CAI-Asia and Sustainable Urban Mobility in Asia (SUMA): Bus Rapid Transit Systems

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21 September 2007
ADB INRM

CAI-Asia Partnership and CAI-Asia Center (1)

CAI-Asia Partnership

Mission:
promote and demonstrate innovative ways to improve the air quality of Asian cities through partnerships and sharing experiences

Objective:
Broad based stakeholder forum on urban air quality in Asia

Status:
To be registered as Type II partnership with United Nations

CAI-Asia Center

Mission:
promote and demonstrate innovative ways to improve the air quality of Asian cities through partnerships and sharing experiences

Objective:
Acts as the Secretariat to the Partnership and contributes to the implementation of the strategy

Status:
Registered as a non-stock, non-profit of the Philippines

CAI-Asia Partnership and CAI-Asia Center (2)

CAI-Asia Partnership

Governance:
Partnership Council composed of 15 members

Members: 150+

- Cities
- National Government Agencies
- Civil Society/ Academe
- Private Sector
- Development Agencies

CAI-Asia Center

Governance:
Board of Trustees composed of 7 trustees

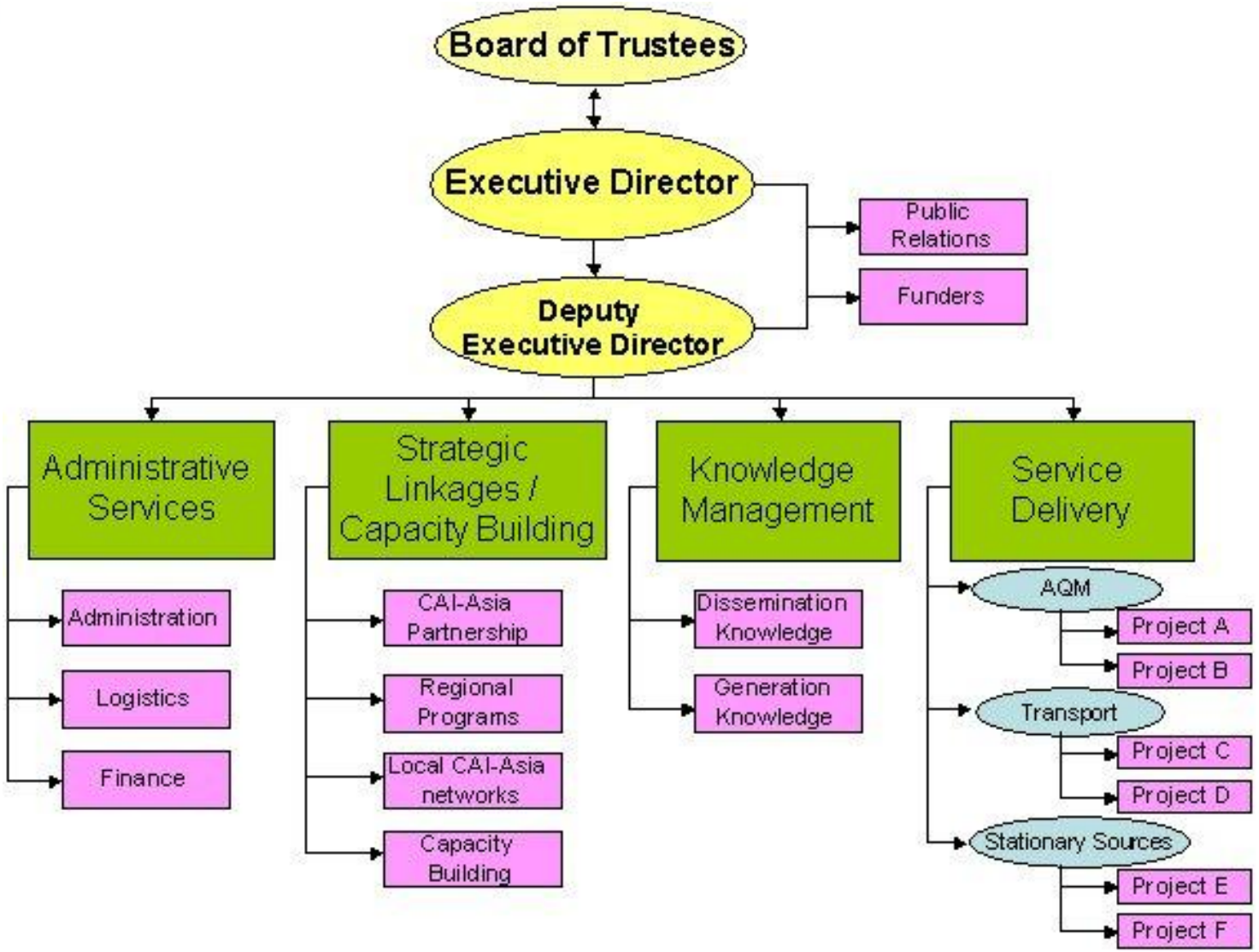
Members: 15-20

- Incorporators
- 5 stakeholder representatives
- Funding organizations contributing over $150,000 per year

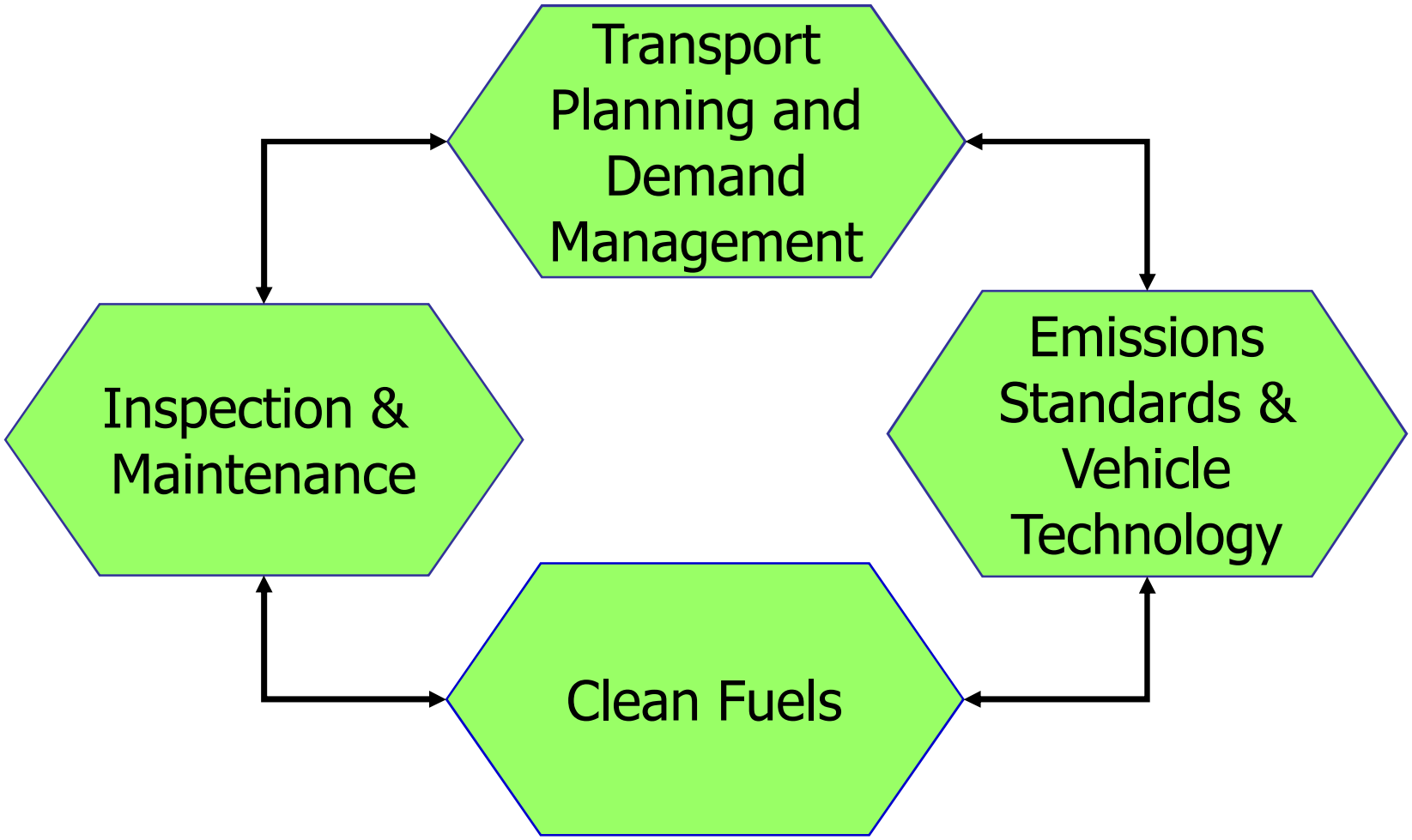
CAI-Asia Partnership and CAI-Asia Center (3)

CAI-Asia Partnership	CAI-Asia Center
Planning: 4 yearly strategy, updated every 2 years	**Planning:** 2 yearly Business plans updated every year guided by Partnership strategy
Funding: Operating costs provided by CAI-Asia Center	**Funding:** Grants and (private sector) membership fees

Organogram CAI-Asia Center



Reducing Emissions from Mobile Sources



SUMA Project Description

- Project Timeframe:
  12 December 2006 – 30 June 2009
- Impact: Stabilization of air pollution levels in major Asian cities and for some cities to achieve improvements in ambient AQ levels
  - Not necessarily achieved within the 2007 – 2009 timeframe and within the SUMA program
- Outcome: Desired outcome of the SUMA program is to accelerate the development of capacity for urban AQM and SUT in Asia through better integration of AQM and SUT in the strategies, policies, programs, and projects of developing countries in Asia and development agencies, like the ADB

SUMA Outputs

Output 1: Institutionalize AQM and SUT knowledge management system at the regional, national and local levels in Asia;

Output 2: Enhance capacity for AQM and SUT of relevant stakeholders;

Output 3: Institutionalize AQM and SUT network at the regional, national and local levels;

Output 4: Increase number of policies for AQM and SUT developed at regional, national and local level;

Output 5: Increase number and strengthened implementation of AQM and SUT activities

Output 6: Establish program coordination, monitoring and evaluation of SUT activities in Asia

Overview of CAI-Asia SUMA Activities

- Program Management
  - Ensure coordination among activities and efficient implementation of various components
- Development and implementation of knowledge management
  - Pulling together the experience and knowledge of the SUMA partners and other organizations and transferring to stakeholders
- Policy development and networking
  - Dialogue with national and local government to promote SUT policies and projects
  - Assessment of the feasibility to establish a regional network on SUT
- Identification of other pilot programs and projects in support of SUMA (in cooperation with SUMA Partners

Overview of SUMA Partner Proposals (1)

- Institute for Transportation and Development Policy (ITDP)
  - Feasibility Study (Operational and Business Plan) for the proposed BRT in Ahmedabad
  - Development of guidelines for integrating 2-3 wheelers to urban transportation system
- Interface for Cycling Expertise (I-CE)
  - Development and piloting of guidelines for integrating cycling in the urban transportation system
  - Research on the role of cycling in urban areas in Asia
  - Training course for cycling inclusive planning

Overview of SUMA Partner Proposals (2)

- Environmental Impacts of electric bikes in China (Jonathan Weinert and Chris Cherry of UC Davis and Berkeley)
  - Assessment of the environmental impacts of electric bikes using lifecycle analysis
- United Nation's Centre for Regional Development (UNCRD)
  - Development of action plan and policy for mainstreaming EST in the Philippines
- Social Impact Assessment (Marie Thynell of Gothenburg University, Sweden)
  - Development and piloting of guidelines for social impact assessment for urban transportation projects and training course

Overview of SUMA Partner Proposals (3)

- GTZ-Sustainable Urban Transport Project
  - Development of comprehensive training course on SUT on:
    - Mass Transit Options
    - NMT
    - Transportation Demand Management and Fiscal Measures
- EMBARQ-WRI
  - Partnering with Indian institutions and local governments in developing and promoting SUT projects

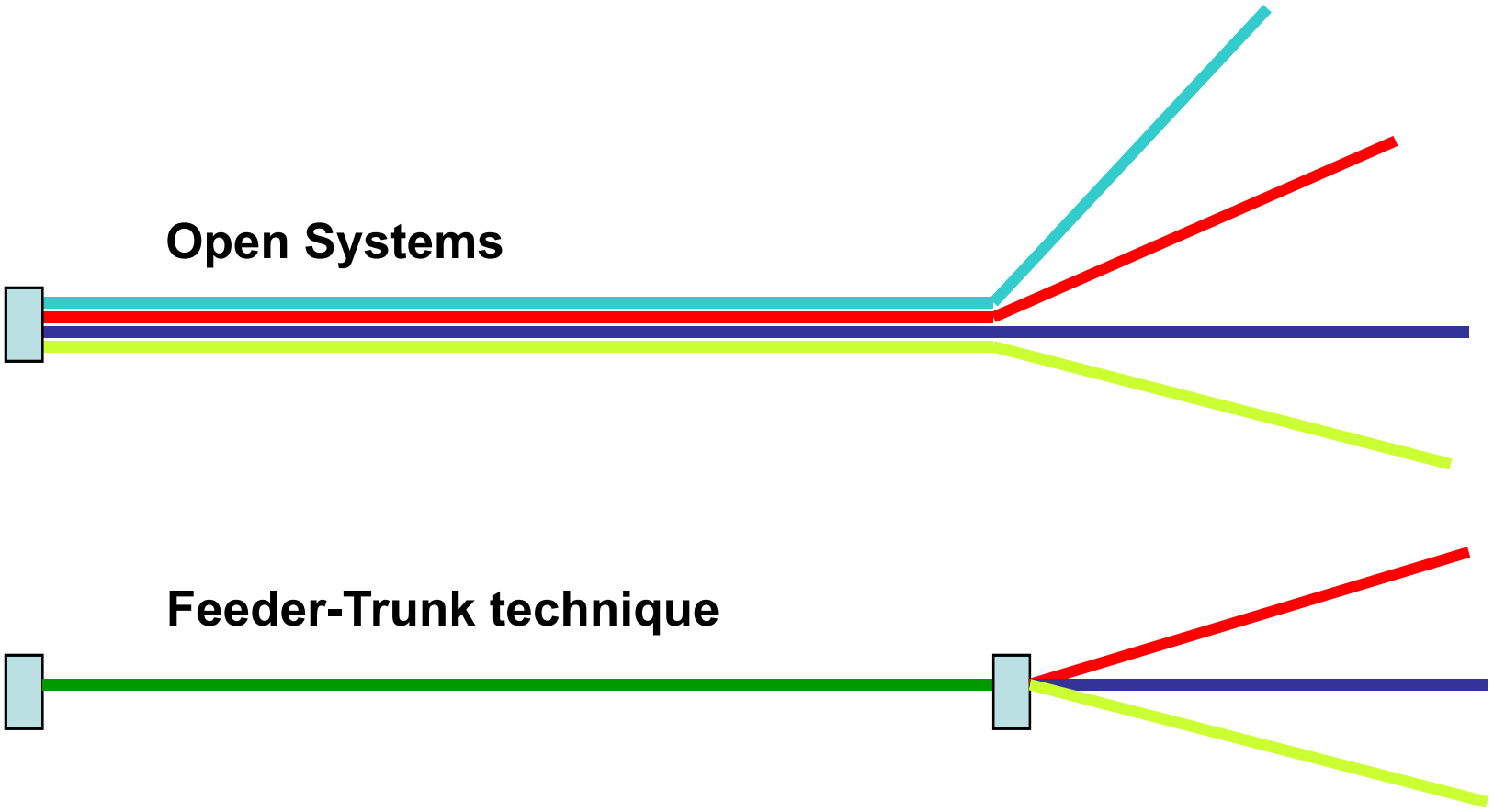
What is a BRT?

Bus Rapid Transit

- Segregated, median busways with median stations
- Pre-board fare collection and fare verification
- Restricted operator access (closed system)
- Free transfers between corridors
- Competitively bid concessions
- High frequency service and low station dwell times
- Clean bus technologies
- Modal integration

Quito, Ecuador

"Open" Systems versus "Closed" Systems



Diagrams: Hook, Walter. Maximizing the air quality benefits of bus rapid transit. BAQ 2004. India.

'Open' BRT system

PROS

- Cheaper to build
- No New Buses Required
- No Changes in Bus routes Required
- No Regulatory Changes Needed
- Fewer passenger transfers

CONS

- People don't appreciate them
- Bus Cueing at Intersections
- Low speed
- Low capacity
- No improvement in bus operation quality

Newly renovated 'open' BRT System in Sao Paulo has cues 23 buses long. Speeds are only 12kph

"Closed" BRT system

- High Capacity
- High Operating Speed
- Paying at the Station Rather than On the Bus Reduces Boarding Time
- Articulated Buses Can be Used
- Reduces the Total Number of Buses on the Corridor, Decongesting Mixed Traffic Lanes
- Allows for Fast Free Transfers in a Safe & Comfortable Place
- Increases Possibilities for effective PPPs

Feeder Systems

- Feeder access and infrastructure and their integration must be considered in planning for BRT systems
- Feeder systems ensure ridership and connectivity
- These may be buses, pedestrians, cyclists, taxis, or rail systems

Employment

Areas of direct employment

- Planning
- Construction
- Vehicle fabrication
- ITS technology
- Drivers
- Fare collection
- Administration
- Security

Road space requirements

BRT can be implemented even amongst severe road space limitations

Quito, Ecuador

Rouen, France

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

Source: Lloyd Wright

The Economics of Mass Transit

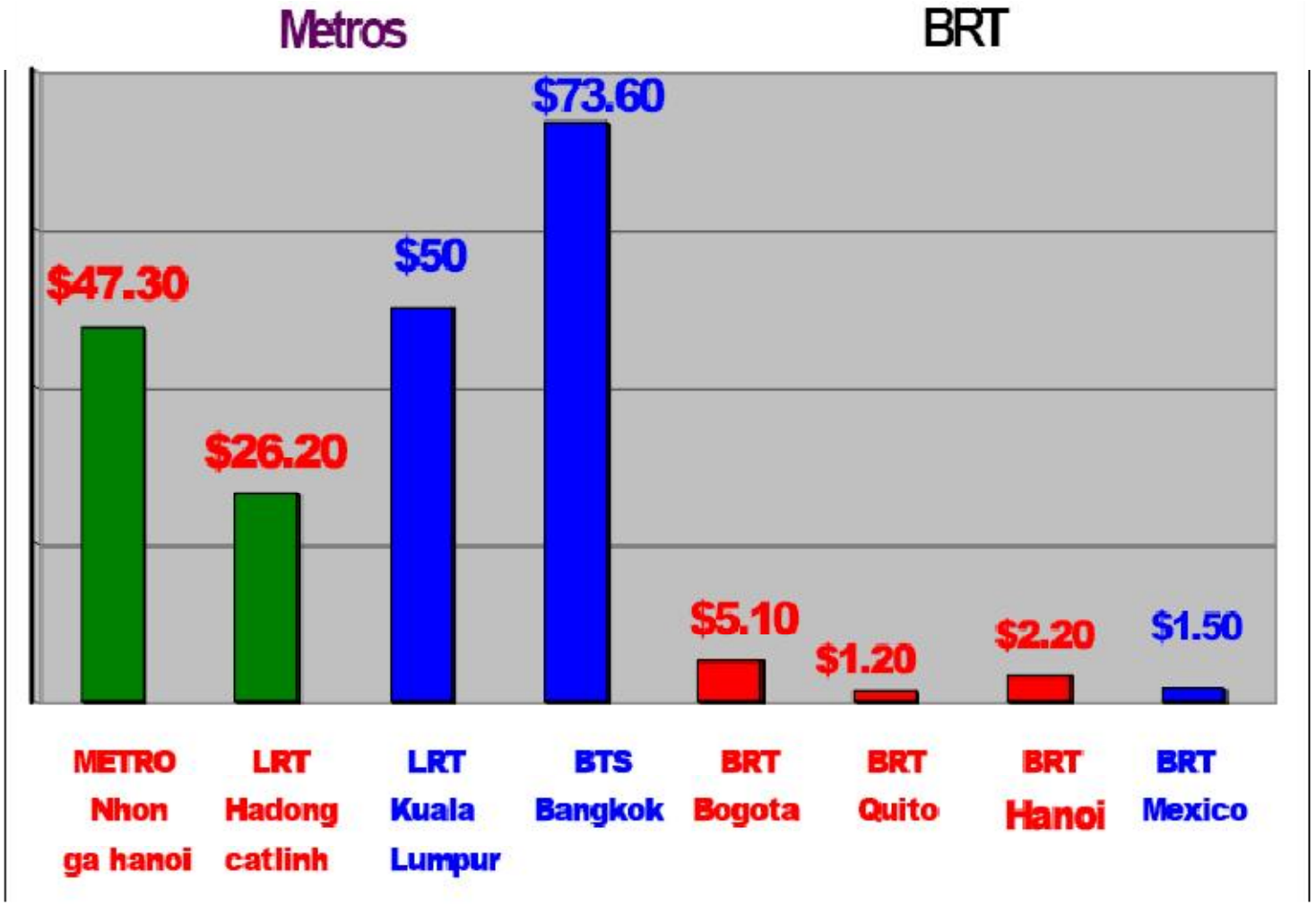
BRT Cost: $1-10M/km

Metro Cost: $40-220M/km

BRT Construction : 12 - 18 months

Metro construction time: 3 – 30 years

US$ million/km for rail and BRT systems

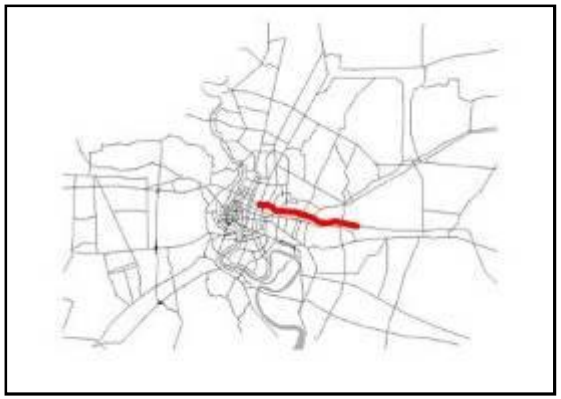


Source: Feasibility Study for Hanoi (by MVA Ltd.) in Menkhoff, Gerhard. 2006. Lessons Learned from Experience with Bus Rapid Transit (BRT). Presented at Conference on Alternative Technologies for Public Transport. Institute of Urban Transport. New Delhi, India. 21-23 March.

Mass Transit Systems at the same cost (US$1 billion)

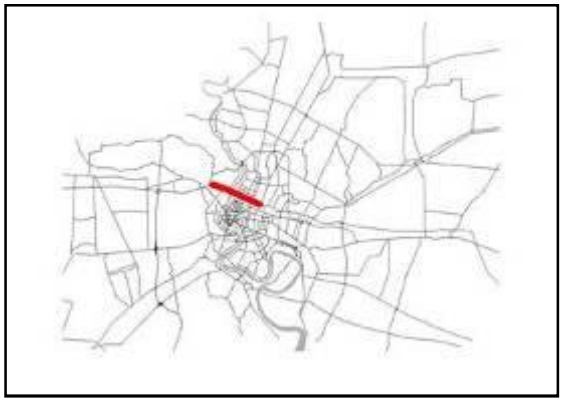
426 kilometres of BRT

US$ 1 M – 7 M / km



14 kilometres of elevated rail

US$ 60M – 100 M / km



7 kilometres of subway

US$ 50 M – 320 M / km

Bangkok Network Simulations by L. Wright

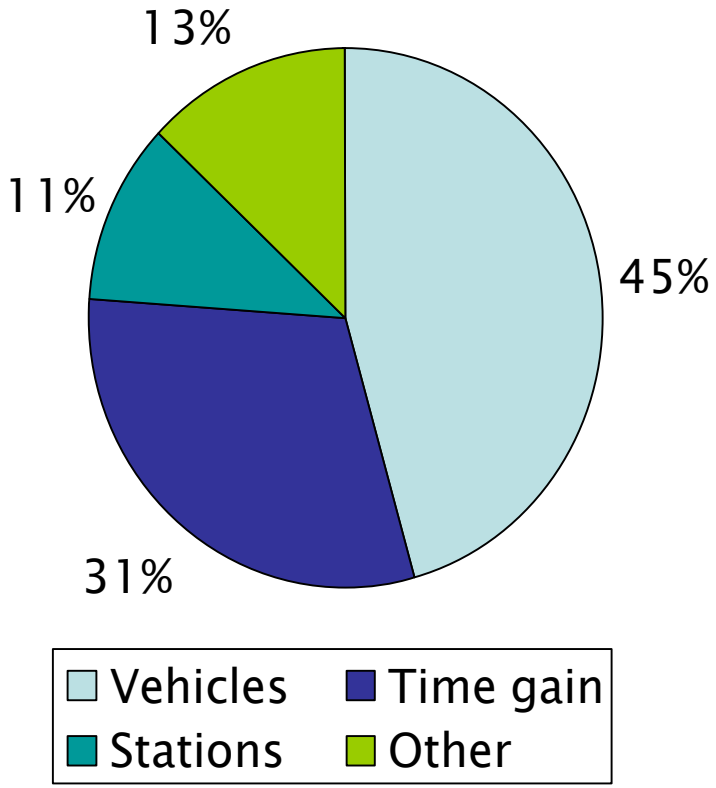
Capital Cost vs. Capacity

City/Line	Type	Capital cost in US$million/km	Actual Capacity (passengers/hour/direction)	Performance Index (capacity/cost)
Hong Kong	Subway	220	81,000	0.4
Bangkok Skytrain	Rail metro	74	50,000	0.7
Mexico Line B	Rail metro	41	39,300	0.5
Kuala Lumpur PUTRA	Light rail	50	30,000	0.6
Bogota TransMilenio	BRT	6	53,000	8.8
Sao Paulo 9 de Julho	BRT	2	35,000	17.5
Porto Alegre Assis	BRT	2	28,000	14.0
Curitiba Eixo Sul	BRT	2	15,100	7.6
TransJakarta	BRT	1	8,000	8.0
Taipei,China	Bus Lane	0.8	1,100	13.8
Beijing	BRT	1.8	15,000	8.3

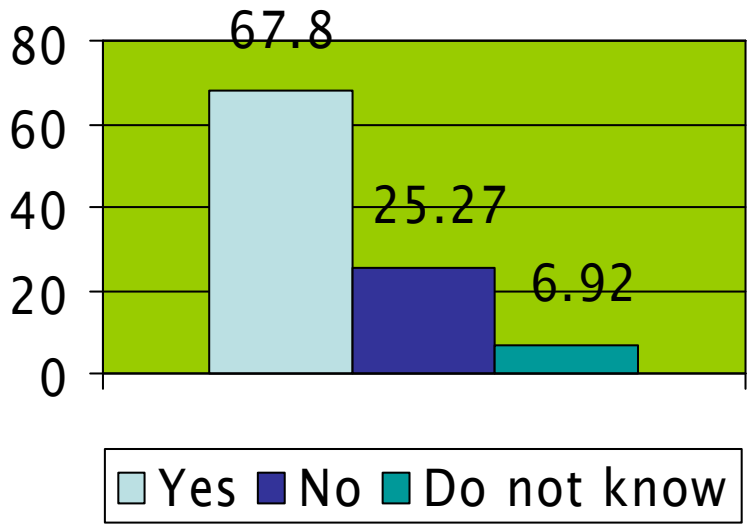
Source: Chang, Jason. 2005. Presented at Conference on Alternative Technologies for Public Transport. Institute of Urban Transport. New Delhi, India. 21-23 March.

BRT Users Perception in Mexico

What do they like most about the system?



Do they think this system should be implemented in other main roads of the city?



Source: Lobo, Adriana. 2006. BRT Options and results after 6 months. Presented in Transforming Transportation: Faster and Cleaner Breezes from Sustainable Urban Transport in Latin America. Washington, DC. 22 January.

Case study: TransMilenio

Bogotá, Colombia

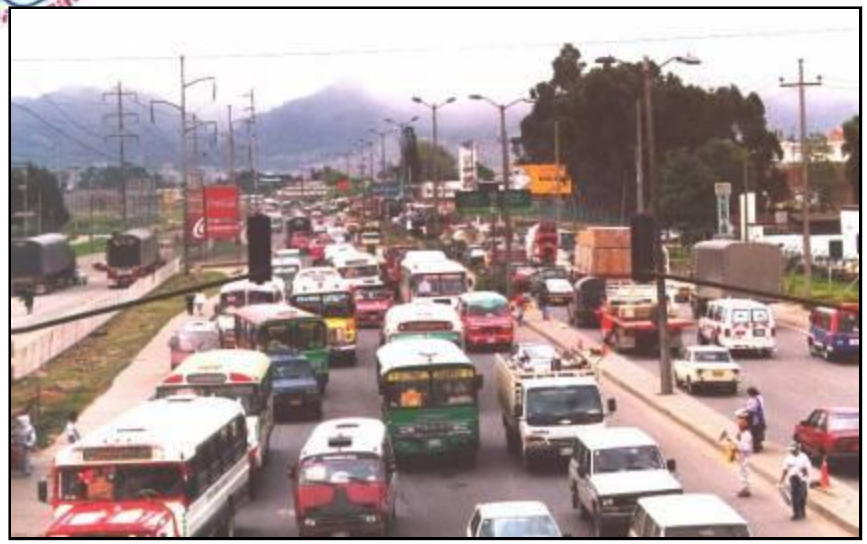
New surface metro system called "TransMilenio"

TransMilenio SA

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

Source: Lloyd Wright

Bogotá before BRT



Bogotá experienced traffic congestion – "Guerra del centimo"

Exclusive bus lanes did not speed up bus traffic and even made it worse

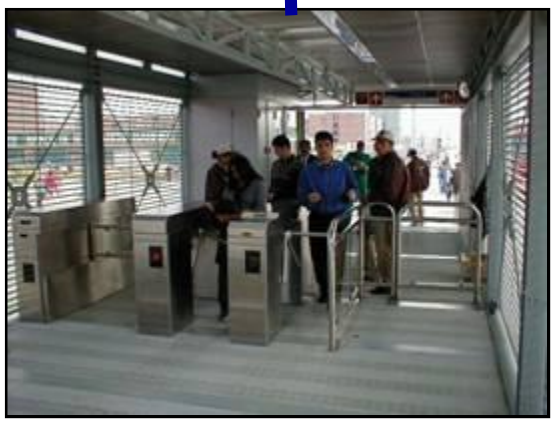
TransMilenio S.A.

Planning, Management and Control (Trustfund)

Infrastructure

- Corridors
- Stations
- Garages
- Complementary Infrastructure

Public



Ticketing

- Equipment
- Smart Card

Private

Operation

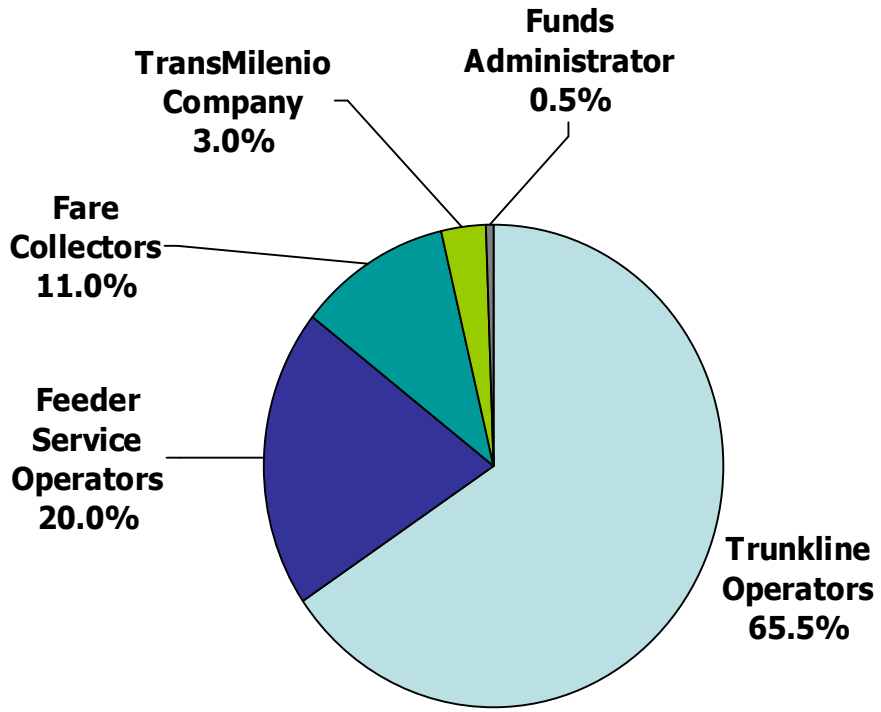
- Companies
- Buses
- Employees

Private

Infrastructure and Operations

- Government took care of basic infrastructure: roads, stations, plazas
- Government encouraged the setting up of consortiums mostly made up of existing bus operators to operate the buses (basic trunk + feeders) to reduce social displacement and improve public acceptability of the BRT system
- Government contracted a private company to run the ticketing system & another company to manage the Trust Fund

Bogotá BRT Revenue Distribution



- Proceeds go to the trust fund and divided accordingly
- Bus operators' share of the revenue is divided according to the number of kilometers driven.

Pedestrian Spaces and Bike Paths

- Bogotá bicycle riders increased from 0.3% to 4.4% when the bike paths were built

- Stations are located every 500m with pedestrian access through overpasses, tunnels or signalized intersections

High Levels of Service at Low Cost

- High LOS at Low Cost - the US $ 0.40 fare covers capital investment of buses, operating and maintenance of bus fleet, ticketing system and stations; supervision and control of the system; and administrative costs of the trust fund used to deposit the revenues

Source: Pardo, Carlos. 2005. Personal communications.

- TransMilenio buses have 4 doors 1.1m wide. Boarding time per passenger reduced from 3.0 sec to 0.3 sec

Impacts of BRT in Bogotá, Colombia

- Faster trips - 32% reduction in average trip times for TransMilenio users (from 12-18Km/h to 26.7Km/h)
- Better safety
  - 92% less fatalities, 75% less injuries, 79% less collisions
  - 47% less robberies
- Better Air Quality
  - 43% less SO2, 18% less NO2, 12% less PM10
  - Lower noise levels

Equal Opportunity Access and Social Inclusion

- Easy for users with disabilities, elderly, children, and pregnant women
- Bikes can be brought into the BRT

Bus Rapid Transit in Asia (to be updated)

Systems in operation (17):

Akita, Japan
Ankara, Turkey
Beijing, China
Fukuoka, Japan
Gifu, Japan
Hangzhou, China
Jakarta, Indonesia
Kanazuwa, Japan
Kunming, China
Miyazaki, Japan
Nagaoka, Japan
Nagoya, Japan
Nigata, Japan
Pune, India
Seoul, South Korea
Shijiazhuang, China
Taipei,China

Systems in planning or under construction (23):

Ahmedabad, India
Bangalore, India
Bangkok, Thailand
Chengdu, China
Chongqing, China
Colombo, Sri-Lanka
Delhi, India
Guangzhou, China
Huai'an, China
Hyderabad, India
Incheon, South Korea
Jinan, China
Karachi, Pakistan
Metro Manila, Philippines
Shanghai, China
Shengyan, China
Surabaya, Indonesia
T'aichung, China
T'ainan, China
Tienjing, China
Wuhan, China
Xi'an, China
Xiamen, China

"Overall, more cities are now planning or building BRT systems in Asia than cities planning or constructing subway or light rail lines"

Jakarta, Indonesia

- 1st closed BRT system in Asia
- Initial corridor of 12.9 km completed in January 2004
- 2nd corridor opened in January 2006
- 4 New corridors by December 2006

Beijing, PRC

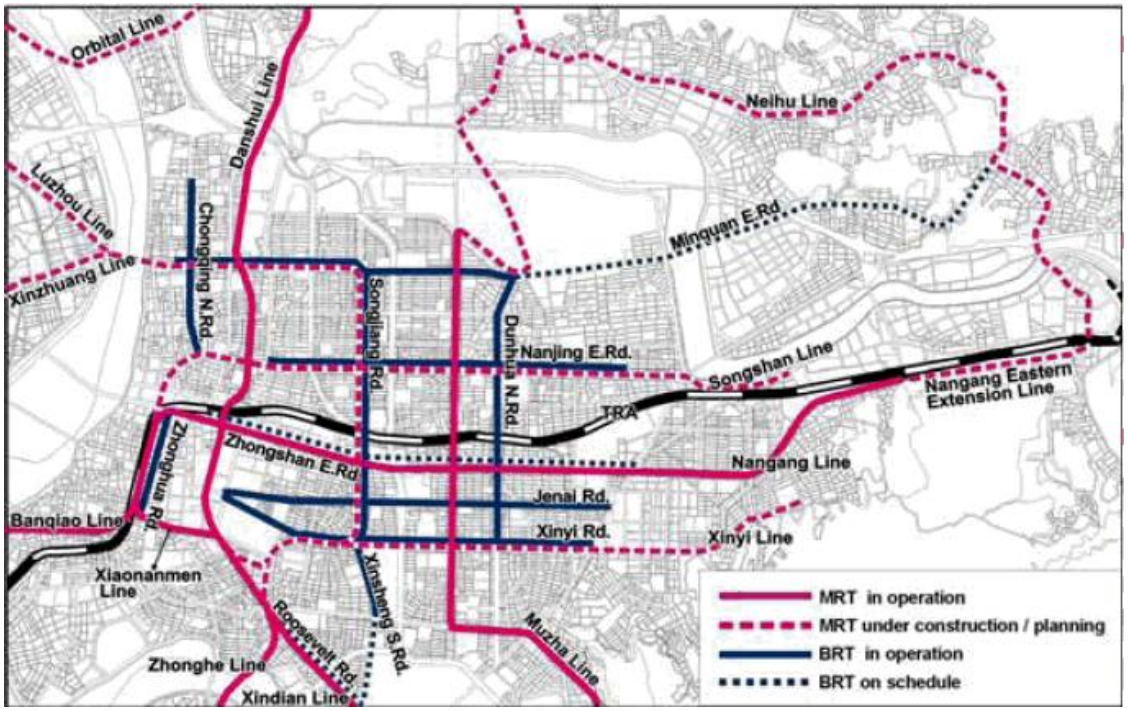
Initial 5.5 km demonstration opened on 25 December 2004

Remaining 11-km of the 16-km Phase I still under construction

Source: Lloyd Wright

Taipei,China

- Integrated BRT with MRT -> BRT on 10 streets connecting 4 MRT lines
- Total length: 57km
- 143 Bus stops
- Construction cost: US$0.6-1.2million/km
- Faster bus operating speed
  - –Before 11.6km/hr
  - –After >18.0km/hr
- Faster automobile speed
  - –Before 16.2km/hr
  - –After >20.0km/hr



Seoul, South Korea

- Increased average speeds for BOTH cars and buses
  - From 10 km/h to over 20 km/h
- Increased capacity of corridor
  - 1 BRT lane = 6 car lanes
- Increased number of public transport users for BOTH buses and rail
  - 9.9% increase for buses
  - 12.6% increase for subway
- Reduced accidents on corridor
  - 26.9% decrease in accidents

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