

QUITO, ECUADOR

Trolley Bus

TROLE

El Trolebús



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ENVS 634-660

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Quito, Ecuador

- Population 1.6 million
- 2,850 meters above sea level
- 8km wide – 42km long
- Narrow mountain valley
- UNESCO's World Heritage List
- WHO - @ risk for high pollution levels
- 1990 – transportation officials devise plan
 - Integrated transit between main-axis & radial terminals
- Utilize hydro-electric dams & existing infrastructure

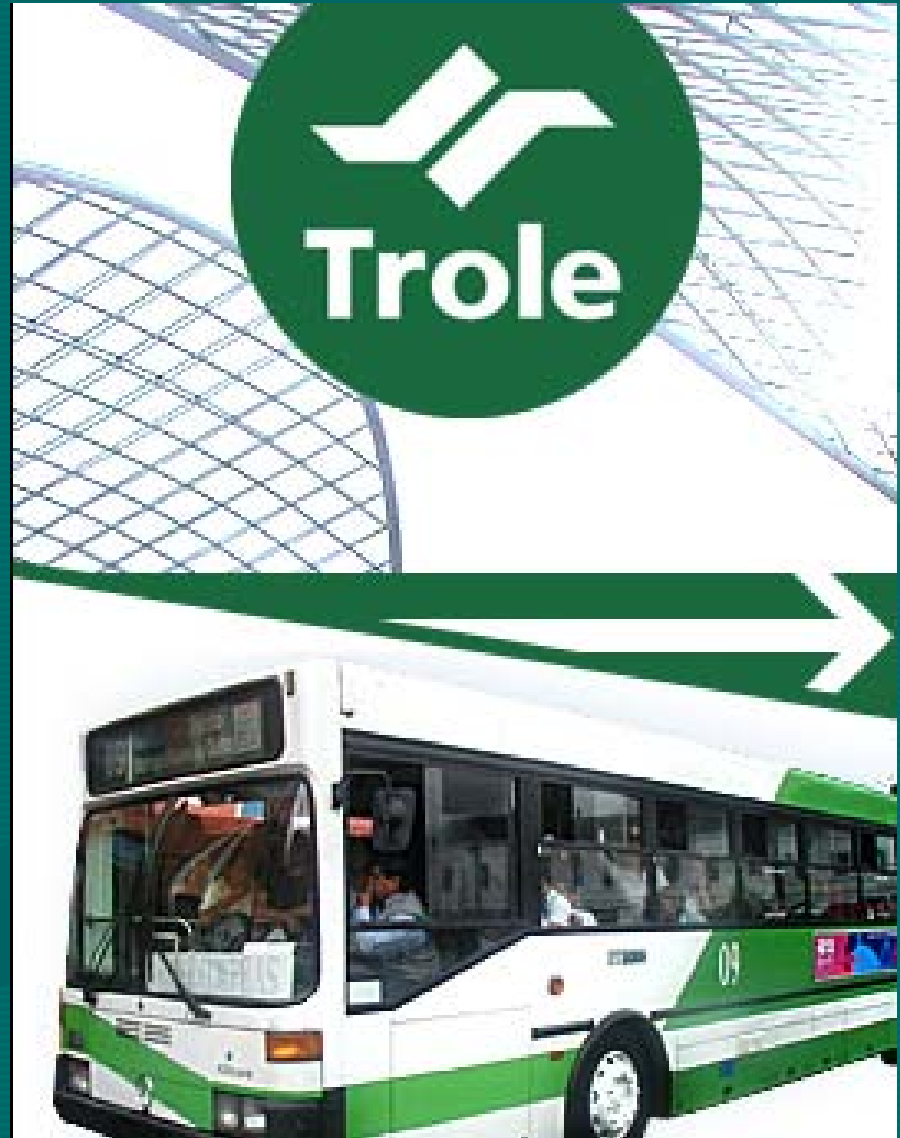


(Image Source: Trole)



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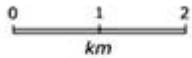
- Implementation costs: US\$ 5.1 million/Km
- Underground metro implementation costs: US\$ 40-90 million/Km



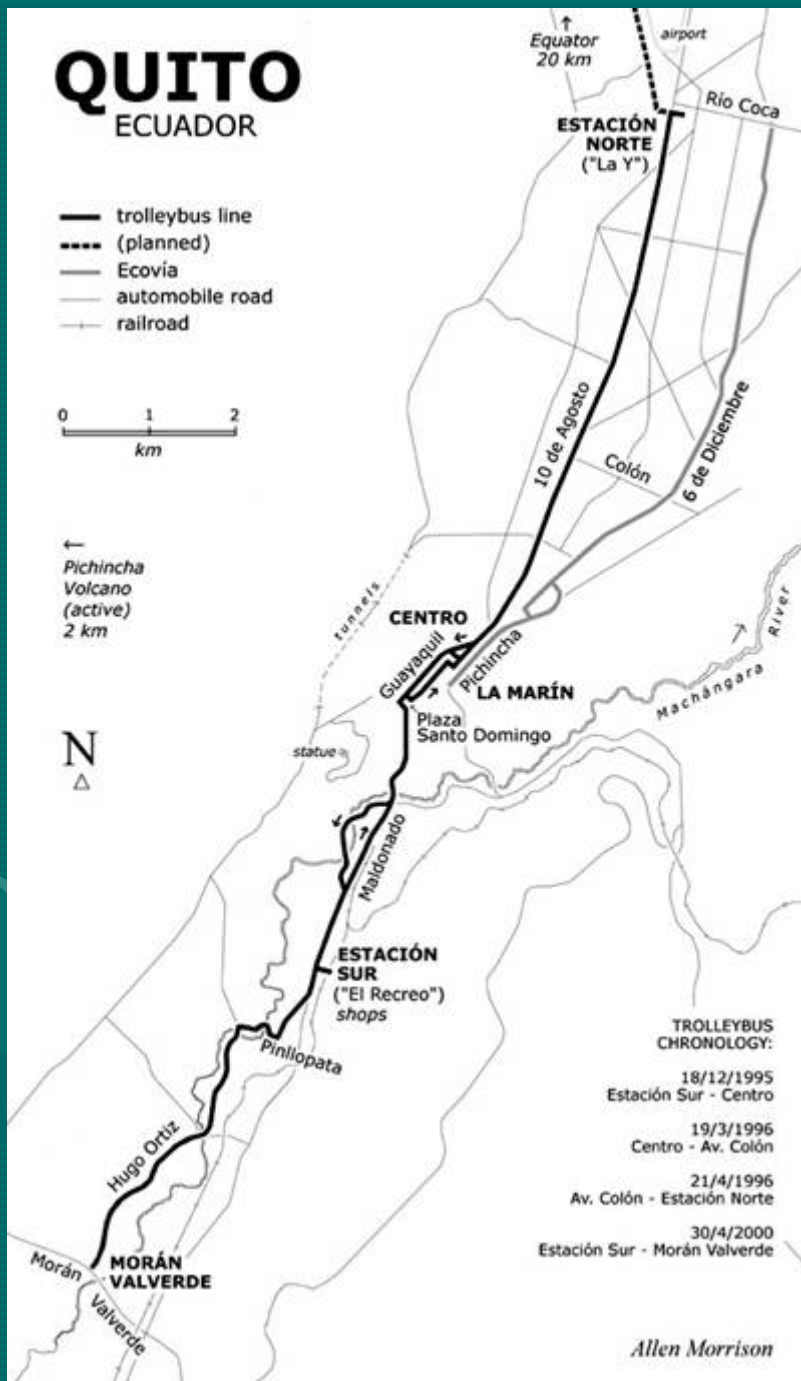
(Image Source: Trole)

QUITO ECUADOR

- trolleybus line
- - - (planned)
- Ecovía
- automobile road
- railroad



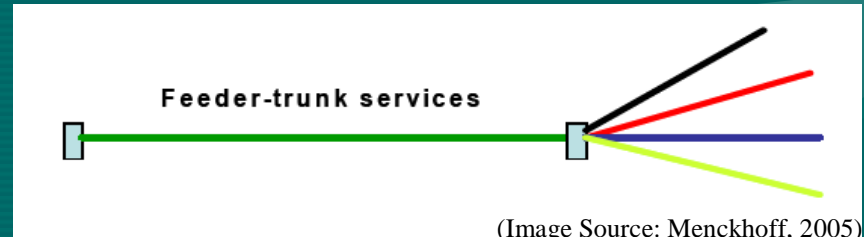
←
Pichincha
Volcano
(active)
2 km



**TROLLEYBUS
CHRONOLOGY:**
18/12/1995
Estación Sur - Centro
19/3/1996
Centro - Av. Colón
21/4/1996
Av. Colón - Estación Norte
30/4/2000
Estación Sur - Morán Valverde

Allen Morrison

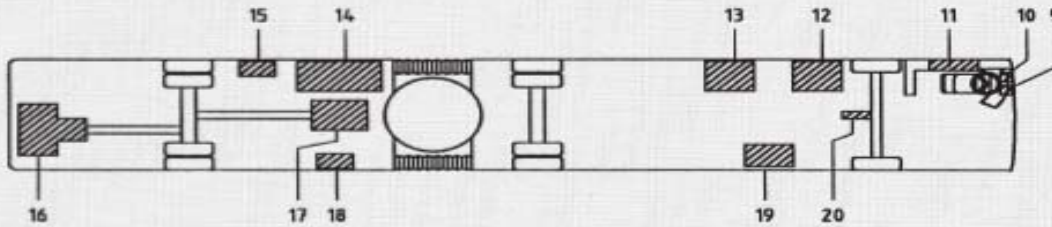
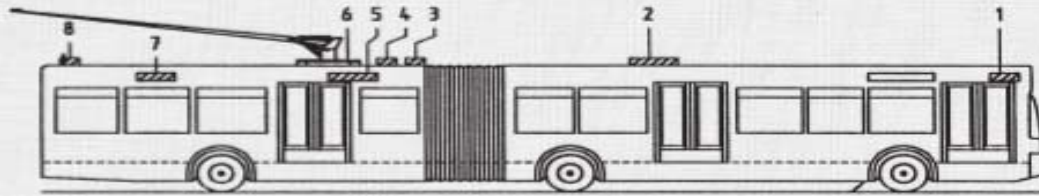
- 39 individual stops
- Avg. interval: 400 meters



(Image Source: Menckhoff, 2005)

TRANASOC

Cooperative with private bus operators
+200 “feeder-trunk services”



- 1 Isolationswächter
- 2 Bremswiderstand
- 3 Hauptsicherungen
- 4 Steuergerät für Stromabnehmer
- 5 Elektronischer Fahr-Bremse regler EFB
- 6 Stromabnehmer und Überspannungsableiter
- 7 Isolationsprüfklemmkasten
- 8 Stangenvermiegung Stromabnehmer
- 9 Fahrhöhwertgeber
- 10 Bremskraftgeber
- 11 Bodnetztafel
- 12 Bodnetzumschler
- 13 Batterieraum
- 14 Direkt-Pulsrichter DPU
- 15 Netzinduktanz
- 16 Notfahr-Aggregat
- 17 Traktionsmotor
- 18 Netzrossel
- 19 Kompressor-Aggregat
- 20 Schleife

- 1 Controlador de aislamiento
- 2 Resistencia de freno
- 3 Fusibles principales
- 4 Aparato de mando para el tomacorriente
- 5 Regulador electrónico de marcha y frenado EFB
- 6 Tomacorriente y descargador de sobretensión
- 7 Caja de bornes para el control del aislamiento
- 8 Bloqueo de las barras tomacorriente
- 9 Indicador del valor teórico de marcha
- 10 Indicador del valor teórico de frenado
- 11 Tablero de red
- 12 Convertidor de la red de a bordo
- 13 Cámara para la batería
- 14 Convertidor de tracción de impulsos directos DPU
- 15 Condensador de red
- 16 Grupo de marcha de emergencia
- 17 Motor de tracción
- 18 Inductancia de red
- 19 Grupo compresor
- 20 Contacto a tierra

KIEPE equipment produced to standard ISO 9001

- 176-passenger articulated bus
 - 52 seats & 124 standing room
- Top speed: 60 Km/h
 - Terminal-to-terminal : 15-20 Km/h
 - Central District: 10 Km/h
- Avg. speed before *TROLE*: 6 Km/h



TROLE

- 6am to 12am daily, until 10pm weekends
- Fare: US \$ 0.25 Reduced: US \$ 0.12
- One-fare system
- Off-vehicle payment (Pre-paid ticketing)
- Elevated boarding ramps
- Free transfers from feeder busses
- Exclusive bus lanes
- Color-coded routes
- Widely displayed System Maps
- Enclosed Stations
 - Posted transit staff
 - Seating
 - Public telephones
 - Video screens



Image Source: Morrison - [HOY, Quito, 30/4/2000]



Image Source: Trole

“fare affordability index”

- calculated by dividing the cost of 500 trips by the GNI/capita.
- Quito’s value is 6.8% the average person that utilizes the *Trole* spends only 6.8% of their income on transportation.
- Curitiba 13.6%
- São Paulo 14.3%
- Bogotá 14.4%

(Menckhoff, 2005)

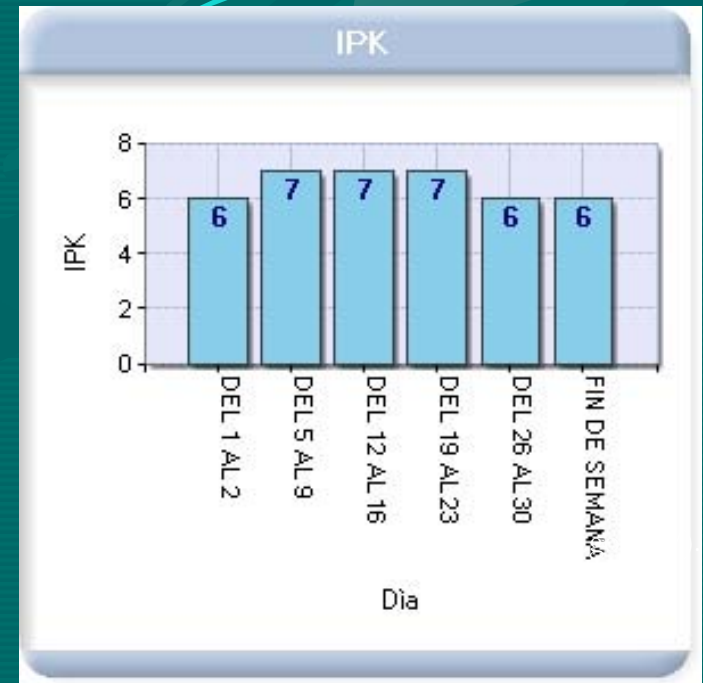
Productivity

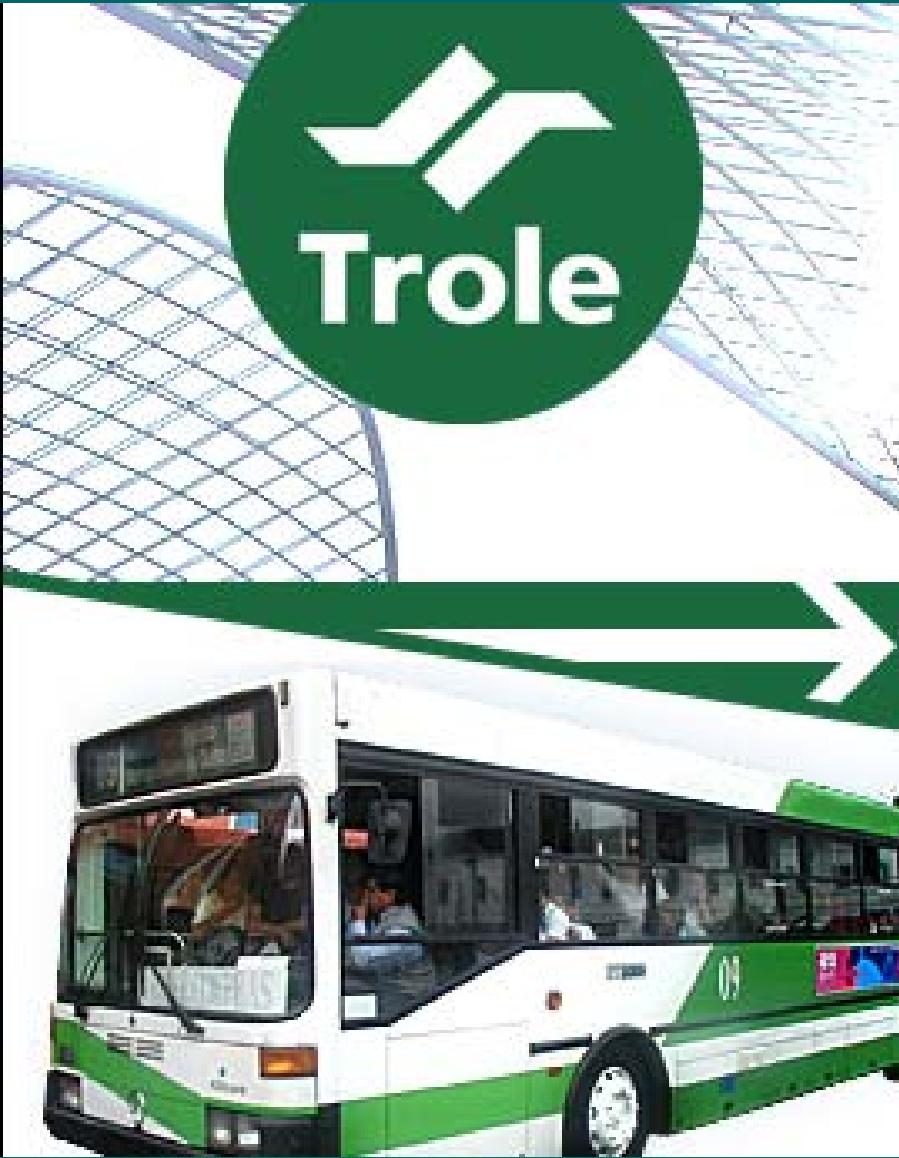
- Line-haul capacity: 8,000 passengers per hour per direction
- 300,000 passengers per day
 - Forecast to handle 400,000 passengers per day

TROLE IPK

Index of Passengers / bus-Kilometers run per day

Days of the month	Total Passengers Transported	Total KMS. Traveled	IPK	IPK (Optimal)
DEL 1 AL 2	157145	269008	6	6
DEL 5 AL 9	231354	34685	7	6
DEL 12 AL 16	227866	34312	7	6
DEL 19 AL 23	225900	34080	7	6
DEL 26 AL 30	216199	33432	6	6
FIN DE SEMANA	137473	22513	6	6





Works Consulted

Buses International Association. *Busways: The way to go in Quito, Ecuador.*

http://www.busesintl.com/Dec_2002.htm

Construccion Pan-Americana. "ECOVI: proyecto de transporte urbano." Edicion Julio 2000. Paginas 12-14.

Gardner, Geoff. Cornwell, Phil. & Cracknell, John. The performance of busway transit in developing countries, TRRL Research Report 329, Crowthorne, UK, 1991.

Jurado, J. Southgate, D. Environment and Development Economics (1999), 4: 375-388

Dealing with air pollution in Latin America: the case of Quito, Ecuador

Cambridge University Press Copyright © 1999 Cambridge University Press. doi:10.1017/S1355770X99000248.

Published Online 02 Apr 2001

Menckhoff, Gerhard. *Latin American Experience with Bus Rapid Transit.*

Annual Meeting – Institute of Transportation Engineers

Melbourne, Australia, August 2005

http://www.gobrt.org/Latin_American_Experience_with_Bus_Rapid_Transit.pdf

Morrison, Alan. *The Trolley Bus System of Quito, Ecuador.* <http://www.tramz.com/ec/q/00.html> Webpage created: 8/8/2000

Natural Resources Forum, JNRF 25:2, May 2001 Lloyd Wright: *Latin American Busways.*

[Latin American Busways, Lloyd Wright, Natural Resources Forum, May 2001.pdf](http://www.naturalresourcesforum.org/latin_american_busways_lloyd_wright_may_2001.pdf)

Rebelo, Jorge. Basic Busway Data in Latin America, World Bank, 2003.

http://www.worldbank.org/transport/urbtrans/pub_tr/bus_data.pdf

Trole. <http://www.trolebus.gov.ec/> Website created: 17/09/2004

Kiepe-Elektrik.. Technical Data for Articulated Trolleybus MB O405 G HCE <http://www.kiepe-elektrik.com/english/trolleybusse/quito1/>