

ISTANBUL, NOVEMBER 20, 2013
The Marmara Hotel, Taksim

➤ YAŞANABİLİR ŞEHİRLER SEMPOZYUMU, LIVABLE CITIES SYMPOSIUM

➤ Salvador Herrera
CTS EMBARQ Mexico Deputy Director



Metrobus Line 4 Connection to Historical District

➤ 15:30-16:50

➤ Session: Transit Oriented Development and Safe Traffic

➤ **Content of the presentation**

- Historical districts and mass transit systems, is there a suitable combination?
- The Mexico City Historical District
- The Mexico City experience on mass transit systems and BRTs.
- Bringing the BRT to the historical district. Challenges.
- The safety and accesibility perspective.
- The project and its implementation.

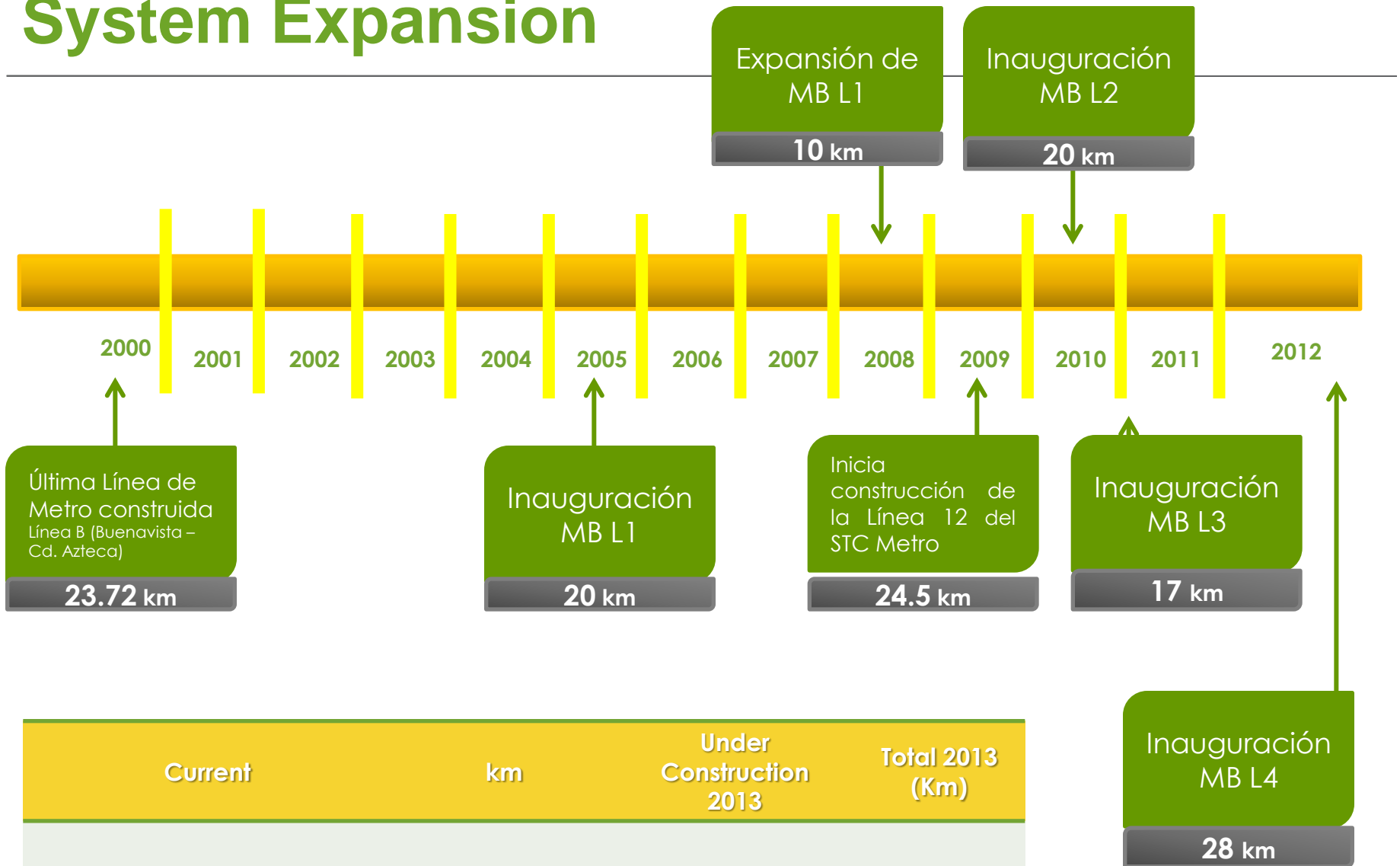
➤ **Description**

- This presentation aims to demonstrate that BRTs are an appropriate solution in historical districts if the correct design and integration efforts are done. Key is to address safety and accesibility. Here, the relevance of road safety audits is highlighted. The example of Metrobus Line 4 in Mexico City, opened to the public 2 years ago is shown in detail.

A decade of investment 2002 - 2013



System Expansion



Current	km	Under Construction 2013	Total 2013 (Km)
Metro + Metrobús + TL	334	20	354



Metrobus BRT

- Dedicated, confined bus lanes.
- Enclosed stations.
- Electronic fee payment prior to boarding.
- Large buses, either articulated or bi-articulated.
- Advanced control systems to regulate times between buses, overcrowding, etc.
- Distinctive image.

	Line 1 Insurg entes	Line 2 Eje 4 Sur	Line 3 Eje 1 Pte	Line 4 Down town	Total
Km	30	20	17	28	95
Passengers (K/day)	420	160	130	40	750
Stations	43	34	31	30	138
Terminals	3	2	4	4	13
Buses	161	96	54	54	365



Financing Schemes

Line	Infrastructure	Fleet		Fare collection	Total
		Private	Public		
1	1,277	327	109		1,713
2	850	255	85		1,190
3	1,200	250	-		1,450
4	450	250	-		700
3,777		1,082	194		5,053
Costs in millions of pesos.				Private	
Source: Escalante, 2012.				Public	

Line 1 and 2 – Public contribution to infrastructure and fleet, private participation for bus financing.

Line 3 – Payment-for-Services.

Line 4 – Financed via second tier of beltway.

Cobertura

Línea 1 **Línea 2** **Línea 3** + **Línea 4** = **95** kilómetros
Metrobús Metrobús Metrobús Metrobús
De corredores

67 28



Mexico City Downtown Improvement











ECOBICI
SISTEMA DE TRANSPORTE INDIVIDUAL

ECOBICI
SISTEMA DE TRANSPORTE INDIVIDUAL

07

0742

0751

0598

0752 **CTSEMBARQ**
México

MAPA EXPANSIÓN FASES II y III ECOBICI



SIMBOLOGÍA

	OCLOSTACIÓN INSTALADA		METROBUS LÍNEA 1
	OCLOSTACIÓN PENDIENTE		METROBUS LÍNEA 2
	FASE I		METROBUS LÍNEA 3
	FASE II		METROBUS LÍNEA 4
	FASE III		METRO

VERSIÓN DE DIVULGACIÓN
NO PRODUCE EFECTOS JURÍDICOS



Conectividad



SIMBOLOGÍA

Metrobús	 
Metro	      
Tren Suburbano	
Corredor Cero Emisiones	

Pasajeros al día

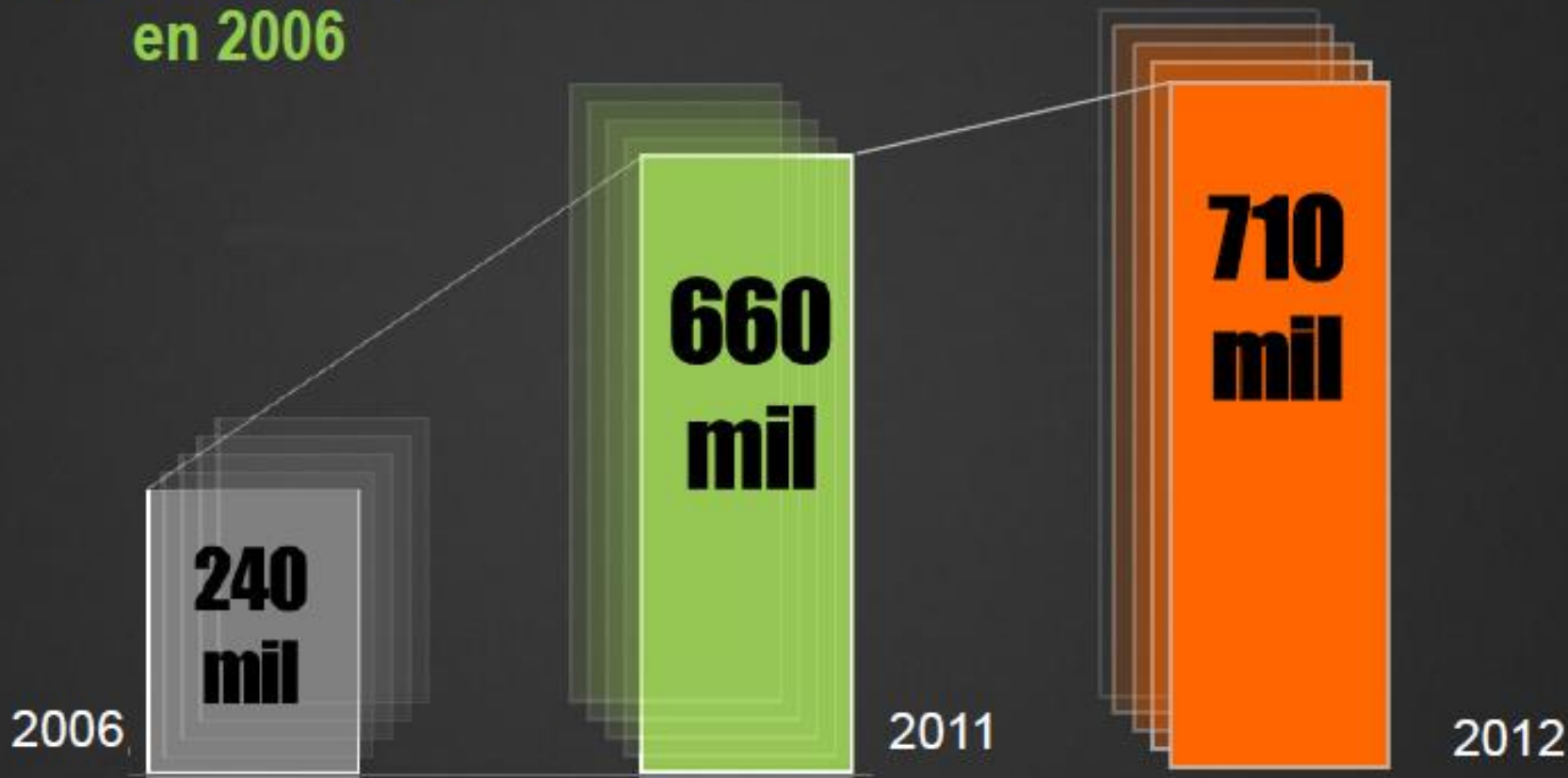
Más de 3 veces
de Usuarios que
en 2006

Línea 1 Metrobús + Línea 2 Metrobús + Línea 3 Metrobús + Línea 4 Metrobús = 710 mil pasajeros

660 mil

50 mil

710 mil
pasajeros



Principios básicos

Tarjeta inteligente

7.8 millones de tarjetas en uso



Cobro en estación



Cobro en autobús



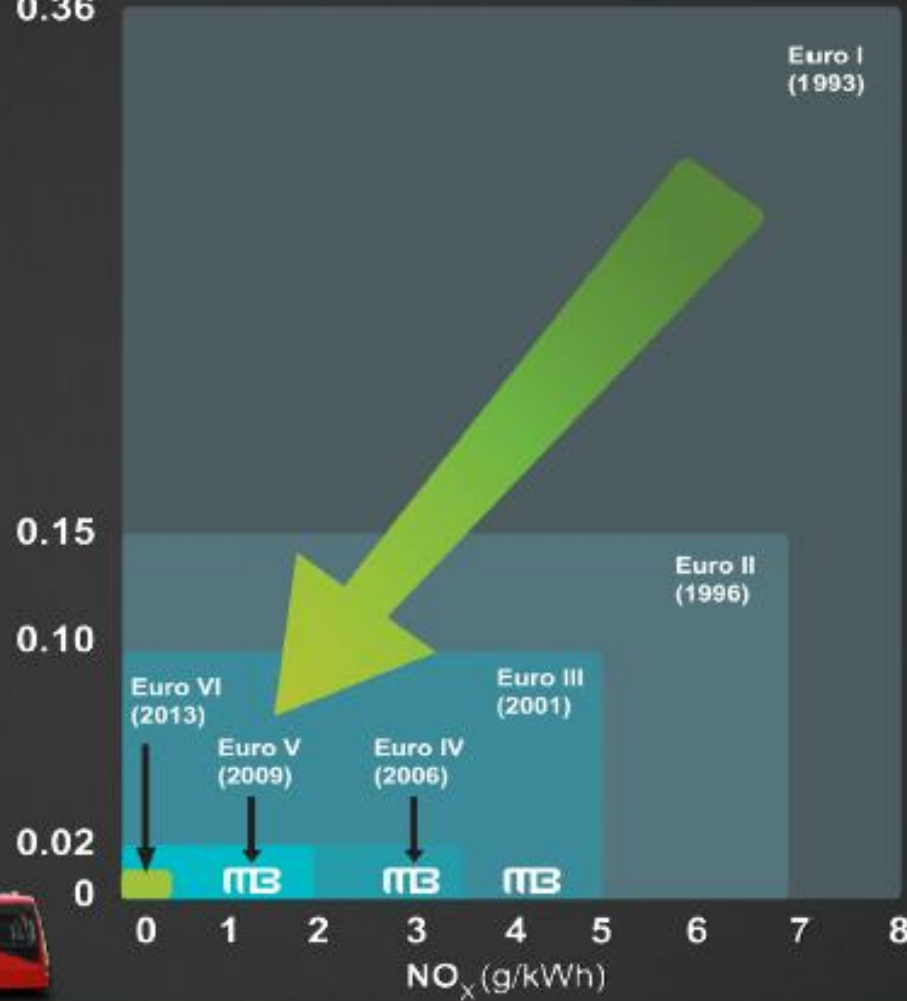
Principios básicos

PM (g/kWh)
0.36

Cambio tecnológico

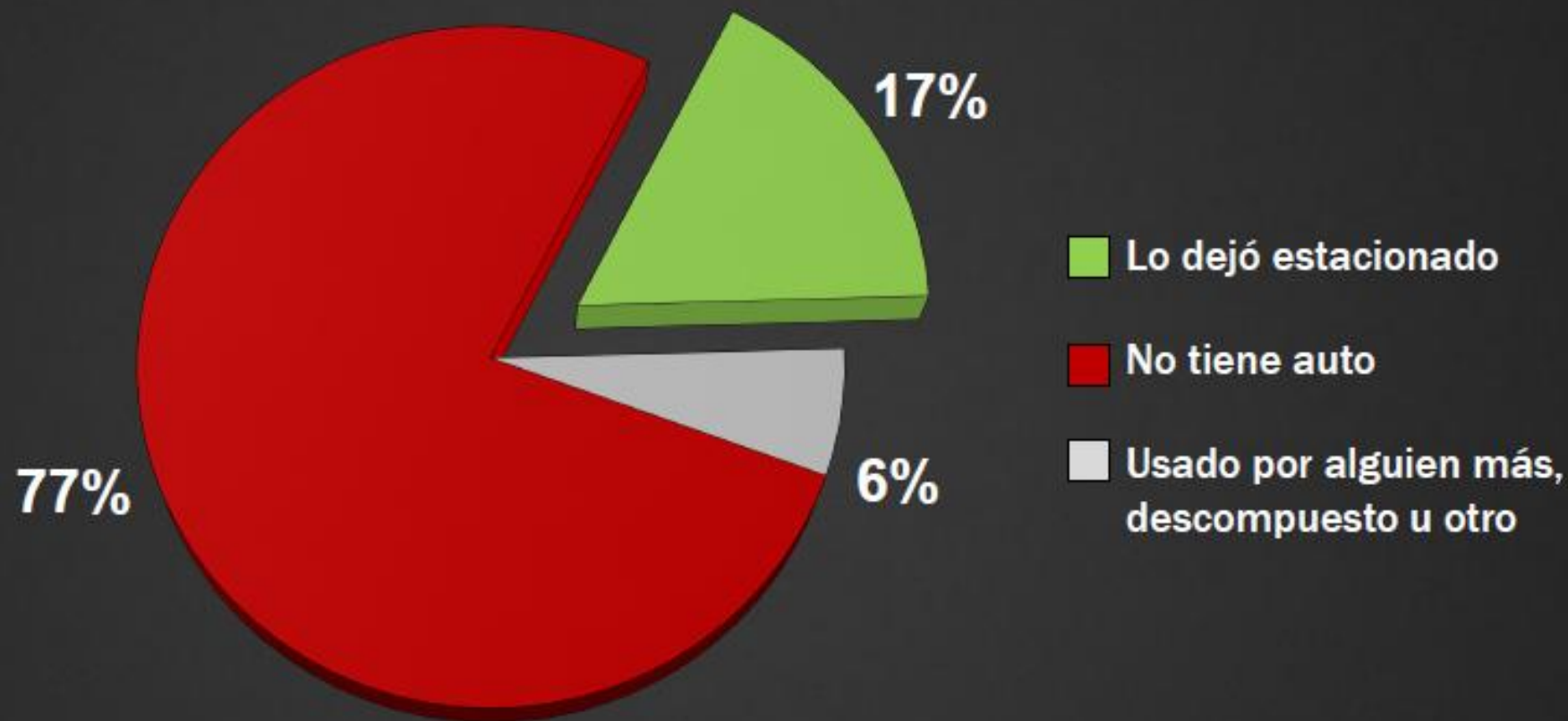


Euro 0
(Microbuses)



Principios básicos

Propietarios de automóvil / Cambio Modal



* Encuesta de Opinión marzo de 2011

Principios básicos

Cambio modal

110 mil



+

12 mil



17% de los usuarios
dejó su automóvil por
Metrobús

122 mil

viajes en automóvil
menos al día

Previous situation



Previous Situation



Previous Situation



Sustainable Transport saves lives



Road safety audit process

» Site visit to understand existing conditions on the road



» Detailed review of project drawings



Road safety audit process

» Presentation of main findings



» Showing initial recommendations



Road safety audit process

» Workshop with Metrobus, analyzing project drawings



» And working together on recommendations



Ranking of recommendations

- »» Mapping the recommendations, descriptions, type,
- »» Safety impact,
- »» Feasibility of application
 - »» Time
 - »» Cost
- »» Politic Cost



Highlights of key recommendations implemented

- Protected pedestrian space
- Pedestrian signals
- Recovered sidewalks
- Pedestrian safety at terminals
- Counterflow
- Bus speeds
- Traffic signs
- Safety and accessibility

Protected pedestrian islands

»» Road safety audit report 2011:

“4.5.1. Pedestrians waiting in the median are particularly vulnerable in case vehicles using the adjacent lanes accidentally run over the pedestrian refuge island.

The designers should also ensure that pedestrians waiting in [median refuge islands] are protected from traffic. This can usually be achieved by placing bollards along the edges of the islands [...] or other types of security devices [such as kerbs].”

Before (2011): Unprotected pedestrian refuge island at the corner of Jesus Garcia and Luis Donaldo Colosio



After (2012): Well protected island



»» Road safety audit report 2011:

“4.4.1. It is recommended that pedestrian signals be installed in all signal-controlled junctions.

Before (2011): Signalized intersection without pedestrian signals (corner of Jesus Garcia and Luis Donaldo Colosio)



After (2012): New pedestrian signals installed at the corner of Jesus Garcia and Luis Donaldo Colosio)



Recovered sidewalks

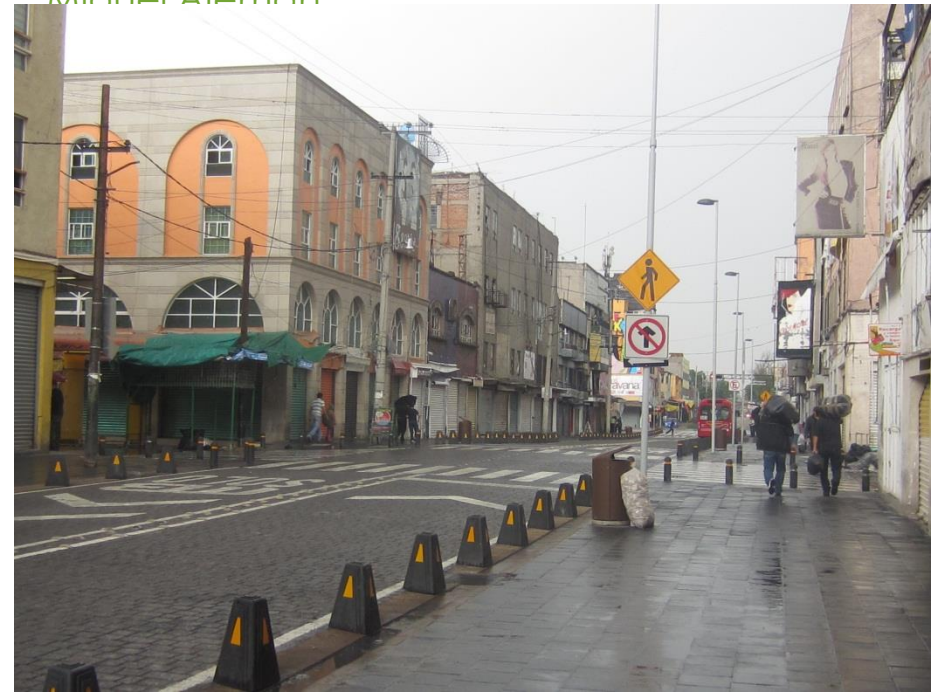
»» Road safety audit report 2011:

“5.64. This section features many informal vendors occupying the sidewalks, which may also result in pedestrians walking in the roadway [...] From a safety perspective, it is important to provide adequate space for pedestrians on the sidewalks, to ensure that they do not end up walking in the bus lanes.”

Before (2011): Sidewalks completely taken over by street vendors on General Miguel Aleman



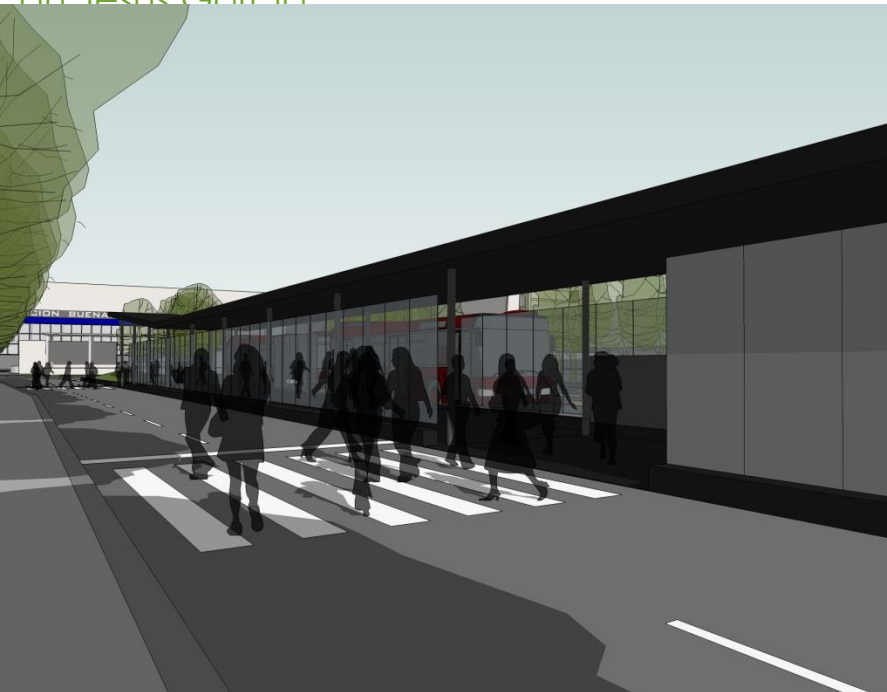
After (2012): 500 meters of sidewalks were recovered for pedestrian use on General Miguel Aleman



»» Road safety audit report 2011:

“5.1. Many passengers are expected to transfer [at Terminal Buenavista] to other Metrobus or Metro lines. This will create many conflicts [...] **It should be considered to close Jesus Garcia to vehicle traffic on this section.**”

Before (2011): Rendering showing access to Terminal Buenavista across two lanes of traffic on Jesus Garcia



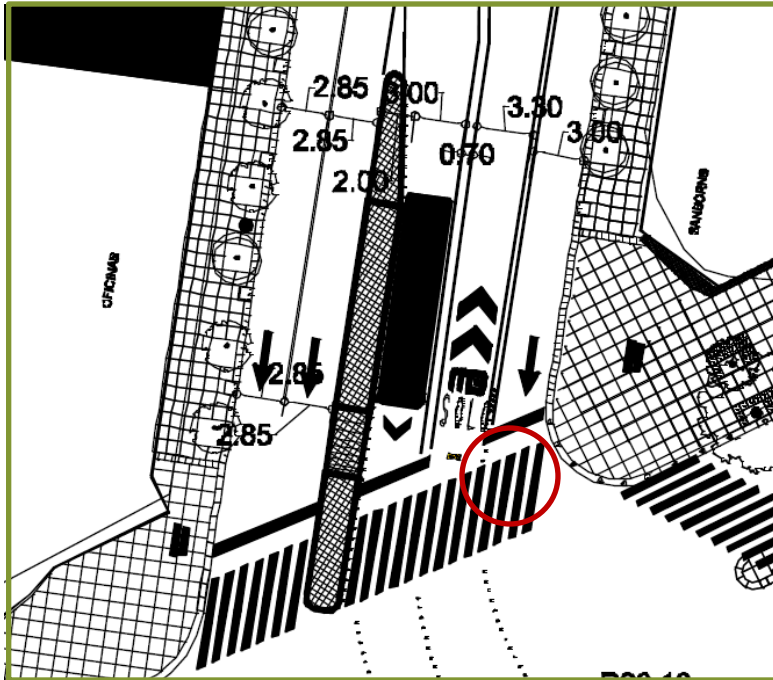
After (2012): Entrance to Terminal Buenavista from a pedestrian plaza, closed to vehicle access



»» Road safety audit report 2011:

“5.6. In Lafragua between the circle and Reforma the design includes a counterflow lane for traffic from the circle. This is considered very unsafe especially because of the bus stop [...] The [counterflow] lane should be taken out.”

Before (2011): Project drawings showing a counterflow configuration on Lafragua



After (2012): The counterflow has been eliminated and the curbside lane now faces



»» Road safety audit report 2011:

“5.75. The sign indicating “Tacuba” should be removed from above the bus lane. [...]

“4.3.3. There should be clear and consistent signs and markings used for each type of lane (e.g. exclusive Metrobus lane)

Before (2011): misleading traffic signs over bus lanes along Puente de Alvarado



After (2012): Correct signs installed



»» Road safety audit report 2011:

“5.55. The pedestrian crossing on the northern side [...] is not accessible at present.

Before (2011): Inaccessible pedestrian crossing along Eduardo Molina



After (2012): Pedestrian access restored, along with bollards for protecting



»» Road safety audit report 2011:

“5.53. The pedestrian crossing should be made a raised area or protected by a gentle [speed] hump. “

Before (2011): Signalized mid-block crossing on Eje 2 Oriente, with no traffic calming. Vehicles did not stop for pedestrians.



After (2012): Speed hump installed before the pedestrian crossing, slowing traffic down and allowing pedestrian to cross safely.



Traffic calming

»» Road safety audit report 2011:

“5.52. [The street] is very wide here and the number of lanes and the width of the lanes vary. It was observed that many pedestrians cross here although there are no facilities for them. This is very unsafe because of the relative high speed of vehicles.”

Before (2011): Eje 3 Eduardo Molina. Very wide street with high vehicle speeds and frequent jaywalking. A major black spot.



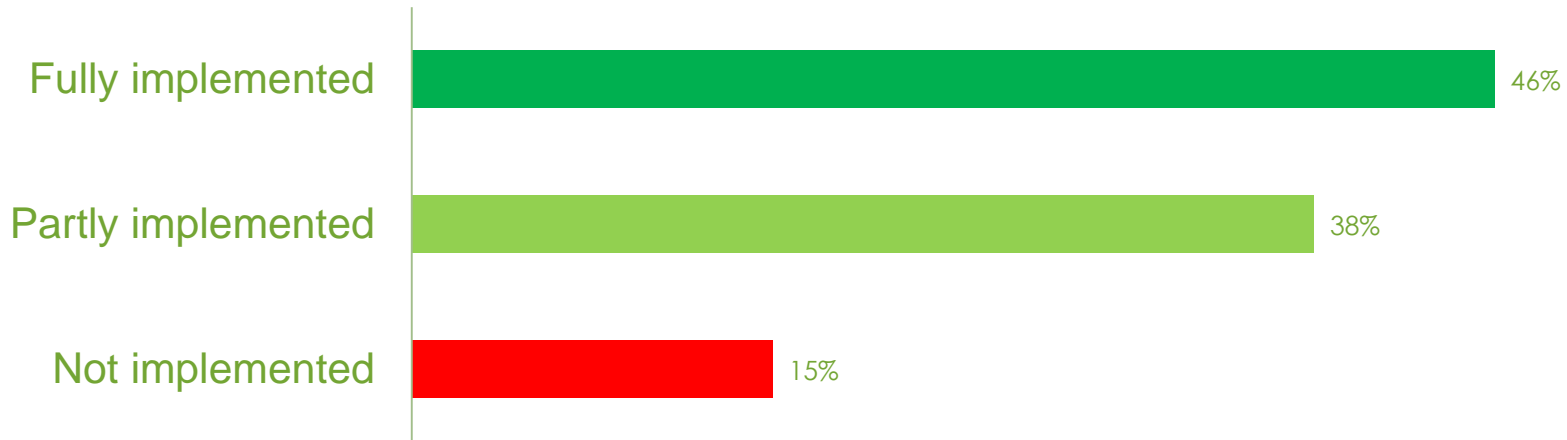
After (2012): Signalized pedestrian crossing installed, with protected pedestrian space and four refuge islands to break up the





Audit implementation results

General recommendations



- A general recommendation is one that applies to the entire project
- Example: all signalized crossings should feature pedestrian signals



Estimated lives saved

- Before Metrobus Line 4 (for the 14 kilometer section from Buenavista to San Lazaro)
 - 343 annual accidents
 - 342 annual injuries
 - 5 annual fatalities

- Estimated impact: 40 to 50% reduction in crashes, injuries, and fatalities (source: EMBARQ KPI methodologies for lives saved on BRT corridors)
- Estimated annual crash statistics post-Metrobus implementation:
 - 170 to 200 annual accidents
 - 170 to 200 annual injuries
 - 2 to 3 annual fatalities

- Estimated impact: :
 - up to 170 accidents avoided per year
 - up to 170 injuries avoided per year
 - up to 3 fatalities avoided per year

Changing a city's safety culture

Before : Safety used to mean building fences



Now: Safety becomes integral part of planning for mobility and accessibility



MBL4

TERMINAL BUENAVISTA





ASCENSO DE PASAJEROS



ASCENSO
DIRECCIÓN
SAN LÁZARO
AEROPUERTO T1 Y T2



NO CRUCE
SALIDA
AMARILLA



PERMITA
SALIR ANTES
DE ENTRAR



SANTIAGO



SANTIAGO
ENCARNAÑONES



SALIDA



Buenavista



ASCENSO PASAJEROS



NO PASAR
SIN EL PASAJERO



MODULO DE
ATENCIÓN

SALIDA
LADO OESTE

Buenavista



HYBRID

Por una ciudad más verde

SALIDA

Centro Histórico Downtown

ENTRADA

-50%
CO₂

-30%
emisiones

Híbrido

Centro Histórico
Downtown

MTB

70%





E2

RUTA SUR

BU

553

ESTACIONAMIENTO
TECHADO

Centro Histórico
Downtown
MTC











Línea 4



Bellas Artes



Ruta Norte
Por República de Venezuela

-  Buenavista
-  Delegación Cuauhtémoc
-  Puente de Alvarado
-  Museo de San Carlos
-  Hidalgo
-  **Bellas Artes**
-  Teatro Blanquita
-  República de Chile
-  República de Argentina
-  Teatro del Pueblo
-  Mixcalco
-  Ferrocarril de Cintura
-  Morelos
-  Archivo de la Nación



EFACCIONES
PRESORAS
MPUTADORAS

YUNTAMIENTO
#10

AQUI

POUNPUN

E2 RUTA SUR
SAN LAZARO

528

Centro Histórico
Downtown
ITB Metrolib







Línea 4



Centro Histórico a Centro



Mapa del Plan Maestro del Eje Histórico

Mapa de Línea



Mapa de Línea

HOTEL ROTBU

BUENAUISTA

543

Centro Historico
Downtown
Metrobús



ISTANBUL, NOVEMBER 20, 2013
The Marmara Hotel, Taksim

➤ Thank You

➤ Salvador Herrera
CTS EMBARQ Mexico Deputy Director

