages of BRT's operation and the role play of BRT operation, such as end-user, ticketing staff, security and driver. ● To simulate the possible conflicts between BRT and other public vehicles, and also propose possible solutions by role play. <p><u>Expected result:</u> Publics including the institutions of BRT will be more easily convinced about the BRT program, and its impacts.</p>
3	<p>Briefing workshops Briefing workshop will be organized for all the associations of alternative public modes of transportation and it will be addressed by the informal leaders (scholars).</p> <p>Time : weekly workshops</p>	<p>As a typical characteristic of Indonesia, this paper emphasizes the important role of Informal Leaders (Scholars) in motivating the institutions. Informal leaders consist of <i>Ulama</i> (Islam), Priest (Christians), and Monks (Buddhists). Informal actors are important members of civil society, and increasingly play an important role in development. The role of informal leaders in Yogyakarta is very important for all the institutions of BRT. Informal leaders are respected and honored by people for his knowledge, wisdom and ability to chair a group of religion. The Governor of Yogyakarta has responsibility to select informal leaders who have knowledge and capacity to explain BRT program and to persuade their follower. In addition, all informal leaders' activities to succeed BRT program must be financed by annual local government budget.</p> <p>In BRT program, the informal leader will act as:</p> <ul style="list-style-type: none"> ● A mediator when there is a dispute between and among the parties. ● A source of feedback for BRT program in terms of social conflicts within BRT areas.

4. Utilization BRT versus Motorbikes as Daily Transport

Motorbike production in Indonesia are increasing dramatically since year 2001 (refer to Figure 2). National demand of motorbikes in Indonesia reached to 7.39 million unit in 2010 and it continues to grow. The situation is not different in Yogyakarta city either. Yogyakarta is a city for students where large number of universities are located. There are 137

universities located only within the city of Yogyakarta. As a result, many students from other provinces come to this city to study for at least 5 years, and live together with other people within the populated areas. Out of the total productive population, 44.03% are students (Badan Pusat Statistik Nasional, 2011). They ride motorbikes as daily transports.



Source: AISI, 2011

Figure 2. Trend of Motorcycle Production and Export in Indonesia

4.1 Motorbikes as Popular Mode of Transportation

Motorbikes are easy to ride, easy to operate, low cost for maintenance and operation. Therefore, motorbike is popular mode of transportation in Yogyakarta. In congested road, motorbike can be ridden easily through narrow spaces between cars and it can be used for medium range commuter of approximately 75 kilometers a day. Supported by financial banking or leasing companies, it is easier for people to pay for it. Therefore, every family owns at least 1 motorbike, as a result of which, Jogjakarja suffers worst traffic jams. Large number of motorbikes passing through the same road at the same time will create worst congestion and traffic jam. Now the question is how to decrease the number of motorbike used in the same time or how to persuade people to adopt BRT as a public transport. Not only congestion, but pollution from smoke and noise of motorbikes is also getting worst. Even though Indonesian transport allows limited 4 strokes engines to be used in Indonesia, these engines produce NO_x, CO_x and noise pollution.

4.2 Participatory Approach to Convince Motorbike

Now, how to persuade citizen to use BRT is the main objective of local government to alleviate traffic jam, and decrease the pollution. Moreover transportation is not only a government problem, but also a matter of concern for all people. Traffic jam and pollution are worst for all. We have to change our behaviour and our habit to have a comfortable future transport system. Therefore aggregate action from all citizen using participatory approach is suitable method to convince local people to utilize BRT. The suitable participatory method in this case involves public campaigns and information dissemination. The details are explained in the following table.

Table 5. Participatory methods for convincing motorbike users to use BRT in Yogyakarta

S.No.	Methods	Explanation
1	<p>Use of Mass Media Media types:</p> <ul style="list-style-type: none"> ● Newspaper ● TV ● Radio <p>This campaign will be conducted daily and last for 1 year.</p>	<p><u>Topics:</u></p> <ul style="list-style-type: none"> ● Local people's needs, in terms of better transportation. ● Traffic jams due to excessive number of motorbikes, and their negative impacts including pollution. ● The objectives of operating BRT in Yogyakarta, and its advantages. ● Why it is better for motorbikes users to adopt BRT. <p><u>Expected outcomes of these public campaigns are :</u></p> <ul style="list-style-type: none"> ● Awareness about the congestion and pollution caused by excessive use of motorbikes. ● Each people understand the overall objectives of BRT and its impacts for long term development. ● Motorbike users will be convinced about the advantages of reducing the use of motorbikes and commuting by BRT.

2	<p>Face to Face Interactions Face to face interactions will be held with individual or group of people at open space / public parks, malls, schools, universities, private and government offices to have discussion.</p> <p>Time : weekends</p>	<p><u>Promote informal leaders (scholars) in these face to face interactions</u> The importance of informal leaders (scholars) in the Indonesian society has already been discussed in the previous case study as well. They have a very strong hold among the followers and therefore can influence them easily. Informal leaders (scholars) can thus be mobilized to address their followers during their weekly religious meetings. This method can be quite effective to persuade the end-users of motorbikes to help in reducing emissions, pollution, and congestion by shifting to BRT.</p> <p>Expected results:</p> <ol style="list-style-type: none"> 1. Informal leaders (scholars) will feel honoured to be a part of city planning. 2. BRT will be promoted among the motorbike users.
3	<p>Questionnaire Survey (paper-based communication) Questionnaires and BRT information including time table, fare, etc. will be send to schools, universities, private and government offices.</p> <p>Time : quaterly for one year</p>	<ul style="list-style-type: none"> ● Local government and BRT operators know the background of people who are using and not using BRT, while survey participants can obtain BRT information. ● Participants also can participate to provide feedbacks about BRT and give suggestions to improve BRT system. ● Participants can help the responsible institutions to identify current issues and suggest solutions.

5. Conclusion

Demand for transportation facilities has been increasing due to the rising population, rising income levels and increasing socio-economic activities. However, in case of developing countries, due to limited road facilities, parking areas, bus terminals, shelters and traffic signals, there has been inadequate supply of transportation facilities. This imbalance of transportation demand and supply of facilities lead to traffic jams. Furthermore, characteristics that are typical to Indonesian situation like driving manners, growing number of *angkots*, unscheduled trips, old vehicles, street vendors are all adding to congestion. The situation is also the same for Yogyakarta, the city of our case study. Yogyakarta is one of the most important cities in Indonesia, especially famous for education as it is home to 137 universities. Thus, students from all over the country go to Yogyakarta for attaining higher education. More than 44.03 % of the productive populations in Yogyakarta are students (Badan Pusat Statistik Nasional, 2011). Motorbikes are popular modes of transportation among the students. However, rapidly increasing numbers of motorbikes are causing congestion and traffic jams in the city. The local government of Yogyakarta has already implemented BRT as a solution to solve the problem. BRT has already proven successful in many big cities all around the world. However, BRT itself is not free from limitations. On the decision making part, harmonizing BRT with other means of transportation, reducing the competition for road spaces, fare collection methods, deciding the route, and getting legislative support to subsidize the BRT are some of the problems that need to be addressed. Similarly, once the BRT is implemented, it will face problems like repair and maintenance, management of schedules and motivating private vehicles owners to shift to BRT.

Since BRT involves a large number of institutions ranging from government offices, private investors, BRT operators, various transport associations, and end-users, participatory approaches play an important role in solving some of the issues related to BRT in decision-making phase as well as the implementation phase.

This paper focuses on two problems as the cases of study, and proposes possible participatory methods for solving the problems. In order to harmonize BRT with other modes of public transportation (like *angkot*, *ojek*, *becak*) that might get displaced by BRT, these alternative modes can be operated in the feeder routes for collecting passengers up to BRT route. For this case study, meetings among the institutions, street drama, and workshops have been proposed as the possible tools of participatory approaches. Another case study is how to motivate motorbike users to shift to BRT once it is implemented. This will be possible by organizing public campaigns and information dissemination. For this purpose, use of mass media, face to face interactions and questionnaire survey have been proposed as the suitable participatory tools.

Through the case studies, two important facets that should be taken into account in BRT planning and implementation process in Indonesia have emerged. First, Indonesian specific public transport modes, such as *angkot*, *ojek* and *becak* should be considered in the process. The role of these modes is not only for providing mobility for local people, but also providing jobs for drivers. Therefore, harmonization between existing modes and BRT might be a central concern for local authorities when BRT is introduced in Indonesia. Participatory approaches are certainly useful for solving this problem. Second, as a typical

case for Indonesia in general, and Yogyakarta in particular, the role of informal leaders (scholars) have been emphasized to solve the problem in both the case studies. Informal leaders include *Ulama* (Islam), Priests (Christians), and Monks (Buddhists). Informal leaders have a very huge influence among their followers in the Indonesian society. Thus, informal leaders can be used as a medium to address the public in all the participatory approaches in order to convince their followers to adopt BRT as their mode of transportation. Similarly, they can play an influential role as a mediator in mitigation of conflict that might exist between BRT and other public modes of transportation.

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