Development of a Global BRT Database

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Member of ALC-BRT Center of Excellence

Duke University
Center on Globalization, Governance & Competitiveness (CGGC)
March 7, 2012

BUS RAPID TRANSIT
ACROSS LATITUDES AND CULTURES

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BRT-ALC Center of Excellence

- 2010, VREF-funded ALC-BRT Center of Excellence
  - Pontificia Universidad Católica de Chile (PUC)
  - MIT
  - Instituto Superior Técnico de Lisboa
  - Institute of Transport and Logistics Studies, University of Sydney
  - EMBARQ
- To support the successful deployment of BRT, through the identification and effective communication of the conditions necessary for its success.

ALC-BRT Center of Excellence www.brt.cl

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Event wrap up: General Assembly

This year our General Assembly was held on January 25, during the Transportation Research Board Meeting in Washington DC.

Event wrap up: General Assembly

Graduate studies programs within our Centre of Excellence

12th International Conference on Advanced Systems for Public Transport / 23-27 July 2012 / Santiago, Chile

MIT Transit Leaders Meeting

The global BRT industry

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Latest Publications View All Publications »

Jiang, Y., Zegras, C. and Mehndiratta, S. (2012)

Walk the line: station context, corridor type and bus rapid transit walk access in Jinan, China

Journal Of Transport Geography 20, 1 - 14.

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ALC-BRT CoE Observatory

- Critical review of BRT implementation – success and issues
- Compile indicators of BRT system characteristics and performance
- Corridor-level data, starting in Latin America

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Opportunity: Expanding Global BRT Industry

- In 2011, at least 147 cities with BRT, BHLS or bus corridors

Opportunity: Expanding Global BRT Industry

- At least 100 cities planning/constructing BRT

Challenge: No consolidated public data source

- BRT Planning Guide
- ITDP's China BRT
- National BRT Institute
- BRT CoE Observatory
- EMBARQ datasets
- IEA datasets
- BHLS publication
- Online presentations, papers
- Transit agencies, associations (SIBRT)

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ACROSS LATITUDES AND CULTURES

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Qualitative comparisons

Chile and Mexico

✔ – Yes x – No P – Partial I – Insufficient network to make a conclusion NA – Not applicable

BRT Feature	Santiago (Transantiago)	León (Optibus SIT)	Mexico City (Metrobús)
Segregated busways or bus-only roadways	P	✔	✔
Existence of an integrated "network" of routes and corridors	✔	✔	x
Enhanced station environment (*i.e.*, not just a bus shelter)	P	✔	✔
Special stations and terminals to facilitate transfers	✔	✔	x
Overtaking lanes at stations / Provision of express services	P	x	x
Improvements to nearby public space	P	x	x
High average commercial speeds (> 20 km/h)	P	✔	x
Actual peak ridership over 8,000 passengers per hour per direction	P	✔	x
Pre-board fare collection and fare verification	X	✔	✔
At-level boarding and alighting	x	✔	✔
Fare- and physical-integration between routes and feeder services	✔	P	x
Entry to system restricted to prescribed operators under a reformed business and administrative structure (closed system)	✔	✔	✔
Competitively-bid and transparent contracts and concessions	✔	x	x
No need for operational subsidies	✔	✔	P
Independently operated and managed fare collection system	✔	✔	✔
Quality control oversight from an independent entity / agency	x	P	✔
Low-emission vehicle technology (Euro III or higher)	✔	✔	✔
Automated fare collection and fare verification system	✔	✔	✔
System management through centralised control centre, utilising automatic vehicle location system	x	P	✔
Signal priority or grade separation at intersections	x	x	x
Distinctive marketing identity for system	✔	✔	✔
High-quality customer information (*e.g.*, clear maps, signage, real-time information displays)	✔	✔	✔
Modal integration at stations (*e.g.*, bicycle parking, taxi stations, easy transfers between public transport systems)	x	x	x
Supporting car-restriction measures (*e.g.*, road pricing)	x	x	x

1. Santiago data courtesy of Eduardo Giesen.
2. León and Mexico City data courtesy of Bernardo Baranda (ITDP)

ITDP

Institute for Transportation & Development Policy

ITDP-中国 itdp.org.cn

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Photo Library | Topics ▸

Ahmedabad	Changzhou	Fuzhou	Jakarta	Manila	Sao Paulo	Tokyo
Amsterdam	Chengdu	Geneva	Jinan	Mexico City	Sapporo	Utrecht
Antwerp	Chongqing	Guangzhou	Kolkata	Nagoya	Seoul	Washington
Bangkok	Copenhagen	Guiyang	Kuala Lumpur	Nanjing	Shanghai	Wuhan
Barcelona	Curitiba	Hangzhou	Kunming	Nanning	Shenyang	Wuxi
Beijing	Dalian	Hanoi	Kyoto	Nantes	Shenzhen	Xiamen
Berlin	Dar es Salaam	Harbin	Lanzhou	New York	Singapore	Xian
Bogota	Delhi	HCM City	Lima	Osaka	Stuttgart	Yancheng
Boston	Dhaka	Hefei	Los Angeles	Paris	Suzhou	Yantai
Brisbane	Dongguan	Hong Kong	Lyon	Quito	Sydney	Zaozhuang
Brussels	Foshan	Hyderabad	Macau	Rotterdam	Taiyuan	Zhengzhou
Cairo	Frankfurt	Jaipur	Madrid	San Francisco	Tianjin	

Bike Sharing | Bike sharing systems ▸ | Bike sharing photos ▸

ChinaBRT.org | BRT systems ▸ | BRT photos ▸ | BRT maps ▸

Ahmedabad	Bogota	Curitiba	Hefei	Mexico City	Quito	Yancheng
Amsterdam	Brisbane	Dalian	Jakarta	Nagoya	Seoul	Zaozhuang
Bangkok	Changzhou	Guangzhou	Jinan	Nantes	Utrecht	Zhengzhou
Beijing	Chongqing	Hangzhou	Lima	Paris	Xiamen	

videos Guangzhou bus routes Guangzhou walking tours

Updated: 11-Jul-2011

Links ▸

China Bus Rapid Transit

BRT in China & Asia

中文 Español

BRT systems ▸ | BRT photos ▸ | BRT maps ▸ | Quantitative parameters ▸ | Qualitative parameters ▸ | Guangzhou | Xiamen

- Ahmedabad
- Amsterdam
- Bangkok
- Beijing
- Bogota
- Brisbane
- Changzhou
- Chongqing
- Curitiba
- Dalian
- Guangzhou
- Hangzhou
- Hefei
- Jakarta
- Jinan
- Kunming
- Lima
- Mexico City
- Nagoya
- Nantes
- Paris
- Quito
- Seoul
- Utrecht
- Xiamen
- Yancheng
- Zaozhuang
- Zhengzhou

Performance data, maps and photo library on BRT in China & worldwide

ITDP

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Bogota BRT, updated 23-Jun-2011

Links | BRT in China & Asia

China Bus Rapid Transit

中文 Español

BRT systems | BRT photos | BRT maps | Quantitative parameters | Qualitative parameters | Guangzhou | Xiamen

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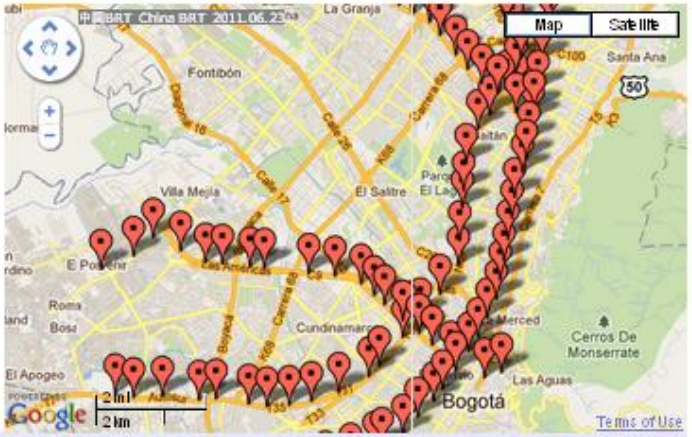

Bogota - TransMilenio

Segregated busways or bus-only roadways ✓	Peak throughput (passengers/hr/direction): **30,500** South of Calle 76 stn, 22-Jun-11 AM peak to south. PM peak N-S south of Calle 72 stn 26,500
Network of routes and corridors ✓	City centre peak hour speed (km/hr): **23** Around 18-28km/hr. Express routes have highest speeds
Enhanced station environment (more than just a bus shelter) ✓	BRT system coverage (km) (1 fare): **532** Source: TransMilenio
High peak period operational speed (>20km/hr) ✓	Peak city centre buses/hr/direction: **310** South of Calle 76 station, 22-Jun-11 AM peak to south
Buses operating both inside and outside the busway corridor ● Feeder buses integrated into system	Average bus occupancy (peak hour & direction & point): **98**
Majority of bus passengers in corridors carried by BRT buses ✓	Operational mode: **trunk-feeder**
Net time saving for bus passengers in corridor ✓	System passenger-trips per day: **1,650,000** includes boardings on feeder buses
Overtaking lanes at more than half of all stations ✓	Location of busway lanes: **Centre of roadway**
Actual peak ridership >10,000 passengers per hr per direction ✓	Stations with functioning passing lanes (%): **114**
Actual peak ridership >20,000 passengers per hr per direction ✓	Longest BRT station (m): **365** 2-module offset stations; long connecting walkways
Carries more people than a mixed traffic lane (~3000 pphpd) ✓	Shortest BRT station (m): **55** one module central platform
Pre-board fare collection and fare verification ✓	Most station substops: **3**
Distinctive BRT buses ✓	Year system commenced: **2000**
Distinctive marketing identity for system ✓ TransMilenio	Fleet of special BRT buses: **1,215** including 10 bi-articulated buses
Distinctive BRT stations ✓	Fleet of integrated BRT feeder buses: **515**
Includes BRT-only tunnels or bridges ✓	Total length of dedicated busway (km): **84**
Sliding doors in BRT stations ✓	Length including mixed traffic portions (km): **86.5**
Stations away from intersections ✓	Number of stations: **114**
	Average distance between stations (m): **790**

Currently Operating

(Survey Data Current as of March 2011)

Agency	Route	City, State	Total Length (Miles)	Number of Stations	Number of BRT Vehicles	Vehicle Manufacturer	Propulsion System	AM Peak Headway	AM Off Peak Headway	PM Peak Headway	PM Off Peak Headway	Average Operational Speed (MPH)	Average Weekday Ridership	Intelligent Transportation System Technologies	Fare Payment Method	Total Capital Cost of Project (Millions)
Community Transit (Snohomish County)	Swift BRT - SR 99	Everett, WA	16.7	29	15	New Flyer	Hybrid Electric	10	10	10	15	24	4300	AVL, APC, real time information (stations, vehicles, internet), Cameras (Vehicles, stations), TSP, smart card techniques	Proof of payment, ticket vending machine	$30
City of Albuquerque (ABQ RIDE)	The Red Line (Central Avenue)	Albuquerque, NM	11	N/A	N/A	N/A	Hybrid Electric	15	15	15	15	N/A	5100	AVL, APC, real time information(stops, bus, internet), TSP	On board fare box,	N/A
Foothill Transit	Silver Streak (El Monte Busway)	West Covina, CA	40	20	N/A	N/A	CNG	10	10	20	20	N/A	4700	AVL, APC, real time information(Bus), TSP	On board fare box, proof of payment	$28
Greater Cleveland Regional Transit Authority	Healthline (Euclid Corridor)	Cleveland, OH	9.4	58	N/A	N/A	Hybrid Electric	5	5	15	15	N/A	10500	AVL, APC, real time information(stops, bus), cameras(Vehicles), TSP, Smart card techniques, Vehicles guidance and control	Proof of payment, ticket vending machine	$200
TheBus (Hawaii DTS)	Route B – City Express!	Honolulu, HI	8	41	N/A	N/A	N/A	15	15	15	15	N/A	6300	AVL, Real time information (Vehicle)	On board fare box	N/A
TheBus (Hawaii DTS)	Route A – City Express!	Honolulu, HI	19	N/A	N/A	N/A	Hybrid Electric	15	15	30	30	N/A	9000	AVL, Real time information (Vehicle)	On board fare box	N/A
TheBus (Hawaii DTS)	Route C – County Express	Honolulu, HI	39	50	N/A	N/A	N/A	10	10	15	15	N/A	4000	AVL, Real time information (Vehicle)	On board fare box	N/A
Kansas City Area Transportation Authority	Max Main	Kansas City, MO	6	47	14	Gillig	Diesel	10	10	15	30	N/A	4800	AVL, Real time information (Internet), Cameras (Vehicles), Smart card techniques	On board fare box	$23
King County Metro Transit	RapidRide - A Line	Seattle, WA	11	51	16	New Flyer	Hybrid Electric	10	10	15	15	4.1	N/A	AVL, APC, real time information(Stops), cameras(Vehicles), TSP, smart card collection techniques	On board fare box, proof of payment	$262
Lane Transit District	Franklin EmX	Eugene, OR	4	10	4	New Flyer	Hybrid Electric	10	10	10	20	17	6000	AVL, APC, cameras(vehicles), TSP	N/A	$22
Lane Transit District	EmX Springfield Gateway	Eugene, OR	7.8	15	N/A	N/a	Hybrid Electric	10	10	15	15	N/A	N/A	AVL, APC, cameras(Vehicle), TSP	On board fare box	$41.30
Livermore Amador Valley Transit Authority (WHEELS)	The Rapid	Livermore, CA	16	50	14	Gillig	Hybrid Electric	10	10	15	15	N/A	N/A	AVL, APC, real time information (Stops, internet), cameras (Vehicles), TSP, smart card techniques	On-board far box	$21

Modernizing Public Transportation

Research led by Director of Research & Practice Dario Hidalgo provides key findings and lessons learned from a comprehensive review of major bus improvements in 13 Latin American and Asian cities.

"Modernizing Public Transport," a 40-page report released in October 2010, is based on research and interviews with planners and public officials in cities and transport agencies around the world.

The report reviews and synthesizes information regarding challenges experienced by transport system decision makers in three key areas: planning, implementation and operations. In order to assist urban transport planners and implementing agencies, the study also provides recommendations on avoiding or mitigating similar difficulties when introducing bus reforms in developing world cities.

Downloads:

Research

A Study on Para-Transit System in Indore City

Bus Karo: A Guidebook on Bus Planning & Operations

China Motorization Trends

Citywide Transportation Greenhouse Gas Emissions Inventories

Cleaner Buses for Mexico

Delhi Bus Corridor Evaluation

From Here to There: A Creative Guide to Making Public Transport the Way to Go

India Transport Indicators

Measuring the Invisible

Modernizing Public Transportation

Movilidad Amable (Friendly Mobility)

Nationally Appropriate. Mitigation Actions (NAMAs)

Fichas Técnicas

Elige una ciudad en la lista abajo o haz clic en el mapa para acceder informaciones, fotos y mapas de los Sistemas Integrados de Transporte y BRTs de Latinoamérica.

- Brasil
- Chile
- Colombia
- Ecuador
- México
- Peru

COMPARAR SISTEMAS

SIBRT ha desarrollado las Fichas Técnicas en colaboración con Across Latitudes and Cultures - Bus Rapid Transit (ALC-BRT).

SIBRT

Asociación Latino-Americana de Sistemas Integrados y BRT

Usuario | ***** | ok

Español | Portugués

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English | Español | Portugués

Secretaría Ejecutiva SIBRT

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Información general	
Ubicación	Belo Horizonte, Brasil
Agencia	Empresa de Transportes e Trânsito de Belo Horizonte S.A.
Corredores	3
Nombre especial y logo	✓
Población Población BRT	2.400.00 1.800.00
PIB / capita	R$ 17.220,00 US$ 10.200
División Modal	47% Público 28% Privado 25% No Motorizado
Tarifas	R$ 0,60 – 2,45 US$ 0,33 – 1,30
Centro de Control de Operaciones	✗

BHLS
Buses with High Level of Service

HOME | STATE OF THE ART | ANALYSIS | RECOMMENDATIONS | DISSEMINATION

cost

PRIVATE

> HOME > Analysis

ANALYSIS

- From plenary sessions
  - BHLS vs Tram market
  - BRT / BHLS comparison
  - Chronobus programm (Nantes)
  - Concept analysis
  - New BRT guideline (ITDP)
  - On going researches
- Short Term Missions
  - Italien STSMs - 03/2009
  - French STSM - 04 / 2010
  - Italien STSMs - 03 / 2010
  - Portuguese STSM -2010
- Evaluation or studies

Analysis of the best practices

http://www.bhls.eu/-Analysis-

BHLS Buses of High Level of Service

http://www.bhls.eu/-Analysis-

Problem: No consolidated public data source

- No single repository, fractured institutionally and geographically
- Different indicators, scope (corridor vs. system)
- Inconsistent data between experts' datasets
- No full accounting of the state of the industry
- Duplicated resources

Problem: Published data lacks transparency

- Indicators not clearly defined
- Data sources not always cited
- Update date not always published

- Therefore, difficult to assess data reliability

Problem: Static data about dynamic industry

- Published data updated infrequently
- Scope of system data not clear
  - System or corridor?
  - Mexico City data includes Lines 3 and 4?

Solution: BRT Data Sharing Platform

- Consolidate datasets
  - EMBARQ's datasets
  - SIBRT (www.sibrtonline.org)
  - BRT-ALC CoE Observatory
- Expand with datasharing partners (IEA)
- Create online data sharing platform
  - Increase transparency & reliability
  - Lower barriers for organizations/agencies to publish data

Global BRT Data Sharing Platform

- Consolidate datasets
- Develop online platform for publishing, searching, visualizing and updating data
- Incorporate quality assurance process

Consolidated Dataset

- Combining three datasets (EMBARQ, CoE, IEA)
  - Different set of indicators
  - System and corridor data
  - Contradictory data
- Merged indicators
- Reconciled conflicting data
  - Compared source and date
  - Deferred to most current, primary source or peer reviewed data
- Assessing data accuracy
  - Check random sample for reasonableness
  - Identify & scrutinize outliers

Consolidated Dataset

- Inclusive – 147 cities with BRT, BHLS or bus corridors
- In depth – 89 system & corridor-level indicators
- Transparent – date and source metadata associated with each data point

Indicators

- System-level indicators
  - Year commenced
  - # Corridors
  - System length
  - User fare
  - Annual fare revenue
  - Commercial speed
  - Daily & annual demand
  - # Stations
  - # Integration terminals
  - # Transfer stations
  - # Depots
  - Peak load
  - # trunk routes
  - # feeder routes
  - Length of feeder routes
- Capital productivity
- Operational productivity
- Operations control center
- Position of bus lanes & doors
- Lane material
- Average station spacing
- Pre-board fare collection
- Stations with passing lanes
- Total fleet
- Fleet by bus type
- Fleet, fuel type
- Fleet, fuel economy
- Total cost, cost/km
- Planning, capital & operational costs
- Unique bus livery
- Unique brand & logo

Indicators

- Corridor-level indicators
  - Corridor name
  - Corridor length
  - Managing agency
  - Year corridor commenced
  - Type of service
  - Peak load
  - Daily demand
  - Length, segregated lanes
  - Length, contra-flow lanes
  - Length, exclusive lanes
  - Position of bus lanes
  - Position of contra-flow lanes
  - Position of bus doors
  - Lane material
  - Grade-separated intersections
  - Fixed signal priority
  - Dynamic signal priority
  - # stations
  - Average station spacing
  - Enhanced station environment
  - Pre-board fare collection
  - Station passing lanes
  - Station boarding level
  - Average dwell time

Online Platform

- www.brtdata.org
- View by region, country, city or indicator
- Data tables and map with scale points
- Easy to update – save csv to Dropbox
- User feedback

GLOBAL BRT Data

BY LOCATION

BY INDICATOR

MORE

WHAT IS THIS DATA?

This information is an aggregation of data collected by Embarq and it's partners.

EMBARQ

Location Filter

Search a location

By region

Asia

Latin America and the

By country

Colombia

India

By city

Ahmedabad

Barranquilla

Bogota

Cali

Cartagena

Medellín

Worldwide

Summary

Passengers per day
NaN

Number of systems
6

Total length
153 km

Key indicators per region

Region	Passengers / day	Number of BRT systems	Length (km)
Asia	(NaN%)	1	39(25.5%)
Latin America and the Caribbean	1,950,000(NaN%)	5	114(74.5%)

Feedback

GLOBAL BRT Data

BY LOCATION

BY INDICATOR

MORE

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By country

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By city

Ahmedabad

Barranquilla

Bogota

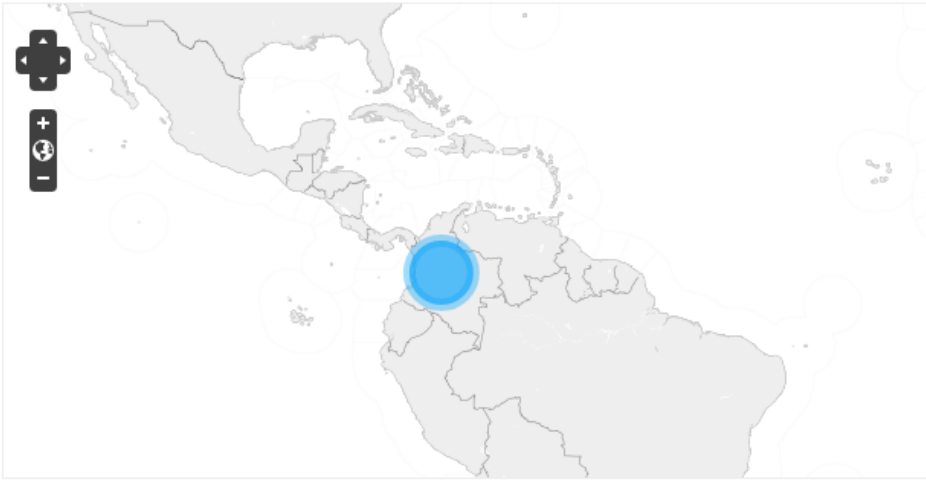
Cali

Cartagena

Medellín

Latin America And The Caribbean

Summary



Passengers per day
1,950,000
NaN% of passengers

Number of systems
2
66.7% of the systems

Total length
114 km
74.5% of the global network

Key indicators per country

Region	Passengers / day	Number of BRT systems	Length (km)
Colombia	1,950,000(100.0%)	2	114(100.0%)

Feedback

GLOBAL BRT Data

BY LOCATION

BY INDICATOR

MORE

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EMBARQ

Location Filter

Search a location

By region

Asia

Latin America and the

By country

Colombia

India

By city

Ahmedabad

Barranquilla

Bogota

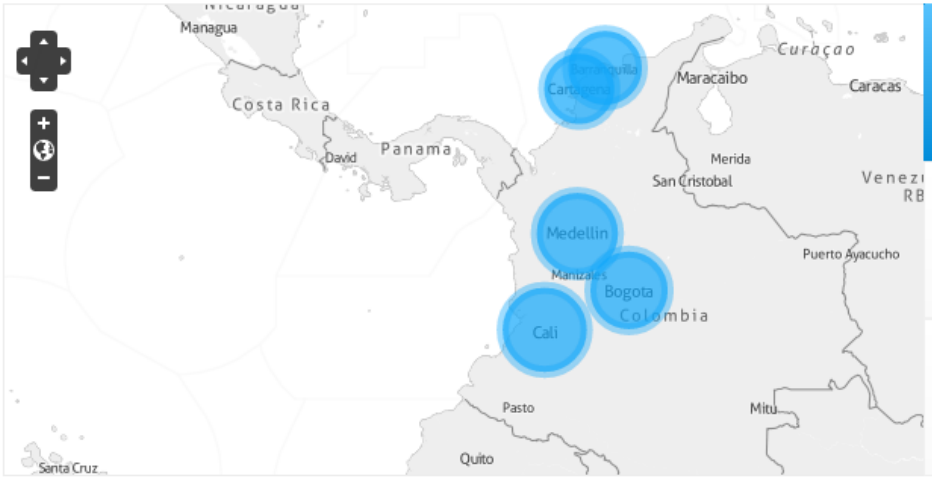
Cali

Cartagena

Medellín

Colombia

Summary



Passengers per day
1,950,000
100.0% of passengers

Number of systems
2
100.0% of the systems

Total length
114 km
100.0% of the global network

Key indicators per city

Countries	Passengers / day	Number of BRT systems	Length (km)
Barranquilla	450,000(23.1%)	2	19(16.7%)
Bogota	350,000(17.9%)	2	25(21.9%)
Cali	250,000(12.8%)	2	30(26.3%)

Feedback

GLOBAL BRT Data

BY LOCATION

BY INDICATOR

MORE

WHAT IS THIS DATA?

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dev.em.wiredcraft.com/#/indicator

By indicator

Search an indicator

Signal Priority

Corridors

Daily Demand

Length (km)

Location of busway

Population

Initial year of operations

Length (Km)

Key indicators

Region Name	Country Name	City Name	Value	Year	Source
Asia	India	Ahmedabad	39	2009	CEPT
Latin America and the Caribbean	Colombia	Cali	30	2011	SIBRT
Latin America and the Caribbean	Colombia	Medellín	20	2010	TransMilenio
Latin America and the Caribbean	Colombia	Barranquilla	19	2010	TransMilenio
Latin America and the Caribbean	Colombia	Bogota	25	2010	TransMilenio
Latin America and the Caribbean	Colombia	Cartagena	20	2010	TransMilenio

Feedback

GLOBAL BRT Data

BY LOCATION

BY INDICATOR

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More

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About Us

As of 2010, approximately 120 cities worldwide had implemented BRT systems or priority bus corridors, serving nearly 27 million passengers daily. There is growing interest and demand for BRT as cities seek low-cost, sustainable urban transportation solutions. As the number of BRT systems in the world increases, current, accurate and complete information about existing and planned systems becomes increasingly important but difficult to collect.

The goal of the BRT data sharing platform is to improve the sustainable transport community's access to reliable and current data about the BRT and bus corridors in operation and planning. We aim to improve the quality and impact of the BRT industry by opening up access to data about the design, performance and cost of these systems. The platform provides a convenient repository of data from a variety of sources including researchers, transit agencies, municipalities and NGOs.

Data Aggregators

- ALC-BRT Across Latitudes and Cultures - Bus Rapid Transit (ALC-BRT) is the Bus Rapid Transit Centre of Excellence funded by the Volvo Research and Educational Foundations (VREF) hosted by Pontificia Universidad Católica de Chile in Santiago. The center involves researchers from Massachusetts Institute of Technology (MIT), Instituto Técnico Superior de la Universidad Técnica de Lisboa, University of Sydney's Institute of Transport and Logistics Studies, and EMBARQ – The World Resources Institute's Center for Sustainable Transport.
- EMBARQ EMBARQ's mission is to catalyze and help implement environmentally and financially sustainable transport solutions to improve quality of life in cities.
- International Energy Agency The International Energy Agency (IEA) is an autonomous organisation which works to ensure reliable, affordable and clean energy for its 28 member countries and beyond.

Feedback

Next Steps

- Final data consolidation & verification
- Final website development
- Launch website – March 2012
- Continue to improve on dataset
  - Fill in data gaps; add new systems
  - Crowd-source updates
- Add systems in planning to website
- Look for funding for phase 2 website development