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**Comparative assessment of success and failure factors
for implementation of bus rapid transit system in
Accra and Bogota**

ZEF Doctoral Studies Program

Interdisciplinary Term Paper

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Abstract

Bus rapid transit is one of the transport reforms being adopted to overcome problems of traffic congestion in cities of both developed and developing countries. This study focuses on assessment of the success and failure factors for BRT implementation in Accra and Bogota, cities with distinct level of implementation of BRT. Bogota is one of the best examples for successful implementation of BRT while Accra is struggling to implement the system for the last six years bounded by several challenges. We used sustainable transportation framework to assess the planning and implementation of BRT in the two cities.

We argue that using sustainable transportation framework can help to understand the interaction behind most factors influencing the planning and implementation of BRT system. These factors largely relate to institutional, social, economic and ecological dimensions of the sustainability framework. The most important factors influencing the success of implementing BRT in the two case studies are: commitment of the political leadership; lack of institutional integration and capacity; inadequate participation of stakeholders; poor or no communication of BRT plans to the stakeholders; unfair treatment of the victims of right of ways of the BRT infrastructure; lack of affirmative actions to ensure equality of access to services; declining consumer satisfaction; lack of allowance for re-investment in distribution of profits; increasing BRT development costs in successive expansion phases and system obsolescence and associated increased level of ecological degradation. These factors have been explained in this study with the expectation that addressing them can help cities when planning and implementing their BRT system.

Key words: Bus Rapid Transit, cities, sustainability

1. Background and justification

City authorities in many developing countries are confronted with the challenge of rising urbanization due to growing population and sprawling human settlement patterns. According to the United Nations (2014a), the number of people who live in cities has increased from 2.4 billion in 1994 to 3.8 billion presently. The projections are that more than 5 billion people (more than half of the global population) will live in cities in 2030. Gwilliam (2013), made similar observations and further indicated that "at the global level, all future population growth will be in towns and cities".

Significant share of the projected 5 billion people will live in cities of developing countries compared to developed countries. UN (2014b) estimate that the gap between urban populations of more developed and less developed regions of the world will be increasingly widening overtime. The population living in less developed cities will represent more than 4 times the population in developed cities in 2050 (Figure 1).

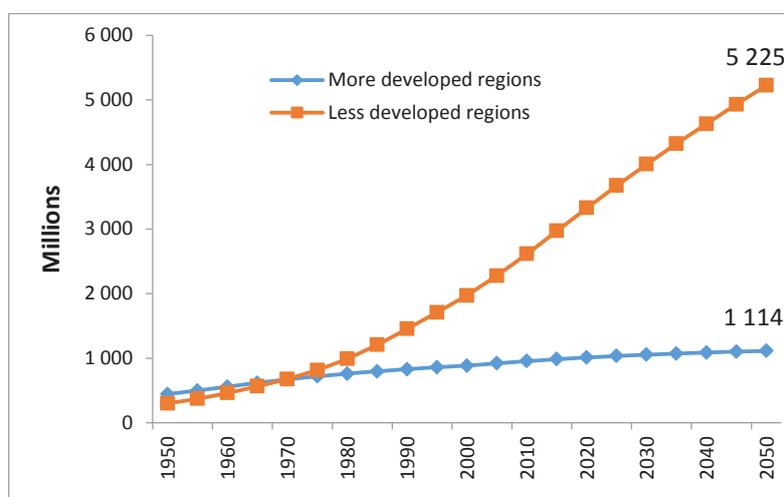


Figure 1: projection of urban population in less and more developed regions

Source: UN (2014b)

High rate of urbanization coupled with improvements in standard of living and changing lifestyle put considerable pressure on city governments to meet demand for public services. One of such challenges is the rising demand for transportation service to support mobility of people and goods within cities. In addition, as economic situation in many cities of developing countries gets better, personal car ownership and demand for travel also rise.

City lives in several respects depend on transport services. Transport is therefore considerably important for the mobility of people and goods from place to place. Urban transport links city residents to work places, education, health services, businesses, recreation and other day to day activities. However, most local governments can hardly provide urban transport services to meet rising demand for mobility in developing cities.

As we have stated earlier, dependency on individual car ownership continuous to rise due to higher standards of living in emerging cities. However, the limitation of road space in cities creates a situation where privately owned cars use more road space than public transport (UNDP, 2012). Additionally, increasing motorization is accompanied by a number of undesirable side-effects (negative externalities) such as increased pollution, congestion, safety failures, extremely-long travel times and work absenteeism, among others. The rising level of motorization among individuals alone is then not enough to attain sustainable urban transport goal most cities aspire.

The notion of *sustainability* implies the judicious use of resources, without destroying the potential for further development (World Commission on Environment and Development, 1987). In the specific case of transport, it involves meeting mobility needs of all social groups without compromising the circulation of the entire system. In this respect, the following questions will arise; (a) what options are available to cities in the development of sustainable transport and (b) what factors would determine its successful implementation?

Developing cities use different modes of public transportation to cater for the mobility needs of their population. Most of the cities use both public mass transports such as city buses, shared taxis and private vehicles sharing common roads under weak or no coordination in most of the cases. The rich and middle income groups of the urban population rely on private vehicles while vast majority of the city dwellers rely on public transportation services. However because of lack of dedicated roads for public transportation, all the vehicles line up in the same overcrowded road. An alternative that have gained popularity in the last years and that overcome the issue of dedicated lanes (at least in its "ideal" conception) is the bus rapid transit (BRT) system. A powerful idea associated with this transport solution is the notion of "road democracy". As per the public lecture by the former Mayor of Bogota, Peñalosa (2013), "*there should be a road democracy*

in which a bus with 80 passengers will have 80 times right over the road space than a private vehicle with one person". Different cities have implemented (are implementing) BRT to overcome the problem of road congestion and provide fast, comfortable, safe and secure mass transport service to their citizens. However, the success in implementation of cities varies even among cities within the same country (Rizvi and Sclar, 2014).

This study will assess success and failure factors for BRT implementation in two specific environments: Accra, Ghana (West Africa) and Bogota, Colombia (Latin America). Bogota is one of the most successful cities of the world in implementing BRT system while Accra is one the cities that is facing different challenges in implementing this system. Our main purpose is to draw lessons for future planning and implementation of similar projects in other cities, given its potential as a low cost, efficient, environmentally friendly and clean massive transport system. The study will make use of an interdisciplinary sustainability framework to assess the reforms in the two cities.

This paper is organized in five sections. The first section is the introduction, which provides information on the background and rationale and objectives of the study. Section two is on approaches of the study. The third section presents conceptual framework adopted for assessment of the BRT system in Accra and Bogota from the perspective of sustainable transport framework. The fourth section focuses on the discussion of the implementation process and key success and failure factors for BRT implemented in the two cities. The final section will highlight lessons learnt from the experience of the two cities and conclude paper.

1.1. Objectives of the study

The major objective of this study is to assess the implementation of bus rapid transit system in the selected cities using sustainable transportation framework and identify the key underlying factors for their success and failure. The specific objectives of the study are:

- To identify critical success and failure factors for the bus rapid transit system projects implemented in Accra and Bogota.
- To draw lessons from the planning and implementation of the bus rapid transit system in the two cities for future use in the planning and implementation of similar system in other cities.

2. Approaches

This study was conducted using review of literature and experience of one of the authors in the planning and implementation process of BRT in Accra. We used a sustainable transportation framework for comparative assessment of the planning and implementation of BRT system in Accra and Bogota. The two cities were purposively selected for this study based on their very distinct level of success of implementation of BRT system. For instance, in Accra, implementation of the BRT system started six years ago, yet the pilot phase is not completed (GoG, 2007). On the other hand, the planning and implementation of the Bogota BRT was completed in less than three years (Hidalgo, et al., 2014) and the system is fully operational. The system in Accra has got several challenges and could not move forward, while that of Bogota is mentioned as one of the best examples in the world.

3. Conceptual framework

3.1. Sustainable transportation system

Several authors, (Agarwal, 2013; Litman, 2011; Godard, 2013; and FTS, 2011) have considered different dimensions of sustainable transport system. Agarwal, (2013) argued that sustainable transport system must be capable of financing itself through adequate fares. Litman (2011), FTS (2011) and Godard (2013) expanded financially-scoped notion of sustainability.

Litman (2011) adopted the three traditional pillars of sustainability framework (economic, social and ecological) and applied them to transport-specific concerns such as traffic congestion (economic), inequity of impacts (social) and air pollution (ecological). FTS (2011) emphasized that sustainable transport must be compatible with the broad notion of improving people's welfare through reliable, safe and affordable transport service that does not harm the environment and can be sustained over time. Godard (2013) introduced institutional pillar in the sustainable transport definition in discussing the transport reform in West and North Africa. Similarly, Stanley and Lucas (2014) indicated that a sustainable transport reform should: “i) provide an efficient service and integrate people; ii) foster economic activity and community participation; iii) be environmental-friendly and iv) include adequate institutional provisions and be built through consensus”. In this study, we have considered the four dimensions of sustainable transport (economic, social, ecological

and institutional) in assessing the successes and failures of the BRT systems planning and implementation processes in Accra and Bogota.

Economic perspective

Many authors have emphasized the importance of financially-sustainable transport system in the implementation of transport reforms. In this respect, Litman's (2011) views on financial sufficiency of sustainable transport, transport efficiency (minimizing costs) and above all the ability to foster and accommodate economic growth by allowing increased demand for mobility of people and goods become important ingredients on the economic perspective of sustainability. Jones et al. (2013) developed a framework to evaluate how sustainability goals are incorporated in urban transport program in Accra. He identified accessibility, inclusiveness and reliability as the major criteria for evaluating the level of accomplishment of economic sustainability of the BRT project.

Following these inputs, we consider that an economically-sustainable transport system should: aim at becoming financially self-sustaining over time through the collection of fair fares; be efficient in transporting people at the minimum cost; and boost economic activity allowing a positive feedback for the economic activities of all the involved agents.

Social perspective

Litman, (2011) identified a number of factors that are vital to achieve a socially sustainable transport system. He indicated that, in order for transport system to meet social sustainability goal, it must be affordable to social groups. Of course, maintaining equilibrium between the affordability and the financial viability of the system is a difficult task. This tradeoff illustrates the complexity transport planners are confronted with in the design of a sustainable transport system. Other objectives mentioned by Litman (2011) were that the system should enhance human health, contribute to an equal urban development and provide safety for the people and their property.

Stanley and Lucas (2014) argued that in developing countries, transport systems face the risk of collapsing due to oversupply. This has to do with poor regulation capacity and the emergence of an informal transport sector that struggle to maintain their market share. Oversupply could lead to poor outcomes in terms of reliability of the service, quality, affordability and safety. In this respect, it is important to assess how a reform should

integrate the old transportation system with the new (BRT in our case). From this social perspective, Stanley and Lucas (2014) also considered the fare levels so that the poor can have access to the transport system.

Therefore in this study, we consider that from a social-sustainability point of view, the transport system should aim to be affordable, such that the very poor can benefit from it; safe in the sense of assuring security of all users at all times; accessible, such that everyone that needs the service can make use of it (e.g. access for the disabled). The system should also promote livelihood in the sense that the reform must assure that everyone is benefited, and those who are affected by the reform are compensated (for example, because the reform could affect those working in an informal transport segment).

Ecological perspective

Stanley and Lucas (2014) mentioned that any transport reform should reduce the impacts on the environment for every service kilometer provided. The most visible impacts are related with air and noise pollution. Litman(2011) considers emissions as an undesirable by-products of any transport project. The construction of suitable infrastructure for the system would also have negative environmental consequences. Therefore, the desirable characteristics of an environment friendly project should include the reduction of CO₂ emissions, prevention of noise contamination and respect for green areas (for example if the reform implies construction works).

Institutional perspective

Finally, we consider the governance side of the reform that has to do with the institutional capacity of the government to implement a sustainable transport system. Stanley and Lucas (2014) argue that coordination problems between different government institutions can lead to delay or even suspend the implementation of a project. Lack of enforcement of regulations and the right to operate are also mentioned as important factors to be consider from an institutional point of view.

In order to reduce the risk of failure, it is important to understand the specific governance and institutional context of most BRT projects as well as how the inbuilt consensus building mechanism works among governmental and non-governmental stakeholders. Stanley and

Lucas (2014) indicated that “institutional and organizational capabilities are important factors for sustainable public transport delivery”.

It is clear that the institutional perspective is a sort of ‘overarching factor’ that encompasses and can determine the success or failure of reforms in a given transport system. It is related to institutional capacity of the government to implement the BRT. This involves enforcement of the laws and the capacity of the government to negotiate, coordinate and get consensus with potential stakeholders that could be affected by the reform.

3.2. Tradeoffs and relationships

One key factor that emerges from the discussion of the sustainability of transport system is the recognition of the complexities of the tradeoffs among the four pillars which is difficult to tackle from a singular perspective. It would require a balance of issues from the four dimensions of sustainability. For example, a transport system can be designed to be financially sustainable, but at the same time it might not be inclusive, because of high fares. On the other hand, a socially-inclusive system can also be financially sustainable but rely on the destruction of green areas, or the implementation of polluting transport modes. Finally, as mentioned, institutional flaws can determine the failure of the reform. This study tries to explain the interactions and tradeoffs between the different success and failure factors in implementing the BRT system using the conceptual framework (sustainable transportation framework) we used in our assessment of the two BRT systems (Figure 2).

From Figure 2, the institutional dimension serves as the fulcrum around which three pillars of sustainability revolve in order to attain sustainable transport. This is consistent with view of Stanley and Lucas (2014) on the pivotal role institutions (institutional set up and capacity) in attaining sustainability goals. Any transportation reform that does not have sound and sustainable institutional base is at risk of not achieving its intended targets. More specifically, a reform which does not involve relevant institutions and lacking political commitment will not be successful to attain its social, economic and ecological targets. Other aspects of sustainability are also inter-related and complementary to each other and they equally contribute to the development of sustainable transportation system. For instance, a reform that will not avoid social exclusion will not be able to progress towards its

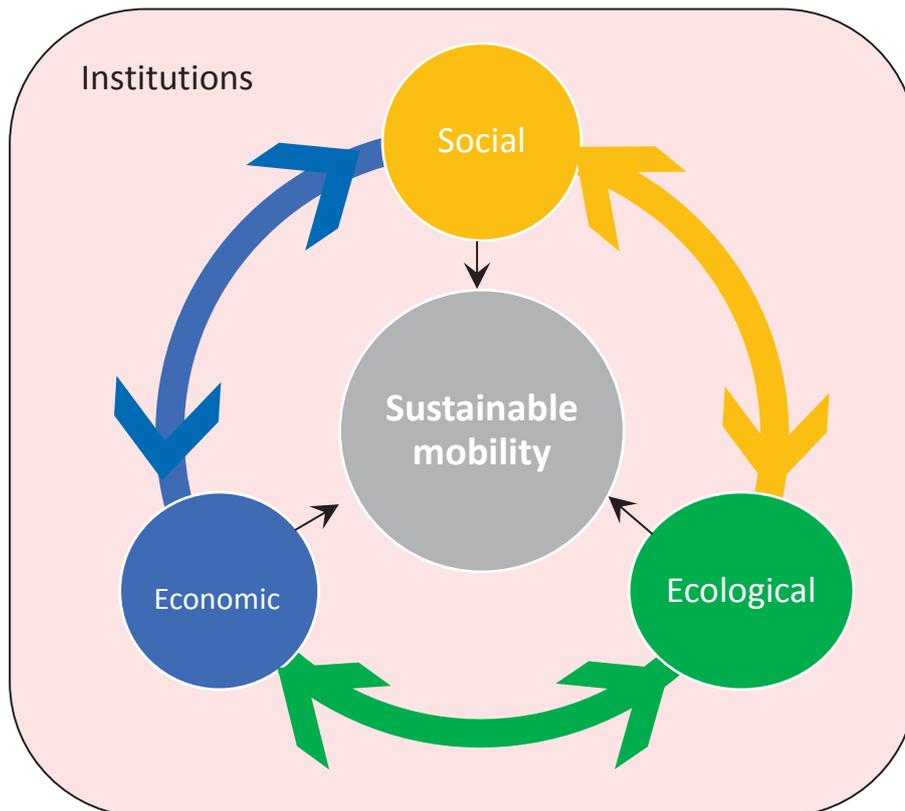


Figure 2 - Conceptual framework for Sustainable transportation system

ultimate goal and attain economic and environmental goals. Similarly, failure in the economic dimension will jeopardize the attainment of social and ecological dimensions.

3.3. Bus Rapid Transit System

Levinson, et al (2003) define Bus Rapid Transit (BRT) system as "a flexible, rubber tired rapid transit mode that combined stations, vehicles, services, running ways, and intelligent transportation system (ITS) elements into an integrated system with a strong positive image and identity. BRT applications are designed to be appropriate to the market they serve and their physical surroundings and can be incrementally implemented in a variety of environments". From this definition, some key characteristics of the system are:

- *Running ways (busways)*. It is the lane the bus uses for the trip. It can range from a completely separated right-of-way to a mixed-traffic system, in which other vehicles can also use the busway.
- *Stations*. It is the meeting point for users and BRT vehicles. Its physical characteristics can vary widely, depending on features as spacing, length, fare collection units and side services.

- *Vehicles.* It ranges from standard diesel-fueled vehicles to articulated "clean" vehicles (hybrid).
- *Intelligent Transportation System (ITS).* These are features aimed to facilitate the use of the transport system to the users. It includes characteristics such as automatic vehicle location systems, real time information systems and traffic signal priorities.
- *Service patterns.* This is another feature that can vary widely, also depending on the time of the day. In peak hours, the service can offer non-stop trips, while in less busy periods it can stop in intermediate stations regularly.

BRT systems have been implemented thoroughly both in developed and developing countries. Practitioners explain its popularity "due to its low cost, rapid implementation and high performance and impact" (Hidalgo and Gutiérrez, 2013).

4. Discussions

4.1. Description of Cities and their status of implementation of BRT

4.1.1. City of Bogota

Bogota, the sixth largest city in Latin America and the capital city of Colombia, was established in 1538 (Figure 3). It is the main governmental, financial, cultural and service center of Colombia. Rural urban migration has been one of the major challenges in Colombia. This has been because of the movement of rural people searching for better employment in urban areas and the civil war which displaced most of the rural population. As a result, about 76% of the total population of Colombia is living in urban areas (<http://data.worldbank.org/indicator/SP.URB.TOTL.IN.ZS>).

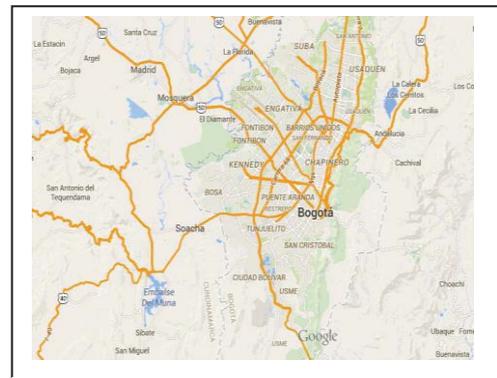


Figure 3: Location of Bogota

Bogota has been receiving a huge influx of migrants and has a total population of 7.8 million people which accounts for about 16% of the total population of the country (<http://www.dane.gov.co>). The population in Bogota is growing at 2.5% and this is one of the fastest in Latin America (ibid). Fast population growth in Bogota has been generating tremendous demand for the limited urban services including the urban public transportation. However, the existing system could not cope with increased demand and

this favored expansion in use of private vehicles. As a result, over 95% of the road was occupied by the private cars carrying only 19% of the urban population in Bogota (UNDP, 2012).

The city roads were in poor condition with inadequate maintenance. The city had very old public transportation busses with low operating speed and hence excessive travel time causing high congestion and accidents. The city buses did not have comfortable seats, ventilation and security (Figure 4). Since they were very old, they were creating extremely high level of environmental pollution (World Bank,



Figure 4: Traffic situation in Bogota before BRT

2004). According to the BRT project document, Bogota city emitted pollution levels of 750,000 tons of atmospheric pollutants per year generated by traffic and noise levels above 90 decibels on major streets. There were also 52,764 traffic accidents and 1,174 fatalities recorded in the year before the introduction of TransMilenio (ibid).

In order to alleviate congestion and provide an efficient and cost-effective means of transportation, the city administration of Bogota has planned and implemented different reforms in the transport sector. One of the reforms was introduction of bus rapid transit (BRT) system to Bogota in 1999(Figure 5). The BRT system implementation in Bogota is cited to be among the most successful urban transportation reform programs in the world (Hidalgo, 2013). BRT in Bogota has significantly reduced the transportation problem in the city and the government is working to expand it in different parts of Bogota and other cities.

The first step taken in the process of putting the intended system in place was creation of Transmilenio. Transmilenio is a public private partnership that created a flourishing BRT system in Bogota and is composed of two entities: associates of the managing company Transmilenio S.A. (public) and the associates of operating system (private). Under the Transmilenio partnership, the public sector is responsible for the construction of the infrastructure and overall control of the BRT system while the private sector is in charge of



Figure 5: BRT in action in Bogota

the system operation and maintenance. Accordingly, the design, planning and investment of the infrastructure was carried out by members of Transmilenio S.A, public institutions such as Bogota City Hall, the Fund for Education and Road Safety of the Secretary of Transit and Transportation, Institute of Urban Development, the District Institute of Culture and Tourism, the

Secretary for Transportation and Traffic, the Department of Planning, the Secretary of Finance and Metrovivienda¹.

The overall operation of the Transmilenio was carried out by private companies including exclusive lane operators in charge of the articulated buses operation that circulate on exclusive lanes, feeder operators in charge of feeder buses operation, fare collectors and trust fund operators that are responsible for receiving and distributing funds to all the operators and the Transmilenio S.A (World Bank, 2000).

The planning and implementation of Bogota BRT was a participatory process involving both national and international stakeholders and relevant institutions. The process was as exhaustive as possible in terms of getting the participation of all sectors of the society including the most experienced experts in the sector, government officials at all levels, technicians and bus operators that have been working in the old public transportation system (UNDP 2012,). The concerns of all citizens and voice of the society was captured through the face to face discussion and open lines of communication. These concerns and voices have been tried to be considered in the design and implementation process.

A particular feature of planning and implementation of BRT in Bogota was the active involvement of the private transport operators that used to provide services in the old transportation system. As indicated earlier, the operation of Transmilenio is performed by private entities. Each private company was selected through an open and competitive bidding process. Four trunk-line operators run the local and express services on the main highways. About 96% of the private operators that provided transit service prior to

¹ Metrovivienda is a public enterprise owned by the local government of Bogota that promotes construction and acquisition of social interest houses in the city.

Transmilenio acquired stock in the four firms that were awarded the contracts (UNDP, 2012). In addition, there are seven feeder bus operator companies who run services from the rural areas to the main highways. These approaches have enabled the Transmilenio to be as inclusive as possible and created a condition free from protests of the operators in the old system and less obstacles in the implementation process. The sustained dedication and commitment of the political leaders starting from the planning, initial implementation and further extension of Transmilenio is one of the most important forces that enabled a smooth realization of BRT in Bogota.

4.1.2. City of Accra

Accra is the commercial and administrative capital of Ghana and has over 2.5million population with a growth rate of 4.4 % per annum (World Bank and GEF, 2006). The Accra Metropolitan Assembly is the local government authority responsible for city administration and planning. Expansion of the city has shifted from “compact city growth” (where there is high population densities with land use and high concentrated residential pattern) to “network city” development pattern where there is decentralization of land use with lower population densities and sub-urban residential development. The road network is concentric and centripetal in structure. The series of radial routes converge at the central business districts because that is where economic and social services are concentrated. In the past decades, the rising population in the city has led to sprawling settlement pattern.



Figure 6: Location of Accra

The sprawling settlement pattern (growing sub-urban residents) encourages dependency on private cars especially for the rich and the middle class who can afford them. On the other hand, the poor who live in city margins tend to bear the high cost of unreliable public transport because they do not have alternatives. In addition, general improvement in economic circumstances of the city has contributed to the growing middle class. Given the rising population and the growing class, the demand for public services, particularly,

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passenger transport has seen significant increases beyond the limit the city authorities can provide.

With the rising population, sprawling (Figure 7) urban structure and the associated growing demand for mobility and unattractive public transport, individual car ownership is on the ascendency. There were 1.07million cars in Accra (DLVA, 2013). Although the rising motorization and demand for mobility

have led to heavy traffic congestion in AM/PM peak hours, the inefficient use of road space and indiscriminate parking and street trading are also contributing factors (World Bank, 2006). The traffic congestion situation in Accra explains the kind of share of transport modes.



Figure 7: Traffic congestion in Accra

According to DUR(2012), although 70% of person trips in the city depend on buses, it only uses less than 25% of the road space unlike private cars and taxis, which only move less than 30% of person trips but use 70% of road space.

The poor traffic situation in the city has resulted in a number of attendant social, environmental and economic problems (Figure 8). EPA (2012) stated that road transport emissions is a major contributor of local pollution because of traffic congestion and emissions from poorly maintained engines. Road transport contribute 42.5% of the national greenhouse gas



Figure 8: Gross polluting cars in Accra

(6,300.4GgCO₂) (EPA, 2014) and consumes more than 61.9% of oil products in the transport sector (IEA, 2010). The situation poses public health threats especially to street sellers (mainly young male and female who have migrated to the city looking for jobs) and school children that walk long distance along the road to go to school. There are also rising reported cases of traffic accidents and poor road safety associated with growing motorization in Accra. According to the national road safety commission, the city records

1,500 traffic accident every year due to driver aggression, illiteracy, disregard for transport laws (Okoye, et. al., 2010).

In an effort to reform public transportation in the city, the Ministry of transportation introduced the Ghana Urban Transport Project with financial support from the World Bank and the Global Environment Facility in 2008 (Figure 9). Accra is one of the pilot cities for this project.



Figure 9: Artist Impression of Ghana's BRT

The project aims at improving urban transport mobility and promote shift to environmentally sustainable transport mode (World Bank, 2006) through (a) institutional development, (b) traffic engineering, management and safety, (c) development of BRT system and (e) integration of urban development and urban planning (World Bank and GEF, 2006) .

According to the restructuring report (World Bank, 2012), although the project had advanced in terms of the required infrastructure to be used by the BRT, less progress has been observed in the overall transport reforms (including institutional arrangements required by the project). While the civil works represent an important part of total budget, it alone will not serve as a solid foundation to face the transport system reform. In addition to the institutional innovations required by the project, there is also the need to define which actors will operate the bus system and their associated responsibilities into the project's scope, aspect which has not yet defined thus far.

4.2. Key success and failure factors for implementing BRT system in the two cities

Despite the advantages BRT bring to urban passenger transport, its implementation comes with a number of challenges of varying degrees among cities within the same country (Rizvi and Sclar, 2014) and between cities in different countries. These challenges largely boarder on the four pillars of sustainability: institutional, social, economic and ecological aspects. The analysis of Accra and Bogota BRT implementation would help to highlight key factors driving the success or failure of the reform.

4.2.1. Institutional dimension

Lack of coordination among different institutions

Unlike other projects such as light train that could be managed by a single consulting company, BRT by its nature is a project needing multidisciplinary and multi-stakeholder approach (Lindau, et al, 2014). Planning and implementation of BRT requires the attention and action of different institutions in the city and the national government. As a result, there is a need to have a comprehensive entity composed of the different institutions and the private sector operators that will work throughout the project planning and implementation.

In the case of BRT of Bogota, the first step that the office of Mayor of Bogota city took in the process of planning and implementation of BRT was to set up this entity (Transmilenio). As indicated above, Transmilenio has two components, the private and public. The public component is composed of the essential institutions and was responsible for the planning and investment in the physical infrastructure (UNDP, 2012). The private sector was responsible for operation of BRT. Because of the proper institutional arrangement at the planning and implementation stages, BRT in Bogota was smoothly implemented and is a living example for the rest of the world (Lindau, et al., 2014).

According to the restructuring report of World Bank (2007) on Accra BRT report, there is a remarkable gap in the institutional arrangement of BRT. The different institutions responsible for the planning and implementation of BRT were not organized and empowered to accomplish intended activities. The report states that *“creation of the key planning and management entity for urban passenger transport, Greater Accra Passenger Transport Executive (GAPTE)... has been delayed by about three years and remains to be established”*. However, institutional reforms to be undertaken by GAPTE such as restructuring the operational systems of the current passenger transport are essential for the successful implementation of BRT in Accra. Different institutions are named to be responsible for the establishment of GAPTE. However, some of them have got double responsibilities in the implementation process apart from their regular duties and others are not paying due attention to the matter. In general, there is a remarkable weakness in the

institutional arrangement during the planning and implementation of BRT in Accra and this is contributing for the failure of implementation of the project.

Lack of Political Commitment

As is indicated earlier, the commitment of the office of Mayor of Bogota in setting up relevant institutions, supporting their daily activities and coordinating the overall institutional coordination was probably one of the most important factors that contributed for the success of the BRT implementation in Bogota (UNDP, 2012). On the contrary, this sort of coordination and support was not observed in the case of Accra. The World Bank Monitoring and evaluation team has been visiting Accra officials to negotiate for earlier coordination of institutions to set up GAPTE. Lack of full participation and commitment of political leaders has resulted in similar problem in other cities such as Delhi (Rizvi and Sclar, 2014) and Cali (Hidalgo, 2013). The World Bank evaluation team considered lack of political commitment as a high risk factor for the Accra BRT project.

Insufficient institutional capacity

BRT system development needs having sufficient institutional capacity that can undertake time oriented, context specific, cost effective and inclusive plans and implementation of these plans. There is also a need to have a capacity to properly estimate the amount of resources needed to compensate for properties to be removed from the right of way and the time dimension of costs of construction and facilities to implement BRT. Experiences in both cases reveal that there was under estimation of compensations and increases in costs over time. The Bogota project has been very quick in implementing the first phase and has taken advantage in overcoming the increases of costs over time. However the Accra project is facing this challenge mainly because the project could not be implemented as per its intended initial plan. Costs of compensation were also underestimated mainly because the low institutional capacity to critically consider such things at the very design stage of the project.

4.2.2. Social dimension

Lack of participation of operators in the old transportation system

Getting full participation of the relevant stakeholders in the planning and implementation process was essential to ensure smooth implementation of the project in Bogota. The

potential stakeholders in this case were experts with long years of experience, technicians, the operators of the old public transportation system such as minibuses (tro-tros), buses and actors involved in transport related activities and that felt threatened by the reforms.

One of the good practices to be learnt from Transmilenio is the involvement of these stakeholders from its very inception throughout the implementation of the project as private associates in the Transmilenio partnership framework (UNDP, 2012; Lidau, et al., 2014; Hidalgo, et al., 2013). Private sector operators were organized in different companies, took responsibility for the operation of Transmilenio, and in this way had an active interest in the success of the company. This has ensured inclusiveness of the project and its social responsibility. As a result, there was minimum resistance from these operators and the project was implemented with less difficulties.

Regarding the Accra BRT project, there was no early consultation and involvement of actors in the old public transportation system. The focus of the city administration was mainly on the construction of physical infrastructure while the operation of the BRT system, which involves the social aspect of restructuring the operating system of the old transport system, was neglected (World Bank, 2007). Since the operators in the old system were not involved in the planning and implementation of the physical part, they considered the project as their potential enemy. BRT implementation process in Accra did not consider working with relevant stakeholders and the project confronted strong resistance against its implementation and this is becoming one of the most important failure factors for the project. The World Bank evaluation team considered lack of stakeholder's commitment in the planning and implementation of Accra BRT as the modest risk factor to the success of the project (ibid).

Lack of communication and networking

Full participation of stakeholders in the planning and implementation of BRT demands communicating and networking with all stakeholders and the citizens in order to inform them about the intentions and progresses of the project and getting feedback in turn (Wright and Hook, 2007). This has been the principle followed in the case of Transmilenio. Communication lines have been open to get the concerns and voices of people. These voices and concerns have been incorporated or considered in the planning process. The continuous

communication with the residents of the city and all the necessary stakeholders during the implementation process has also enabled Transmilenio to get feedback and resolve issues as they appear over time (UNDP, 2012). This has enabled the project to be implemented smoothly without interruptions due to negative reactions from people.

In the case of BRT project in Accra however, this did not happen since there was no organized and well-coordinated institutional setup to play this role. As a result, issues and voices of people were not heard and it created resistance against the implementation of the project. In general, there is a need to create public awareness about the new BRT system and its purposes through information campaigns to gain public buy in of the project (Wright and Hook, 2007).

Fair treatment of social groups affected by the implementation of BRT

Beyond the intended welfare gain aimed by any particular reform, there are winners and losers in its implementation. However, the trade-off should be at fair terms without affecting the welfare of both parties. Implementing BRT influences different groups of people including owners of kiosks near the roads, people trading on streets, business owners whose buildings should be demolished and businesses relocated because of the right of road, residents whose residential quarters will be demolished and others. These groups of people should not lose their livelihood as a result of BRT and left aside with insignificant amount of compensation. There should be appropriate communication and psychological treatment and they deserve enough amount of compensation that can enable them to be rehabilitated somewhere else without much suffering (Porter, 2010). If projects fail addressing this dimension, their success cannot contribute to the sustainable development of the nation.

Lack of affirmative actions to ensure equality of access

The major purpose of implementing BRT system in cities is to resolve the problem of transportation which is limiting the mobility of the population and their access to different services and work places. The major victims of this problem are women, school children, elderly and other segments of the society. Implementation of BRT system can provide better physical access of this segment of the society to the transportation services. However, the availability of infrastructure and services alone does not guarantee equality of all groups of

the society in terms of their access to the system. In order to be inclusive, the system should be affordable for those social groups that cannot afford to pay the fare. For instance, BRT system in Bogota is based on a fixed fare system without any subsidy by the government. At the initial stage, this fare was 6% higher than the fare charged by other transportation systems in other cities of Colombia (UNDP, 2012). This is unaffordable for many of the city's poorest and most vulnerable citizens including women, students and elderly (Porter, 2010). There is a need to consider taking affirmative actions for specific groups of the society to ensure their equality of access to the BRT service.

4.2.3. Economic dimension

Full implementation of the project in Bogota has implied that the project not only cover its own costs, but also generated profits over time (Rode and Burdett, 2011). In terms of employment creation, Carrigan, et al. (2013) reported that the project created a net of between 1,900 and 2,900 permanent jobs in operations. Also, a benefit of USD 288 million has estimated in avoided traffic incidents and fatalities. Moreover, gains related to reduced travel time has been estimated in the order of USD 1,830 million (Hidalgo, et al., 2012). Of course, all of these outcomes that could have been obtained by the Accra BRT system were not achieved in light of the institutional failures and lack of vision towards the inclusion of important stakeholders that harmed the implementation of the project.

Declining consumer demand and consideration for quality improvement

Consumer satisfaction surveys are important tools to get feedback from the users of the transportation services. An ex-post impact assessment made on the implementation of the Transmilenio (Hidalgo, et al., 2014) reported very positive impacts of the project. This study also revealed the declining consumer satisfaction using the data obtained from the monthly consumer survey that is conducted by the agency responsible for system operation. The results of this survey reveal that from 2002 to 2005, consumers rated Transmilenio service as good and very good and this rating has declined from 2006 onwards (ibid). The study attributed the low rating of the project starting from 2006 to slow expansion of the Transmilenio. There were no new busways in operation after 2006 and the infrastructure built in the pilot and subsequent expansions were deteriorating. In order to overcome this problem, the infrastructure needs to be periodically maintained and the operating buses be improved in terms of their occupancy, personal safety of passengers and security.

Overcoming funding gaps for infrastructure development for further expansion

One of the challenges for the further expansion of the BRT projects is demand for better quality of infrastructure based on the lessons learnt from the pilot phases and the associated increase in costs. Given the limited initial resources allocated by the municipalities and lending organizations, this inhibits the progress of expansion projects. Both Bogota and Accra projects have confronted this challenge. However, as long as the project is economically feasible, financial constraints should not halt further expansion of the project that will ensure better economic wellbeing of the society. The remedy is for the municipalities to be innovative and solicit for alternative sources of finance (UNDP, 2012).

Lack of allowance for re-investment

Under the current public private arrangement of the Transmilenio, investment cost by the public sector on physical infrastructures is not recovered from the revenue generated from its operation. The revenue generated by Transmilenio mainly goes to the private operators (96%) with only 4% given to the Transmilenio S.A, (the public entity) to finance its running costs (Porter, 2010). None of the revenue generated from the Transmilenio goes to the system for re-investment for maintenance of the physical infrastructure and further expansion of the system. There is a need to reconsider mechanisms to re-invest a certain portion of the profit in order to ensure the sustainability of the system.

4.2.4. Ecological dimension

Delays in the implementation process

Implementation of Transmilenio in Bogota has enabled the city to realize the intended reduction in emission of greenhouse gases and pollutants. This will be maximized as the project gets expanded to the other parts of the city and more number of old buses and private vehicles get out of the street. In the case of Accra, since the project implementation is jeopardized mainly because of lack of political commitment and failure in the institutional arrangement, the project is held back from attaining its economic and ecological targets.

System obsolescence and the associated emission

As indicated earlier, consumer surveys revealed low passenger ratings for the Transmilenio's services. This shows the system is becoming obsolete in terms of the comforts, safety and security of passengers. The associated and very important dimension that need due attention is the rate of emission of greenhouse gases and other pollutants emission that will

increase with age of the buses. There should be a periodic monitoring on the level of emissions and substitution of buses in order to maintain the ecological benefits obtained from implementation of BRT systems.

5. Conclusions and lessons learnt

Increasing population growth and subsequent urbanization are causing increasing demand for essential services in urban centers. Demand for mobility is one of the most important needs for people in emerging cities. In this sense, emerging cities' leaders had looked for affordable and flexible alternatives to develop in their cities. Bus rapid transit system is a low cost and efficient system that is being implemented in several cities. The purpose of this document has been to assess the success and failure factors in the implementation of BRT system in Bogota (Colombia) and Accra (Ghana) using a conceptual framework that incorporates an interdisciplinary approach.

The comparative assessment of implementation of rapid bus transit (BRT) system in Accra and Bogota cities using a sustainable transportation system framework confirmed the interdependence and complementarity of the four pillars of the sustainability framework: institutional, social, economic and ecological perspectives of the transport reform. Results of this assessment revealed the fact that implementation of BRT system in Accra has lagged because of the failure of the city administration to address the institutional dimension of the reform. The implementation of the system in Accra also suffered from the failure to address the social dimension and create the buy-in of the project idea by the relevant stakeholders. As a result, the reform in Accra has failed to achieve its economic and ecological benefits even after six years of struggle to implement the BRT system. On the other hand, implementation of BRT system in Bogota has addressed basic institutional and social dimensions and is enjoying modest level of achievement in terms of economic and ecological gains. This implies the need to address of the four dimensions of the sustainability framework in the planning and implementation of BRT systems. The specific lessons learnt from implementation of BRT in two cities are discussed in the next paragraphs.

Among the four dimensions of sustainability, the institutional aspect is the overarching component and important compounding factor that determines the overall success of the

BRT system implementation. There are different factors influencing the institutional aspect of the BRT system planning and implementation process. The first among these factors is the commitment and willingness of political leadership in setting up public private partnerships (PPP), coordinate institutions and support the day to day activity of institutions and public private partnership (PPP) engaged in the planning and implementation of BRT system. The PPP in turn needs to have strong public and private components with clearly demarcated roles and responsibilities.

The business as usual practice of isolated actions of institutions will result in delays and eventual failures of the BRT projects. Bringing the private actors in the PPP framework should be started at the very beginning of the project through a very transparent and accountable process. As witnessed in the process of implementation of BRT in Accra, delays in setting up and operationalization of the private entity of the PPP will end up with delays in the overall implementation or ultimate failure of the system.

On the other hand, the plan for BRT and its intended outcome need to be communicated to all relevant stakeholders. There could be misunderstanding and even fear of the project idea especially among operators in the old transportation system. If these groups of stakeholders and others with similar feeling are not well communicated, they may act to hinder or halt the project implementation. Thus, there should be a rigorous stakeholder analysis to identify all potential stakeholders of the project and incorporate them from the initial steps. Failure to be inclusive by incorporating these actors in the new system could create negative reaction to the project so that it will be difficult to successfully implement the pilot and successive expansion phases of the project.

Putting the BRT system in place will improve the transportation problem and respond for the mobility needs of the urban population. The major users of public transport in the old transportation system are the urban poor and vulnerable group such as poor women, school children, elderlies and other low income groups of the society. The mere presence of the BRT system and its service will not ensure accesses of these groups of the society to the transportation service. The fare need to be affordable considering the income of the poorest and vulnerable groups of the society. There is a need to consider affirmative actions

such as subsidy for women, school children, students and elderlies in order to ensure their equal access to the improved service.

Implementation of BRT should not be limited to some corridors of the city. Expansion should take place as early as possible in order to reduce pressure on the early built systems and maintain the quality of service. The major challenge related to expansion of BRT is the increased costs of implementation and source of finance to cover these costs. Costs increase because of the need for better quality infrastructure and facilities in subsequent phases based on experiences of earlier phases of implementation. The potential solution for the financial shortfall is creating innovative alternative sources of funding especially through boosting the revenues of the city from different sources such as expanding the tax bases or more creative solutions like advertisements (Hidalgo, et al., 2013). Some cities introduce parallel reforms that will raise funds for further expansion and also reduce the traffic congestion by imposing congestion fees.

One of the issues arising in terms of the implementation of BRT systems is the distribution of revenue generated in the operation of the system. The fare collected by the BRT system covers costs of operation and provide income for private sector actors involved in the operation. As per the lessons learnt from BRT in Bogota city, the public entity receives only 4% of the revenue to cover its running costs. However, there is no allocation for re-investment into maintenance of the existing physical infrastructure and expansion of the system through re-investment of the profits generated through the operation of the existing BRT system. This puts the sustainability of the system under question mark. There is a need to reconsider the distribution of profits generated by the existing BRT system in order to ensure the economic sustainability of the system.

The ecological aspect of BRT system implementation entails focusing on issues that would slow down or hinder realization of the ecological targets of the reform which may also influence the other aspects of sustainability. In this regard, strict follow up should be made on system obsolescence and maintenance needs that may induce higher emission of buses. In general, all aspects of sustainability should be addressed and regularly revised in order to ensure the smooth implementation of BRT system and development of sustainable transportation system.

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