

BOGOTÁ, COLUMBIA

BRIEF: TRANSMILENIO BRT

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BOGOTÁ, COLUMBIA

Brief: TransMilenio BRT

CITY CONTEXT

Bogotá, the capital of Columbia, located 8,000 feet above sea level in the Andes, has an urban population of more than 5 million. Within the last 3 years, a multibillion-dollar capital improvement program has refurbished 877 parks, paved 117 miles of roads, introduced sewage treatment to 417 neighborhoods, and built 72 schools and libraries. The TransMilenio Bus Rapid Transit (BRT) system is an important symbol of this transformation.

PLANNING AND IMPLEMENTATION BACKGROUND

The TransMilenio median busway system was built over a 3-year period and placed in revenue service in December 2000. [Figure 1](#) shows a view of the TransMilenio system in Central Bogotá.

TransMilenio is a public/private system that is designed for operation by private contractors under government oversight. System implementation required detailed technical, legal, and financial design; creation of a new public entity in charge of system planning, development, and control; overcoming resistance to change from traditional operators and small bus owners; development of the infrastructure; contracting and starting up the operation; and earmarking local and national funds for system expansion.

THE TRANSMILENIO BRT SYSTEM

TransMilenio is composed of four components: specialized infrastructure; efficient operations; advanced billeting; and a new institution for system planning, development, and control. Public institutions provide infrastructure, planning, and control, and operations and billeting are contracted out to private companies.

DESIGN FEATURES

The system's infrastructure includes exclusive dual bus lanes each way designed for trunk line service, roads for feeder buses, stations, and complementary facilities, with an average investment of \$8 million (U.S. dollars) per mile. Trunk buses use central lanes of existing streets that are longitudinally segregated from the general traffic. The system is complemented with integrated feeder buses on local streets.

The system includes 38 kilometers (24 miles) of physically separated dual median bus lanes and 59 stations. Another several kilometers and three stations under construction are scheduled for operation in 2002. [Figure 2](#) shows the busway, median separation, and stations.

The main axis of the system is Avenida Caracas. There are branches along Autopista Norte and to Portal del Tunnel.

Stations

Stations on the trunk lines are closed facilities, located in the median at an average distance of 500 meters (1,640 feet). They have from one to three berths and vary from 40 meters to 180 meters in length (130 to 590 feet). The system also includes pedestrian access infrastructure (sidewalks, plazas, over-passes) as well as bus maintenance and parking facilities. The stations have high platforms that allow level entry to buses. They are “closed” facilities in that doors open when buses arrive. Fares are paid before entering the platforms.

Figure 3 shows a typical station entrance. Figure 4 shows the fare collection and turnstile arrangements within stations; there is a striking similarity to the fare collection provisions on rail rapid transit lines.

Figure 5 shows passenger interchange within a station. Station signage is similar to that for many island rail stations.

Vehicles

Some 460 red-colored Volvo and Mercedes articulated buses built in Brazil and assembled in Columbia provide trunk-line service. The buses can carry up to 160 passengers, at European standee densities (4 per square meter) and were built for a cost of \$200,000 each. (See Figure 6.)

Two sets of double doors and two single doors are placed on the left side of buses for use at island stations (Figure 7). As shown in Figure 8, these doors expedite level bus boardings at stations.

The standard green-colored feeder buses carry up to 80 passengers and comply with strict operational and environmental requirements.

Operations

TransMilenio operates express and local service to maximize service supply. The express service stops at selected stations only, whereas local services stop at all stations. Express routes are numbered from 10 to 70, and the regular (local) routes are numbered 1 and 2. As shown in Table 1, service operates from about 5 a.m. to 11 p.m. on weekdays. Average frequencies for each route range from 2 to 5 minutes.

Table 2 gives service statistics on route kilometers, speeds, fleet size, and ridership.

Service Providers and Fare Collections

Private providers carry out system operation with strict conditions set forth through concession contracts with centralized control. TransMilenio operators are consortia of traditional local transport companies, associated with national and international investors that own the buses and hire drivers and maintenance personnel. Concessions were awarded through open bidding processes and payment related to the route kilometers served by each operator³.

The billeting (fare collection) system is also privately operated. It includes production and distribution of smart cards and acquisition and installation of turnstiles and validating systems, passenger information, and money handling. A concession contract was awarded through an open bidding process. The money collected from card sales is deposited in a trust fund, which has the mandate to pay the operators according to the rules set forth in the concession contracts.

To assure operations and work out issues of expansion and maintenance, the system created a new public company known as TransMilenio S.A. Its structure is very small, given that it performs its charter through third parties, and its operations are funded with 3 percent of the ticket sales and ancillary activities.

ITS

TransMilenio operates a control center that allows service and passenger access supervision. Each articulated bus is equipped with a Global Positioning Satellite system and a processing unit that reports its location every 6 seconds. The control center also receives information from turnstiles that report the number of passengers entering and leaving the system. Supply of buses and service demand are then coordinated, and contingencies managed in real time.

SYSTEM PERFORMANCE

The TransMilenio BRT line carried 18,000 riders on its first day of service. In October 2001, the system carried 540,000 paid trips per weekday. By the end of the first quarter of 2002, daily ridership was estimated at 800,000 with 26 miles of exclusive lanes, 62 stations (including 4 terminals), and 3 intermediate integration stations.

Peak-Hour Riders

Peak-hour, peak direction passenger volumes have been reported at 45,000. This high number likely reflects “ridership turnover” along the long BRT trunk routes. Maximum load point volumes are probably less.

Speeds

System speeds average 26 kilometers per hour overall. They are 30 kilometers per hour [19 mph] for express routes and 21 kilometers per hour [13 mph] for all-stop services.

Safety

After 5 months of operation, TransMilenio reported a 93-percent reduction in fatalities from traffic accidents, a 40-percent drop in some air pollutants, a 32-percent decline in travel time for users, passenger acceptance level of 88 percent, and ticket cost equivalent to \$0.36 (U.S. dollars).

Cost Recovery

The system runs without any operating subsidy from public agencies. TransMilenio is designed for 100-percent fare box recovery. Given that it is privately operated, any

increase in revenue from expanding passenger totals goes to the operators. Likewise, if costs increase or demand declines, the private operators are required to absorb the risk and cover losses. The national and city governments cover capital investments only.

FUTURE EXPANSION

The system will be gradually expanded to 22 corridors covering 242.5 miles of exclusive lanes, planned for implementation in a 15-year span. Work on the first 7.5 miles of the expansion is expected to begin early next year; bids for operators are now open. 210 additional articulated buses will be needed to move an additional 200,000 passengers daily.

ASSESSMENT

TransMilenio is based on, but goes far beyond, the successful experiences of the Brazilian cities of Curitiba, Porto Alegre, and Goiana, as well as Quito, Ecuador. The system incorporates advanced technologies for billeting and control and a sustainable private participation scheme. It is, perhaps, the only four-lane busway in service. The high ridership likely reflects (1) high development densities, (2) large numbers of short-distance trips (e.g., high line turnover), and (3) midday lunchtime travel. Nevertheless, it clearly shows that BRT can provide capacities that approach those afforded by many rail transit lines.

The TransMilenio system has many attractive features that may be applicable to BRT systems in the United States. These include the high-capacity median stations (some with overhead pedestrian connections), off-vehicle fare payment, multi-door articulated buses, and an extensive GPS bus-tracking system.

However, U.S. application will often require buses to leave the busway for neighborhood collection. Thus, low-platform boarding with doors on *both* sides of buses would be required.

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1. Forero, J. “Bogotá Journal Conflict Rages, But Capital Basks in Good Times,” International New York Times, September 15, 2001.
2. <http://www.transmilenio.gov.co>: 8080/transmilenio/fotos/sistema4.jpg
3. “International, Bogotá’s BRT Achieves Farebox Coverage of Operating Costs” Passenger Transport, November 5, 2001, p. 4.

Table 1: TransMilenio Routes and Service Frequencies

<u>Type</u>	<u>Number</u>	<u>Average Frequency</u>	<u>Service Hours</u>
Regular	1, 2	3 minutes	5 am – 11 pm
Express	10, 20 – 40, 30, 50, 60, 70	2 to 3 minutes	5:30 am – 10 pm
Feeder	Depends on Route Taken	5 minutes	4:30 am – 11:45 pm

Source: TransMilenio, SA; <http://www.transmilenio.gov.co:8080/transmilenio/citras.jsp>

Table 2: TransMilenio Service Summary

1.	Annual passengers	(Millions)
	Trunk	1,430.7
	Feeder	43.8
	Inter-district	3.5
	Total	1478.0
2.	Peak Hour passengers (both directions)	63,400
3.	Trunk Service	
	Route kilometers in operation	38
	Stations	59 to 62
	Buses	457
	Speeds	26.2 km/hr
	Annual bus kilometers	28,252,000
4.	Feeder Service	
	Routes	29
	Buses	197
	Route kilometers	107
	Districts Served	48

Source: TransMilenio, S.A.

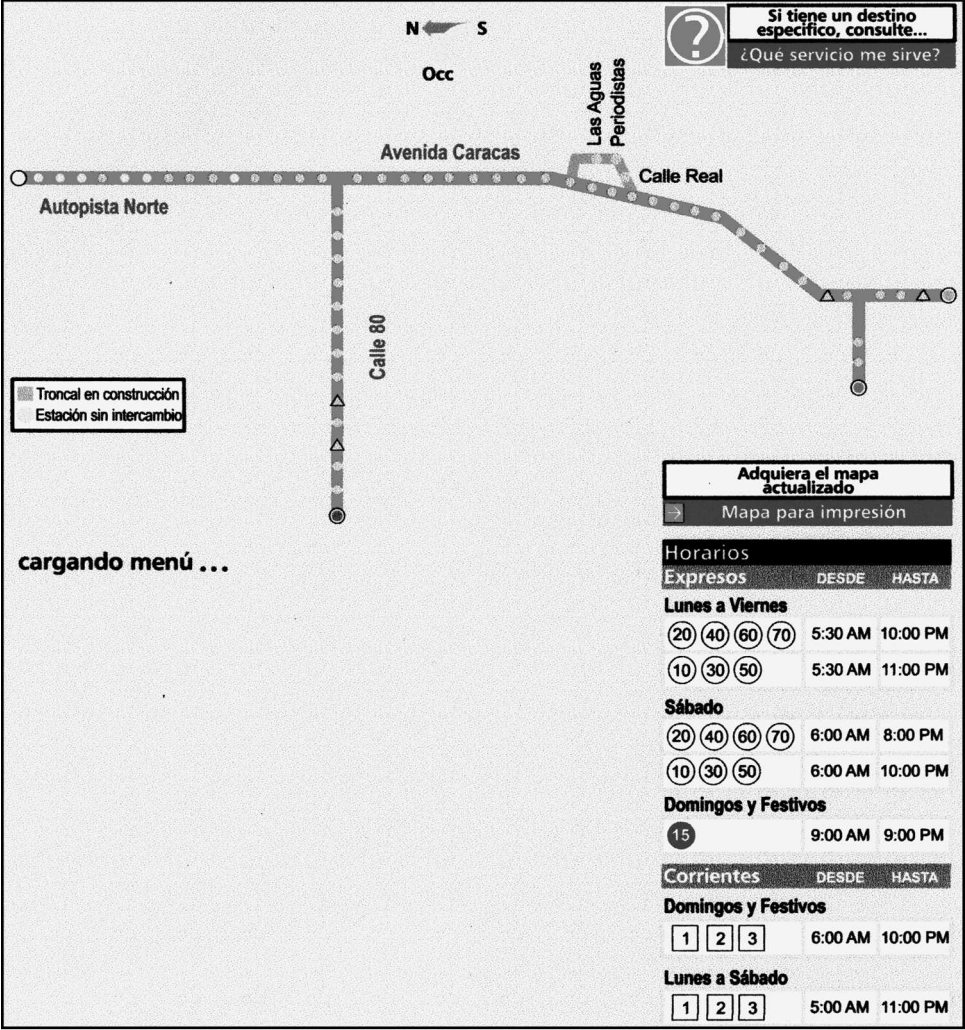


Figure 1: TransMilenio System



Figure 2: Busway – Median Separation and Station



Figure 3: Station Entrance – TransMilenio Median Busway



Figure 4: Fare Collection



Figure 5: Passengers Boarding TransMilenio Bus



Figure 6: TransMilenio Articulated Bus



Figure 7: TransMilenio Bus – Door Arrangement



Figure 8: Level Bus Boarding at Island Station