Bus Rapid Transit

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Presentation outline

I. Introduction to BRT

II. Video

III. Case studies

- Jakarta and Beijing

IV. Financing BRT

V. Field trip in Nagoya

A global view of transit improvement

Bus transit projects completed

Latin America
- Belo Horizonte
- Bogotá
- Campinas
- Curitiba
- Goiania
- León
- Manaus
- Mexico City
- Porto Alegre
- Port of Spain
- Quito
- Recife
- Sao Paulo

Europe
- Amsterdam
- Bradford
- Claremont Ferrand
- Eindhoven
- Essen
- Ipswich
- Leeds
- Lyon
- Nice
- Rouen
- Runcorn
- Utrecht
- West Sussex

Oceania
- Adelaide
- Brisbane
- Sydney

Africa
- Abidjan
- Saint-Denis

Asia
- Beijing
- Jakarta
- Kunming
- Nagoya
- Seoul
- Shejiazhuang
- Taipei

North America
- Alameda
- Boston
- Chicago
- Las Vegas
- Los Angeles
- Miami
- Ottawa
- Orlando
- Philadelphia
- Pittsburgh
- Vancouver

Projects in planning or construction

Latin America
Barranquilla
Calí
Cartagena
Ciudad Juarez
Cuenca
Guatemala City
Guayaquil
Lima
Medellín
Panamá City
Pereira
Puebla
Querétaro
San Juan
San Salvador
Santiago
Santo Domingo

North America
Albany
Charlotte
Cleveland
Eugene
Hartford
Houston
Louisville
Montgomery Co.
Reno
San Francisco
Toronto

Asia
Bangalore
Bangkok
Chengdu
Delhi
Dhaka
Guangzhou
Hangzhou
Hanoi
Ho Chi Minh City
Hyderabad
Shanghai


Lloyd Wright

Africa
Accra
Cape Town
Dakar
Dar es Salaam

Oceania
Auckland

Busways versus bus lanes

BRT is about a total quality approach.
It has nothing to do with bus lanes.

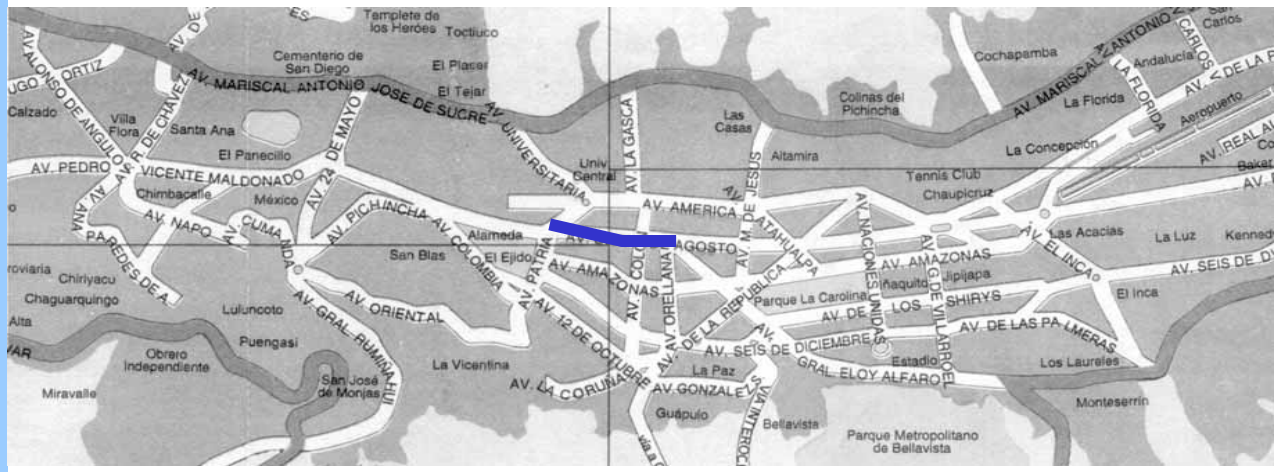
Photo taken from front seat of bus in bus lane (Mexico City)

Two systems at the same cost

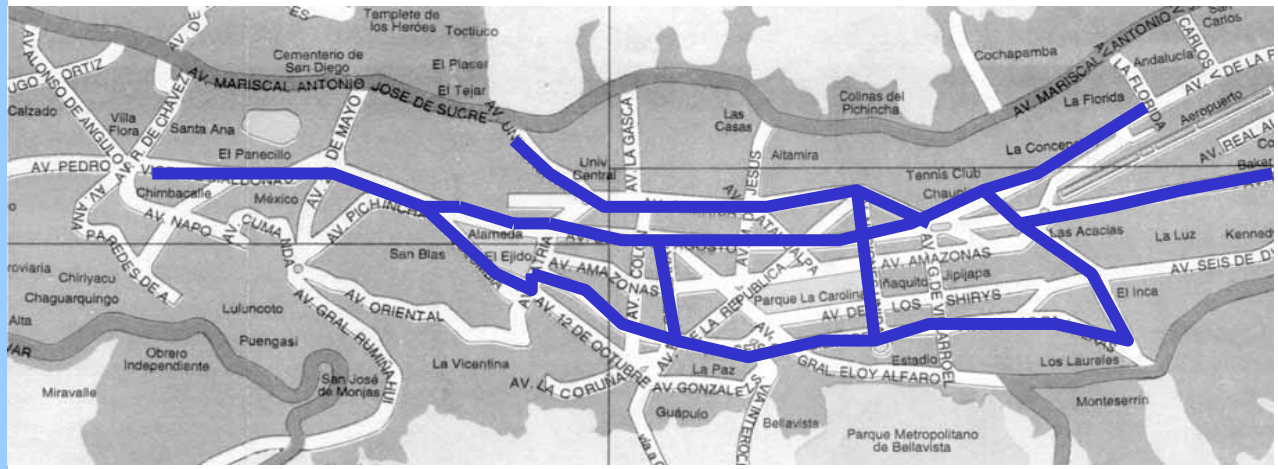
Customers want a full network, not a few kilometres of high technology

Unless a high-quality public transit system covers most destinations, the system will never compete with the car

Rail-Based system



Bus Rapid Transit system



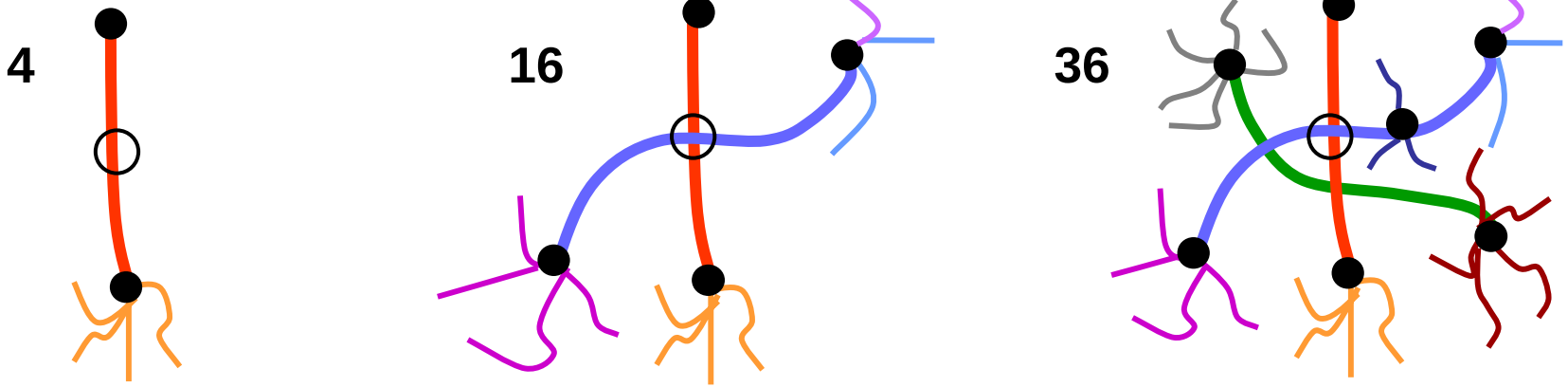
Road space requirements

BRT can be implemented even amongst severe road space limitations

Lloyd Wright

In Quito and Curitiba, BRT has been with as little as 3.0 meters of road width

Networks not corridors



a. Single trunk corridor with feeder services

b. Two trunk corridors with feeder services

c. Three trunk corridors with feeder services

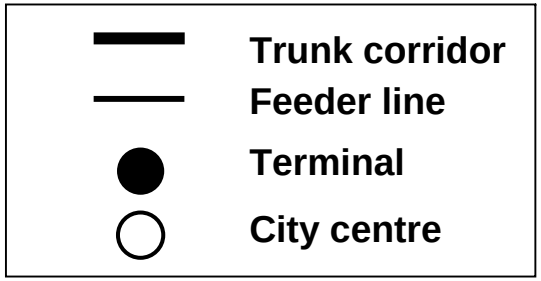
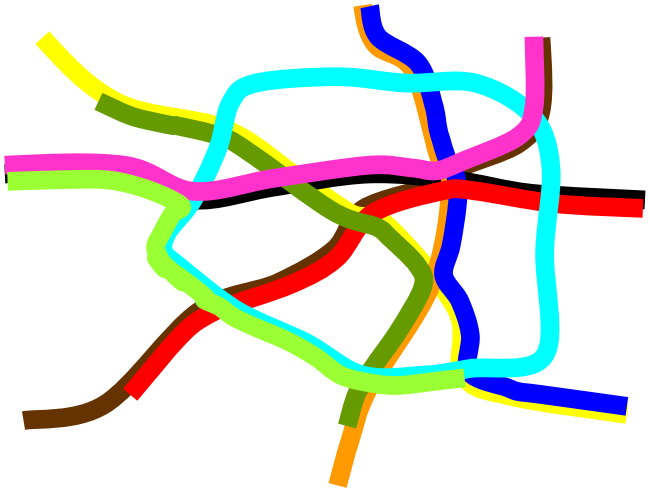


Figure represents the number of permutations of corridor segments available to the customers

Types of transfers



Level 1: No transfer necessary
(Good route design)

Level 2: Platform transfers
(High customer convenience)

Level 3: Grade separated transfers (High cost / low convenience)

Level 4: Grade separated and fare separated (Inconvienent)

Level 5: Physical barriers to transfer
(Poor customer service)

Marketing identity

BUS RAPID TRANSIT

TRANSITWAY

SILVERLINE

Rapid

Transmetro

cta

busway

busway

Catch a Better Bus

CATS

SOUTH DADE BUSWAY

VTA

Local services and express services

Express services make BRT very time competitive

Bogotá achieves high volumes (42,000 pphpd) using express services

Gives customers a choice

However, express services require passing lanes at stations

Busway design

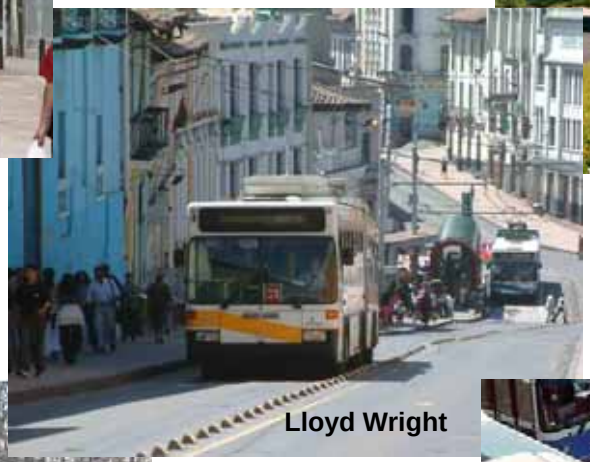
Median aligned, with flow

Example: TransMilenio; Bogota, Colombia

Avoids conflicts with turning vehicles

Bus technologies

Clean diesel



Electric trolley

Hybrid electric

Fuel cell

Natural gas

Modern buses

“Think rail, use buses”

Curitiba, Brazil

Started in 1974

Serves five major corridors

1.9 million passenger trips per day

58 km of express busways, 270 km of feeder routes

270 passenger bi-articulated buses

US examples

Honolulu

Miami

Los Angeles

Pittsburgh

Australia

Brisbane

Adelaide

England

Bradford

Leeds

Sao Paulo, Brazil

World's longest collection of exclusive bus lanes

Use of passing lanes to achieve high flow rates

Quito, Ecuador

Currently:	**2 lines, 25 km**
2005:	**4 lines, 48 km**
2006:	**5 lines, 98 km**

Infrastructure costs:
US$ 2 million / km

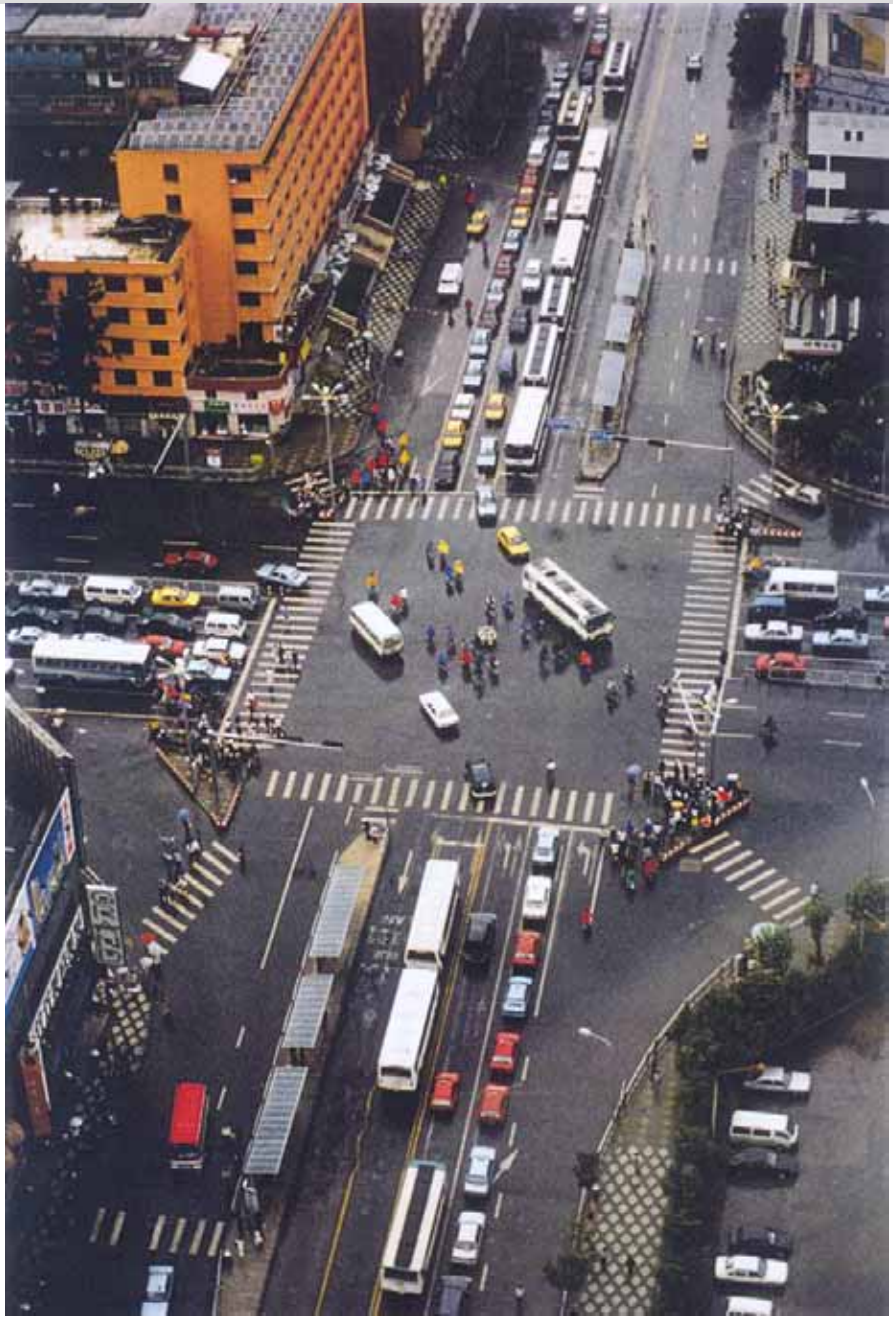
Bogota, Colombia

BRT system called "TransMilenio"

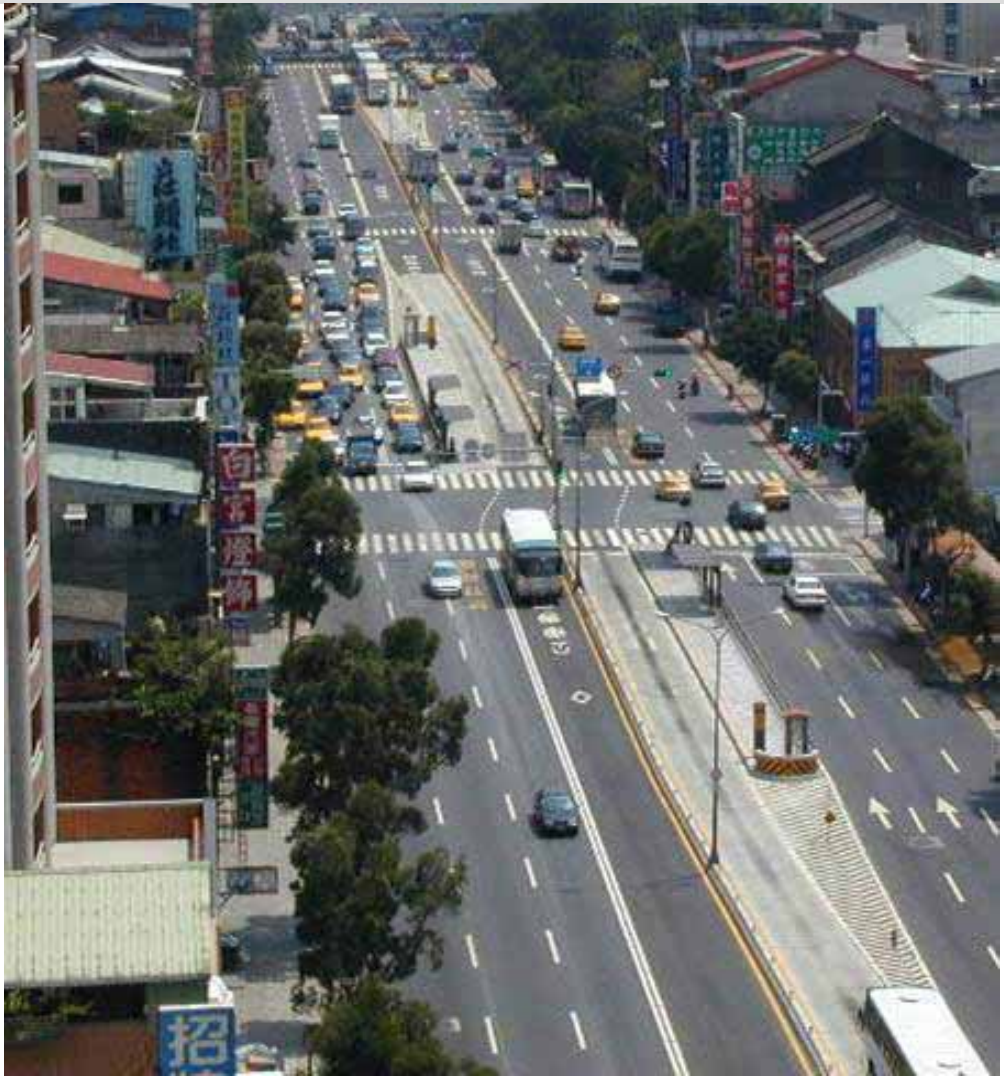
TransMilenio SA

By 2015, TransMilenio will serve 5 million passengers per day over 388 kilometers of busways.

Kunming, China



Taipei, Taiwan



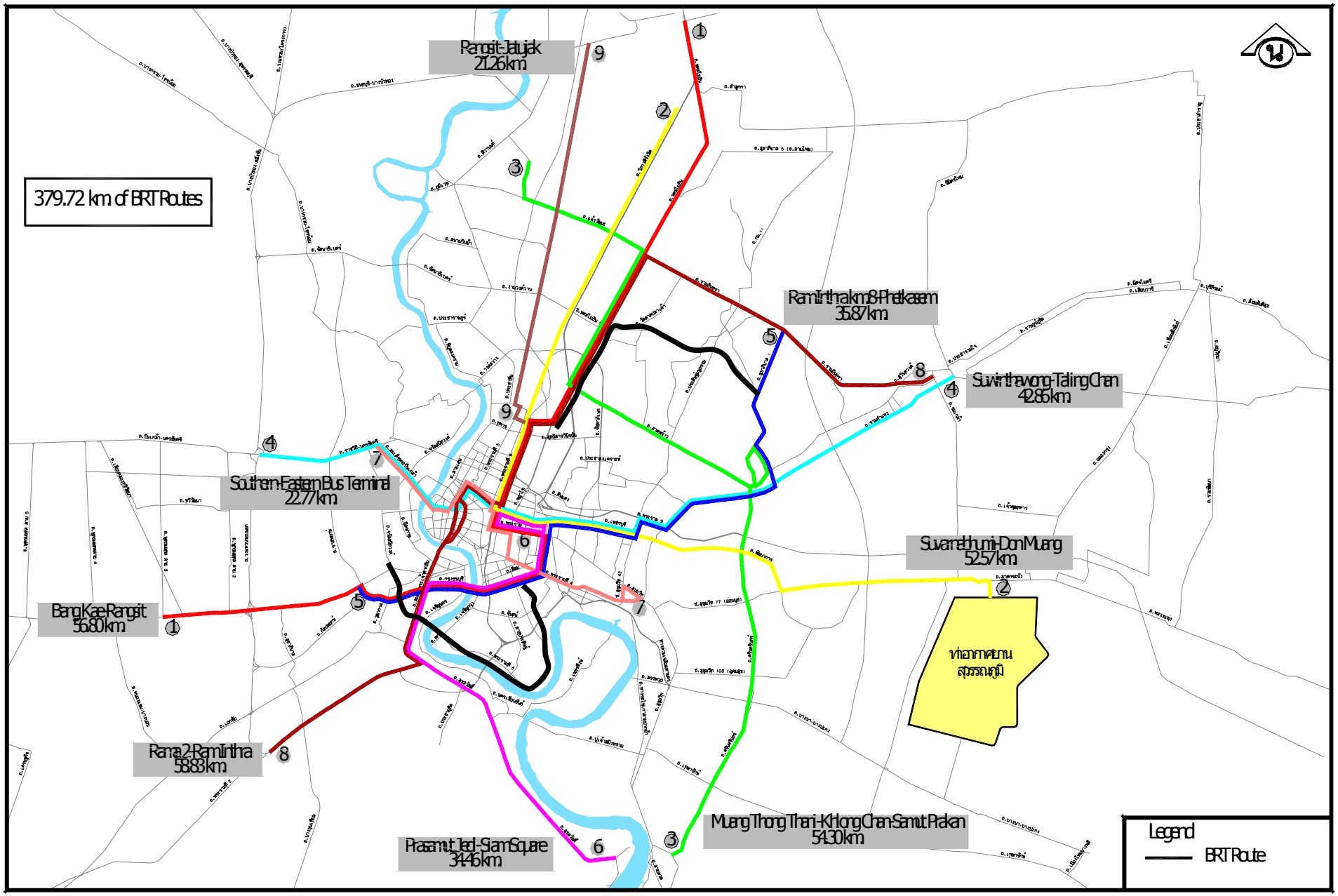
Construction costs:
US$ 500,000 / km

Jakarta, Indonesia

Initial corridor of 12.9 km completed in January 2004

BRT projects in China

Bangkok, Thailand



Organisational structure

ALCALDIA MAYOR
BOGOTA D.C.

Planning, management, and quality control
Public company

Infrastructure
Private sector

- Specifications developed by public sector
- Contracts awarded through competitive bidding

Fare collection
Private sector

- Concession awarded through competitive bidding
- Private operators are responsible for purchasing fare equipment and managing fare process

Busway operations
Private sector

- Concessions awarded through competitive bidding
- Private operators are responsible for purchasing vehicles and operating vehicles

Revenue based on vehicle-kilometres and not the number of passengers

Before: Drivers worked 16 hours per day under difficult conditions

After: Drivers work 6 hours per day under greatly improved conditions and earn more

Staffing at TransMilenio

Functional Area	Number of Employees
General management	5
Managerial assistants	5
Legal advisors	5
Internal control office	3
Administrative	17
Planning	8
Financial	7
Operations	27
Marketing	3
Total	*80*

TransMilenio SA (Public company)
Only 80 people managing transit system for city of 7.5 million persons

TransMilenio's impact

Safety 93% reduction in accident fatalities

Environment 40% reduction of some pollutants

Efficiency 32% travel time savings

Customer satisfaction 88%

Physically disabled users: 9,000 trips per day

All achieved with a fare of US$ 0.40 and with NO SUBSIDIES

TransMilenio’s impact as a brand

TransMilenio SA

BRT financing

Cost categories

- **Planning**
- **Infrastructure**
- **Buses**

Phase I costs

Typical costs for a Phase I with 20 kilometres of busways

Component	Total cost (US$ million)	Cost/km (US$ million)
Trunk lines	7.0 – 30.0	0.35 – 1.5
Stations	2.0 – 8.0	0.1 - 0.4
Terminal	2.0 – 8.0	0.1 - 0.4
Fare collection system	3.0 – 10.0	0.15 – 0.5
Pedestrian overpasses	2.0 – 6.0	0.1 – 0.3
Bus depots	1.0 – 6.0	0.05 – 0.3
Control centre	1.0 – 4.0	0.05 – 0.2
Other	2.0 – 8.0	0.1 – 0.4
Total	*20.0 – 80.0*	*1.0 – 4.0*

Planning costs: US$ 1 million – US$ 2 million

Total Phase I costs: US$ 21 million – US$ 82.0 million

Financing components and options

1. System Planning

Local and national sources
UNDP
Global Environment Facility
Overseas Development Agencies
Private foundations

2. Infrastructure

Local and national sources
Regional Development Banks
World Bank
Commercial Banks

3. Equipment

Private sector operators
Bus manufacturers
Bi-lateral export banks
International Finance Corporation
Commercial banks

Global Environment Facility (GEF)

Mechanism to catalyse projects that reduce greenhouse gases: www.gefweb.org

PDF A route (Project Development Funds A)
- **US$ 50,000 to prepare project proposal**
- **US$ 1 million to implement project**

PDF B route (Project Development Funds B)
- **US$ 350,000 to prepare project proposal**
- **US$ 2 million – US$20 million to implement project**

Implementing agencies: UNDP, World Bank, UNEP, IFC, Regional development banks

Cities with GEF funding for BRT development:

Dar es Salaam
Hanoi
Lima
Mexico City
Santiago
Colombian cities
Chinese cities

Bi-Lateral Agencies

German Overseas Technical Assistance Agency (GTZ)

BRT support in Bangkok and other cities
Offers BRT training course to cities
BRT Planning Guide (www.sutp.org)

US Agency for International Development (US AID)

Supporting BRT development in Africa (Accra, Ghana; Dakar, Senegal; Cape Town, South Africa) and Asia (Jakarta, Indonesia and Delhi, India)

Swedish International Development Agency (Sida)

BRT assistance to Dhaka and Bangalore

Japanese International Cooperation Agency (JICA)

Master transport plans and modelling in various cities of Asia and Latin America

Foundations and NGOs

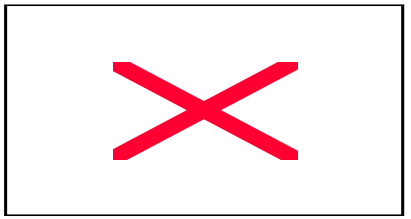
Hewlett Foundation

THE WILLIAM AND FLORA HEWLETT FOUNDATION

Supporting BRT initiatives in Mexico City, Sao Paulo, and China

Institute for Transportation & Development Policy (ITDP)

BRT support to: Cartagena, Mexico City, Accra, Dakar, Cape Town, Dar es Salaam, Guangzhou, Jakarta, Delhi, Hyderabad



World Resources Institute, EMBARQ programme

World Resources Institute
EMBARQ
THE WRI CENTER FOR TRANSPORT AND THE ENVIRONMENT

BRT initiatives in Shanghai and Mexico City

Funding through local revenue sources

1. Existing budgets
2. Parking controls
3. Road pricing
4. Tax hypothecation
5. Station commercial development
6. Advertising
7. Merchandising

Special tax revenues

North Carolina, USA

0.5% of State sales tax dedicated to public transit

Provides $50 million of funding each year

State uses funds to provide 50% match to municipal projects

Bogota, Colombia

28% of Colombian petrol tax funds public transport projects like TransMilenio

Property development

Transit systems generate wealth in surrounding areas

There are various mechanisms for cities to capture this value to pay for the transit system

Property development

Charging a fee to permit connections commercial centres

Letting commercial space on transit concourses

Information resources

National Bus Rapid Transit Institute
www.nbrti.org

Australian Systems
www.transportroundtable.com.au

Breakthrough Technologies Institute
www.gobrt.org

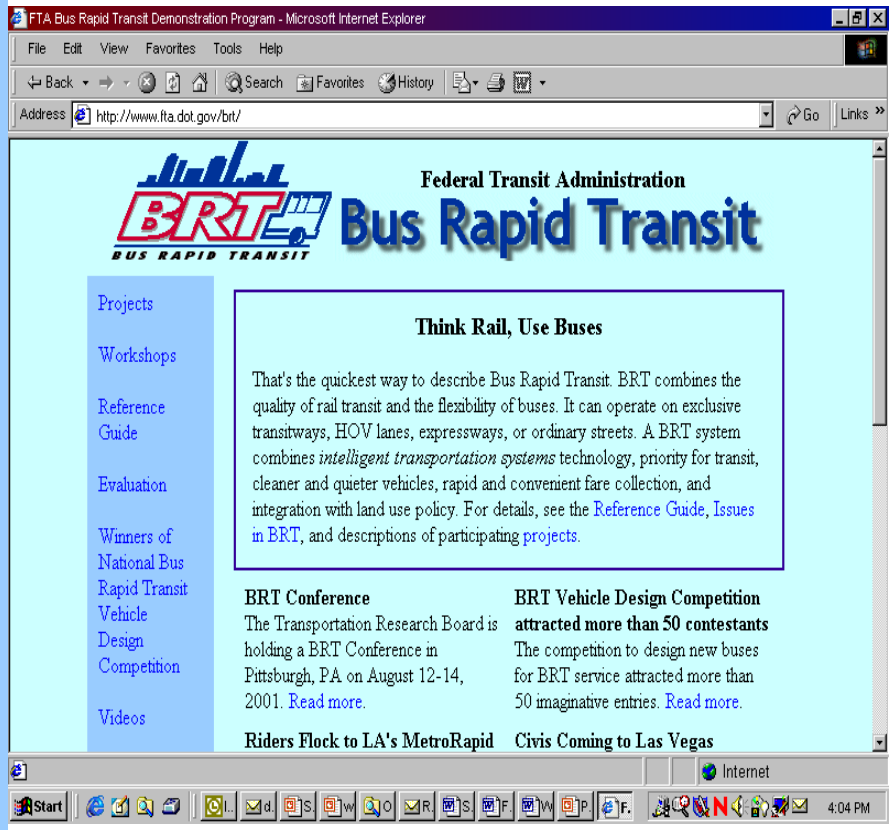
US Bus Rapid Transit Program
www.fta.dot.gov/brt

Bus Rapid Transit Central
www.busrapidtransit.net

Bogota TransMilenio
www.transmilenio.gov.co

GTZ Sustainable Urban Transport Project
www.sutp.org

Institute for Transportation & Dev. Policy
www.itdp.org



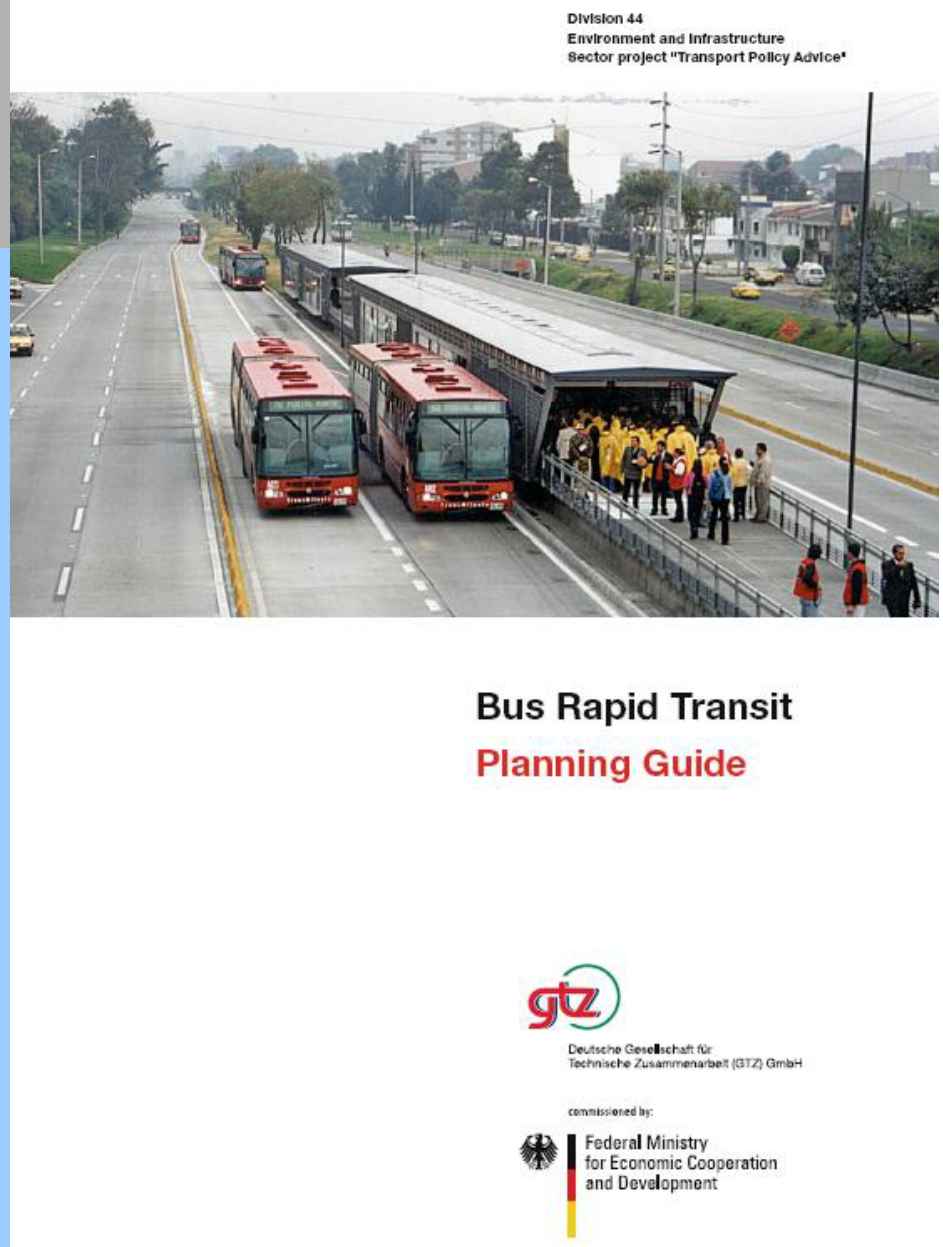
Resources

GTZ Sustainable Urban Transport Project

www.sutp.org

BRT Planning Process

1. Project preparation
2. Demand analysis
3. Communications plan
4. Operational plan
5. Business & institutional structure
6. Infrastructure
7. Technology
8. Multi-modal integration
9. Impact analysis
10. Implementation plan



Putting people first

Nagoya field trip

1. Subway to Ozone

Kokusai Center to Ozone, ¥ 260. Start at Kokusai Center station, then change lines at Hisaya-odori station, exit at Ozone.

2. Walking tour of BRT station and area

3. Optional bus ride (¥ 200 or more)

4. Return to hotel by subway or by JR train