

**Asia-Pacific Environmental Innovation Strategies (APEIS)
Research on Innovative and Strategic Policy Options (RISPO)
Good Practices Inventory**

TransMilenio Bus Rapid Transit System of Bogota, Colombia

Summary of the Practice

Keywords: bus-based transit system, exclusive lanes

Strategy: Development of environmentally sustainable transport system in urban areas

Environmental areas: Air pollution, Urban environment

Critical instruments: Design, planning and management, Economic instruments, Organisational arrangements, Technologies,

Country: Colombia

Location: Bogota

Participants: TransMilenio is a public-private partnership.

- Design, planning, and investment in the infrastructure is carried out by public institutions such as the Bogota Mayor's office, FONDATT (Fondo de Educación y Seguridad Vial FONDATT—the fund for education and road safety of the Secretary of Transit and Transportation), IDU (Instituto de Desarrollo Urbano—Institute of Urban Development), IDCT (Instituto Distrital de Cultura y Turismo—the District Institute of Culture and Tourism), Metrovivienda.
- Its operations are overseen by private entities such as trunk line operators (SI99 S.A., Metrobus S.A., etc.), feeder bus operators (Sidauto, Codatermil, etc.), fare collection concessionary (Angelcom S.A.), and control center providers (Electronic Traffic ETRA).

Duration: 18 December 2000—ongoing

Funding:

- Development of the system will continue until 2016 with a total investment of U.S.\$1.97 billion.
- The infrastructure of the system is funded by the national government, a loan from the World Bank, the Bogota Mayor's Office, and stakeholders from the transport sector.
- The system is funded entirely by fare collection and no subsidies are provided.

Background:

- Bogota, the capital city in central Colombia, is located at an altitude of 2,650 m (8,660 ft.) on the highest plateau in the Colombian Andes. It has a population of 6.4 million (as of 2000) in an area of 1,732 square kilometers.
- Its high elevation gives it a mild climate year-round with the mean annual temperature being 14°C, even though it lies only 4°36' north of the equator.
- Bogota's economy showed 3.6 percent annual GDP growth during the period 1991–1999 and its GDP accounts for 25 percent of the national total. Per capita GDP of Bogota was U.S. \$3,300 in 1999.
- TransMilenio is much more cost effective than a railway system.

Objectives:

TransMilenio's main objective is to improve the quality of life and productivity in Bogota through a faster, safer, and cheaper but less polluting and more equitable transportation system.

Description of the activity:

TransMilenio is a public/private system, designed for operation by private contractors under government oversight, using 470 Volvo and Mercedes articulated buses and 300 standard feeder buses built in Brazil and assembled in Colombia.

The system improves upon the Curitiba system¹ in Brazil and runs without any operating subsidies from public authorities. TransMilenio is designed to recover 100 percent of its costs through passenger fares. Given that it is privately operated, any increase in revenue from expanded ridership goes directly to the operators. Likewise, if costs increase while demand declines, the private operators are required to cover the risks and losses. The national and city governments cover only capital investments.

TransMilenio is based upon, but goes far beyond, the successful experiences of the Brazilian cities of Curitiba, Porto Alegre, and Goiania, and Quito², Ecuador. The system incorporates advanced technologies for ticketing and control, and a sustainable private participation scheme.

Although the system is bus based, its operation is similar to a rail-based system. While some buses stop at all stations, others operate express routes stopping at only a few stations. Passengers can change from a local to an express bus as well as from one route to another using the same ticket. The combination of express and local buses allows the system to carry up to 45,000 passengers per hour in each direction.

Stations on the trunk lines are closed facilities, located in the median at an average distance of 500 meters from each other. They have one to three berths and vary from 40 meters to 180 meters in length. The system also includes pedestrian access infrastructure (sidewalks, plazas, overpasses), as well as bus maintenance and parking facilities.



Main station (Source: www.bogota-dc.com/trans/transmil.htm)

Private providers carry out system operations, with strict conditions set forth through concession contracts under 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 are awarded through open bidding processes and payment is related to the number of route kilometers served by each operator.

The main advantage of TransMilenio over a rail system is its low cost. The total investment will be U.S.\$1.97 billion for the total route length of 388 kilometers up to the year 2016. The cost is U.S.\$5 million per kilometer which includes dramatic improvement of the public pedestrian space around the system, including sidewalks, plazas, trees, and the like, while the cost for a metro system reaches U.S.\$100 million per kilometer. It is cheaper to operate than a railway system and thus requires no additional subsidies. While almost all rail systems in the world require operational subsidies of around U.S.\$0.40 per passenger, TransMilenio private operators not only recover costs but also make a profit.

Critical Instruments

Overview

Improving upon Curitiba's innovative system, TransMilenio introduced a bus-based rapid transit system. The success of TransMilenio is attributed to a combination of various elements. One important factor has been the city government's strong leadership with careful design and planning. This leadership has combined with the mobilization of necessary funds, state-of-the-art technologies adopted to run the system, the establishment of a good management company, and a sound investment in infrastructure, and an efficient single fare pricing system.

¹ Refer to the practice, "Integration of Land Use and Bus System in Curitiba, Brazil"

² Refer to the practice, "The Electric Trolleybus System of Quito, Ecuador"

Design, planning and management ***Bus-based Rapid Transit System***

TransMilenio is comprised of four components: specialized infrastructure; efficient operations; advanced ticketing; and a new institution for system planning, development, and control. The system's infrastructure includes exclusive bus lanes based on the Curitiba model designed for trunk line services, roads for feeder buses, stations, and complementary facilities. Trunk buses use the central lanes of existing streets, longitudinally segregated from the general traffic. The system is supplemented with integrated feeder buses on local streets.

The main system is being gradually developed to meet all the demand for a public transportation system. When it is fully developed in 2016, TransMilenio will serve 5 million passengers per day along 388 kilometers of main lines on 22 corridors.



Bogotá's TransMilenio system projected to 2016 (Source: www.transmilenio.gov.co)

Economic instruments

Single fare pricing system

The ticket price is 900 pesos (approximately U.S.\$0.30) and allows the transfer to other buses called “alimentadores” serving areas the TransMilenio has not yet reached.

The system started operating on 18 December 2000, and from that day until 6 January 2001, the service was free for all residents of Bogotá.

With this fixed fare, cross subsidizing among passengers occurs. Passengers who travel a short distance subsidize those who travel a longer distance. This seems socially equitable because the poor normally must travel a longer distance from their residence far from the city center.

Organisational arrangements

Division of labor and rules for efficient operation

To oversee 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 operation is funded with 3 percent of the ticket sales and ancillary activities.

Under the supervision of TransMilenio S.A., the main lines are operated by four companies (Integrated Transportation System SI-99, International Consortium for Massive Transportation, Metrobus, and Future Express) and feeder buses are operated by three companies (Sidauto S.A., Codatermil, and Uribe and Uribe Consortium). Investment comes from five public entities including the Bogotá Mayor's office.

TransMilenio has specific user rules to be followed inside the buses and stations for efficient and safe operation of the system:

- For safety and comfort, children must always be held by an adult and no animals are allowed onto the system.
- Always walk on your right, to move quickly and safely.
- Always stand behind the yellow line until the bus stops and the doors open.
- Have exact change ready to purchase your ticket, and take good care of the ticket.
- Your ticket or Capital Card is owned by the TransMilenio System, and if you lose it you must pay for it.
- Do not board the bus while under the influence of drugs or alcohol.
- Call 275 7000 or 9800 11 8765 to request general information about the system and its services, to make suggestions, or to report lost items.
- Please use the suggestion boxes in the portals, as your opinion is valuable to improve the system.

Technologies ***Ticketing System***

The ticketing system is privately operated. It includes production and distribution of smart cards, acquisition and installation of turnstiles and validating systems, passenger information, and money handling. Each of these systems operates by way of a “smart card,” a modern technological innovation. A concession contract was awarded through an open bidding process. The money collected from card sales is deposited in a trust fund, from which the operators are paid according to the rules set forth in the concession contracts.

Control Center

TransMilenio S.A. operates a control center that supervises the operation of the buses and the number of passengers. Each articulated bus is equipped with a GPS (Global Positioning Satellite) system and a processing unit that reports its location every six 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.

Articulated Buses

An articulated bus is constructed of two red buses connected in the middle by a flexible tube. The buses are equipped with clean diesel engines that comply with Euro Two environmental standards. Contractual arrangements guarantee that buses are extremely clean, well lighted, and in excellent working condition. Each bus has a capacity of approximately 160 passengers (43 seated and 114 standing).



Source: www.bogota-dc.com/trans/transmil.htm

Articulated buses operate on exclusive busways, using one or two lanes in each direction. Passengers board the buses only at stations, having already purchased a ticket upon entering the station or at a store outside. In this way, when the bus arrives and opens its two doors at the same time as the station doors, a hundred passengers can get off and another hundred can get on within seconds. The bus floor is level with that of the station, making entering and exiting the bus a rapid and safe operation, as well as ensuring the buses is fully accessible to the handicapped.

Impacts

In only three years, the TransMilenio Bus Rapid Transit system of Bogota has progressed from the blueprint stage to operations that serve the 5 million commuters and residents of the metropolitan area. The system accounts for more than 630,000 daily trips and the main line carries in excess of 40,000 passengers per hour, more than many rail systems.

After just five 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 (among whom 9 percent used to drive to work); a passenger acceptance level of 88 percent; and a ticket cost equivalent to U.S.\$0.36 without operating subsidies. TransMilenio aims to move more than 80 percent of the city's population by 2015.

By the end of the first quarter of 2002, daily ridership is estimated to be more than 800,000 in 26 miles of exclusive lanes, 62 stations (including four terminals and three intermediate integration stations), 470 articulated buses, and 300 feeder buses. The system will be gradually expanded to 22 corridors covering 242.5 miles of exclusive lanes, planned for implementation over 15 years. This enormous ridership means the TransMilenio is one of the world's largest BRT systems, second only to Curitiba, Brazil, which started 40 years ago and now transports about 1.3 million passengers daily.

Lessons Learned

- *A low cost and less polluting metropolitan mass transport system is achievable.* By utilizing the current road infrastructure, a bus-based mass transit system can be built and operated more efficiently than a railway system in an urban area.
- *Efficient operation can be achieved by the private sector.* The operation of the system by the private sector seems to be key to cost recovery through fare collection with no subsidies.
- *Connection with existing road transport system is important.* Efficient connection with existing road transport systems, such as feeder buses, enhances the quality of service and passenger convenience.
- *Information campaigns are essential.* It is necessary to create awareness of the transportation system for current and upcoming generations, to make the public feel ownership of the project. For instance, the system operated free of charge for the first three weeks, allowing more than 1 million passengers to become acquainted with the system.

Potential for Application

TransMilenio is a system inspired by Curitiba's all-bus network transit system. Even though the system is relatively new and has not been extensively analyzed it has a high potential of success in urban areas where auto ownership is low, public transportation need is great, and a high population growth rate is anticipated. All that is needed is a will to reserve exclusive lanes for the system. It has been studied for replication in other Colombian and Latin American cities. Medium-sized cities (population of 0.5 to 1.0 million) are currently preparing projects to set up bus-based systems with similar busways and economic incentives. Valencia, Venezuela, Panama City, and Lima are looking to Bogota's experience as they start up transportation projects.

The TransMilenio system can also be integrated into more comprehensive urban planning which seeks a sustainable transportation system by providing a substantial network of connecting railway systems and other road systems with low costs and minimal pollution.

Contact

TransMilenio S.A.
Av. El Dorado #66-63
Bogota D.C.
Colombia
Tel. 571-275-7000 / 220-3000
Fax. 571-324-9870/80
www.transmilenio.gov.co

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Case reviewer: Myung-Kyoon Lee

Senior Economist, UNEP Collaborating Centre on Energy and Environment
P.O.Box 49, Risoe National Laboratory, DK-4000 Roskilde, Denmark
mk.lee@risoe.dk

Information date: April 2003