Latin American Experience with Bus Rapid Transit

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Existing busways and BRTs in Latin America

• Brazil
  – Curitiba 1974 65
  – Goiânia 1976 35
  – Porto Alegre 1977 27
  – São Paulo 1979 142
  – Belo Horizonte 1981 6
  – Recife 1982 16
  – Campinas 1985 5

• Other Countries
  – Quito (Ecuador) 1995 33
  – Bogotá (Colombia) 2000 67 (July 2005)
  – León (Mexico) 2003 26
**Conventional busways**

Bogotá (before TransMilenio)

- High passenger throughput
- Operational control difficult
- Chaotic and unattractive
- **OFTEN: BAD IMAGE**

Lima (now)

São Paulo (before passa-rápido)
**Curitiba (Brazil) BRT**

- **Segregated Busways**
  - First busway in 1974
  - Five busways now, 65 km
  - 14,300 pass/hour/direction

- **Operational Aspects**
  - Integrated transport system
  - Trunk (bi-articulated buses – 260 pass/bus), feeder, express services
  - High station platforms, fare prepayment
  - URBS distributes revenues to private bus companies

- **Transport + Land-Use Coordination**
  - High-density development along busways
  - City services at transfer terminals
  - Maintain city center vitality
**Quito (Ecuador) BRTs**

- **Trolleybus Busway (“El Trole”)**
  - Started operation in 1995
  - 17 km of busway (+ 1.5 km by 2006), 28 intermediate stations + 3 feeder terminals
  - 113 articulated Trolleybuses, Diesel standby motors, **right-hand doors**
  - High station platforms, fare prepayment
  - 240,000 pass./day, maximum load point 8,000 pass./hour/direction

- **Ecovía Busway (Diesel Buses)**
  - Started operation in 2003
  - 9 km (+ 4 km by 2006) of busway
  - 16 median stations + 2 feeder terminals
  - 42 articulated buses, with **left-hand doors**

- **Central-Norte Corridor (Diesel Buses)**
  - Started operation in 2004
  - 11 km of busway (+ 8 km by 2006)
  - Articulated trunk buses with **right-hand doors**
  - Passing lanes at intermediate stations
Bogotá (Colombia)
TransMilenio

• Phase 1 (2000-2002)
  – 42 km of busway, of which 25 km are 2+2 lanes
  – 57 stations and 4 transfer terminals (connecting with 39 feeder lines)
  – 470 articulated trunk-line and 235 feeder-line buses
  – 770,000 pass./day, maximum load point 35,000 pass./hour/direction

• Phase 2 (2003-2005)
  – 42 km of busway, 50 stations and 5 terminals
  – 335 articulated trunk-line and 146 feeder buses

• Operations
  – Similar to Curitiba, but much higher volumes
  – Rapid implementation, reform of bus industry
  – Commercial success, excellent image
  – July 2005 volume > 1 million passengers/day
León (Mexico) BRT

- Started operation in 2003
- 26 km of trunk line
- 2 terminals and 51 intermediate stations
- High station platforms
- Fare prepayment
- 52 articulated trunk-line buses (doors on left)
- 31 feeder routes with 209 conventional buses
What do these BRTs have in common?

- Physically segregated busways
- Controlled operation of trunk+feeder buses
- High station platforms
- Fare prepayment, flat fares, free transfers with feeder buses
- Mostly operated by private bus companies
- High passenger volumes
- High commercial speeds of bus operations
- Much lower cost than LRT or metro alternative
- BUT: Metro-like appearance
- Distinct identity and good image
What do these BRTs have in common?

**Physically segregated busways**

Curitiba

Bogotá

Quito
What do these BRTs have in common?

**Trunk-feeder operation**

**Advantages of “open” operation**
- Fewer passenger transfers
- No need for transfer terminals
- Less bus route restructuring

**Advantages of trunk-feeder operation**
- Better bus control \(\rightarrow\) \(\rightarrow\) \(\rightarrow\) higher capacity
  and \(\rightarrow\) \(\rightarrow\) \(\rightarrow\) faster + more reliable flow
- Special trunk-line buses can be used
- Fare prepayment and faster boarding/alighting
- Distinct (usually more attractive) image
What do these BRTs have in common?

High station platforms

- only BRT buses have access
- rapid boarding and alighting
- disability-friendly
What do these BRTs have in common?

Fare prepayment

Bogotá

Quito
What do these BRTs have in common?

Mostly operated by private bus companies

• TransMilenio (Bogotá) -- Phase 1+2
  – 7 trunk bus and 6 feeder bus concessions with companies which are owned by investors and traditional bus operators
  – All buses (incl. 805 new articulated trunk buses, at about US$ 200,000/bus) were privately financed
  – Investment and operation paid 100% from fares

• Quito -- Trole is operated by municipality; Ecovía and Central Norte Corridor by private sector

• Curitiba -- 9 Privately-run area concessions; no Government subsidies
What do these BRTs have in common?

**High passenger volumes**

*Passengers on a typical weekday*

- **Bogotá** (TransMilenio Phase 1+2a)  
  - Maximum peak-hour volume per direction: 35,000 passengers/hour  
  - 1,020,000 pass./day

- **Curitiba**  
  - Maximum peak-hour volume per direction: 14,000 passengers/hour  
  - 530,000 pass./day

- **Quito** (Trole)  
  - Maximum peak-hour volume per direction: 8,000 passengers/hour  
  - 240,000 pass./day
What do these BRTs have in common?

**High commercial speeds**

- **Despite at-grade intersections**
- **Main reasons for higher speed**
  - Segregated busways
  - Fare prepayment
  - High station platforms
  - Express services
- **Examples** (commercial speeds incl. stops)
  - Bogotá express lines  32 km/h
  - Bogotá all-stop buses  21 km/h
  - Quito Central-Norte  20 km/h
  - Curitiba          19 km/h
What do these BRTs have in common?

*Much lower cost than rail alternative*

- **Bogotá**
  - *TransMilenio* infrastructure investment (Phase 1) US$ 245 million
  - *TransMilenio* private investment US$ 100+ million
  - Total public investment **US$5.8 million/km** US$ 0.34/pass. (3 years)
  - *Rail Metro* – was ready for bidding in 1998 (30 km, US$3.04 billion, 1.1 million pass/day estimated for 2008) **US$101 million/km** US$ 2.36/pass. (3 years)

- **Infrastructure Costs** (US$ million per km of busway)
  - Quito Ecovía 1.2
  - Mexico City 1.5
  - Guayaquil (u.c.) 2.7
  - Quito Central Norte 2.3
  - Pereira (under constr.) 1.9
  - Santiago (u.c.) 2.3
What do these BRTs have in common?

**BUT: Metro-like appearance**

Curitiba

Bogotá
What do these BRTs have in common?

**Distinct identity and good image**

Curitiba

Choice of name
Distinct logo
New type of buses
Attractive stations

Bogotá

Quito
BRT systems opening in 2005 - 2007

Opened in June 2005
  • Mexico City 20 km of busway

Scheduled to open in 2005/06
  • Pereira (Colombia) 16
  • Guayaquil (Ecuador) 45
  • Santiago (Chile) 20
  • Medellín (Colombia) 13

Expected to open in 2007
  • Lima (Peru) 32
  • Barranquilla, Bucaramanga, Cali, Cartagena (Colombia) 82
  • Guatemala City 11
  • Others?
19.5 km of trunk line
2 terminals and 34 intermediate stations
Fare prepayment
High station platforms
Buses with left-hand entry
80 articulated trunk buses
250,000 passengers/day in first three weeks of operation when no fare was charged
220,000 passengers/day after July 10, with a 32 US Cents equivalent fare
Overcrowding and other teething problems at beginning
BRT systems being implemented

**Santiago (Chile)**

- **Integrated Transport System**
  - Full-scale reform, to be completed by mid-2006
  - Covers 100% of public transport
  - Full ticket and fare integration
  - Bus-Bus and Bus-Metro transfers

- **Institutional and Operational Aspects**
  - Transantiago: Overall management role
  - 80 km of metro line: Government operated
  - 4700 buses--15 private concessions (trunk and zonal)

- **Busways (20 km)**
  - Alameda (see center left) - Pajaritos and Sta. Rosa in 2005
  - Other busways to be added in subsequent years, incl. existing Avenida Grecia busway (see bottom left)
  - Some trunk bus lines extend beyond busway
  - Low-floor buses, doors on the right
  - On-bus fare control - contact-less cards
BRT systems soon to be implemented

Lima (Peru)

- **Proposed BRT System**
  - 32 km of exclusive busway, 42 stations
  - Construction scheduled for 2006-2007
  - Total investment: $134 million, including complementary works, goods and services

- **Segregated Busways**
  - First busway (Vía Expresa -- built in 1972-74) will be incorporated in system
  - Main adaptation: extra passing lanes at stations, to increase busway capacity
  - 2+2 lanes on most other busway sections (56% of total busway length)

- **Operational Aspects**
  - Trunk and feeder services, private bus operating concessions
  - High station platforms, fare prepayment, bus doors on left
  - 624,000 passengers per day (forecast for 2007)
  - 15,000 passengers/hour/direction at maximum load point
  - Private concessionaire to collect and distribute revenues to bus companies
  - Overall control by autonomous municipal agency (ProTransporte)
What can we learn from these BRT experiences?

- Great improvement over traditional bus services
- Often: linked to general public transport reform
- Much less costly to implement and operate than rail alternatives
- Implementation is complex → requires competent planning + design and strong political leadership
- Rapid public acceptance → positive political benefits
- STILL: Frequently voiced doubts when considering BRT
  - BRT (as opposed to rail) would not attract car users
  - BRT is slow
  - BRT has a low capacity
  - BRT pollutes and creates a barrier effect
  - No development impact with BRT
Frequently voiced doubts when considering BRT

**BRT (as opposed to LRT) would not attract car users**

→ *not so in Latin America!*

- **Curitiba:**
  - City has relatively high income per capita and car ownership is second highest in Brazil
  - BUT: gasoline consumption per capita is lower than any other comparable city

- **Bogotá:**
  - About 15% of TransMilenio passengers previously traveled by private car
Frequently voiced doubts when considering BRT

**BRT is slow**

→ not so in Latin America!

If at-grade, with intersections:
- speed is similar to LRT

If grade separated:
- speed is competitive with metro

**One great advantage:** express bus can overtake other buses at stations
- Now: in Bogotá, São Paulo, Quito (Central-Norte)
- Planned: in Lima, Guayaquil, Cali, Pereira, Barranquilla

**Observed commercial speeds (km/h)**

- **BRT:** Bogotá 21-32 Quito: 15-20
- **LRT:** Tunis 13-21
- **Metro:** Hong Kong 34 São Paulo: 29
Frequently voiced doubts when considering BRT

**BRT has a low passenger capacity**

→**But its throughput is generally higher than LRT!** See regularly achieved maximum volumes (observed passengers per peak-hour per direction)

**Conventional busways** (1+1 lanes, with at-grade crossings)
- Belo Horizonte 21,000  
- São Paulo 22,000  
- Porto Alegre 14,000

**Bus Rapid Transit** (with at-grade crossings)
- Bogotá (2+2 lanes) 36,000  
- Quito (1+1) 8,000  
- Curitiba (1+1) 14,000

**Light Rail Transit** (with at-grade crossings – 1+1 track)
- Alexandria El Rami 13,000  
- Tunis 9,000

**Rail Rapid Transit** (fully grade separated – 1+1 track)
- Hong Kong 81,000  
- Mexico City 65,000  
- Washington, DC 17,000*

* Blue/Orange Line – highest RRT volume in the US, outside New York City
Frequently voiced doubts when considering BRT

**BRT pollutes and creates a barrier effect**

- Yes, much more than underground metro
- Somewhat more than at-grade LRT
  - Even clean Diesel creates more local pollution than electricity
electric Trole in Quito, CNG in buses in Cartagena, “clean” buses in Santiago
  - Long bus stations in Bogotá, “wall of buses” in São Paulo

- Environmental problems caused mostly by cars
Frequently voiced doubts when considering BRT

No development impact with BRT

**BUT Bogotá:**
New shopping center at TransMilenio terminal

**AND Curitiba**

Express Bus Corridor
More on Curitiba’s urban development
Conclusions

• Curitiba’s BRT (1974) used to be considered a “special case”
• Quito (1995), Bogotá (2000) and León (2003) demonstrated that this concept could indeed be replicated elsewhere
• Latin America has become a fantastic laboratory for innovative urban transport solutions
• Now: dozens of new BRTs are being built and planned – in Latin America and elsewhere throughout the World
  – BRTs are now operating in Australia, China, Indonesia, Korea, USA ... ...
  – International consulting firms are associating with Latin American experts when advising other countries
Thank you for listening!