Chapter 2

An Overview of Bus Rapid Transits in the World

October 2014

This chapter should be cited as
ERIA (2013), 'An Overview of Bus Rapid Transits in the World', in Kutani, I. (ed.), *Improving Energy Efficiency in the Transport Sector through Smart Development*. ERIA Research Project Report 2013-27, pp.5-25. Available at: http:/www.eria.org/RPR_FY2013_No.27_Chapter_2.pdf

CHAPTER 2
An Overview of Bus Rapid Transits in the World

Introduction

Major Asian cities in the early stages of development generally suffer from chronic traffic congestion problems. The rapid income growth has spurred the mobility needs, whilst the infrastructure and capacity for public transport—rails or buses—are neither developed sufficiently nor available punctually to satisfy the growth in passenger transport demand. Lack of public transport infrastructure or service has, in turn, facilitated the growth of passenger vehicles or motorcycles, as they are the sole options that can handle mobility needs. Nevertheless, to accommodate the fast growth in economic activities, cities tend to sprawl to include the neighbouring ones from where commuters travel long, congested roads to the core business district.

As the first phase of this study identified, it is important for the rapidly growing cities of Asia to pursue the ASIF approach:

- **A**void dependence on motorised transport through the integration of land use planning and transport planning to create city clusters that require less mobility or reduce travel demand.
- **S**hift toward public transport including mass rapid transits (MRTs) and buses that can achieve lower energy/carbon dioxide (CO_2) intensities per passenger kilometre.
- **I**mprove the overall transport efficiency through technological innovations or policy measures to manage road traffic or use of information technology; and
- **F**inance the transport-related systems by reallocating the revenues from transport-related taxes to road improvement or public transport enhancement.

This phase of the study focuses on the ‘Shift’ toward public transport as it is the critical element toward the energy efficiency improvement in urban transport systems. The study focuses on bus rapid transits (BRTs), which can handle larger passenger capacities and theoretically can travel with faster speed compared with ordinary buses because of the provision of dedicated lanes. By taking the case of Jakarta, which has developed the BRT infrastructure, the study tries to present the current situation, identifies the benefits from the BRTs, and analyses areas for improvement.

Before presenting the discussions on the case of Jakarta, this chapter describes its benefits and costs, presents the global trends in BRTs, and analyses the two cases in Bogota and Seoul to learn the lessons.

Key Features of Bus Rapid Transits

The zest and zeal for BRTs have been maintained high in cities that are in the early stages of development. City planners of rapidly developing ones, in particular, would have to cope with the challenges of handling the increasing mobility needs before the city faces gridlock caused by traffic congestion as well as the repercussions stemming out from congestion, such as wasteful fuel use and air quality problems and their health impacts. BRTs can mitigate the congestion and its related problems since they are theoretically designed to provide (1) punctual operation on the dedicated lane; (2) faster travel speed than vehicles, buses, or motorcycles on congested roads; and (3) larger capacity to handle passengers compared with passenger vehicles or motorcycles.

Besides, the BRT is the attractive transport option for city planners as it can facilitate shifts from passenger vehicles or motorcycles with lower cost than the LRT (light rail transit) or MRT. Additionally, the BRT’s attractiveness to city planners lies in its relative flexibility to change routes and add branch routes depending on the changes in demand.

Table 2-1 compares the key features of the BRT, LRT, MRT, and Suburban Rail. As shown, each transport mode has its own benefits: MRTs can serve well to carry the relative large number of passengers (more than 60,000 passengers per hour per direction) at a fast speed (30–40 km/hr). Nevertheless, its construction cost is higher than the other modes, as underground ones reach US$60 million–US$180 million per kilometre in contrast to the BRT's US$1 million–US$5 million per kilometre.

Table 2-1: Comparison of BRTs, LRTs, MRTs, and Suburban Rails

Characteristics	BRTs	LRTs	MRTs (Metro)	Suburban Rails
Segregation	At-grade	At-grade	Elevated or underground	At-grade
Space Requirement	2–4 lanes from existing road	2–3 lanes from existing road	Elevated or underground, little impact on existing road	-
Flexibility	Flexible, robust operationally	Limited flexibility, risky in financial terms	Inflexible and risky in financial terms	Inflexible
Traffic impact	Depend on policy/design	Depend on policy/design	Reduce congestion when city coverage is high	May increase congestion when frequencies are high
Para-transit integration	Straightforward with bus operations. Problematic with para transit	Often difficult	Often difficult	Usually existing
Initial cost (million US$/km)	1–5	10–30	▫ 15–30 at grade ▫ 30–75 elevated ▫ 60–180 underground	-
Practical capacity (passenger/hour /direction)	10–20,000	10–12,000 (?)	60,000 +	30,000
Operating speed (km/hr)	17–20	20	30–40	40–50+

Source: Fox (2000).

Table 2-2 shows the key characteristics of BRTs as summarised by Nakamura *et al*. (2013) in four aspects: (1) initial and operational costs, (2) passenger handling capacity, (3) construction time, and (4) infrastructure flexibility and expansibility. As shown, BRTs could be a reasonable public transport option for cities in their early stages of development because of the lower initial cost, large capacity to handle passengers, short construction time, and flexibility in changing routes and developing additional routes, depending on the changes in demand. BRTs could also be replaced by LRTs and MRTs in the future if demand increases. In other words, BRTs could serve well to facilitate shifts in mode from passenger vehicles and motorcycles at an initial stage, creating a demand basis for developing LRTs or MRTs in the long run. Meanwhile, it is important to note that the operational cost of the BRT may be higher because more drivers are needed per passenger handling capacity.

Table 2-2: Characteristics of BRTs

	Characteristics
Initial cost and operational cost	BRTs' construction cost—including land cost—is much lower than that for LRTs and MRTs. Meanwhile, operational cost, particularly drivers' cost, is higher for BRTs as these require one driver for every three cars accommodating 250 passengers (at maximum). MRTs, on the other hand, can handle more passengers with lesser staff.
Passenger handling capacity	Hourly, more than 300 BRTs could be operated at one-level crossing and in non-intersection roads. The introduction of rapid BRTs (that travel stops at major BRT stops only) could increase the number of BRTs further.
Construction time	Construction time is much shorter than that of LRTs and MRTs.
Infrastructure flexibility and expansibility	BRT lanes could be replaced by LRTs or MRTs in the future depending on changes in demand. Additionally, BRTs can flexibly change or add to its operational routes to accommodate changes in population growth or area development.

Source: Nakamura, *et al*. (2013).

Table 2-3: Differences between High-End BRT and BRT Lite

	High-End BRT/Full Service	Low-End BRT/BRT "Lite"/Moderate Service
Running ways	Exclusive transit ways, dedicated bus lanes, some grade separation, intersection treatments	Mixed traffic, modest intersection treatments
Stations/stops	Enhance shelters to large temperature-controlled transit centres	Stops, sometimes with shelter, seating, lighting and passenger information
Service design	Frequent services, integrated local and express services, time transfers	More traditional service designs
Fare collection	Off-vehicle collection, smart cards, multi-door loading	More traditional fare media
Technology	Automated Vehicle Location (AVL), passenger information systems, traffic signal preferences, vehicle docking/guidance systems	More limited technological applications

Source: Cervero (2013).

In contrast to the above two discussions comparing BRTs with MRTs or LRTs, Cervero (2013) argues that all BRTs are not the same. BRTs can be classified at least into two categories: (1) high-end BRT with full service and (2) low-end BRT with moderate service. According to this classification, the identified characteristics of BRTs in general could be applied to 'high-end BRT with full service', which distinguishes itself from 'low-end BRT with moderate service' in its provision of dedicated bus lanes, availability of frequent service, provision of shelters with fare collection system, and use of information technology such as the Automated Vehicle Location. This type of BRT offers metro quality service and is operational in Bogotá, Colombia, and Guangzhou, China.

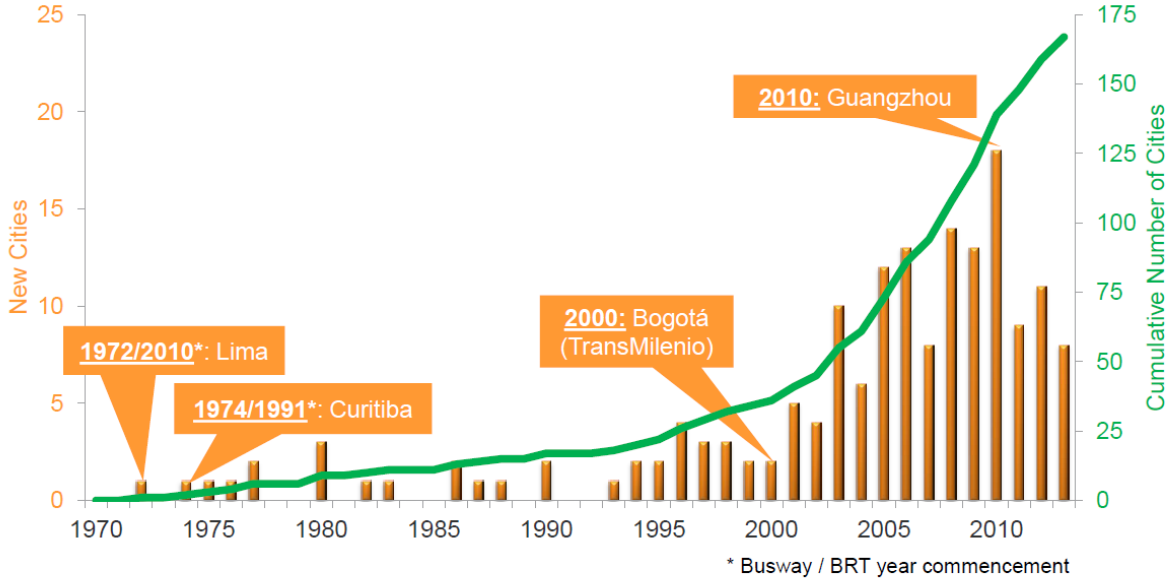
Bus Rapid Transit Trends

Globally, BRTs are operated in 168 cities, with a total length of 4,454 km; as many as about 31 million passengers rely on BRTs daily.[1] As Figure 2-1 shows, the number of cities that recently introduced BRTs reached its peak in 2010 when cities such as Guanghzou, Heifei, Yancheng, Zanzhuang (China), Jaipur (India), Palembang, Gorontalo, Surakata (Indonesia), Bangkok (Thailand), East London (UK), Joao Passoa (Brazil) Barranquilla, Bucaramagna (Colombia), Esado Mexico (Mexico), Lima (Peru), and Brampton (Canada) started BRT operations.

Meanwhile, the drivers behind the introduction of BRT systems differ by country and by time. Early BRT adopters such as Ottawa (Canada) and Curitiba (Brazil) in the 1970s decided to build bus ways as BRTs were developed at a lower cost compared with that of LRTs (Cervero, 1998). In recent years, cities such as Seoul (Korea) and Mexico City (Mexico) have invested in BRT systems because they consider BRTs as the public transport that can complement the existing urban rail systems (Cervero, 2013). Aside from these, in cities such as Lagos (Nigeria), Jakarta (Indonesia), and Ahmedabad (India), BRTs are intended to serve as the city's backbone of urban transport where its pre-existing private bus systems are un-integrated and para-transit services are not coordinated well with private bus services(Cervero, 2013). In Europe, small and middle-sized cities introduce buses with a high level of service (BHSL) that are operational on existing roads (without fixed lanes), whilst it is the cost-effective alternative to tramways in improving the frequency, operational hours, reliability, punctuality, journey time, comfort (including semi-sheltered bus stops), and accessibility.[2]

[1] BRTData.org
[2] DGIMTM, CERTU, CETE. 2010. *Buses with a High Level of Service (BHLS), the French Bus Rapid Transit (BRT) Concept*.

Figure 2-1: Historical Trend in the Number of New BRTs



Source: BRTData.org

Then which regions and countries in the world have adopted BRTs? Regionally, Latin America tops the world in the number of cities that introduced BRT systems, reaching 56 in total by the latest figure (May, 2014), representing 33 percent of the world total. This is followed by Europe at 43 cities, Asia at 35 cities, and North America at 24 cities. The number of cities in Oceania and Africa that introduced the BRT is respectively 7 and 3—relatively small compared with the other regions.

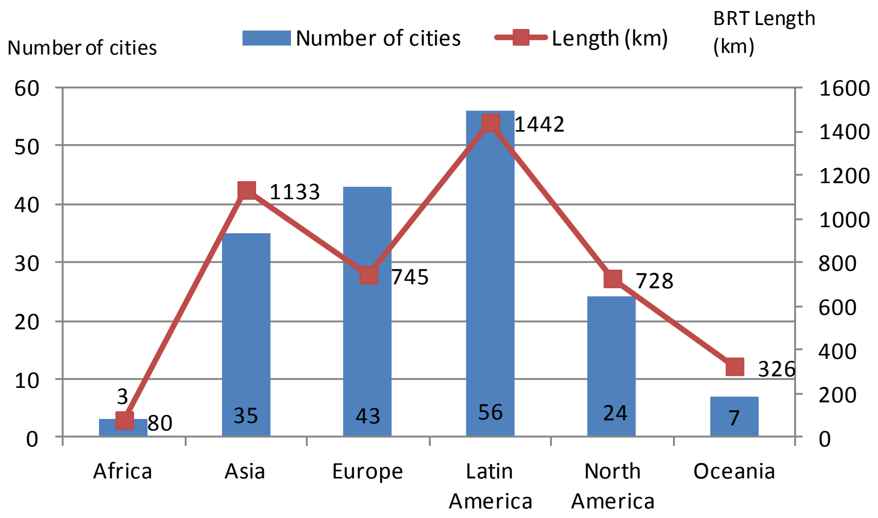
As Figure 2-3 shows, by country, Brazil leads the world in the number of cities (32) which adopted the BRT. It is followed by China (18 cities), the USA (17 cities), France (13 cities) and the UK (11 cities) using the latest figure at the time of writing.[3] Aside from the number of cities, Brazil leads the world in the number of passengers per day (11.9 million per day) and total BRTs' route length (682 km). The driving factor behind Brazil's becoming a global leader in BRT is exemplified by Curitiba, the first city in Brazil to introduce BRT systems and is spreading the experiences to other Brazilian cities. Curitiba's urban master plan that it has had since 1968 integrates public transport with land use planning. In fact, the BRT system started its operation in 1976 as the cost-effective public transport option—compared with the

[3] BRTData.org

metro system in Sao Paulo—that can provide exclusive right-of-way, sheltered stations, and frequent and fast service. It is best known for its restriction of urban growth along the key transport routes; buildings are allowed only along bus routes.[4] As a result of integrating urban transport as the core element of land use planning, currently no one in Curitiba lives more than 400 metres away from a bus (and minibus) stop.[5]

China's BRT systems follow those of Latin America with the introduction of dedicated right-of-way, sheltered stations, and frequent/punctual service. The outstanding cases of BRT systems in China include Guangzhou (38,300), Langzhou (15,500), and Zhengzhou (21,600), where the number of passengers per day per route kilometre is more than 10,000.

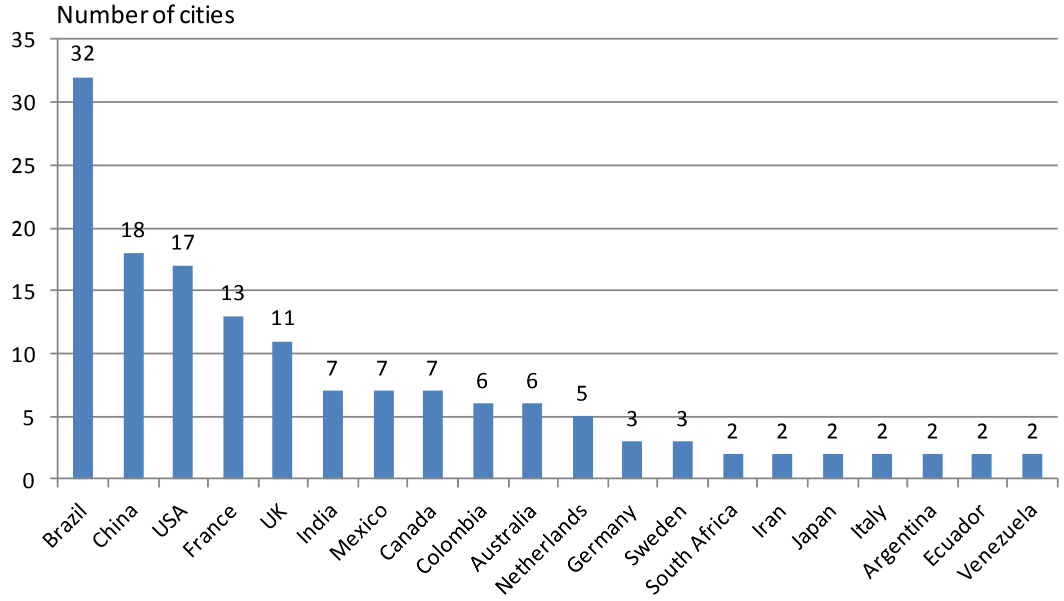
Figure 2-2: Number of Cities with BRTs (per region) and BRT Length (km)



Source: BRTData.org

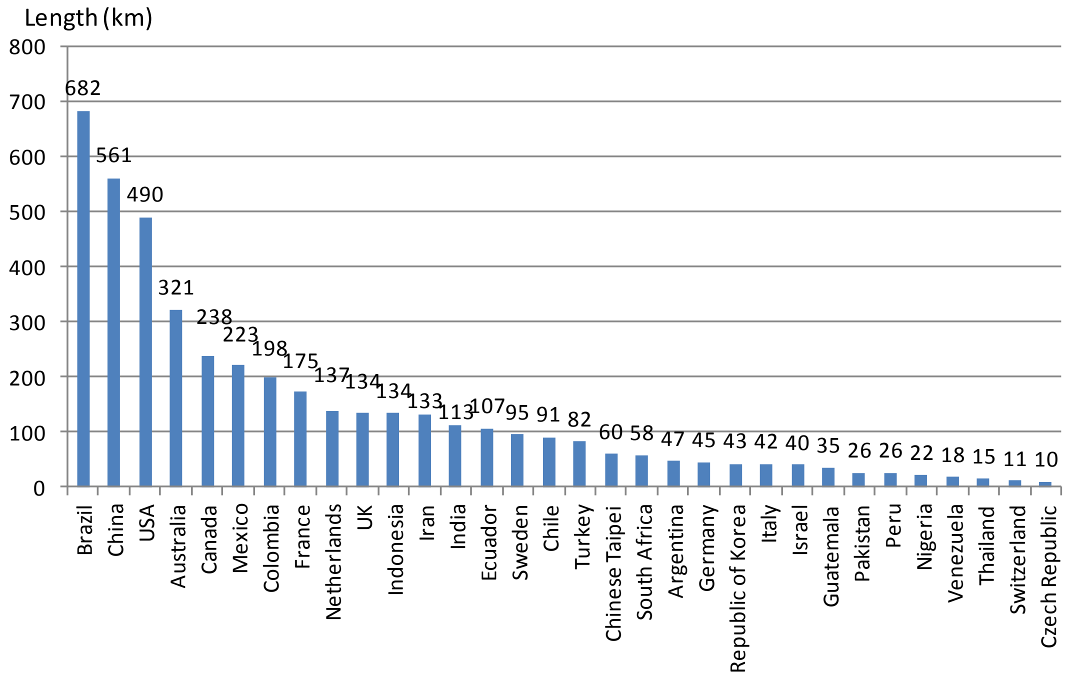
[4] BBC. *Case study: the BRT in Curitiba. Geography – Sustainable Living.*
[5] Ibid.

Figure 2-3: Number of BRTs, by country



Note: The cities with one BRT operational line are excluded from the figure.
Source: BRTData.org

Figure 2-4: BRTs' Length, by country



Source: BRTData.org

It is important to note that among the top five countries in terms of the number of cities that adopted the BRT, the types of general BRTs differ between emerging countries and developed ones. As previously described, BRTs of emerging members such as Brazil and China are generally the high-end type, being operated on dedicated right-of-way lanes. In contrast, BRTs in the USA, France, and the United Kingdom are the combination of high-end BRT and BRT-Lite systems, the latter of which does not have fixed operational lanes. The difference in terms of BRT types, operational aspects (such as frequency, coordination with para transits, including mini buses), and urban settings (such as the location of work area, and its distance from residential area, and urban population densities) explain the difference in the number of daily passengers among the top five countries with BRTs as shown in Table 2-4.

Table 2-4: BRTs in Brazil, China, the USA, France, and the UK

Countries	Passengers per day	Number of cities	Length (km)	Passengers per day per km
Brazil	11,962,888	32	682	17,541
China	3,978,250	18	561	7,091
USA	360,969	17	490	737
France	381,900	13	175	2,182
UK	162,429	11	134	1,212

Note :UK = United Kingdom, USA = United States of America.
Source: BRTData.org

Cases of Bus Rapid Transits

Bogota

TransMilenio in Bogota[6] (Colombia) offers the outstanding example that the city's BRT systems—in coordination with feeder bus systems—could facilitate shifts away from passenger vehicles and minimize congestion as well as transport-related air quality problems. The city's BRT undertakings

[6] Bogota has an urban population of 6.77 million at an area of 1,587 km^2.

and achievements offer good examples for other cities in the early stages of development to follow. In fact, experts from TransMilenio were invited to Jakarta and contributed to the creation Jakarta's TransJakarta.

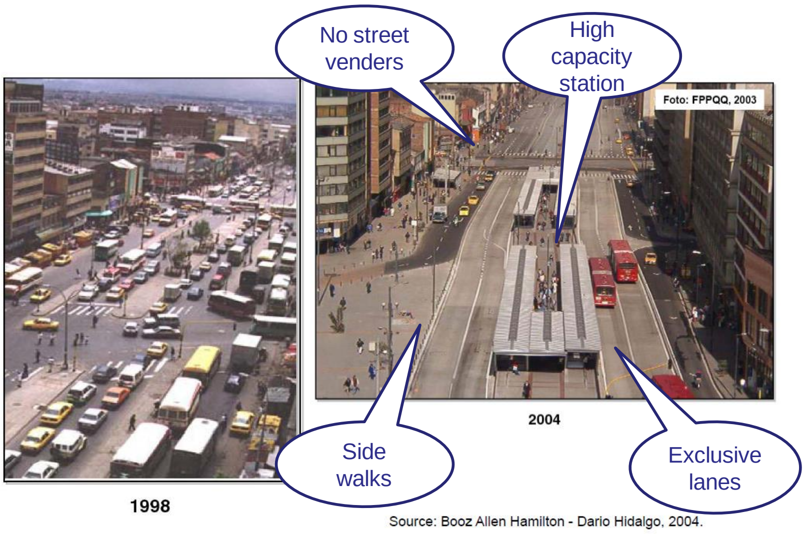
Before the introduction of BRTs in 2002–2003, Bogota suffered heavy congestion and air pollution problems resulting from the exhaust fumes from old buses. Data show that by 1994, the city had 22,000 units of small and old buses that were at least 14 years old; these buses were controlled by more than 60 loosely formed 'companies' or 'associations'.[7] The operations of these bus companies were not coordinated to have required passenger journey time, the average of which was one hour and 10 minutes, and the passenger vehicles occupied 95 percent of the road space for handling 19 percent of motorised trips. These posed obstacles for the buses' fast operation.[8]

Assisted by the Japan International Cooperation Agency (JICA), Bogota has developed an urban transport master plan that delineated the handling of urban transport demand with the provision of bus-based trunk line. A feasibility study was implemented in 1998, along with the regulation of vehicle numbers controlled by plate numbers during the peak hours, and upgrades and realignment of pedestrian areas—all of which efforts culminated in the introduction of BRT systems in 2000.[9]

---

[7] Asian Development Bank and Ministry of Urban Development, *BRT – Case Study 2. Bus Rapid Transit (BRT): Toolkit for Feasibility Studies*, http://sti-india-uttoolkit.adb.org/index.html (accessed on May 19, 2014).
[8] Ibid.
[9] EST portal site (in Japanese), http://www.estfukyu.jp/estdb6.html

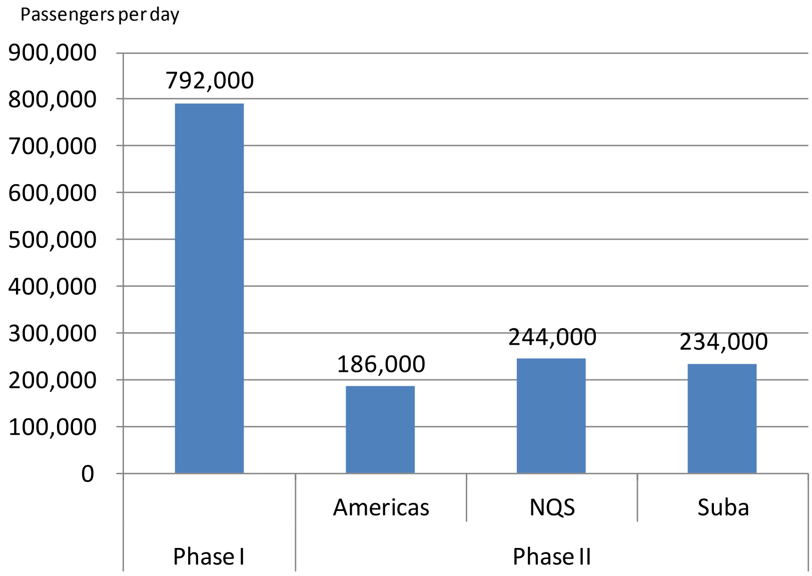
Figure 2-5: Bogota's Transport System Reform: Before and After



In Bogota, the BRT system was developed in phases, with the initial phase being implemented in 2002–2003, the second phase in 2005, and the third phase currently under the planning stage, with the aim for the whole system to cover 95 percent of the urban area. The initial phase comprises three trunk lines, with a total length of 42 km, and seven feeder routes totalling 346 km. The second phase comprises 43 km of three trunk corridors. Figure 2-5 compares the street before and after the introduction of the BRT system whose major trunk lines have two dedicated lanes in each direction and a high-capacity-sheltered station. Aside from the mere introduction of BRT systems as the trunk line, the supporting measures should be effectively taken to eliminate street vendors and provide pedestrian sidewalks.

TransMilenio S.A. was established in 2000 as a state stock company responsible for planning, management, and operation. A main objective of the TransMilenio establishment was to reorganise the operation of buses amounting to 30,000–35,000, and to reduce the numbers of buses in the corridor (Hook, 2005).

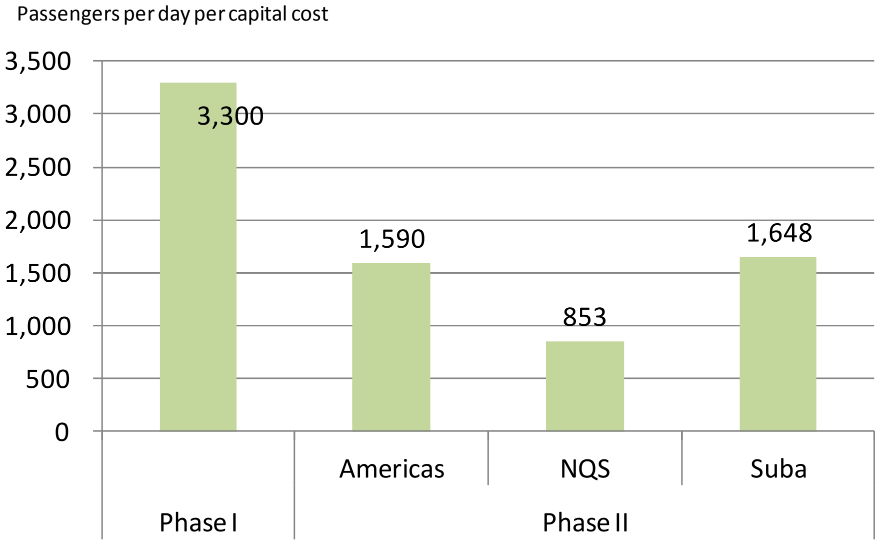
Figure 2-6: Number of Passengers, per day



Source: Dario Hidalgo, TransMilenio-Booz Allen Hamilton, 2004

The TransMilenio successfully attracted passengers. The number of daily passengers differs by the phase of development, reflecting the difference in length and operational areas (Figure 2-6). Phase I–developed–trunk line performs well to attract nearly 800,000 passengers daily, and its per capital cost performance represents the highest as well, representing 3,300 passengers (Figure 2-7). It has also successfully increased the share of BRTs in the entire modal split, representing 62 percent in 2008 (Figure 2-8).

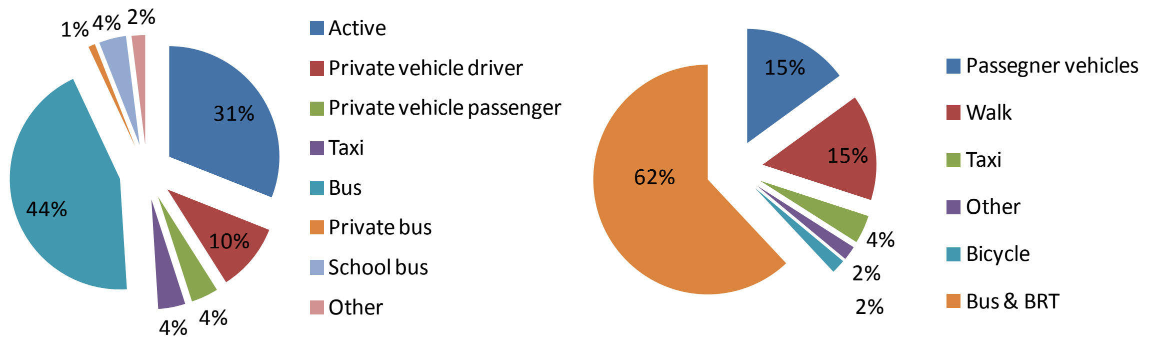
Figure 2-7: Number of Passengers, per day per capital cost



Note :NQS = Avenida Norte-Quito-Sur, an arterial road in Bogota, Colombia.

Source: Dario Hidalgo, TransMilenio-Booz Allen Hamilton, 2004.

Figure 2-8: Modal Share (left – 1999, right – 2008)



Source: Mayor of Bogota – TransMilenio S.A. and travel survey Bogota region 2008.

The key element in TransMilenio's success that is widely accepted globally rests on financial sustainability. Public funds were provided to develop the infrastructure for exclusive bus lanes, sheltered bus stations, terminals, control centre, and the sidewalks and bicycle paths, whilst no operational subsidies are provided since the system implements means for maximising profits.[10]

For meeting the profit maximisation objective, TransMilenio considered it important to estimate passenger demand, and invested US$1 million in traffic demand modelling and planning. Accurate demand estimates could provide a basis for engineers to develop the system that can efficiently handle the traffic demand, whilst it could also provide reference for TransMilenio to negotiate with the private trunk-line operators, and decide their travel kilometre. Additionally the traffic demand modelling results were utilised to estimate bus fare; it was at US$0.40.

The trunk line is operated by four different private companies that originate from local transport companies, invested by international companies. They are supposed to share the commercial risks, including passenger demand (Hidalgo, 2008). Trunk-line operators are essentially paid by the travel distance (bus kilometre); nevertheless, if the demand is lower than projected, TransMilenio has the right to reduce the trunk-line operators' travel distance.

[10] Ibid.

Meanwhile, a 10-year concession contract could be extended if the demand is lower than projected so the originally estimated demand can be achieved. This way trunk-line operators have incentives to improve their service quality so they can attract enough ridership within shorter bank loan payback period for buses' rolling stock, if any (Hook, 2005).

Another important feature contributing to the financial sustainability of TransMilenio is its fare collection system. The fares are not directly collected by the trunk-line operating companies; these are collected by a separate company using smart cards. Revenues are initially stored in a trust fund, managed by a financial service provider, and distributed to the participating companies. This way TransMilenio ensures fairness among the participating private companies.

Seoul

In 2004, the then city mayor (later President of Korea) Myun-Bak Lee implemented the urban transport reform, focussing on bus reforms and integration of the fare collection system among buses, rails, and subways. This reform provides a good example for other Asian cities to follow due to the innovative measures taken to reduce traffic congestion and improve the overall efficiency of urban transport systems.

Before the reform, nevertheless, bus services in Seoul were operated by a number of private companies whose operations—in terms of routes, schedules, or other services—were uncoordinated. The Seoul metropolitan government was responsible only for determining fares (Pucher, *et al.*,2005). Because the operational routes were not coordinated, buses competed at the profitable routes, provided passengers with poor service quality, and frequently caused accidents. Such poor service quality deteriorated the city dwellers' confidence in buses, increased reliance on passenger vehicles, worsened congestion, and increased illegal parking and accidents. Of course, these factors resulted in air quality problems and wasteful energy use.

The Seoul metropolitan government adopted the following measures to reform the public transport sector:

- **Reorganisation of bus routes**

  Buses were reorganised into (1) trunk-line buses, (2) metropolitan trunk-line buses, (3) general branch-line buses, and (4) circular branch-line buses. Trunk-line buses are painted in blue, and run along major trunk roads or between city outskirts and central business districts (CBDs). Metropolitan buses are red, and run between the areas beyond the city border and CBDs. General branch route buses (in green) operate to enhance connections between trunk route buses and rails. And circular buses are operated within the CBD (Ministry of Land, Infrastructure and Transport, and the Korea Transport Institute, 2013).

- **Quasi-public operation system of bus companies**

  Private companies operate on the four types of routes specified above, whilst the Seoul metropolitan government determines fare price, schedule, and routes. It also collects the fares, and distributes the revenues to private bus companies based on bus kilometre travelled instead of passenger kilometre in the attempt to improve bus service quality. Those bus companies that cannot collect enough fares to cover the operational cost are compensated through municipal subsidies. This way the operation of bus service has a quasi-public nature that incentivizes private companies to improve the service quality rather than to be competitive to grasp passengers or to drive recklessly.

- **Automated fare collection system using smart cards and fare integration**

  Public transport fares, including those of buses, rails, and subways, are integrated so that the passengers are charged with the travel distance. Fares are automatically collected using smart cards called T-money. Using T-money, passengers who transfer between buses and rails/subways can enjoy some discounts.

- **Improvement in bus operation**

  Bus operations at the trunk road have been improved as buses can use median bus lanes, which can avoid traffic congestion. The Bus

Management System is introduced to understand real-time bus operation, using GPS (global positioning system); the control centre provides information on traffic conditions and instructions on route change or adjustment on distance with other buses on the lane.

Data show clearly that the public transport reform was successfully improving the service quality of buses and public transport. Table 2-5 compares several indicators between 2003 and 2005 that show how the reform helped improve public transport services and contributed to cost savings. Indicators such as buses' operational speed clarify the impacts of mitigating congestion to increase the speed to 22 km/hour from 16.7 km/hour. The number of accidents was reduced from 659 to 493 in 2005. Meanwhile, the modal share of public transport, including both buses and rails, did not substantially change immediately after the public transport reform, whilst the impacts are felt long term.

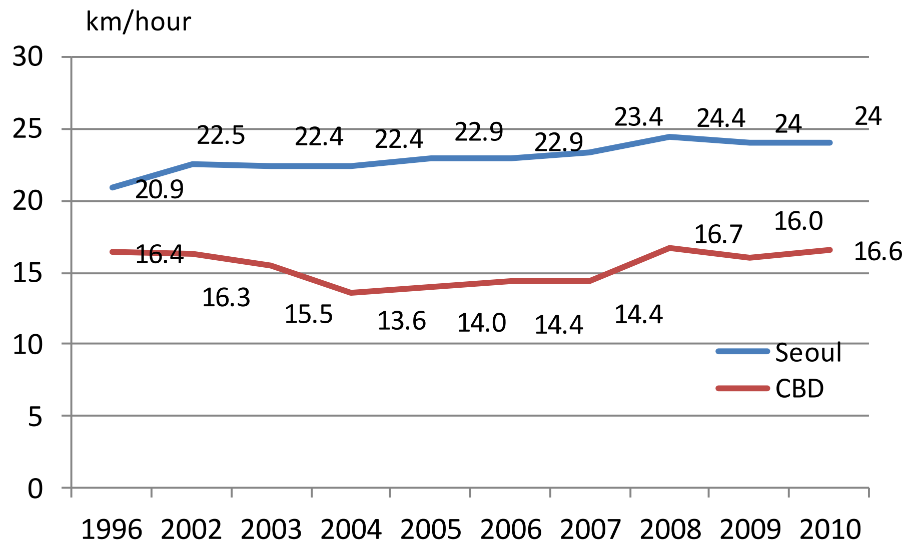
Table 2-5: Achievement Indicators of Seoul Buses (2003 and 2005)

Categories	Achievement Indicators	Goal Achievement Rates
Bus speed	Operational speed (km/hour)	16.7 → 22.0
Service supply	Operational rate (%)	82.5 → 96.4
Operational safety	Accidents (number)	659 → 493
Punctuality	Distribution of operational interval	0.69 → 0.56
Affordable fares	Fare per trip (KRW)	620 → 592
Revenue transparency	Card usage rate (%)	77.4 → 88.9
Shifts to public transport	Modal split (%)	61.2 → 62.3

Air quality improvement	PM10	69 → 61
	CO	0.7 → 0.6
Cost reduction	Travel cost savings benefit	Savings of about 225.1 billion won

Source: Seoul Metropolitan Government (2006).

Figure 2-9: Travel Speed of Passenger Vehicles in Seoul and CBD (1996–2010)

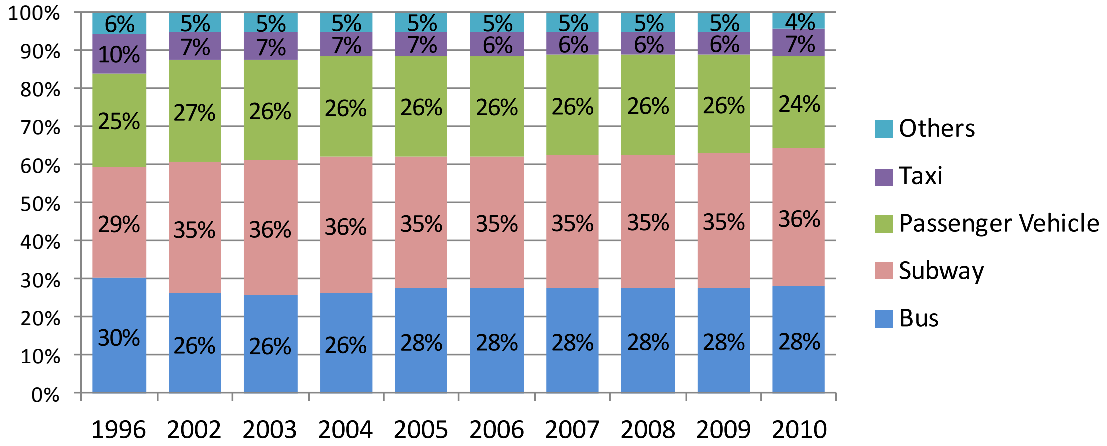


Note :CBD = central business district.
Source: Seoul City Transport Bureau homepage http://traffic.seoul.go.kr/archives/285

Figure 2-10 shows the travel speed of passenger vehicles in Seoul and CBD (1996–2010). The average speed in Seoul has increased from 20.9 km/hour in 1996 to 24.0 km/hour in 2010, whilst that in the CBD did not improve until 2007, representing 14.4 km/hour in contrast to 16.4 km/hour in 1996. It started improving from 2008 onwards, which should be caused by reduced traffic volume resulting from higher gasoline/diesel prices due to the rise in the international crude oil price levels.

Figure 2-11 shows the modal share in Seoul from 1996 to 2010. Although the bus share dropped from 30 percent in 1996 to 26 percent in 2002, it recovered to reach 28 percent in 2010 at the expense of decreased share of passenger vehicles. Easier transfer from buses to buses or subways to buses, using the smart card system, contributed to the increases in bus share among all the modal choices.

Figure 2-10: Modal Share in Seoul (1996–2010)



Source: Seoul City Transport Bureau homepage http://traffic.seoul.go.kr/archives/285

Issues and Implications

BRTs are the attractive transport option for city planners as these can facilitate shifts from passenger vehicles or motorcycles with lower cost to LRTs or MRTs. Additionally, the BRTs' attractiveness to city planners lies in its relative flexibility in changing routes and adding branch routes, depending on the changes in demand. Nevertheless, the success of BRTs depend on various factors, including system operation, fare collection, and integration with the other trunk-line rail, subway systems, and feeder buses. BRTs alone cannot be the solution to cope with urban transport–related issues, of course.

In the case of Bogota, despite the global praise over the outstanding performance and achievements of BRT systems, protest against the TransMilenio took place in 2008 and 2012 due to the increased dissatisfaction with the BRT systems caused by overcrowded buses, low frequencies, lack of alternative public transport options, and high fare. Seoul's public transport reform has successfully increased the modal share of public transport, and it has greatly improved bus service quality. Nevertheless, financial sustainability on the bus system operation remains to be an issue. In fact, the poor financial performance of bus companies is supplemented by municipal subsidies, and the fiscal burden has been increasing with time. For instance, in 2009, the subsidies provided to the bus companies by the Seoul municipal government reached 664.3 billion Korean won, accounting for 16 percent of transport-related budget. And such subsidies are increasing at above 10 percent per year (Shimoda and Shimizu, 2013).

Ultimately, BRTs could serve as the intermediate transport option that can create the basis for framing city dwellers' lifestyle towards shifting away from passenger vehicle dependence with due considerations for its infrastructure, frequency, punctuality, service quality, and connection with feeder buses and other trunk-line rails. Meanwhile, it could serve as the intermediate public transport option for the 'megacities' at the early stages of development before full-fledged public transport infrastructure—including subways, rails, and connection with bus systems—are in place. In other words, cities need to formulate a long-term plan on how to manage the rising mobility needs with the provision of public transport infrastructure, in steady cooperation and coordination with relevant local and national organisations.

References

Cervero, R. (1998), *Transit Metropolis – A Global Inquiry*.

Cervero, R. (2013), 'Bus Rapid Transit (BRT) – An Efficient and Competitive Mode of Public Transport'.

Cervero, R. (2013), *Bus Rapid transit (BRT) – An Efficient and Competitive Mode of Public Transport.*

Fox, H. (2000), 'World Bank Urban Transport Strategy Review – Mass Rapid Transit in Developing Countries'.

Hidalgo, D. (2008), *TransMilenio: A high capacity – low cost bus rapid transit system developed for Bogota, Colombia.*

Hook, W. (2005), *Institutional and Regulatory Options for Bus Rapid Transit in Developing Countries*, Institute for Transportation & Development Policy.

Hook, W. (2005), *Institutional and Regulatory Options for Bus Rapid Transit in Developing Countries,* Institute for Transportation & Development Policy.

Ministry of Land, Infrastructure and Transport, and the Korea Transport Institute (2013), *Best Experiences from Public Transport Reform.*

Nakamura, F., Y. Toyama, S. Tanaka, R. Wang (2013), 'BRT perspectives as a sustainable transport mode in developing cities', *3rd International' Symposium on Engineering, Energy and Environment*, 2013/11.

Pucher, J., H. Park, and M. H. Kim (2005), 'Public Transport Reforms in Seoul: Innovations Motivated by Funding Crisis', *Journal of Public Transportation*, 8(5).

Seoul Metropolitan Government (2006), 'Convenient Public Transport, Happy Seoul Citizens'.

Shimoda and Shimizu (2013), 'An analysis of public transport reform in Seoul and Kyongi-do area with the focus on fare integration' (in Japanese).