



BULLETIN

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FACILITATION OF TRANSPORT AND TRADE IN LATIN AMERICA AND THE CARIBBEAN

What is BRT? Rolling out the Metrobús in Buenos Aires, Argentina

Background

The Metrobús line, in operation along the Avenida Juan B. Justo corridor in Buenos Aires since May 2011, has sparked a number of questions regarding its characteristics and performance. This document aims to answer those questions, based on a study of the first year of operations along the corridor carried out by the Technological Centre for Transport, Transit and Road Safety of the National Technological University of Argentina and a review of the relevant literature.

This study is divided into four sections, the first of which provides some definitions of bus rapid transit (BRT) according to the literature. The second section looks at the Metrobús operating conditions, infrastructure and technology. The third part ranks the Metrobús service according to the BRT Standard scoring system. The fourth and final section sets out the main conclusions of the study.

I. What is BRT?

A bus rapid transit (BRT) system is a versatile transit mode: each system can be tailored and, in some cases, take advantage of existing infrastructure and vehicles. This means that solutions can vary widely from one city to another. And so, very dissimilar systems may still be classified as BRT.

The confusion stemming from this profusion of definitions is due, in part, to the influence of two paradigmatic BRT networks often referred to in the literature: Bogota (Colombia) and Curitiba (Brazil). The experiences of these two cities, each one unique, are admired and emulated worldwide.

Many of the system characteristics which these cities share are often associated with an ideal BRT network, in particular, closed stations, bi-articulated buses with platform-level boarding and a feeder-and-trunk route structure. However, many other BRT systems do not have these characteristics. This means that although the systems in both cities are

This issue of the *FAL* bulletin describes the Metrobús line which recently started operating in Buenos Aires and provides a preliminary analysis of its performance. The Metrobús initially met with a certain amount of rider scepticism. But any doubts were dispelled as its benefits became obvious. The conclusion is that, like all processes, this one has not been problem-free. But the line has overcome obstacles and capitalized on lessons learned.

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successful examples, they are not the only options. A system in another city may not have these characteristics, but it could still rightly be classified as BRT.

This calls for caution when accepting what various organizations define as a standard “BRT package”, which usually bundles multiple components from these success stories into recommended best practices. The same practices are recommended for other modes, so the set of characteristics they endorse do not necessarily define a good BRT. It could be argued that these two cities’ greatest accomplishment lies in having done things right that many others did not, successfully integrating their transport systems and taking a qualitative leap forward in operations. Achieving this using BRT along the principal corridors is especially commendable because doing so overcame the budgetary restrictions that ruled out other modes of transport such as a subway or light rail transit (LRT).

Bogota and Curitiba were successful not only because they opted for a BRT system as the mode of transport for their main corridors but also because of the policy measures taken. Citing a study on the TransMilenio and its potential lessons for the United States, David Hensher noted: “The most important findings relate to connectivity and network integrity, reinforcing the view that it is all about networks and not corridors per se.”¹

When the BRT package as defined above is held out as the solution to a city’s transport problems, it adds to the confusion as to whether BRT is an integrated mode or system because the recommendations for BRT also draw on lessons learned from integrated systems. An example of this is the trunk-and-feeder structure in Curitiba, Bogota and other cities. When planning a transport network, the authorities decide on a structure when choosing the mode for providing service to trunk and feeder corridors alike. A BRT system does not have to be structured that way; direct corridor service is also a possibility.²

Another issue is that BRT is often identified with a particular type of vehicle: articulated buses. Perhaps this is because a system’s visual identity tends to be linked to the vehicle providing the service. Although articulated and bi-articulated vehicles are used in many BRT systems, in many cases service is also provided by conventional buses. There is no one “correct” kind of BRT vehicle; the choice depends on the needs and constraints in each case.

¹ Hensher, (2008).

² In a trunk-and-feeder system, low-capacity routes feed into high-capacity corridors. A classic example is a railway trunk line that attracts not only passengers who are near the station but also people who live farther away but can take a bus (feeder) to the train station. A direct service system tends to have less direct, more complicated routes in order to serve the largest number of destinations without transfers. Bus services in Buenos Aires usually work like this, but in practice they often operate as feeder services for metro and rail lines.

The term “BRT” did not come into wide use until the early 2000s, but the concept goes back many more years.³ It is usually thought that the first BRT project (even though it was still not known as such) can be traced back to 1937 when the city of Chicago in the United States⁴ outlined a plan to replace rail lines with express bus routes. Two years later, bus-only lanes were implemented for the first time in the city. Since then, many cities have rolled out their own version. But it was not until the 1970s that embryonic forms of BRT came into operation.

Most of the literature by far regards Curitiba’s as the first BRT system and 1974 as the year that express services began. Although there are several notable examples of exclusive busways launched around this date (such as in Runcorn in the United Kingdom in 1973), BRT operations were still at the early stages and it was mainly in Curitiba that improvements and innovations continued. Perhaps that is why Curitiba’s BRT system is considered a pioneer, not so much because of the year it was launched but rather because of the scale of its operations and the continuous development spanning almost 40 years. Without taking away from this accomplishment, Curitiba did take advantage of its urban planning successes to promote itself as a model to follow.⁵

A number of interesting systems have emerged since the 1970s, particularly in Ottawa, Canada, in the 1980s, although they did not have the same impact as the TransMilenio in Bogota (1998), which was based on the experience in Curitiba.

Such systems began growing exponentially worldwide after that, and they still are. Evidence of this lies in the fact that in 2007, the year in which the Institute for Transportation and Development Policy (ITDP) published the Bus Rapid Transit Planning Guide, there were “more BRT systems under development than in existence”.⁶ The relatively recent rise in popularity of BRT explains why there is still no blanket definition of such systems.

After looking at the many definitions used by an array of institutions and examining existing BRT systems, it is clear that BRT is a bus service which has been improved to such an extent that it is no longer considered a conventional bus service.

BRT is, therefore, clearly not a type of vehicle or an integrated transportation network. So what are the improvements that turn a bus system into a BRT system?

Of all the ways that a corridor can be improved, the only essential one is dedicated lanes. In second place are all

³ CERTU (2010).

⁴ Levinson and others (2002).

⁵ Mees (2010).

⁶ Institute for Transportation & Development Policy, ITDP, (2007).

of the other improvements, which are non-requisite and include replacing stops with stations and branding the system. Nevertheless, any combination of improvements, if well implemented, can make a huge difference.

There is such a wide range of potential improvements that BRT has, naturally, become an umbrella term encompassing systems that have very little in common. Just as heavy rail and light rail systems can be differentiated from each other, BRT systems could be distinguished on the basis of capacity rather than infrastructure. Darío Hidalgo suggested calling heavy- or high-capacity BRT systems, such as the TransMilenio in Bogotá, High Level Bus Rapid Transit (HBRT).⁷

Branding is worth mentioning separately. It is such a broad concept that it is tempting to label any system as BRT if it is marketed as such. The importance of branding these systems has received considerable attention, and what was once touched on in general documents is now the focus of special publications and seminars. A good example is the workshop which took place in Brazil in 2011 called “Marketing BRT: How to attract and captivate users”.

Branding is undoubtedly crucial for the success of a BRT system. The initial message must be that this innovative system is not a conventional bus service. For riders, buses tend to have a negative image. Distancing the BRT system from these preconceptions is a must.

However, branding is much more than this. Just like the other characteristics of BRT, taken separately, these recommendations apply to transport systems in general. For example, recommendations concerning logo design, name choice, slogans, campaigns and public information would be equally valid for conventional bus and rail systems or any other mode of transport. According to best practices, they should be implemented across the system instead of being used for just one mode. ITDP and EMBARQ⁸ both do a good job of highlighting the differences between BRT and traditional bus systems, seeking the “complicity” of riders, the general public and the media in efforts to encourage the use of public transport in major cities of the world.

BRT has played a leading role in helping create integrated transport systems, particularly in developing countries. However, as a result, many recommendations for BRT are mistaken for the characteristics of the system. This can be seen in *From here to there: A creative guide to making public transport the way to go* published by EMBARQ, and the Portuguese-language version *De cá para lá: Um guia criativo de marketing BRT para atrair e cativar usuários*

published by EMBARQ Brazil. The solutions proposed are the same in both cases, but the Brazilian version is in line with the current trend in Latin America, which is conveying good practices for transport within the BRT package.

In view of the above and given the need for a definition of BRT, the Technological Centre for Transport, Transit and Road Safety (C3T)⁹ adopted the following definition.

- BRT is a motorized transport system which uses buses that operate on lanes with exclusive right-of-way infrastructure to increase speed, punctuality and passenger comfort.
- The system incorporates technology and infrastructure designed to maximize operating efficiency and encourage passengers to use it, for example, platform-level stations, air conditioning, pre-board fare collection, intelligent transportation systems (ITS) and branding of the system.
- Buses do not always have to operate on exclusive lanes. They can also operate in mixed traffic before or after their journey along the BRT corridor.
- While emergency vehicles may use exclusive lanes (when they are in an emergency situation), taxis and other high-occupancy vehicles which are not BRT corridor buses are not permitted to do so.
- The right publicity is needed so that a BRT system is not confused with traditional bus systems. The message should be one of public policy in action; the goal is wide acceptance.

According to this definition, BRT is primarily about making changes to the road infrastructure that may (or may not) go hand in hand with the use of specific vehicles, such as articulated buses, or changes to boarding procedures such as off-vehicle fare collection. However, these are not features that determine whether a system is BRT. Effective use of exclusive lanes is virtually the only way to achieve the three operational objectives of these systems (improving speed, reliability and comfort). When buses operate in mixed traffic, movements and unexpected stops by other vehicles increase the frequency of sudden braking, constant zigzagging and stopping far from the curb. Not only do these factors increase travel time, but they also make it difficult to predict arrival times because, outside dedicated corridors, it is impossible to know in advance exactly how many vehicles will be operating. Even if this were known, there would be no way to counteract their impact on operating times.

⁷ Hensher, op. cit., quoting Hidalgo (2005).

⁸ The World Resources Institute Center for Sustainable Transport.

⁹ C3T is a research centre specializing in transport and related issues. It is part of the University Extension Office of the National Technological University of Argentina.

II. The Avenida Juan B. Justo Metrobús in Buenos Aires

Understanding the design and operation of the Metrobús in Buenos Aires must start with an explanation of the underpinning regulatory framework. Greater Buenos Aires is made up of the city of Buenos Aires and several administrative areas (municipalities) in the suburbs, which belong to the Province of Buenos Aires.¹⁰ Strictly speaking, the city of Buenos Aires is not an Argentine province; however, it operates as one in the area of transport. As a result, any public transport service which crosses the interjurisdictional border is subject to the national government's regulatory framework.

Until the 1990s, the city of Buenos Aires was governed by the federal administration. It was not until the city's autonomous government was formed at the end of the twentieth century that certain powers (such as the authority to regulate bus services operating in the city) were transferred to it. Although legislation in this regard was approved in 2012, the transfer is still not effective. Since the bodies regulating these services and the road system are at different levels of government, and to make matters worse are political enemies, cooperation is practically non-existent. As a result, the government of Buenos Aires city adopted the Metrobús initiative and carried out road infrastructure projects but has been unable to make any changes to existing bus routes and services.

City buses in Buenos Aires are usually run by private companies, ranging from corporations which operate a number of lines and even intercity (or long-distance) services, to smaller companies which in some cases comprise groups of vehicle owners. The latter was the way that bus services in Buenos Aires were traditionally run, when they began at in the late 1920s. Although this is not as common nowadays, it still occurs. At present, organizations follow similar operating standards which are based on this framework. Some of them follow good practices; the operations of others are somewhat more questionable.

Avenida Juan B. Justo was chosen for the first BRT system in Buenos Aires¹¹ because it showcased a number of special characteristics. It crosses most of the city, linking the neighbourhood of Liniers, located on the western limit of the city, with Palermo, which is located on the northern corridor. It is not one of the arterial corridors leading to the city centre, but rather a link between two major transfer points: Liniers (rail and bus) and Pacífico (bus, metro and overground train). The latter is on Avenida Santa Fe, a

thoroughfare for traffic from the north corridor entering the city centre. Avenida Juan B. Justo is part of the city's heavy transit network.

Public transport was relatively good before the Metrobús was implemented. There were several public bus lines running down the avenue, but only two, lines 34 and 166, that covered it from start to finish. Line 34 is part of the Federal District pricing group, which includes all the lines whose entire route is within the city of Buenos Aires. Line 166 is part of the Suburban I pricing group, which has the most lines in Greater Buenos Aires and is made up of those which operate in the city of Buenos Aires and the administrative areas in the suburbs. Both lines operate more than one branch line, but they all meet along Avenida Juan B. Justo. Exclusive lanes are also used by other lines along some sections.

Thanks to the characteristics of this thoroughfare, implementation of the central lanes was relatively straightforward and as a result could be used as a pioneer experience. With just two lines operating along most of the route, cooperation between different companies would be much simpler compared with other avenues. And the existence of a culverted stream, the Maldonado, running under the avenue, shielded the system from unfavourable comparison with a metro, even though, from a technical point of view, there were no grounds for comparing a BRT system of this kind with a metro because their carrying capacities are different.

A. Metrobús operations

From the beginning, the Metrobús has been operating in an unusual regulatory framework. The design process was marked by limited or zero cooperation between the two governments; this affected the end product, which was a compromise between what those involved wanted and what was allowed. Despite this, the system has brought considerable improvements for riders.

Exclusive lanes were implemented along the centre of the avenue, extending from Vélez Sarsfield station¹² near Liniers to slightly before Avenida Santa Fe, beside Palermo railway and metro stations. Some infrastructure components, like the railway stations Liniers and Pacífico, are located outside the lanes.

According to C3T measurements, the average time taken to travel the length of the corridor in these lanes is 32% shorter than in 2010. This is a significant improvement, particularly since traffic congestion in Buenos Aires is always on the rise. The time taken during peak hours went from 49m 09s in 2010 to 32m 39s in 2012 (down by 33.58%), while during off-peak hours it decreased from 40m 36s

¹⁰ The definition of Greater Buenos Aires varies significantly depending on the organization defining the concept. It can include anything from 24 suburban municipalities to more than 40 (according to the National Transport Secretariat).

¹¹ The first BRT in Argentina was launched in the city of Posadas in the province of Misiones in 2007.

¹² Opposite Vélez Sarsfield football stadium.

in 2010 to 27m 44s in 2012 (a 31.71% improvement). The times correspond to line 166 because it runs the full length of the lane. Line 34 only exits at one section of the corridor. Times were recorded at the end of 2011 and during the first half of 2012 when traffic was disrupted due to work on at least in one section of the corridor; this may have had a negative effect on service times.

Also worth mentioning is that the lines cover a distance of 2.1 kilometers over different roads before approaching Avenida Santa Fe because their routes remain unchanged. However, line 166 runs along the central lanes of Avenida Juan B. Justo in this section, so the time taken to complete the journey is between 20% and 45% less than line 34 which uses other streets.

Frequencies were already quite good along the corridor, and they remain the same. What riders consider more important than the absolute values of time and frequency is the consistency of these variables, so that they know what to expect when planning their journey and can manage their time better. This aspect has improved as the lanes separate Metrobús vehicles from the changing flow of traffic in general.

The stock of vehicles for both lines remains unchanged in terms of number, but the average carrying capacity has increased thanks to the addition of articulated buses. Line 166 has 71 buses while line 34 has 63, including 10 articulated buses which operate along each line. These vehicles have approximately double the capacity of a conventional bus. However, as a result, the cost to run each vehicle is higher and for this reason the fleet must be well managed to ensure that these units do not operate with low loads.

An analysis was also carried out of data gathered by the National Transport Regulation Commission (CNRT), a national agency which controls public transport services in this jurisdiction regarding passengers carried, number of kilometres covered and the passenger-kilometre index for both lines. The comparison was made between each line within their respective pricing groups. Line 34 was compared with the Federal District group, while line 166 was compared with Suburban I group. The variables showed similar patterns in both cases, and their performance was better than others in their pricing groups. The difference was less noticeable for line 166, perhaps because it only runs along part of the Metrobús route while route 34 covers a longer stretch of the corridor.

In both cases, the number of passengers transported rose at a faster rate than other lines in their respective pricing groups. Average fleet use efficiency showed above-average improvement when taking into account the

number of kilometres travelled and passengers carried. In the case of line 34, the passenger-kilometre index was markedly different from the Federal District pricing group. In the case of line 166 the difference was still very noticeable but seems to narrow in January when demand is lowest. The increase in the number of passengers is in line with the rise in supply as higher-capacity vehicles entered operation. The change in the passenger-kilometre index is a quick indicator of improved operational efficiency, which has a positive effect on fuel consumption and greenhouse gas emissions per traffic unit. Bearing in mind that the kilometres covered are similar before and after the Metrobús roll-out, and the journey time is shorter, the conclusion is that the vehicles spend more time at route starting points.

B. Infrastructure

Exclusive right-of-way in central lanes is crucial to the performance of this system. Definitions usually highlight that the permeability of the right-of-way is based on disruptions to the flow of public transport. At one end of the scale is the most permeable system, which is mixed traffic on normal streets, and at the other end is the 100% exclusive right-of-way with no junctions, for instance, a railway running over a viaduct. The Metrobús, like most BRT systems, is somewhere between these two extremes. For the most part, private cars respect the lanes, as do cargo vehicles and passenger vehicles that are not part of this service. However, at times these vehicles do encroach on the lanes and not only obstruct the buses' right of way but also create dangerous situations, particularly if motorcycles are involved.

As for level crossings, the consensus is that private vehicles turning left across central lanes are one of the highest risks in terms of road safety, in addition to manoeuvres made by motorcycles. Accidents of this kind made the news during the first few months after the Metrobús started operating because there were several cases of cars being hit by buses when turning at streets where there had previously been traffic signals with turn arrows. At issue is a classic disregard for the rules, combined with an unfamiliar situation and, probably, a lack of proper information. However, the number of such accidents has been declining over time.

There are no traffic lights providing segregated right-of-way along Avenida Juan B. Justo, except for buses exiting the avenue to enter other streets. The rights-of-way are obvious during the day because they are signposted "buses only", although in some cases drivers of private cars became confused. At night these signposts are not visible, so it is not clear who the electronic sign is for and the driver must make an assumption based on prior knowledge.



C. The Metrobús stations

The design of the stations is consistent with the current scale of the Avenida Juan B. Justo BRT system, which does not have pre-board fare collection at most stations. One weakness is that some stations are dark at night, which lowers service quality. Most security cameras were installed in recent months, where before there were just empty housings. Electronic signs showing bus arrival times have been implemented in recent months, and more stations will have them in the future.

There has been controversy surrounding the lack of pre-board fare collection, as it is considered one of the most important features of a high-quality BRT system. However, given the characteristics of the corridor and transport in Buenos Aires in general, the method currently used may be the most appropriate. For example, a conventional payment system is in place at stations with the fewest passengers, while stations located at the start of a route have staff selling tickets to passengers waiting during peak hours in order to speed up boarding. This is the method most commonly used at the bus lines in Buenos Aires, and it seems to meet the current Metrobús needs. It could, however, be improved by implementing SUBE¹³ readers to pay outside the vehicle.

Branding, an area which requires further development, is considered crucial to the implementation of any BRT system. Although the stations are well designed and provide information about the lines stopping there, they are starting to look run-down, sometimes because of vandalism, and this has a negative impact on the image of the Metrobús system.

the Metrobús provides only one service, when in fact each line continues to operate separately and the appearance of the vehicles remains unchanged.

III. Characteristics of the Metrobús based on the BRT Standard

ITDP has published several reports which should be used as references when implementing BRT systems. One of the reports¹⁵ suggests a ranking system, called the BRT Standard. This methodology, which is by no means conclusive, is useful in that it aims to standardize the ranking system so that there is a clearer distinction between a conventional bus service with slight improvements and a BRT system. The BRT Standard is based on a number of characteristics which are considered desirable and are awarded a maximum score. The total score indicates if the service is a BRT system and which of the three categories it falls into.

Each characteristic is weighted using the scoring system, and the total determines if it is a BRT system and its category. Out of a maximum of 100 points, a total score of 85 or above classifies a BRT system as Gold Standard; 70 to 84 as Silver Standard; and 50 to 69 as Bronze Standard. A system awarded under 50 points does not qualify as BRT. A low score does not mean that a system is inadequate or poor. It may mean that the best solution for the city is to make small improvements to its bus system or work towards the Bronze Standard. In other cases, the best thing might be to go for a Gold Standard BRT.

What makes the BRT Standard more popular than other ranking methods is that the list of characteristics is more complete and none of them are mandatory, so it applies to all types of BRT systems worldwide while helping distinguish between those that are actually BRT and those that are not. The C3T, however, has a number of reservations about some of the characteristics on the list since, taken individually, they are applicable to other modes and not

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