BRT BOGOTÁ (COLOMBIA): TransMilenio System

- City: Bogotá (Colombia)
- Average Temperature: 17°C / 63°F
- High: 2,600 meters over the sea level
- Total Area: 37,414 ha aprox.
- Population: 7,000,000 inhabitants (15% of the country’s population)
- Population density: 286 inhabitants/ha in the urban area
- Rate of growth of the population: 2.5% per year.
- Trips in public transport: 6,081,000 trips per day
- TransMilenio passengers per day: 1,700,000 pass
- Travel Demand: Aprox. (28% of total daily trips in public transport)
TransMilenio within a Mobility Policy

Promoting non-motorized modes

Restriction on private cars. Pick and Plate (1998)

Non-Car Day

Development of the Integrated Mass System Transport
TransMilenio. 1999.
1999 TransMilenio System – BUS RAPID TRANSIT - BRT

- Characteristics:
  - Massive system
  - Trunk corridors and feeder roads
  - Based on buses
  - Control System
  - Exclusive lanes: Comfortable highways
  - Operated by articulated and bi-articulated buses
  - Feeder buses which bring the passengers from their neighborhoods to the head stations
BRT Characteristics: Bus System Transport

Phase I and Phase II (in operation)

Fleet: 1254 trunks buses and 516 feeder buses
Passengers per day: 1.700.000 aprox.
28% demand public transport in the city

Trunk corridors: 7
Stations: 114
Terminals: 7
Intermediate Stations: 6
Exclusive bus lanes: 81 km
Feeder corridors: 515 km
Feeder Routes: 71
Trunk Routes: 96
Bicycles Parking: 1.653 spots
Sustainable Development Contribution
Environmental Management Institutional Plan

- Monitoring, Control and following to environmental Parameters
  (Noise, emissions, water, solids, energy, urban and landscape management, CDM project)

- Environmental Observatory
  (Research, Information system, Indicators system, documental center)

- Join with others Institutional Projects
  Quality (ISO 9001, ISO 14001, OHSAS 18001, GP1000)

PIGA
TRANSILMENIO S.A.
External Component

Communication Strategy

Qualification and Generation of Environmental Culture
Potential GHG Impact of a BRT

**New buses:** Units with less emissions per km  
**Large buses:** Units with less emissions per transported passenger  
**Higher occupation rate:** more efficient transport  
**Modal switch:** from taxis, motorbikes or cars to buses  
**Technology and/or fuel change:** usage of bio-fuels, gas or Hybrids buses

AM0031 includes all impacts except bio-fuels

The methodology is based on comparing emissions per passenger trip of the baseline and the project (not per kilometer)

The methodology includes emissions per passenger trip of various transport modes: Public transport (buses), Cars, Taxis, Motorcycles, NMT(bikes, foot), Induced traffic and compares these with the emissions per passenger trip of the new system
MAIN OUTCOMES
Climate Change

*CDM Project - Methodology approved AM0031 - Methodology for Bus Rapid Transit Projects*

Amount of Reductions: 246,563 tons CO₂ eq per year
Verification Audits (2006-2009): 4
VER’s (Voluntary Market) Phase I: 1,394,001 tons CO₂ eq.
Total emissions Reductions: 1,671,045 tons CO₂ eq.
Local emissions Reductions (NOx, SOx, PM): 61,288 tons
Safe fuel consumption in front CPT (59%): 583,380 barrels of fuel per year
Economic safe for fuel: USD$57,096,166
### OTHERS OUTCOMES
**ENVIRONMENTAL AND HEALTH**

- **Noise Reductions levels in corridors:** 3 – 10 db
- **Safe Water (98% water is recirculated):** 30 – 40% (46.249 m³ per year)
- **Safe Electric Energy (3.2%):** 469.926 kwh per year
- **Reduction in solid waste generation:** 31%

#### Road Traffic Crashes Reductions levels in corridors:

<table>
<thead>
<tr>
<th>ROAD TRAFFIC CRASHES TYPE</th>
<th>1998</th>
<th>2008</th>
<th>% REDUCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>WITH DEATHS</td>
<td>123</td>
<td>52</td>
<td>57.7%</td>
</tr>
<tr>
<td>WITH INJURIES</td>
<td>2953</td>
<td>1396</td>
<td>52.7%</td>
</tr>
<tr>
<td>WITHOUT VICTIMS</td>
<td>7764</td>
<td>3966</td>
<td>48.9%</td>
</tr>
<tr>
<td>TOTAL ROAD TRAFFIC CRASHES (50 m around TransMilenio Network)</td>
<td>10840</td>
<td>5414</td>
<td>50.1%</td>
</tr>
<tr>
<td>TOTAL ROAD TRAFFIC CRASHES (citywide)</td>
<td>46760</td>
<td>35984</td>
<td>23.0%</td>
</tr>
<tr>
<td>% ROAD TRAFFIC CRASHES TM NET/TOTAL CRASHES CITYWIDE</td>
<td>23.20%</td>
<td>15.00%</td>
<td>35.3%</td>
</tr>
</tbody>
</table>
• Traffic accidents have been reduced by approximately 50% in the corridors where TransMilenio operates, with a reduction in injuries of more than 56% in average to 2008 in all network, and more than 80% in specific corridors in 2010.

• Encouraging public transport, TransMilenio promotes walking and recover 1,694,090 m² of public space represented in pedestrian corridors, sidewalks, parks, plazas and malls.

• Campaings of citizen culture, environmental, promoting and prevention of health (road safety, H1N1, etc)
OTHERS OUTCOMES

HEALTH

• Working standards are high for TransMilenio bus drivers, in contrast to conditions under traditional public transport providers, where drivers often worked 15 hour shifts and lacked access to health and social security benefits and long-term contracts.

• All of TransMilenio’s bus drivers are now covered by health and social security benefits, and the system regulates work hours and wage levels.

• Good occupational health services are provided, as are physical activity and nutrition facilities and services. TransMilenio also sponsors wider road safety and health promotion campaigns.
OTHERS OUTCOMES
Employment Generation and Gender Equity

- In 2009, the system generated 39,869 direct jobs and 55,817 indirect jobs, prioritizing employment of vulnerable social groups such as single mothers and Bogota’s mission program workers.

- While traditionally the transport sector has employed men, in the TransMilenio system women have been able to significantly increase their workforce participation.

- Female participation is currently 24% of the total system workforce, among whom 62% are single mothers, while in activities such as fare collection and bus washing the participation of women reaches 70% and 43%, respectively.

- “Democratization transport process”- The operators companies must have a percentage of participation from small owners (32% for feeders, 26% for trunks), to be allowed to participate into the operation system process.
RESEARCH
Assessing the impact on health and welfare of the public transport drivers in Bogota for the entry into operation of the TransMilenio system

- Cross-sectional study
- Ergonomic conditions for drivers
- Microenvironments Assessment: environmental and occupational level (quality air, noise, vibrations, T, etc.)
- Review of Medical Records, laboral absenteeism and Statistics causes. Morbidity and mortality statistics (Road Traffic Accidents)
- Occupational medical examinations and clinical tests for biological tracers (carboxyhemoglobin, benzo-pyrenes).
- Condition assessment surveys for quality of life, welfare and psychosocial conditions to assess mental health. - Program evaluation. Levels of exposure - working hours
FINANCIAL PROJECT SCHEME

• Infrastructure is financial to government:
  – Máx. 70% National Government
  – Aprox. 30% Local Government

• Investment in Infrastructure Phases I, II and III: USD$2,040,433,882

• The operation system is an scheme with public and private participation. the operation is supporting through fare (Cop$1.600 = US$0.80)
  – Private operators put the logistic for the operation (buses, drivers, human resource, etc)
  – Technology for fare collection, Employees for selling and control.

• The resources come from CDM project are investment in the support to control and physical infrastructure for the operation system and environmental projects.
  – USD$ 894,737 per year
Why TransMilenio System is a good practice in sustainable Transport to reproduce in Colombia and the world?

- The system offering coverage and accessibility to 536 neighborhoods, and offering particular benefits to low-income populations living in the periphery of the city.

- Saving up to 40 minutes per trip compared with a 1998 base year. Right now transport 85.000 pass/hr, travel demand similar a subway.

- In 10 years of operation the system has mobilized more than 3.000 million passengers

- TransMilenio is considered to be the best practice in sustainable transport for its operational model and its social and environmental responsibility.

- The system transport TransMilenio has brought city-planning, environmental, social, cultural, operational and economic benefits to the city and has improved the environmental quality, the quality of life and the well-being for the citizens of Bogota.

- The transport sector accounts for around 40% of CO2 global emissions for burning fossil fuels but less than 1% of CERs issued.

- There are about 177 BRT’s projects around the world (48 operation, 15 construction, 100 planning, and 14 in expansion), potential to applied CDM projects. 7 are currently under development in Colombia.
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Financing – Infrastructure

**Infrastructure**

- Exclusive Trunk corridors
- Stations
- Pedestrian bridges
- Side walks
- Public Space
- Main stations and technical garages
- Control Center

Max 70% National Government

Aprox. 30% Local Government

50% Oil taxes
PHASE I – RECRUITMENT SCHEME

- Public works without funding
- Fixed unit price contracts without the adjustment formula.
- The contracts did not include maintenance, only designs and construction implementation.
- It was hired by specialty, depending on the type of work

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Contracts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design and construction</td>
<td>61</td>
</tr>
<tr>
<td>Auditing</td>
<td>53</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>114</strong></td>
</tr>
</tbody>
</table>
PHASE II - RECRUITMENT SCHEME

- Global fixed-price contracts without adjustments.

- For the NQS and the Suba Avenue (30 km.) corridors financial concessions were structured with future fiscal periods of the District and the Nation.

- The contracts include maintenance for 5 years.

- The concessions include different specialties by the contractor (floors, metal structures, signals, etc.).

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Contracts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design and construction</td>
<td>20</td>
</tr>
<tr>
<td>Construction</td>
<td>26</td>
</tr>
<tr>
<td>Auditing</td>
<td>26</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>72</strong></td>
</tr>
</tbody>
</table>
### Investment in Infrastructure Phases I, II and III (USD$)

<table>
<thead>
<tr>
<th>Phases</th>
<th>Nation</th>
<th>District</th>
<th>Administrators</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase I</td>
<td>30.789.104</td>
<td>80.375.014</td>
<td>0</td>
<td>111.164.118</td>
</tr>
<tr>
<td>Phase II</td>
<td>882.398.243</td>
<td>406.241.524</td>
<td>3.564.091</td>
<td>1.292.203.858</td>
</tr>
<tr>
<td>Phase III</td>
<td>20.258.101</td>
<td>53.194.973</td>
<td>563.612.832</td>
<td>637.065.906</td>
</tr>
<tr>
<td>Total</td>
<td>933.445.448</td>
<td>539.811.511</td>
<td>567.176.923</td>
<td>2.040.433.882</td>
</tr>
</tbody>
</table>

USD$ VALUES
## Infrastructure Costs - TransMilenio System

<table>
<thead>
<tr>
<th>Troncal</th>
<th>Km</th>
<th>Costo / Km</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Pesos(1)</td>
</tr>
<tr>
<td>Calle 80</td>
<td>10,10</td>
<td>35.750</td>
</tr>
<tr>
<td>Caracas</td>
<td>19,86</td>
<td>20.403</td>
</tr>
<tr>
<td>Autonorte</td>
<td>10,30</td>
<td>31.329</td>
</tr>
<tr>
<td>Jiménez</td>
<td>1,94</td>
<td>16.365</td>
</tr>
<tr>
<td><strong>Fase I</strong></td>
<td>42,20</td>
<td><strong>26.557</strong></td>
</tr>
<tr>
<td>Américas</td>
<td>12,98</td>
<td>39.470</td>
</tr>
<tr>
<td>NQS</td>
<td>19,30</td>
<td>64.132</td>
</tr>
<tr>
<td>Suba</td>
<td>9,95</td>
<td>60.002</td>
</tr>
<tr>
<td><strong>Fase II</strong></td>
<td>42,23</td>
<td><strong>55.579</strong></td>
</tr>
<tr>
<td>Calle 26</td>
<td>12,20</td>
<td>69.757</td>
</tr>
<tr>
<td>Carrera 10</td>
<td>7,65</td>
<td>76.597</td>
</tr>
<tr>
<td>Carrera 7 (3)</td>
<td>17,50</td>
<td>50.761</td>
</tr>
<tr>
<td><strong>Fase III</strong></td>
<td>37,35</td>
<td><strong>62.258</strong></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>121,78</td>
<td><strong>47.571</strong></td>
</tr>
</tbody>
</table>

1. Pesos constantes de 2008
2. TRM a diciembre de 2008 $2,243.59 (Banco de la República)
3. Estimaciones de costo de construcción obtenido de los Estudios y Diseños

**Notas:**
- Los valores incluyen todos los costos de mantenimiento
- Los valores no incluyen costos de financiación
- Los valores de costos para las Fases II y III son asociados a proyectos urbanos integrales
- No se incluyen costos de obras en rutas alimentadoras

Source: TRANSMILENIO S.A. - IDU
Fleet operation

- High capacity Trunk busses (160 pax)
- Medium capacity feeder busses (80-90 Pax)
- Private operators selected with a tendering process
- Paid by kilometer (Trunk operators)
- Paid by passenger (Feeder operators)

Fare Collection Process

- Private companies
- Technology (Hardware and Software)
- Entrance Cards
- Employees for selling and control
- Paid by sold ticket.

Financing

Cop$1.600 = US$0.80