Worldwide Panorama on BRT systems

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Unprecedented road investments
View from World Bank Beijing office
How to tackle the problem with urban transport?

**REDUCE/AVOID**
- Reduce or avoid travel or the need to travel
  - Integration of transport and land-use planning
  - Smart logistics concepts
  - ...

**SHIFT**
- Shift to more environmentally friendly modes
  - Mode shift to Non-Motorized Transport
  - **Mode shift to Public Transport**
  - Public Transp. Integration
  - Transport Demand Management (TDM)

**IMPROVE**
- Improve the energy efficiency of transport modes and vehicle technology
  - Low-friction lubricants
  - Optimal tire pressure
  - Low Rolling Resistance Tires
  - Speed limits, Eco-Driving (Raising Awareness)
  - Shift to alternative fuels
  - ...

**Reduced Carbon Emissions**

**Capacity Building**
Corridor Capacity

Mixed Traffic 2 000
Regular Bus 9 000
Cyclists 14 000
BRT Single lane 17 000
Pedestrians 19 000
Light Rail 22 000
BRT double lane 45 000
Heavy Rail (e.g. Hong Kong) 80 000
Sub-urban Rail (e.g. Mumbai) 100 000

Source: Botma & Papendrecht, TU Delft 1991 and own figures
The need for BRT

- Not advisable and possible for all cities to adopt expensive rail systems
- Also many cities are low density and sprawling; cannot support the ridership numbers needed for viable rail operations
- Urgent need to offer people an attractive, efficient and cleaner alternative to personal vehicles
- Important to show decision makers in cities that low cost and flexible alternatives are available

"Think train, use bus"
What can you buy with US$ 1 billion?

- 426 kilometres of BRT
- 40 kilometres of LRT
- 14 kilometres of elevated rail
- 7 kilometres of subway

* Actual data from systems built in Bangkok, Thailand
Characteristics of a “full” BRT

- Segregated, median bus ways + stations
- Pre-board fare collection and verification
- Restricted operator access
- Free transfers between corridors
- Modal and fare integration, user oriented
- Competitively bid concessions
- High frequency service and low station dwell times
- Level boarding and alighting
- Emissions reductions through newer fuel technologies
BRT systematically combines infrastructure, equipment and operation to improve service quality.
BRT can be very productive
Guangzhou, China
35,800 pax/day/km

Source: EMBARQ
# BRT in numbers (2011)

- **120 cities** with BRT Systems and Bus Corridors
- **280 corridors**
- **4,335 km**
- **6,683 stations**
- **30,000 buses**
- **26.8 million passengers per weekday**

- **16 cities started operations in 2010** (13% growth) 21 corridors; 396 km; 464 stations; 2,047 buses
- **7 cities expanded corridors in 2010**, 125 km
- **49 new cities with corridors under construction**
- **31 new cities** in planning stages
BRT & Bus ways: 65% is concentrated in 32 Latin-American cities

USA and Canada
20 cities
1 M pax/day

Europe
26 cities
0.62 M pax/day

Europe/Asia
1 city
0.7 M pax/day

Asia
33 cities
6.3 M pax/day

Latin America and the Caribbean
32 cities
17.6 M pax/day

Africa
2 cities
0.29 M pax/day

Oceania
5 cities
0.34 M pax/day

Source: EMBARQ
Some BRT Systems being presented

- **LATIN AMERICA**
  - Curitiba
  - Sao Paulo
  - Rio de Janeiro
  - Bogotá
  - Mexico City
  - Guadalajara

- **ASIA**
  - Ahmadabad (India)
  - Guangzhou (China)
  - Jakarta (Indonesia)
Curitiba (1974) Cradle for BRT

Source: EMBARQ
Curitiba (opened in 1974)

- 65-km median bus ways,
- 139 stations, 26 terminals;
- 340 Km of feeder routes,
- 185 Km of inter-district circular routes,
- 250 Km of ‘rapid buses’ (express) routes;
- 340 bus lines, 1,100 km of bus route
- 1,677 units, 114 bi-articulated diesel, articulated, conventional, small buses, special buses
- 2 million pax/day
- 7 private operators under agreements with a public authority
Curitiba (1974)

BRT: High quality infrastructure for buses

Source: EMBARQ
Curitiba (1974)

Introducing overtaking + real time control center + signal actuation

Source: EMBARQ
Curitiba (1974)

From conventional stops to high quality stations

Source: EMBARQ
Interligado, Sao Paulo

- World longest collection of exclusive bus lanes
- Integrated system under single fare with BRT
- 104 Km median bus ways; preferential bus lanes
- 327 transfer stations; 24 terminals
- 13,711 buses:
- Electronic fare collection system “bilhete único”
- 5,761,000 pax/day
Rio de Janeiro - BRT Project

- 2012 UN Conference Eco Rio + 20
- 2013 FIFA Confederations Cup
- 2014 FIFA World Cup
- 2015 Rio de Janeiro 450th anniversary
- 2016 The Olympic Games

Rio’s Agenda of Mega Events

Source: EMBARQ
Rio de Janeiro - BRT Project

BRS - Bus Rapid Service
20 corridors = 250 km

BRT - Bus Rapid Transit
4 corridors = 179 km

Source: EMBARQ
Rio de Janeiro - BRT Project

“The Priority network”

2015 – with USD 5 bill of investments, 63% of pop expected to use high capacity transit

Source: EMBARQ
Rio de Janeiro - BRT Project

Source: EMBARQ
Transmilenio, Bogotá

Initial phase (2000)

- “Full BRT”
- 84 km in operation
- 841 articulated buses
- 344 feeder buses
- 104 stations
- 10 integration points
- 1.5 million pax / day
- Up to 45,000 pax/h/direction
- Construction: 5.3-13.3 Mill. USD/ km
Transmilenio, Bogotá

Other Characteristics
- Integrated feeder services
- Advanced centralized control
- Electronic fare collection system
- Abating 0.25 Mt CO2e per year (certified emissions)
- Certified CDM project

Latest developments:
- NMT integration in terminal stations
- Phase 3 construction
- Improved signaling
Metro-bus Q, Quito

  - Three BRT corridors
  - 37 trunk line km
  - 400,000 pax /day
  - Public and private operators
  - No fare-and no physical integration
  - 0.5-5mio USD/km
  - 68 stations, 9 terminals
  - Integrated feeder services (each corridor)
  - 189 articulated buses (113 trolley buses); 185 feeder buses
  - Coin based fare collection
  - Public operator/ owner (Trole, Ecovía); Private Operator (Central Norte)
**Mexico City.** 3 BRT lines operating (more than 600,000 pass/day), Line # 4 (Under Construction), Corridor 5 (Detailed Design Finished).

**State of Mexico** (MXC Metro Area). Mexibus Corridor 1 (operating), Corridor 2 (Under Construction), Corridor 3 (Design).

**León, Guadalajara.** Plans to Expand system

**Monterrey, Puebla, Querétaro and Mérida.** First corridor designed and starting implementation

Planning first corridors in Mexicali, Chihuahua, Tijuana, Acapulco, Tampico, Villahermosa, Culiacán, Hermosillo, Torreón, Toluca

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**Mexico : BRT System are expanding rapidly**

Source: ITDP
Metrobus, México City

- Initial phase (2005)
  - 50 km trunk lines
  - 470,000 pax / day
  - 7 operators (public, private)
  - Subsidized fare
  - Reduced travel time 30%
  - Complements metro
  - Construction: 1.5 mio USD/km
  - Improvement of stations and more phases being built
Macrobús, Guadalajara

- **Initial phase (2008)**
  - 27 stations
  - 16 kms
  - 41 articulated buses
  - 125,000 pax/day
  - Old routes reorganized (substituted)
  - 103 Feeder buses
  - Integration with rail-based transit
  - Managed by public transport company
  - 3 more phases are planned (63 km)
ASIA

- India
  - Janmarg, Amadabad (2009)

- Southeast Asia
  - BRT, Guangzhou (2010)

- Indonesia
India

Current Status of BRTS / Bus Corridors in India

- Under Operation
- Under Construction
- Under Advanced Stage of Planning
- Technical Studies / Preliminary Planning

Source: EMBARQ India
Janmarg, Ahmadabad

- **Initial phase (2009)**
  - 17 km
  - **US$ 1.9 million per km**
  - 80,000 pax per day initially
  - Full first phase 90 km

- It is the first full BRT in India, high acceptance by population and at present a benchmark for other cities in India

- **Ahmadabad has received the Sustainable Transport Award in January 2010**
Janmarg, Ahmadabad

Starting Point/Past Situation

- Area of 490m²
- Population of 3.9 million people
- 2 wheelers: 73% of total transport
- Average trip length on bus 6.8km

Vision

- Since 2009 Janmarg carries on average 83,000 passengers every day
- With expansion, numbers will increase
- Additionally development of pedestrian and cycling facilities

Source: Ahmadabad Municipal Cooperation – Bus Rapid Transit System
Janmarg, Ahmadabad

- **Example:**
- **Bus specifications**
  - Large central doors on both sides for flexibility in operations
  - Additional door in front of bus

Source: Ahmadabad Municipal Cooperation – Bus Rapid Transit System
BEFORE: At Anjali (Ahmadabad)
AFTER: At Anjali (Ahmadabad)
ASIA

BRT systems in operation in China and Southeast Asia

1. Bangkok
2. Beijing
3. Changzhou
4. Chongqing
5. Dalian
6. Guangzhou
7. Hangzhou
8. Hefei
9. Jakarta
10. Jinan
11. Kunming
12. Urumqi
13. Xiamen
14. Xian
15. Yancheng
16. Zaozhuang
17. Zhengzhou

Source: Lloyd Wright
BRT Guangzhou (Winner of 2011 STA Award)

Not a closed BRT but a high capacity two lanes per direction bus corridor (with open access)

- Started in 2010
- up to 350 buses/hr/direction.
- 985 buses in BRT
- longest BRT stations in the world, with largest passenger boarding's
- Speed 18-21 km/hr
- full bicycle integration (bike parking and bike sharing) at every station.

Source: Karl Fjellstrom, ITDP China
BRT Guangzhou (Winner of 2011 STA Award)

- 22.5 km of dedicated bus way
- Over 800,000 passengers per day on a single corridor
- 27,400 passengers per peak hour per direction

Source: Karl Fjellstrom, ITDP China
BRT Guangzhou (Winner of 2011 STA Award)
BRT Guangzhou (Winner of 2011 STA Award)

Previous Situation

Photos by Karl Fjellstrom, ITDP & GMEDRI
BRT Guangzhou (Winner of 2011 STA Award)

Current Situation

Photos by Karl Fjellstrom, ITDP & GMEDRI
Integrated Bicycle Sharing System

- 5000 bicycles and 113 cycle sharing stations along the BRT corridor
- At every station bike parking facilities available that can be used without charging
- the same ticket can be used for BRT and for bike rental

Sources: ITDP & GMEDRI and Shreya Gadepalli
Jakarta, Indonesia

- Initial corridor of 12.9 km completed in January 2004
- Meanwhile nine corridors, with 123 km, 300,000 pax/day; largest BRT network in Asia
Africa

South Africa

Rea Vaya, Johannesburg (2009)
“ The first full BRT in Africa”
Rea Vaya, Johannesburg

From paratransit to high quality transportation:
“The Rea Vaya BRT system”
Some Recommendations

- Political **leadership/champion** is key
- Get approval of high level decision makers and other stakeholders (including public) early on in the process
- Put in place required **regulatory and institutional frameworks**
- Involve **existing operators** to mitigate conflicts, but keep open bidding processes to reduce user costs
- Learn from **experiences in other cities**
- Try to create **special purpose teams** for system planning and implementation
- Combine **financial, legal and environmental** aspects with engineering
- **Physical integration** with other public transport modes and with NMT
- Have **extensive marketing** of the system before and after implementation
- **Integrate fares** among the various public transport modes
- Use latest **technology for information systems** and other ITS strategies
- **Evaluate the system after implementation** and take into consideration the responses from the users
Bus Rapid Transit Planning Guide

- The partners:

- BRT PG is a guidance document for stakeholders and planners involved in delivering public transport services (830 pgs)

- 20 different chapters on communications, demand analysis, operational planning, customer service, infrastructure, modal integration, vehicle and fare collection technology, institutional structures, costing, financing, marketing, evaluation, contracting, and construction planning.

- Available from [www.sutp.org](http://www.sutp.org) in various languages
Bus Rapid Transit Planning Guide

Development underway on the 4th Edition of the BRT Planning Guide

Freely distributed world-wide in both electronic and bound versions in multiple languages:

- Chinese
- English
- French
- Indonesian
- Korean
- Portuguese
- Spanish
- Russian
For more information and documents

www.sutp.org
www.gtz.de/transport
www.gtz.de/fuelprices
www.gtz.de/climateandtransport
Welcome to the Sustainable Urban Transport Project

Policy-makers are facing demands to meet the changing mobility needs of citizens in ways which are economically, socially and environmentally sustainable.

The Sustainable Urban Transport Project (SUTP) Asia is a partnership between the German Technical Cooperation (GTZ), the Bangkok Metropolitan Administration (BMA), CITYNET and the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP). It aims to help developing world cities achieve their sustainable transport goals, through the dissemination of information about international experiences and targeted work within cities.

Latest News

GTZ MD shares his vision on sustainable transportation

The internet platform CommentVision - a joint website of the TV station "Euronews", the Newspaper "European Voice" and SHELL - discussed in March the subject "As well as seeking alternative fuels, should we be changing our entire transportation culture?". A variety of experts gave statements to this key question of transport policy, among them GTZ managing director Hans-Joachim Preuß. He concluded that "we need a paradigm shift! (...) Changing the transportation culture is key for sustainable development and prevention of dangerous climate change". Furthermore, he proposed that "alternative fuels alone can't achieve ambitious reduction targets". In his vision, integrated actions that include "priority for walking, cycling and public transit, dense cities and appropriate taxation of fossil fuels" are necessary. GTZ supports several developing countries with training courses on sustainable transport and helps them in implementation of projects.

www.SUTP.org (Chinese website: www.SUTP.cn)
Thank you!

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