Document of
The World Bank

Report No: ICR00001206

IMPLEMENTATION COMPLETION AND RESULTS REPORT
(TF-51612)

ON A

GRANT FROM THE GLOBAL ENVIRONMENTAL FACILITY

IN THE AMOUNT OF US$ 5.80 MILLION EQUIVALENT

TO THE

BANCO NACIONAL DE OBRAS Y SERVICIOS PUBLICOS S.N.C.

AND

UNITED MEXICAN STATES

FOR THE

INTRODUCTION OF CLIMATE FRIENDLY MEASURES IN TRANSPORT

September 24, 2009

Sustainable Development Department
Colombia and Mexico Country Management Unit
Latin America and the Caribbean Regional Office

CURRENCY EQUIVALENTS

(Exchange Rate Effective July 2009)

Currency Unit = Mexican Pesos
1.00 = US$ 0.7
US$ 1.00 = MXN 13.6

FISCAL YEAR 2010

ABBREVIATIONS AND ACRONYMS

AQM	Air Quality Management Plan
BANOBRAS	National Bank of Public Works and Services
CAM	Metropolitan Environmental Commission
CAS	Country Assistance Strategy
CEC	Commission of Environmental Cooperation
CEO	Chief Executive Officer
COMETRAVI	Metropolitan Commission of Transport and Roads
COP 7	Conference of the Parties No. 7
GEF	Global Environment Facility
GHG	Greenhouse gas
IDF	Institutional Development Fund
IMECA	Metropolitan Index of the Quality Air
IMP	Mexican Oil Institute
INE	National Institute of Ecology
IPCC	Intergovernmental Panel of Climate Change
MCCAP	Metropolitan Climate Change Action Plan
MCMA	Mexico City Metropolitan Area
OLADE	Latin-American Energy Organization
OP 11	Operational Program 11
PICCA	Integral Program for the control of the Atmospheric Pollution
PIMAAT	Introduction of Environmentally Friendly Measures in Transport Project
PIU	Proyect Implementation Unit
PROAIRE	Program to Improve the Air Quality in the Metropolitan Area
RAMA	Automatic Net of Environmental Monitoring
RTP	Federal District Bus Network
SETRAVI	Secretary of Transport for the Federal District
SCT	Secretariat of Communications and Transport
SMA	Secretariat of the Environment for the Mexico City
STC	Metro System
STE	Electric Surface Transport System
VOCs	Volatile organic compounds
WRI	World Resources Institute

Vice President:	Pamela Cox
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COUNTRY
Mexico

Project Name
Introduction of Climate Friendly Measures in Transport Project
(PIMAAT)

CONTENTS

A. Basic Information

Country:	Mexico	Project Name:	Introduction of Climate Friendly measures in Transport
Project ID:	P059161	L/C/TF Number(s):	TF-51612
ICR Date:	09/29/2009	ICR Type:	Core ICR
Lending Instrument:	SIL	Borrower:	BCO NAL DE OBRAS Y SERV PUBLICOS, SNC
Original Total Commitment:	USD 5.8M	Disbursed Amount:	USD 5.6M
Revised Amount:	USD 5.6M		
Environmental Category: C		**Global Focal Area: C**	

Implementing Agencies:
Secretaria de Medio Ambiente del GDF

Cofinanciers and Other External Partners:
Shell Foundation
World Resources Institute
Bus Manufacturers

B. Key Dates

Process	Date	Process	Original Date	Revised / Actual Date(s)
Concept Review:	03/04/2002	Effectiveness:	04/13/2003	04/11/2003
Appraisal:	07/01/2002	Restructuring(s):		
Approval:	10/29/2002	Mid-term Review:	08/14/2006	07/18/2006
		Closing:	06/30/2008	03/31/2009

C. Ratings Summary

C.1 Performance Rating by ICR

Outcomes:	Highly Satisfactory
Risk to Global Environment Outcome	Moderate
Bank Performance:	Satisfactory
Borrower Performance:	Satisfactory

C.2 Detailed Ratings of Bank and Borrower Performance

Bank	Ratings	Borrower	Ratings
Quality at Entry:	Satisfactory	Government:	Satisfactory
Quality of Supervision:	Satisfactory	Implementing Agency/Agencies:	Highly Satisfactory
Overall Bank	Satisfactory	**Overall Borrower**	Satisfactory

Performance:		**Performance:**	

C.3 Quality at Entry and Implementation Performance Indicators			
Implementation Performance	**Indicators**	**QAG Assessments (if any)**	**Rating**
Potential Problem Project at any time (Yes/No):	No	Quality at Entry (QEA):	None
Problem Project at any time (Yes/No):	No	Quality of Supervision (QSA):	None
GEO rating before Closing/Inactive status	Satisfactory		

D. Sector and Theme Codes		
	Original	**Actual**
Sector Code (as % of total Bank financing)		
Central government administration	20	20
General transportation sector	60	60
Sub-national government administration	20	20
Theme Code (as % of total Bank financing)		
Climate change	29	29
Environmental policies and institutions	29	29
Other urban development	14	14
Pollution management and environmental health	28	28

E. Bank Staff		
Positions	**At ICR**	**At Approval**
Vice President:	Pamela Cox	David de Ferranti
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ICR Primary Author:	Seraphine Marie Haeussling	

F. Results Framework Analysis

Global Environment Objectives (GEO) and Key Indicators(as approved)

The project development objective is to contribute to the development of policies and measures that will assist in a long-term modal shift toward climate-friendly, more efficient and less polluting, less carbon intensive transport in the Mexico City Metropolitan Area (MCMA). Specifically, the project will support aspects of the recently completed Third Air Quality Management Plan (AQM-III 2002-2010) (Programa para Mejorar la Calidad del Aire en la ZMVM 2002-2010) which are consistent with the GEF Operational Program on Sustainable Transport (OP-11) and the Metropolitan Climate Change Action Plan (MCCAP).

Revised Global Environment Objectives (as approved by original approving authority) and Key Indicators and reasons/justifications

(a) GEO Indicator(s)

Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Actual Value Achieved at Completion or Target Years
Indicator 1 :	Harmonization of sector strategies on air quality issues and Integrated Climate Change Actions Plan;			
Value (quantitative or Qualitative)	No Metropolitan Climate Change Action Plan is available; No harmonization of urban, transport and air quality plans and planning processes has taken place .	Harmonization of plans realized in cooperation with EDOMEX. Initiation of city wide CDM program.		1st city-wide CC Action Strategy in Latin America, with goals, timetables, programs, budget requirements reflecting commitment by City's Gov to reduce GHG in synergy with local policies for reduction of local criteria poll. within UNFCCC and Kyoto context
Date achieved	04/10/2003	12/31/2008		07/30/2009
Comments (incl. % achievement)	100% - The achievement reflects that the first city-wide CC Action Strategy in Latin America, with goals, timetables, programs, and budget requirements has been identified, formulated, designed, completed and published, and is now under implementation.			
Indicator 2 :	Identification of organizational and barrier removal measures (enabling environment) to facilitate the implementation of sustainable, climate friendly			

	strategies;			
Value (quantitative or Qualitative)	No Corridors in Mexico City.	The Insurgentes corridor counts with a financially, socially and environmentally sustainable operation. Metrobus operates two more corridors in a financially sound way and in cooperation with metro.		An enabling environment to facilitate the implementation of sustainable surface transport strategies was discussed, defined and enacted. 2 BRT corridors successfully implemented and operating.
Date achieved	04/10/2003	12/31/2008		07/30/2009
Comments (incl. % achievement)	100% - An enabling environment to facilitate the implementation of sustainable surface transport strategies was discussed, defined and enacted and 2 BRTs were implemented and operate successfully thanks to the created environment.			
Indicator 3 :	Field test demonstrates less polluting, climate friendly transport alternatives;			
Value (quantitative or Qualitative)	Alternnative transport has not been tested in Mexico City.	Field test results provide data/results for decision taking with regard to buses to be used in this and in future corridors. Future corridors expected to partially operate with hybrid-natural gas buse		Comparative pilot field test for alternative drives and fuels successfully concluded, test results have been reported and published and support decision making process on alternative bus technologies
Date achieved	04/10/2003	12/31/2008		07/30/2009
Comments (incl. % achievement)	100% - The project has satisfactorily supported the comparative pilot field test for alternative drives and fuels. The test results have been reported and published and are being considered in the decision making process on alternative bus technologies.			
Indicator 4 :	MCMA transport projects incorporated climate change issues in design and operation.			
Value (quantitative or Qualitative)	MCMA transport projects don't incorporate climate change issues in design and operation.	Transport projects in MCMA contribute to the reduction of local and global pollutants. Transport corridor program in progress (2 more corridors in 2007)		METROBUS operates 2 corridors (50 km), transporting 473,000 passengers/day and 310 mio. since operation started, reduced a total of 107 thousand tons CO2e (2005-2008),

				BRT expansion underway, 1st transport CDM by Bank with approved baseline meth.
Date achieved	04/10/2003	06/30/2007		07/30/2009
Comments (incl. % achievement)	100% - The support provided by the project through the modernization of the regulatory and policy framework was essential to the creation of METROBUS, a decentralized public entity with independent legal status and independent management.			
Indicator 5 :	100% - Better understanding of potential of high capacity vehicles, non-motorized transport modes as well as incresased public awareness of advantages of transport corridors and climate friendly technologies			
Value (quantitative or Qualitative)	There is no project.	Transport corridors represent a recognized option to improve public transport and to reduce transport caused emissions in Mexico. Transport corridor program (masterplan) implemented and operating.		The BRT option has been recognized as an adequate transport option for the city, to improve public transport and to reduce transport caused emissions in Mexico. Transport corridor program (masterplan) under implementation.
Date achieved	04/10/2003	12/31/2008		07/30/2009
Comments (incl. % achievement)	100% - The BRT option has been recognized as an adequate transport option for the city, to improve public transport and to reduce transport caused emissions in Mexico. Transport corridor program (masterplan) under implementation.			
Indicator 6 :	100% - Effective Project Management team established adequate for use in future operations.			
Value (quantitative or Qualitative)	No project (management).	Project activities have been realized in the foreseen time with sustainable results.		Project activities have been realized with sustainable results. Implementing agency has managed project in highly satisfactory manner.
Date achieved	04/10/2003	12/31/2008		07/30/2009
Comments (incl. % achievement)	100% - Project activities have been realized with sustainable results. Implementing agency has managed project in highly satisfactory manner.			

(b) Intermediate Outcome Indicator(s)

Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Actual Value Achieved at Completion or Target Years
Indicator 1 :	Official issuance of city-wide climate change action plan.			
Value (quantitative or Qualitative)	No climate change action plan	Climate change Action plan presented at next COP. Plan has a metropolitan dimension at the end of the project.		Climate change Action strategy and program presented at next COP. Strategy guides City#s government#s actions on climate change.
Date achieved	04/10/2003	12/31/2008		07/30/2009
Comments (incl. % achievement)	100% - Strategy guides City#s government#s actions on climate change.			
Indicator 2 :	Completion of development of the regulations, institutional structure, business and management aspects of Metrobus. Metrobus in final stage of creation.			
Value (quantitative or Qualitative)	No enabling environment for corridors.	Metrobus operates in a sustainabe way and finances itself. Two new corridors under implementation (Eje 4 Sur and Insurgentes extension; OD study developed.		Metrobus operates in a satisfactory and sustainable way. Two new corridors under implementation (Eje 4 Sur and Insurgentes extension)
Date achieved	04/10/2003	12/31/2008		07/30/2009
Comments (incl. % achievement)	Metrobus operates in a satisfactory and sustainable way. Two new corridors under implementation (Eje 4 Sur and Insurgentes extension)			
Indicator 3 :	Satisfactory first stage of field test: 22 buses representing most available advanced and current standard technologies tested with dynamometer and RAVEM. Final test report published in may 2006.			
Value (quantitative or Qualitative)	No field testing of alternative bus technologies in Mexico City.	Results support decision taking process for technology for this and future corridors.		Results support decision taking process for technology for this and future corridors.
Date achieved	04/10/2003	12/31/2008		07/30/2009
Comments (incl. % achievement)	100% - Field test successfully concluded, results published and disseminated, and guiding decision making on alternative bus technologies.			

Indicator 4 :	Future transport projects incorporate climate change mitigation measures.			
Value (quantitative or Qualitative)	Transport Projects don't consider climate change aspects.	Analysis performed on cost-benefit, environmental, climate impacts of sust. transport projects, technical training provided to bus operators, maint. staff, etc.,Emission measurements completed.		Planned transport projects include climate change and air quality considerations, technical training provided to bus operators, maintenance staff, etc., emission measurements completed and capacity to develop emission inventories strengthened.
Date achieved	04/10/2003	12/31/2008		07/30/2009
Comments (incl. % achievement)	100% - Planned transport projects include climate change and air quality considerations, technical training provided to bus operators, maintenance staff, etc., emission measurements completed and capacity to develop emission inventories strengthened.			
Indicator 5 :	Dissemination program: showcasing corridor for the GDF population including TV, video and brochures, indicating characteristics, benefits and costs; scientific publications of field test results.			
Value (quantitative or Qualitative)	No dissemination.	Dissemination of project completed and reaching parties impacted by project. Public acceptance of corridor concept. Surveys indicate increasing acceptance trend.		Dissemination of project completed and reaching parties impacted by project. Public acceptance of corridor concept. Surveys indicate satisfaction with new transport system.
Date achieved	04/10/2003	12/31/2008		07/30/2009
Comments (incl. % achievement)	100% - Dissemination of project completed and reaching parties impacted by project. Public acceptance of corridor concept. Surveys indicate satisfaction with new transport system.			
Indicator 6 :	Most Project activities designed and performed satisfactorily.			
Value (quantitative or Qualitative)	No project management.	Sustainability of management and results of transport and climate projects in Mexico city.		Sustainability of management and results of transport and climate projects in Mexico city.
Date achieved	04/10/2003	12/31/2008		07/30/2009
Comments	100% - Sustainability of management and results of transport and climate			

(incl. % achievement)	projects in Mexico city.

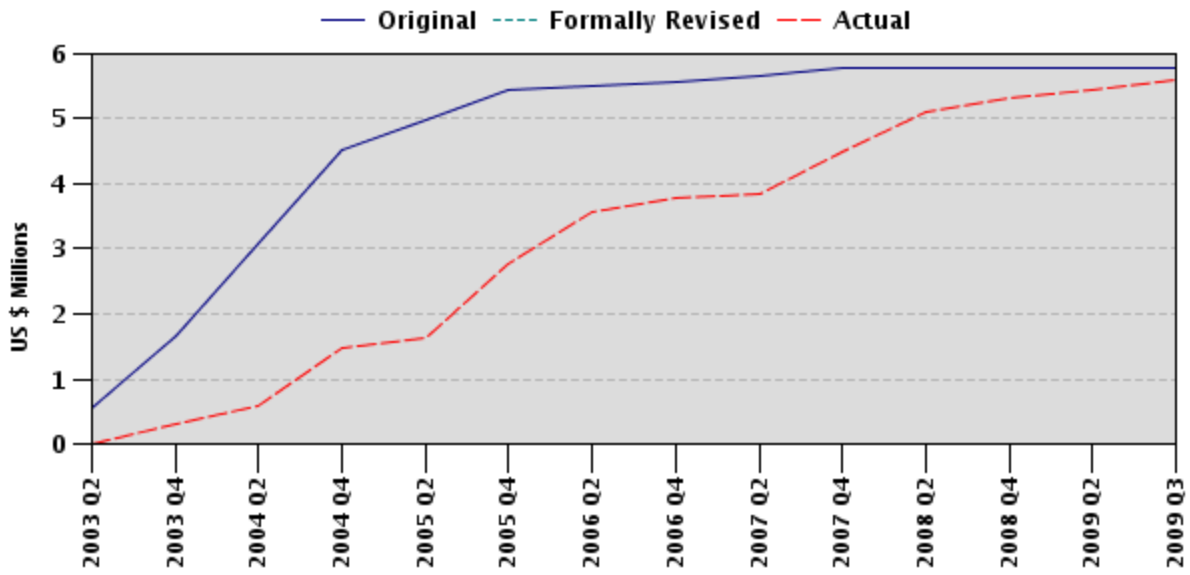
G. Ratings of Project Performance in ISRs

No.	Date ISR Archived	GEO	IP	Actual Disbursements (USD millions)
1	12/20/2002	Satisfactory	Satisfactory	0.00
2	05/28/2003	Satisfactory	Satisfactory	0.00
3	12/08/2003	Satisfactory	Satisfactory	0.58
4	06/04/2004	Satisfactory	Satisfactory	1.13
5	09/21/2004	Satisfactory	Satisfactory	1.54
6	04/27/2005	Satisfactory	Satisfactory	2.76
7	05/01/2006	Satisfactory	Satisfactory	3.66
8	12/27/2006	Satisfactory	Satisfactory	3.86
9	06/26/2007	Satisfactory	Satisfactory	4.51
10	12/11/2007	Satisfactory	Satisfactory	5.00
11	06/04/2008	Satisfactory	Satisfactory	5.29
12	12/24/2008	Satisfactory	Satisfactory	5.48

H. Restructuring (if any)

Not Applicable

I. Disbursement Profile



1. Project Context, Global Environment Objectives and Design

(this section is descriptive, taken from other documents, e.g., PAD/ISR, not evaluative)

1.1 Context at Appraisal

(brief summary of country and sector background, rationale for Bank assistance)

Country Background

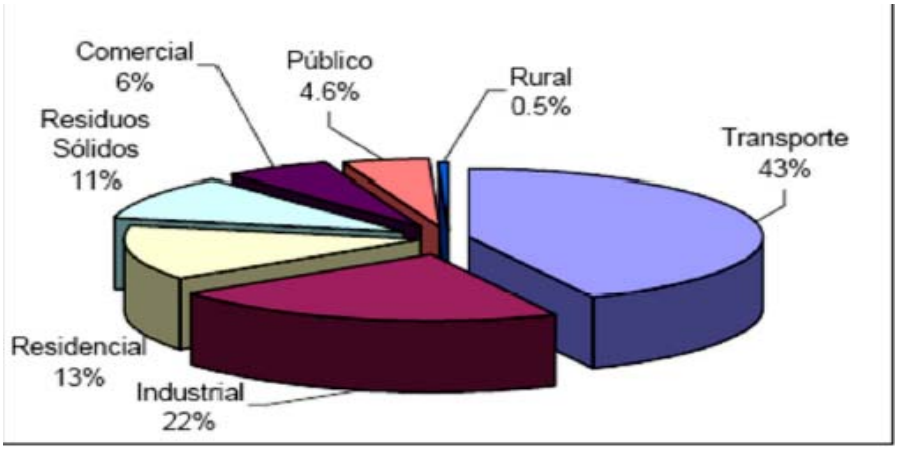
Characteristics of the Mexico City Metropolitan Area (MCMA). Mexico City extends over a surface of 1,428 km2. The metropolitan area has more than 21.1 million inhabitants of which 8.9 million live in Mexico City. This places the Mexico City Metropolitan Area (MCMA) among the most populated urban areas in the occidental hemisphere. Because of geographic and location factors (Mexico City as an elevated bowl due to surrounding mountains), temperature inversions and stagnant air masses contribute to higher concentrations of local criteria pollutants and worsen the local population's exposure. The city also centralizes a large fraction of economic activity, commerce and industry and thus is a major consumer of fossil fuels.

Sector Background

Gradual carbonization (increase of greenhouse gas emissions per passenger-km) of the transport sector - The energy and greenhouse gas inventories for the MCMA at project approval indicated a gradual increase in its energy intensity. This finding was evident in the analysis of the modal evolution in the public transport system in the MCMA during the period 1986-2000 which showed that both the metro system and the bus had lost share of the total public transport market, having been displaced by smaller vehicles. The gradual shift away from large capacity vehicles was, in part, an unintended effect of the atomization of services in the transport sector and the relatively poor regulatory system. This unwelcome development, especially in such a congested and polluted region as the MCMA, generated inefficiencies from a transport and environment perspective by adding to traffic congestion and reducing public transport productivity. It resulted in higher emissions and exposure to criteria pollutants and associated health impacts, caused increased releases of GHG, and was linked to increasing accident rates. A GHG emission inventory was calculated on the basis of the energy balance, following the IPCC methodology. The transport sector was the largest source of methane (CH4) and volatile organic compounds. The emissions of GHGs were linked to those of local airborne pollutants. Over 42% of the GHG emissions in the city were associated to the transport sector.

The Problem** of **Air Pollution in the Mexico City Metropolitan Area - Air pollution in the MCMA is of serious health and environmental concern. At project approval 19 million inhabitants were living in the MCMA, equivalent to about 19% of the country's entire population, and were exposed to high levels of ozone and particulate matter. The need to develop information and tools to tackle the problem in a comprehensive manner had led the City to develop integrated air quality management plans. The Third Air Quality Management Plan, in part supported by the Bank, was intended as a continuation of these efforts while also linking air quality to climate change issues and providing the required scientific and analytical basis to formulate further action. The Plan had the support of a blue-ribbon panel, with the participation of world-renowned specialists.

Figure 1. Emissions of CO_2 equivalent by sector in 2000



Source: SMA, 2006 Estrategia Local de Acción Climática de la Ciudad de México 2006

Health Costs of Air Pollution **-** While previous efforts in air quality management had yielded dramatic reductions in lead concentration, emissions of CO and sulfur dioxide, ozone concentrations had remained high, often exceeding acceptable levels. PM levels were also high along heavily congested zones and in areas under the direct influence of wind erosion of denuded land. Abatement of these contaminants remained a first priority for subsequent efforts since they had been directly linked to respiratory illnesses and mortality. A health impacts study, completed with Bank support as part of the assistance to the formulation of the air quality management plan, provided an economic valuation of benefits from reducing pollution in the MCMA. The study concluded that the annual benefits of a 10 percent reduction in ozone and PM10 is $759 million. High and low estimates of the value of a 10 percent reduction in PM10 are $1,607 million and $154 million, respectively. Obtaining air quality compliance (AQS 1) offers benefits of approximately $2 billion per year. These results highlighted the urgency of dealing with the air quality issue in the MCMA.[1]

Table 1: Summary of benefits from each scenario for ozone and PM_{10} combined (in US$ million per year, 2010 values in 1999 prices, income elasticity 1.0)

Estimates	10%	20%	AQS1	AQS2
High	1607	3184	3952	7636
Central	759	1489	1928	3580
Low	154	275	368	618

Large contribution of the transport sector to the problem of air quality **-** Under the Integrated Transport and Road Program (2002-2006), the transport authority of Mexico City attempted to address the growing demand for transport while minimizing its environmental impacts. However, the number of vehicles in the area is high for the available infrastructure, resulting in road congestion, large fuel consumption, unsafe conditions and high level of emissions. In particular, the increasing number of private cars exacerbates traffic congestion, which

[1] "Improving Air Quality in Metropolitan Mexico City. An Economic Valuation". World Bank, February 2002.

contributed to productivity losses, and higher level of emissions of criteria pollutants. According to the emission inventory and the Third Air Quality Management Plan (AQM-III) (2002-2010), the mobile sources accounted for a majority of NOx emissions, 40% of HC emissions and about 36% of particulate emissions. In addition to the large contributions to the release of local criteria pollutants, the transport sector in the MCMA is the largest contributor of greenhouse gases.

Congestion and low productivity in the transport sector - Traffic congestion affects public transport efficiency and, in addition, imposes direct and indirect costs on the urban economy. Time lost in traffic can add up to a substantial share of a city's output as it reduces the size of the effective labor market, imposes the need for higher inventory and more generally affects individual productivity. In Mexico, between 1990 and 2000, the number of motor vehicles on the road grew by 42%. At the same time, the population grew by 25%, while the number of trips grew even faster than the population. Inefficient public space management, including the lack of properly designed traffic signs and signals, uncontrolled vehicle parking, and inadequate facilities for pedestrians and other non-motorized traffic, contributed significantly to the congestion problem.

Lack of a sustainable business environment for public transport - The business structure of bus services in the Mexico City Metropolitan Area (MCMA) had led to highly inefficient operations, resulting in a costly, unsafe and environmentally unsustainable public transport system. The key issues were: (a) lack of an organizational model that would facilitate efficient public transport operation in the metropolitan area, (b) dispersed operations that hinder the effective control of bus services and contribute to traffic congestion, (c) inefficient use of vehicles, (d) deficiencies in bus inspection and maintenance, (e) lack of professional management among bus operators, (f) lack of coordination between transport operations in the State of Mexico and the City, (g) a fare system which penalizes transfers and thus discourages intermodal movements, and (h) systematic decline in the number of metro passengers since 1989 despite a 35% network extension during that period. These barriers required of substantial efforts at the policy and regulatory levels.

Need for a better harmonization of sector policies on the issue of Air Quality and on Climate Change - At time of project approval the metropolitan authorities had adopted comprehensive sector policies that already identified priority areas in transport, air quality and urban development.[2] However, there was a need for the sector authorities to harmonize the different programs as these relate to the issues of transport, air quality and land use. Successful incorporation of climate-friendly policies and measures would depend on the extent to which sector planning recognized the harmonization potential between climate change and sector policies, and on the realization of local co-benefits from actions on climate change concerns.

Government strategy

In 2001, a long-term, multi-sectoral[3], high-profile **Third Air Quality Management Plan (AQM-III)** was published on February 11, 2002, which provided the strategic framework to

[2] These are: Integrated Transport Program (2002-2006), the General Urban Development Program (2002-2006) and the Environmental Program (2002-2006) of the City. The corresponding Plans of the State of Mexico are: the Institutional Program of Medium Term (2000-2005) that integrates all the specific transport programs, the Sectorial Urban Development Program (1999-2005), and the Environmental Protection Program (1999-2005).

[3] Secretaries of Transport, Urban Development, and Environment.

guide necessary immediate interventions, and to further define, the goals and priorities, while identifying barriers and required reforms. Priority under the AQM-III was given to efforts to reduce particulates and ozone, both of which had shown to have unsustainable impacts on health and the environment. The plan established goals for the ten-year duration of the program in quantitative form. The plan identified the transport sector as a priority area and the adoption of transport corridors as a means to promote a modal shift to reduce its carbon footprint.

Table 2. City air quality achievements based on measurements (1990–Dec. 2006)

Year	*Ozone (ppm) max-min average*	*SO_2 (ppm) max-min average*	*PM_{10} (micrograms/ m^3)*	*$PM_{2.5}$ (micrograms/ m^3)*	*Suspended Particles (micrograms/ m^3)*
1990	0.111–0.207	0.04–0.069	64.2–186.5		1353
2000	0.117–0.162	0.01–0.03	43.7–125.0		634
Dec 2006	0.092–0.127	0.004–0.011	31.7–70.7	17.5–27.2	358

Source: Dirección General de Gestión Ambiental del Aire 2007

The Comprehensive Transport Plan of the MCMA (2002 - 2006) called for: a) gradual elimination of subsidies to the transport sector and restructuring of the fare system, b) integration of the transport system with the State of Mexico and promotion of modal shift through the development of metropolitan corridors; c) strengthening of the public transport system through the development and implementation of bus priorities; d) reduction in the environmental load of the transport sector into the MCMA air shed; and e) support to technology improvements in the transport sector through the introduction of better bus and rail technologies.

Promotion of a modal shift was a central part of the government's strategy. The key measure under consideration was the development of transport corridors on which high capacity, low polluting vehicles would operate. These corridors were being conceived as measures that would make more efficient use of infrastructure and move passengers in an integrated mode with the metro at higher speeds, lower costs per passenger and lower emissions per passenger kilometer and, at the same time, alleviate traffic congestion. The modal shift was expected to contribute to a reduction in the emission of greenhouse gases per passenger kilometer. A key element in the promotion of the modal shift would be the intended introduction of low emission, low carbon emitting vehicles. New-technology buses were also considered for the busway corridors, but first there was a need to obtain solid information on which to base the decision. The government conceived the air quality and transport policy as complementary elements that should facilitate the improvement of transport conditions in the City.

Rationale for Bank Assistance:

The Bank involvement would bring together an extensive experience and technical leadership on public-transport and air pollution issues and their linkage to climate change. The Bank's policy dialogue with the transport, environment and climate authorities was based on extensive expertise on the subject. Bank experience relating to urban climate change strategy, transport regulatory framework and business structure, carbon finance and BRT deployment as well as the provision of several support tools (PHRD, PDF B, GTF, Carbon Finance, GEF) were key assets in the implementation of the project. The Bank assisted the formulation of the AQM-III through: (a) support to the preparation of the 1998 emissions inventory, (b) quantification of the health impacts associated with poor air quality, (c) formulation of harmonization measures that could

jointly address local air quality issues and emissions of greenhouse gases (climate change), (d) modeling of the air quality in the metropolitan area and modeling of the measures, and (e) economic assessment of alternative courses of action (alternative control scenarios). In 2002, based on these studies, the Ministry of Environment of Mexico City together with the World Bank began to develop a comprehensive strategy for addressing greenhouse gas emissions in the city on the basis of a harmonization effort that could also result in reduction of local pollutants.

Global Operation Strategy/program objective addressed by the Project:
The project was consistent with the objectives of GEF Operational Program 11: Promoting Environmentally Sustainable Transport (OP 11). Under the OP 11, a first approach would promote the application, implementation, use and dissemination of commercial and near-commercial climate-friendly technologies where a reduction in greenhouse gas emissions would result. GEF would also support awareness building, assessment and analysis, institutional reform and strengthening, policy adjustments, regulatory measures and strategic transport and land-use planning. Information dissemination and public awareness campaign would be integral to widespread successful examples to raise the acceptance of climate friendly transport options.

Table 2: Sector Issues addressed by the project

Sector issues	Project response
Need for a better harmonization of sector policies on the issue of air quality and climate change	Harmonization of current sector plans and support to the development and implementation of a Metropolitan Climate Change Action Plan.
Lack of institutional coordination between the governments of the City of Mexico and of the State of Mexico	Creation of a technical committee for the implementation of the project. The different institutions would have a representative by jurisdiction (State, City, Federation) at the committee.
Lack of a sustainable business environment for public transport	Support to studies and adoption of recommended measures to strengthen the sustainability of the public transport sector, including the adoption of business practices, organizational measures and incentives that would promote the adoption of a BRT system.
Large contribution of the transport sector to the problem of air quality	Formulation and implementation of measures that would enable a significant modal shift. The intended modal shift would also contribute to address the gradual carbonization of the sector through the intended reduction in carbon emission intensity as well as promote a more efficient (less congested) system along the proposed corridors.
Global need for a comparative field test of low-carbon emitting vehicles.	Field test the types of advanced vehicles that could be used as a complementary measure to the modal shift, to capture gains in greenhouse gas emission reductions

1.2 Original Global Environment Objectives (GEO) and Key Indicators (*as approved*)
The project development objective was to contribute to the development of policies and measures that would assist in a long-term modal shift toward climate-friendly, more efficient and less polluting, less carbon intensive transport in the Mexico City Metropolitan Area (MCMA). Specifically, the project would support part of a 10 year multi-sector program by the metropolitan authorities (State and City), outlined in the Third Air Quality Management Plan (AQM-III 2002-2010) that would seek to contribute to improvements in air quality in the MCMA through the reduction in the emission of criteria pollutants, therefore reducing human

exposure and improving health indicators for the large area population. The program would focuse on reductions in emissions of particulate matter, ozone precursors and emissions of greenhouse gases from mobile and fixed sources in the MCMA, of which the transport sector had been shown to be a large contributor. The GEF project made part of the larger effort to achieve these reductions and harmonize said efforts with investments that would mitigate greenhouse gases from the transport sector. The project would promote the introduction of climate-friendly measures and technologies that would contribute to the sustainability of the transport sector.

Key performance indicators: (see Annex I)
a) Harmonization of sector planning in the environment, transport and urban development as it relates to air quality measures;
(b) Adoption and initiation of a Metropolitan Climate Change Action Plan in transport and associated measures;
(c) Adoption of organizational and barrier removal measures to facilitate the implementation of sustainable climate friendly transport strategies;
(d) Development and execution of a sound, scientifically designed test protocol of global relevance capable of yielding emissions and cost data of use for better decision making about this type of air pollution abatement measures;
(e) Incorporation of climate change issues in the design and operation of transport projects in the MCMA;
(f) Increased use of high capacity vehicles, non-motorized modes of transport as well as the increased public awareness of the advantages of transport corridors and climate friendly technologies; and
(g) Effective project management.

1.3 Revised GEO (*as approved by original approving authority*) and Key Indicators, and reasons/justification

The original GEO and performance indicators were not revised.

1.4 Main Beneficiaries

(original and revised, briefly describe the "primary target group" identified in the PAD and as captured in the GEO, as well as any other individuals and organizations expected to benefit from the project)

The actions promoted through the project would ultimately benefit the population of the MCMA by contributing to the harmonization and implementation of policies that result in direct reduction in exposure to criteria pollutants through the reduction of airborne pollutants and reduction in the emission of greenhouse gases. When implemented at a commercial scale, the emissions reductions and improvement of air quality would result in improvements in health indicators that would benefit the population at large and the most vulnerable groups (children and the elderly).Also drivers of private cars would benefit from decongestion as a result of modal shift and more efficient operation of buses on the roads. The riders of public transportaion would benefit from reduced fares and expanded and efficient services provided by METROBUS.

1.5 Original Components (*as approved*)

Component 1. Harmonization of sector strategies on air quality issues and Integrated Climate Action Plan for Transport (CAP) in the MCMA ($0.8 million with a $0.4 million GEF grant). This component would support efforts to: a) facilitate the process of integration of strategies between the air quality (the air quality management plan), urban development plans (land use plan) and transport sector plans in order to facilitate the adoption of harmonized policies on the air quality; b) assess urban development models as linked to the process of air quality management, review travel forecasting model used by SETRAVI and model interactions of transport activity with land use; and c) assist in the development, evaluation and monitoring of the Metropolitan Climate Change Action Plan as it relates to the transport sector.

Component 2. Definition of an enabling environment to facilitate the implementation of sustainable transport strategies ($4.8 million with a $2.9 million GEF grant). The project would support 1) a review of management and business organization measures in order to promote the adoption, design and use of BRT infrastructure, including a system of business organization, the concessions for specific bus line operations and the structuring of integrated fares; 2) technical assistance to identify, improve and facilitate the adoption of economic incentives and regulatory system reforms required to overcome barriers to adoption of high capacity and non-motorized transport. The reform of public transport regulations for the proposed corridors was supported; 3) definition of an institutional framework for the corridors including the integration with the metro and measures to promote metro rider-ship; 4) an assessment of organizational measures proposed by the Mexico City Authorities to improve air quality and public transport efficiency. The studies were expected to have a metropolitan character; 5) an action plan for non-motorized transport to promote the use of bicycles as a mode of transport and to divert commuters from motorized modes, especially private cars. The expected outputs of this component would facilitate the adoption of measures required to implement the corridors which would be funded under the proposed Second Air Quality and Transport Project.

Component 3) Field Test of Climate-Friendly High Capacity Vehicles ($4.8 million with a GEF grant of $1.6 million). This component would support a comparative pilot field test for alternative bus and fuel technologies (hybrid and CNG) and modern and standard diesel vehicles to test the comparative and absolute technical, economic, and environmental viability and climate advantages under typical operations in the MCMA. The testing vehicles would operate on a route, chosen to represent the average conditions of the metropolitan area, in terms of supply, demand, physical and topographic characteristics, and service providers. The buses would be operating on normal conditions, and their emissions would be regularly measured under a scientifically designed and statistically representative test protocol.[4] The test was aimed at: (a) developing a scientifically test protocol adapted to Mexico City's conditions that can produce significant data on: emission reductions, fuel efficiency, and indicators of operating and maintenance costs, (b) using the results of the pilot test to simulate the level of reductions in local and global pollutants that could be obtained assuming various scenarios of adoption of

[4] The test protocol, including sample size, were designed during project preparation by STE with assistance from MIT, University of West Virginia, the University of Toronto, and the Institute for Transportation Studies at the University of Berkeley). This field test would consist of real time measurement of the following parameters: (a) emissions (local and global) resulting from current and anticipated driving cycles, (b) real operating costs, (c) fuel efficiency per type of vehicles, and other indicators of sustainable transport with assistance from an ad-hoc high level steering committee with significant experience from institutions such as MIT.

these technologies, and (c) enabling cost-effectiveness and possibly cost-benefit analysis to determine the extent or rate to which the adoption of these technologies is justified compared to other air quality measures. The test was linked to other components in that it complemented regulatory and institutional activities that would enable the development of corridors with the examination of alternative buses to be used in the corridors, to reduce GHG emissions in the transport system. This component also included the provision of an essential framework for evaluation of alternative vehicle options. The project would fund the cost of the testing and monitoring protocols including the buses and the operation and maintenance costs.

Component 4. Technical assistance and training for incorporation of climate change and air quality considerations in the design and analysis of transport strategies (US$0.8 million; funded with a US$0.4 million GEF grant). This component's objective was to enhance capacity to incorporate climate and environmental considerations in the design of transport projects. Technical assistance, capacity building and training would be provided in the following aspects:
a) Review and support to the restructuring of legal functions for SETRAVI as related to transport planning;
b) Cost-benefit analysis and modeling using inter-alia, the data produced by the field test and including considerations of infrastructure costs, and local and global environmental impacts, using the data produced by the field test (component c). These assessments were to include the comparative cleaner bus test and the metropolitan transport corridors. The benefits and costs of these measures were to be compared with the benefits and costs of rationalizing existing infrastructure;
c) Development of methodologies for measurement and verification of emissions from Metropolitan Area public ground transport, including provision of training to bus operators, mechanics, and maintenance staff on the operation of the buses used in the pilot field test;
d) Training to transfer knowledge about testing procedures and potential of tested technologies, such as training for contracting and coordinating market surveys and institutional capacity building for the executing agency (SMA); and
e) Review and development of emission standards and transport regulations proposals to be applied in the Metropolitan Area.
The outcomes of this component would be used also for the establishment of the corridors.

Component 5. Public Awareness and Dissemination ($0.3 million, $0.165 million GEF grant). This component was to support the design of a public campaign with respect to the impacts of sustainable transport strategies on climate change, other environmental and health impacts, outlining the advantages and objectives of transport corridors as well as benefits from the use of high capacity vehicles and non-motorized modes of transport. This component would also support the dissemination of technical information produced by the project and will promote and finance workshops and stakeholder meetings.

Component 6. Project Management ($ 0.7 million, $0.335 million GEF grant). This component supported the management of the project activities, including monitoring and evaluation. The project would finance management costs in the form of consultancy services and travel. The implementation agency was the SMA of the City.

1.6 Revised Components
The components were not revised.

1.7 Other significant changes

(in design, scope and scale, implementation arrangements and schedule, and funding allocations)

There were not any significant changes.

2. Key Factors Affecting Implementation and Outcomes

2.1 Project Preparation, Design and Quality at Entry

(including whether lessons of earlier operations were taken into account, risks and their mitigations identified, and adequacy of participatory processes, as applicable)

Overall, quality at entry was highly satisfactory. The most important success factors during project preparation included:

A thorough project preparation process gave the project a solid technical and institutional base. The World Bank provided three grants (through its Policy and Human Resources Development Fund (PHRD), GEF and the German Trust Fund) in support of project preparation. These grants were coordinated through the SMA and the Federal District Government's Secretariat of Transportation and Roads (SETRAVI). Its main objectives were to: (a) define the strategic public transportation corridors that were most viable in the MCMA, providing financing for the basic design of the first corridor to be implemented (Insurgentes Avenue), including an assessment of environmental and social impacts; and (b) strengthen institutional capacity for carrying out these projects as well as for strengthening the management of the financial schemes that will enable the implementation of projects included in PROAIRE 2002–2010. The PDF B supported two types of studies: 1) assessment of the global nature of the air quality issues in the MCMA and; 2) assessment of specific alternative to address the emission of GHG. Under the global assessment, the PDF B supported an energy balance for the MCMA, a GHG inventory, and an assessment of energy intensity of economic activity.The preparation grants together with decisions and assessments undertaken by the Government constituted the basis for the project. The analysis of impacts of the corridors on job generation and any potential safeguard issues was also undertaken.

All these studies were instrumental in defining the project: the energy inventory identified the transport sector as the key user of fuels in the MCMA, and identified type of fuels used. The GHG inventory led to the quantification of GHG by each economic activity, identifying the volume and type of GHG released by the transport sector and confirming its character as key source of GHG. The energy intensity study revealed the increase in carbonization of the transport sector. Under the specific activities studies, the PDF B revealed the barriers that faced the modernization of the transport sector and the introduction of new technologies. Finally the efforts undertaken during 1999-2002 as part of sector work and provided the framework for the Bank's further cooperation with the MCMA and particularly for the project.

The implementation arrangements were fully adequate to address the consideration of climate concerns into transport projects. Given the contribution of the transport sector to air quality issues and to the emission of GHG, and the long term involvement of the SMA in addressing air quality, it was adequate to consider the SMA as the executing agency in close coordination with the Electric Surface Transport System (STE) which operates trolleys of

Mexico City. At the local level, the SMA is responsible for the implementation of Climate Change policy of the Federal District in coordination with federal authorities. SMA and STE helped identify the project at the beginning of 1999, and actively participated in the preparation and supervision of the preparatory studies. Their technical leadership in the project, their close coordination with the Federal District's transport authorities and the support of the co-financiers (including World Resources Institute, Shell Foundation, bus manufacturers and fuel suppliers) strengthened the mainstreaming of environmental concerns into the Federal District's transport sector planning and enabled an integral approach in the implementation of the project.

The government demonstrated a strong commitment to the project. Right from the beginning the project received strong support from the local and federal governments as demonstrated by the inclusion of the project among the administration's strategic priorities and sector programs. With the SMA the project had a local champion that was able to address barriers to the implementation of sustainable transport strategies and that achieved strong cooperation with the different sectors in that regard. The project was prepared with the participation of the SMA, SETRAVI and the STE and counted with the continuous support of private agencies as well as sustainable transport NGOs and counted with the attention of the Mayor of the city who was routinely briefed and met with the project implementation unit and bank representatives during the implementation of the project.

A long term cooperation on air quality and transport issues between the Mexico City authorities and the Bank. The partnership with Mexico City started at a time (early 1990s) when air pollution was of growing concern and gradually extended into climate issues. The Federal was in fact a pioneer in acknowledging climate concerns and recognizes the catalytic effect that the World Bank had in assisting in harmonizing the air quality and climate agendas. The need to develop information and tools to tackle the problem in a comprehensive manner led the City to develop integrated air quality management plans. The AQM-III (2002), in part supported by the Bank, brought a multisectoral, long-term approach that could link air quality efforts to climate change issues and provide the required scientific and analytical basis.

Period	Mexico City's decisions	World Bank's participation	Key results
1970–1990	Mexico City takes a proactive approach to control a deteriorating air quality situation. City enacts the first and second air quality management plans.		Major reductions in key local criteria pollutants are measured.
1994–2002	Measures identified in the second air quality management plan are targeted for implementation.	World Bank finances some measures under the Transport and Air Quality Management Project for the Mexico City Metropolitan Area.	City makes regulatory and policy decisions to reduce further emissions of airborne pollutants. Loan is used to finance fleet modernization and measures to reduce VOCs and PM emissions.
2002	A new regional air quality plan is drafted. It recognizes the role of GHG in air quality issues.	World Bank supports aspects of the analytical base for the plan and the identification of priority measures.	Updated local pollutant emissions inventory; GHG inventory; assessment of avoided health costs; air quality modeling tools are further developed.
2003–	City opts for implementation of climate-related measures in transport.	World Bank as implementing agency provides GEF financing for first climate and transport operation under OP 11.	Citywide climate change strategy is drafted. Testing of alternative public transport vehicles is undertaken.

Under the AQM-III, cooperation with the Bank resulted in an assessment of economic consequences of the failure to address air quality issues in the metropolitan area, the review of opportunities for harmonization of air quality and climate change concerns for the city, and the development of modeling tools to simulate air quality in the metropolitan area**.** The information and tools developed, as well as efforts made in parallel by other groups, enabled the launching of specific efforts to address the combined challenges posed by air quality and climate change in the city. These efforts ultimately led to the formulation and approval of the first transport and climate operation under GEF financing worldwide (Mexico: Introduction of Climate-friendly Measures in Transport—PIMAAT, P059161).

Inclusion of lessons learned in project design:
The design of the project was built upon the experience and lessons learned from the Bank's long-standing involvement in air quality issues in Mexico. The project design took into account the following lessons:

Air pollution** is **a long-term problem that requires a long-term response. The Mexican Government had recognized the need for a long term strategy to address the issues caused by air pollution (PICCA and PROAIRE) and accordingly had committed to the development of long range plans, the first of which covered a 5 year period in the City. To assist in this program, the World Bank needed to continue to have a long-term commitment that matches the time requirements needed to secure sizable and permanent improvements in air quality. A long-term vision and concomitant goals needed to be set, to guide removal of barriers and promote short-term measures. The support of a local climate change strategy, an enabling environment for bus corridors, the generation of data on alternative bus technologies for decision making, as well as technical assistance and dissemination of lessons learned represent long term responses by creating the framework for sustainable transport measures.

Planning for the long-term, however, requires flexibility. Previous experience had shown that, despite the best planning efforts in the preparatory stage, adjustments required in air quality management activities would only become evident during their implementation. The project design built in a sufficient degree to flexibility to account for political and technological changes and to support at the same time long term measures combining the transport and the local and global air quality agendas.

Wide participatory approach is required. A participatory approach, incorporating public opinion in the project, is required to establish legitimacy of the project. Widespread implementation of the proposed measures is also critical in order to achieve the desired results. The project considered a broad participation early on by establishing a technical committee to provide overall technical guidance that included representatives from the government agencies, from the private sector as well as from NGOs and technical, component specific working groups. The multi-sectorial composition of these working groups and of the project implementation unit helped complement and address different sectorial perspectives. Furthermore, a lot of emphasis was placed on the dissemination of results throughout project implementation and on the incorporation of public opinion through the realization of several workshops and seminars.

The Bank's involvement should continue to be used for its catalytic effect. The World Bank catalyzed the involvement and the participation of development banks and agencies, the private

sector, NGO's and foundations and research and training centers in the project design as well as during project implementation. The Bank mobilized technical and financial support and helped the exchange of lessons learned from other cities that had already gained experience with BRT systems. The project included dissemination efforts of the results and experiences obtained through the implementation of its components.

Local air management matters from a global perspective. Local air pollution issues and global concerns are linked. Local programs may contribute to global benefits. Major environmental and economic benefits can be achieved through a well-implemented reform of bus services. The project's focus on improving air quality through improving public transport services (transport being one of the main contributor to the local and global pollution) offered simultaneously local and global benefits as demonstrated by the GHG emission reductions and the reduction in exposure to local pollution measured as part of the project.

2.2 Implementation

(including any project changes/restructuring, mid-term review, Project at Risk status, and actions taken, as applicable) .

Implementation was highly satisfactory. There were no major changes or restructuring of the project. The project was never at risk status. Success factors during project implementation included:

Solid technical and administrative implementation arrangements and efficient coordination mechanisms – The project was executed by the SMA with the support of the STE. The SMA organized a technical committee with the representation of the agencies of the government of Mexico City, represented by the Secretary of SMA and SETRAVI, the State of Mexico, the Federal Government, and the World Resources Institute, which, through the Center for Sustainable Transport, assisted in the planning and coordination of the execution of the project. The technical committee provided guidance to the project implementation unit, located inside the SMA. An Advisory Board was set up to advise on technical/scientific and social matters.

Furthermore, the SMA created in support of the technical committee and for continuous technical support five working groups associated to the project's components. These working groups provided key technical inputs and were responsible for defining the technical characteristics of the supported project activities, and for the development of TORs, the technical supervision and evaluation of the supported studies and activities. These working groups were divided into the following topics: legal, institutional, technical, pre-payment schemes, financial, urban, social and communication, negotiation schemes, non-motorized transport, field test, carbon finance, and full fuel cycle. The PIU operated in a very satisfactory and responsive way, provided the Bank on a regular basis with detailed progress reports and achieved the majority of the pre-defined objectives. Coordination arrangements between the project actors, the financial intermediary and the Bank were adequate.

Supportive disposition by relevant authorities – A key aspect for the project's success was the strong support by the secretary of environment and the effective involvement of the highest city and transport authorities in the project. In addition, the BRT system supported through the project became a priority for the Federal District's past administration and continues to be one for the current administration. This is reflected in the planned corridor expansion program and in

the actions identified under the city-wide Climate Change Action Strategy and Program. The favorable disposition of the deciding authorities led to a rapid implementation of the first BRT system with associated funding.

Implementation of the first BRT corridor on the emblematic Insurgentes avenue: The selection of the Insurgentes avenue resulted in a great success and has considerably improved the image of public transport in the city. Surveys indicate high satisfaction with the system and confirm benefits associated with BRTs such as time savings, higher security, reduced exposure to local pollution and accessible fare system. At project start experiences with BRTs were still limited and the project was seen as a tool to test the BRT system in the conditions of Mexico City. Furthermore, climate change and air quality considerations were not yet fully integrated in transport sector planning and decision making. The executing agency was first considering the implementation of the BRT system on a route in the outskirts of the City. The considered Tlahuac corridor located in the south of the city had limited connection to other transport modes, limited impact on the city´s overall transit patterns and an overall limited visibility. However, as a result of a continuous dialogue between the government agencies, the Bank, strategic partners (e.g. Centre for Sustainable Transport) and BRT system experts, the focus changed to accelerating the learning experience with this type of transport systems and to demonstrating the priority given to public transport by the government.

An emblematic avenue was chosen as a consequence with a significant demand, strong interaction with the metro system, limited number of bus operators, and a strong visibility. The selected Insurgentes avenue was at the project start operated mainly by individual owner-operators of small buses organized under the "Ruta 2" that competed for customers within the market, and their day's pay depended upon passengers carried. While this system had led to high frequencies it had also led to a dramatic oversupply of poorly maintained old buses, slow speeds due to congestion, and ultimately to higher-than-necessary fares as well. The accidents, congestion, pollution and GHG emissions caused by this system affected quality of life and productivity, and the effect was particularly harsh on the urban poor, who were transit-dependent and live far away from jobs and services.

Successful negotiation process over the development of a BRT with Insurgentes bus operators: One of the important project challenges was the negotiation with the private bus operators of the Insurgentes avenue. At project start, the Insurgentes avenue was operated by the public transport operator RTP and by individual owner-operators of small buses organized under "Ruta 2". In order to achieve a successful implementation of the BRT system it was necessary to negotiate with the private operators and to achieve their integration in the new transport system. This process was led by the Federal District's secretaries of transport (in charge of issuing transport concessions) and of environment and resulted in the acceptance of the private bus operators to change their small bus (microbus) concessions against articulated buses concessions. Furthermore the private bus operators were invited to participate as operators of the Insurgentes corridor and created the Corridor Insurgentes Company (CISA) in that regard. The Insurgentes corridor operates today with a 75% participation of CISA and a 25% participation of RTP. The private bus operators benefit today from considerably improved working conditions and from higher and more stable revenues.

A few aspects at project entry led to implementation delays:

While the bulk of activities were completed on time, the project was extended twice (6 and 3 months). Factors that caused delays in the completion of some studies were related to the procurement processes and procedures. The implementation agency identified 15 steps between the developments of the TORs until the conclusion of a given contract. They assessed that it took an average time of 6-7 months to finalize these arrangements. The process was further complicated by the three different norms of the Federal Government, the Federal District government, and the World Bank.

On the substance, the involvement of the State of Mexico was limited considering that the focus was on the metropolitan area. Also, there were political differences between the state and the metropolitan administrations. Even though the authorities of the State of Mexico were permanent invitees to the technical committee which met twice a year, their participation in strategic decisions was of limited nature. However, information and lessons generated through the project were continuously shared with the State of Mexico. And the Insurgentes corridor has significantly benefited the transit of passengers from the State of Mexico who would travel to the City. Cooperation between both administrations has improved considerably recently.

The project was also going to support non-motorized transport and to promote metro ridership. Under Component 2, a non-motorized transport campaign was designed. However due to time constraints, this campaign was not implemented. But the City is committed to carry it out under the "plan verde" promoted by the city. The city was also able to support a variety of non-motorized transport measures with own funds. Progress with these measures include creation of biocycle ways (Ciclovias), bicycle parking, pedestrian walkways. With regard to the Metro the project did not result in analyzing options to promote the ridership. The Insurgentes corridor is however crossing five metro lines and operates in a complementary manner. Also, the metro system authorities are involved in the corridor system planning to ensure an integrated approach.

2.3 Monitoring and Evaluation (M&E) Design, Implementation and Utilization

The system for monitoring and evaluating project performance was implemented as described in the PAD and resulted in keeping implementation on track and in identifying and resolving critical issues affecting the achievement of desired outputs and outcomes. As per the design of the system, the indicators identified in the Project Design Summary (Annex 1 of the PAD) were reported on by the Project Implementation Agencies, were discussed by regular supervision missions, and were the focus of the assessments conducted as part of the Mid-Term Review and the final evaluations done at the end of the project.

The indicators defined at appraisal for the project for all its objectives were realistic and tangible. All the indicators are considered appropriate and useful to the process for assessing the progress towards achieving the project's objectives.

The monitoring and evaluation system included reporting requirements by the implementing agencies on a frequent basis to the project team. This entailed the development of a Design and Construction Summary Report of the BRT, bi-annual operational summary reports, dissemination and training reports, and strategic documents developed as part of the project activities (final field test report, local climate change action strategy and program, emission

reduction reports). The reports were delivered on time and in a satisfactory manner to the Bank through the financial intermediary, Banobras.

2.4 Safeguard and Fiduciary Compliance

(focusing on issues and their resolution, as applicable)

The project was rated category C. The project focused on climate change-related policy and regulatory reform and the development of a Metropolitan Climate Change Action Plan. The only activity with a potential environmental impact was the comparative field test of buses. However, the field test involved established routes, did not require any new works and therefore did not involve resettlement. The only environmental issues were related to standard maintenance of the vehicles. No financial reports are pending. All the audit reports were submitted and accepted by the Bank.

2.5 Post-completion Operation/Next Phase

(including transition arrangement to post-completion operation of investments financed by present operation, Operation & Maintenance arrangements, sustaining reforms and institutional capacity, and next phase/follow-up operation, if applicable)

City-wide Climate Change Action Strategy and Program:

The project resulted in the development of the City-wide Climate Change Action Strategy, the first of its kind in Latin America. The subsequent Mexico City Climate Action Program represents the operational tool of the strategy and defines concrete policy and on the ground actions in the field of climate change for the period 2008-2012. First advances of the climate action program in the transport sector include:

- Adoption of a city-wide BRT system, based on the successful experience of the Insurgentes BRT sponsored through the project. The expansion plan for METROBUs calls for a total of 10 corridors to be implemented over a period of 10 years. Already by mid 2009, a second corridor had been inaugurated (Eje 4) which successfully integrated all the lessons learned during the formulation, design and construction of Insurgentes.

- Design of an energy saving plan for the metro consisting of 1) installation of illumination systems powered by solar energy in the metro's maintenance facilities leading to a saving of 3,000 MWh/year; 2) installation of efficient illumination in metro stations representing a saving of 33,000 MWh/year; 3) realization of improved train operation and modernization of system reducing the energy consumption by 65,000 MWh/year. The full implementation of these measures would represent a saving of 10.95% of the yearly energy consumption of the metro system.

- Non motorized transport: The objective is to increment the percentage of trips realized by non motorized transport from 1% to 5% by 2012. In 2009, the federal district's government will build 21km of bike lanes and bike parking facilities in 5 metro stations.[5] The plan includes also the installation of 1000 bike parking facilities in streets and public spaces, as

[5] In Insurgentes Corridor, 5 bicycle parkings are constructed in Altavista, Revolución, Reforma, Glorieta de Insurgentes, and Sonora Stations.

well as a public bike provision system with a total of 1500 bikes distributed strategically in 51 stations. The totality of these measures is expected to lead to a reduction of 24,479 tCOe per year.

- Taxi substitution program: Mexico City has a fleet of 130,000 taxis of which 32% have been more than 10 years in use. A program has been designed to substitute the oldest taxi vehicles by providing the owner of the concession with 15,000 Mexican pesos in exchange for the vehicle and its destruction. In 2008, 35,043 vehicles were replaced through this program which represents an annual saving of 41 million liter of fuel and a reduction of 100,083 tCO2e.

- Microbus substitution program: There are currently 28,000 microbuses in operation of which 20,000 have surpassed their "useful life". Similar to the taxi substitution program the owner of the buses receive 100,000 mexican pesos in exchange for their vehicle and in order to take a credit to buy a bus certified with EPA 2004. In 2008, 305 have been replaced.

- Trolleybus corridor: One of the actual trolleybus lines will be converted into a corridor which will only operate with trolleybuses avoiding the operation of diesel buses. The resulting emission reductions are estimated at 28,000 tCO2e/year.

METROBUS and corridor (BRT) system:
The project resulted in the creation of METROBUS and the implementation of the first BRT corridor. The institution and the BRT system operate in a very satisfactory manner. This successful experience has led to the expansion of the BRT system (Eje 4 Sur – Line 2) and is now also being replicated in several other cities in Mexico. One of the main commitments of the city's current administration is the expansion of the METROBUS corridor net to a total of 200 km by 2012. The World Bank is currently preparing the Urban Transport Transformation Program (UTTP) supported through an IBRD loan and the Clean Technology Fund (CTF) with the objective to help Mexican cities to the transformation of urban transport toward a lower carbon growth path. Considered measures include the development of integrated transit systems (mass transit corridors and ancillary investments) and the promotion of low carbon bus technologies and scrapping of buses. This program is expected to be effective by December 2009 and incorporates the lessons learned from the GEF project.

Field test: The field test protocol continues to be applied to buses in order to test their performance in terms of local and global emissions, and their operation and maintenance cost. In support of these tests the RAVEM equipment purchased through the project is being used for on board emission measurements of buses. The data generated through the field test which has been published and disseminated supports decision making processes on alternative bus technologies.

Institutional Capacity: The SMA has a very committed and dynamic climate change team that has been key for the development of the city-wide climate change action strategy and program, and for its implementation. However, considering the dimension of the task to deal with the climate change mitigation and adaption agendas in Mexico City and the limited available funding, the team would require further institutional strengthening and support in the prompt implementation of the identified priority measures under the strategy. The SMA indicated strong interest in continuing the collaboration with the Bank in that regard.

3. Assessment of Outcomes

3.1 Relevance of Objectives, Design and Implementation
(to current country and global priorities, and Bank assistance strategy)

The MX introduction of climate friendly measures in transport project now fully implemented, has yielded some very significant results. Key outcomes of the project include 1) the harmonization of sector plans merged into a city-wide climate change action strategy; 2) the creation of a regulatory and business environment that enabled the development of Mexico City's first transport corridors (bus rapid transit systems); and 3) a field test of alternative bus technologies.

1) The first city-wide Climate Change Action Strategy in Latin America, with goals, timetables, programs identified, and budget requirements, was formulated, designed and completed and published as a result of the project. The strategy reflects a commitment by the Mexico City Government to reduce greenhouse gas (GHG), in synergy with local policies for reduction of local criteria pollutants, within the context of the UNFCCC and the Kyoto protocol and as a result of the harmonization of sector policies and climate concerns.
2) An enabling environment to facilitate the implementation of sustainable surface transport strategies was discussed, defined and enacted. The GEF project was instrumental in causing reforms to the policy, institutional, and regulatory framework for the transport sector in the city. The core of the reforms was enabled by the program to develop the BRT System. This is a remarkable achievement, as it involved the modernization of regulations and policies and their approval by the body politic of the city.
3) The support provided by the project through the modernization of the regulatory and policy framework was essential to the creation of METROBUS, a decentralized public entity with independent legal status and independent management under the city´s secretary of transport (SETRAVI). By the end of the project the METROBUS operates 2 corridors with a total length of 50 km, transporting 473,000 passengers every day and having transported 310 million people since operation started. These corridors reduced a total of 107 thousand tons CO2e between 2005 and 2008. Based on this successful experience the expansion of the corridor system to a total network of 200 km is planned under the current administration. Even more important, the measures developed as part of the METOBUS system to reduce the carbon footprint of the transport sector are central to the first Clean Technology Fund-supported project in the region, the Mexico: Urban Transport Transformation Program (UTTP). The project supported the formulation of one of the first methodologies, world-wide for the monitoring and everification of GHG emissions from the transport sector (NM0258).
4) The project has satisfactorily supported the comparative pilot field test for alternative drives (standard, series and parallel drives) and fuels (standard diesel, low sulfur diesel, and CNG) to test the comparative and absolute technical, economic and environmental viability and climate advantages under typical operations in the MCMA. The test results have been reported and published and are being considered in the decision making process on alternative bus technologies to be operated under the corridor program as well as in the context of the proposed UTTP project.

The project objective continues to be consistent with the City's current development priorities. The project focused on transport and it's interference with climate and air quality issues. Both agendas represent a priority for the current administration. With regard to transport, the current administration places its priority on improving public transport services. On the climate side the city has identified priority actions under the climate change strategy and program of which several are already under implementation as described in the previous section.

The latest **Country Partnership Strategy (CPS)**[6] identifies the following core themes for Mexico: *Accelerating Growth, Improving Competitiveness, Promoting social inclusion and reducing poverty, Developing infrastructure and assuring energy security, Strengthening institutions; and assuring environmental sustainability.* Within this broad framework, the CPS and the national development plan for promoting environmental sustainability mention its intention to turn the concept of environmental sustainability into a transversal element of public policies and assure that all public and private investments are compatible with environmental protection. The project's achievements are completely in line with the CPS's core theme on environmental sustainability, with its objectives and strategies. The project has been instrumental in promoting the modal shift toward more efficient and less polluting, less carbon intensive transport in Mexico City through the implementation of the first transport corridor. A considerable reduction of GHG emissions and of exposure to local pollutants has been achieved by the project.

The CPS indicates that the economic cost of environmental degradation is estimated at about *9* percent of GDP. This is said to represent a decline of *2* percentage points since the late *1990s.* Nearly *90* percent of this cost is reported to be due to air pollution. Mexico's National Institute of Ecology, in collaboration with the Sustainable Transport Center, conducted a study to estimate the impacts of the METROBUS operation on local pollutants. Concentrations of CO, PM2.5, PM10, and benzene were measured before and after the implementation of the corridor. The results of the measurements are summarized in the following table:

Table 3: Reduction of exposure to airborne pollutants along Insurgentes Corridor

	Transport Modes		
	Microbus	Autobus	Metrobus
Number of runs	36	37	68
Concentrations:			
Carbon monoxide (ppm)	15.8	11.4	7.5
Particulate Matter: $PM_{2.5}$ ($\mu g/m^3$)	152	129	99
Particulate Matter: PM_{10} ($\mu g/m^3$)	196	202	183
Benzene (ppbv)	10.2	8.9	4.2

Source: INE 2006

The project has demonstrated a feasible option to simultaneously address local and global air pollution concerns and the improvement of the public transport system. At the same time the successful implementation of the project served as a model for replication and has led to the first carbon finance operation in the transport sector in Mexico and by the Bank. The Mexico City

[6] Country partnership strategy of the World Bank Group with the United Mexican States, **March 4,2008 ;** Report No 42846-MX), FOR THE PERIOD FY 2008-2013.

Insurgentes Bus Rapid Transit System Carbon Finance Operation (P082656) seeks to contribute to reductions in local airborne pollutants and greenhouse gas emissions generated by the transport sector in the MCMA. This operation is now in its fourth year of implementation and the Bank is in the process of making the third payment for emission reductions.

The project continues to be consistent with both the GEF Operational Strategy (February 1996) for short-term projects in the climate change focal area and with the GEF guidance (2001) for the **GEF Operational Program 11**: Promoting the environmentally sustainable transport by promoting the long-term shift towards low emissions and sustainable transport forms.

Mexico has played an important role in the **Climate Change Convention** and the subsidiary meetings. It is the first country in Latin America to have submitted the Third National Communication (November 11, 2006). At the same time Mexico City is the first city worldwide to have developed a local climate change strategy which includes the transport sector among the priority sectors for mitigation of GHG. Mexico is also one of the two largest emitters of GHG in the region (1.5% of global GHG emissions[7]) and a country that has shown substantial vulnerabilities to the impacts from Climate Change.

3.2 Achievement of Global Environmental Objectives

(including brief discussion of causal linkages between outputs and outcomes, with details on outputs in Annex 2)

The project emphasized the following measures in ground transport: (a) Modal shifts to more efficient and less polluting forms of public and freight transport through measures such as traffic management and avoidance and increased use of cleaner fuels; (b) Non-motorized transport; (c) Fuel-cell or battery operated 2- and 3-wheelers designed to carry more than one person; (d) (Hydrogen)-powered fuel cell or battery-operated vehicles for public transport and goods delivery; (e) Internal combustion engine-electric hybrid buses; and (f) Advanced technologies for converting biomass feedstock to liquid fuels. The project was particularly successful in promoting the modal shift from small inefficient and polluting buses to articulated ones. Three hundred fifty small buses were replaced by 102 articulated buses achieving accountable reductions of 67,387 tCO2e in the first two years of operation. The replaced vehicles were scrapped in order to avoid their use elsewhere and to achieve the intended GHG emission reductions. In fact, the scrapping certificates are a condition for the payment of achieved emission reductions. In addition to achieving the modal shift from inefficient small buses to articulated ones, the BRT system resulted also in the modal shift from cars. The latest emission reduction report indicates that 15 % have left their cars at home in order to use the BRT system. In addition to that the project promoted the use of non motorized transport and realized the testing of 3 hybrid buses in the operation conditions of Mexico City. As a consequence of this experience and the availability of data on hybrid buses the Bank has facilitated a grant that will support the introduction of a fleet of articulated hybrid buses in Mexico City. This grant has been approved and the introduction of the fleet is expected for next year.

[7] WRI, Navigating the Numbers, 2005.

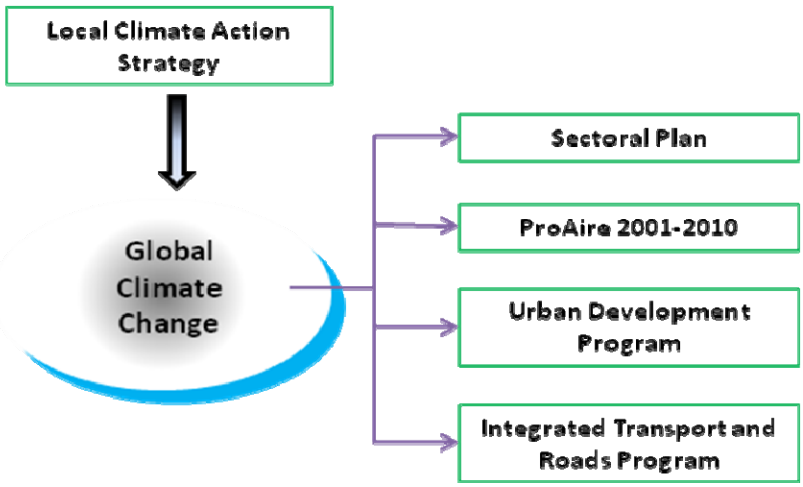
Table 4: Results of Key indicators

Key indicator	Result
The harmonization of sector planning in the environment, transport and urban development as it relates to air quality measures.	The harmonization of the plans took place through a stronger cooperation between the environment, transport and urban development authorities in relation to public transport planning and measures oriented towards reducing air pollution. The harmonization of the sector plans merged into the local climate action strategy and program. The results of the sustainable transport study supported under the project that defines several measures to reduce the pollutants will be integral part of the Urban Development and transport sector programs.
The adoption and initiation of a Metropolitan Climate Change action plan in transport and associated measures;	The SMA produced the first city-wide climate change action strategy and program in Latin America. The strategy and program have both been adopted by the Federal District's dependencies and guide their actions in the climate change field. The program defines priority climate change related policies and actions and is already under implementation. The program focuses on actions in Mexico City and has limited metropolitan character. However, measures identified under the program have benefits on a broader geographical scale. Transport measures are among the priority measures identified in the strategy and program.
The adoption of organizational and barrier removal measures that facilitate the implementation of sustainable climate friendly transport strategies;	The project was instrumental in causing reforms to the policy, institutional, and regulatory framework for the transport sector in the city. Concrete results include development and successful operation of first BRT system and the creation of Metrobus to manage the corridor program. Metrobus operates in a very satisfactory manner.
The development and execution of a sound, scientifically designed test protocol of global relevance capable of yielding emissions and cost data of use for better decision making about this type of air pollution abatement measures.	The project resulted in solid test protocol and testing has resulted in valuable data which are being taken into consideration in the selection of bus technologies. Measurement equipment and field test procotol continue to be applied to test performance of buses.
The incorporation of climate change issues in the design and operation of transport projects in the MCMA.	The climate agenda is fully integrated into the transport sector in Mexico City. Sustainable transport measures represent priorities for current administration and are included among priority measures in the climate change action strategy and program. The project claims the honor of having sponsored the development of one of the first methodologies world wide for monitoring and verification of GHG emissions from the transport sector.
The increased use of high capacity vehicles, non –motorized modes of transport as well as the increased public awareness of the advantages of transport corridors and climate friendly measures;	Mexico City is at the forefront in international forums on climate change and cities and provides a model for several cities. In Mexico City surveys indicate high satisfaction with new transport system and awareness on benefits. The campaign for non motorized transport has been designed and is expected to be implemented under the current administration.
An effective project management.	Project team operated in a satisfactory manner in administrative as well as in technical terms.

Sub-objective 1: Urban, transport and air quality plans and planning processes harmonized; Metropolitan Climate Change Action Plan and associated measures adopted and initiated. The achievement of this sub-component was rated highly satisfactory. This rating reflects the fact that the first citywide Climate Change Action Strategy in Latin America, with goals, timetable, programs identified, and budget requirements, was completed and published in 2006 (SMA 2006 a copy is in the project files). The strategy represents a policy commitment to reduce GHG emissions across sectors in synergy with policies designed to reduce local airborne pollution, within the context of the UNFCCC and the Kyoto Protocol. This initiative concentrates various actions of the 2002-2006 Program of Environmental Protection for Mexico City implemented by the SMA, particularly for the 2002-2012 Program for Air Quality Improvement for the Metropolitan Area of the Valley of Mexico (PROAIRE) and for the program of Ecological Restoration of Conservation Land in Mexico City.

The central tenet of the strategy is to seek reductions of GHG emissions through the implementation of multi-sectoral measures designed to make better use of natural resources, the regulation and efficient use of installed equipment, fuel substitution, and the use of new technologies and alternative sources of energy. The strategy harmonizes development strategies with the goals of a reduced carbon footprint and the adoption of adaptation measures. The strategy seeks an increase in GHG sinks in the city through a reforestation program and better land-use planning. It also includes an assessment of vulnerability to anticipated impacts of climate change and actions to reduce vulnerability through the adoption of preventive measures.

Figure 1. The local climate change strategy and the sector development plans



Source: SMA 2006

The Government of Mexico identified several options in its local climate-change strategy in order to mitigate greenhouse gases from the transport sector. These options include:

(i) the introduction of transport corridors, the regulation of public transport timetables, the design of direct or express routes, and the promotion of cycle lanes. Among new measures to organize traffic, the government identified the broadening and improvement of streets, the improvement of the public transport network including exclusive bus lanes, the regulation of microbuses and

taxis, and the extension of the Metro network. The aim of these measures is to transport a high number of passengers with the lowest possible fuel consumption. Other measures include controlling of the number of circulating vehicles, and organizing taxis.
(ii) the use of fossil fuels with low carbon content such as compressed natural gas; the use of renewable fuels including biodiesel;
(iii) the introduction of climate-friendly technologies such as hybrid, fuel cell, and electric vehicles, and the renovation of the public transport fleet; and
(iv) the establishment of norms that allow emissions to be controlled.

The subsequent development of the Mexico City Climate Change Action Program (CCAP) (2008-2012) supported through the project represents the operational tool of the strategy and defines concrete priority policy and on the ground actions in the field of climate change. The CCAP has two main objectives: the mitigation of GHG that consist in reducing 7 million t CO2e between 2008 and 2012, and the integration of a climate change adaptation program for Mexico City and its full functioning by 2012. The CCAP considers actions in 6 thematic areas: energy, transport, water, waste management, adaptation, communication and environmental education. These actions are divided into 26 mitigation actions, 12 adaptation measures, and 6 communication and education measures. The CCAP is complementary to the Federal District's "plan verde" which represents a public policy tool oriented towards Mexico City's long term sustainability.

Through active participation and consultation with project implementation representatives from the urban planning, transport and environmental authorities, the Mexico City Climate Change Action Program identified actions in the different sectors and has been adopted by the relevant authorities, thus achieving harmonization of different sector strategies on air quality issues.

Sub-objective 2: Organizational and barrier removal measures (enabling environment) to facilitate implementation of sustainable, climate friendly transport strategies identified and action plan for non motorized transport designed. The achievement of this sub-component was rated highly satisfactory. The main outcomes were the development of Mexico City's first BRT system and the creation of the institution METROBUS that manages the BRT system. The efforts brought together through the GEF-funded project were instrumental in causing reforms to the policy, institutional, and regulatory framework for the transport sector in the city. A summary of these reforms is presented in the table below. The core of the reforms was enabled by the program to develop the BRT System. These included the necessary institutional, business management, and regulatory improvements required to operate the proposed corridors. Specifically, the support provided led to the creation of METROBUS, a decentralized public entity with independent legal status and independent management, under the Secretariat of Transport. METROBUS's primary focus is the

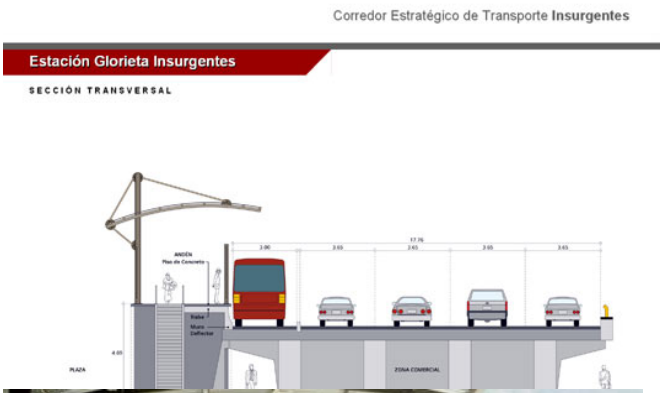


Image: Metrobus

Photo: SMA

management and planning of the corridor program. It also monitors the program's performance and assists in replicating the experience. METROBUS supervises the fare collection and prepayment system. It contracted a specialized company to provide, install, and maintain the necessary payment collection system. The city committed to the adoption of a reform program, summarized below:

The operation of the corridor includes the following elements, which were developed taking into account the experience with the Transmilenio BRT system in Bogota, Colombia:
(a) one entity in charge of administration, planning, and verification (METROBUS);
(b) two corridor operating companies (RTP and CISA) over Insurgentes Avenue under a well-defined regulatory and management structure, representing a significant departure from the chaos of a multiple small companies working under a loose regulatory structure;
(c) physical infrastructure for bus transport;
(d) a modern fare collection system; and
(e) a private trust fund for revenue administration.

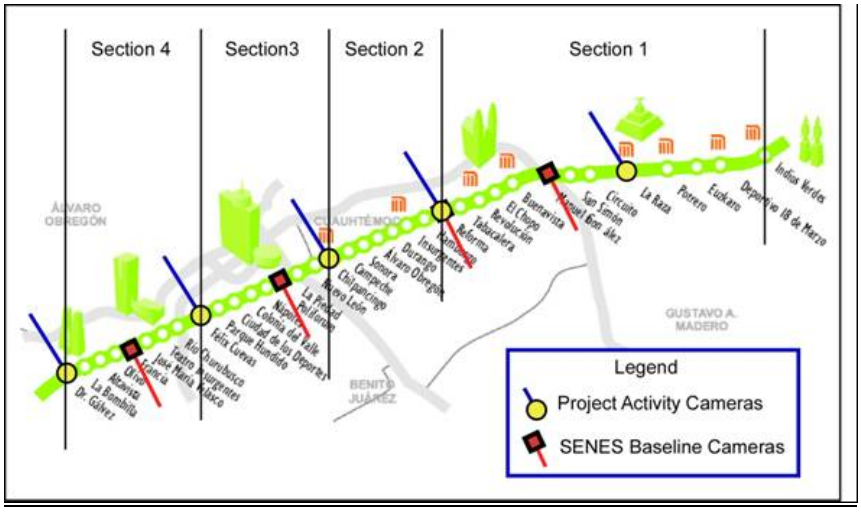
Table 5. Policy, institutional, and regulatory framework reforms caused by the Transport Corridors Program

	Baseline	**Reform caused**
Policy		
Overall transport plan	No inclusion of transport corridors or modal shift measures.	Transport corridors were made part of the AQM and transport plans, and were acknowledged as a modal shift measure.
Institutional		
	No entity responsible for transport corridors.	Creation of METROBUS as a dedicated, independently managed institution for management, monitoring, and planning of transport corridors.
	Bus operators along Insurgentes Corridor based on individual, disorganized, small-scale operators.	Creation of CISA, a commercial operator; financially sound, small-scale operators form a single company.
Business environment		
	Fare structure does not meet efficiency criteria and discourages intermodal transfers.	An integrated fare has been developed, corresponding to actual fare. No additional subsidies are implied. Efficiency gains through the corridor program allowed the fare to be kept at current levels.
	Poor application of regulations	METROBUS will monitor and manage the corridor. SETRAVI has frozen licenses for new microbuses.
Environmental and social impacts		
	Current structure of bus operations is polluting.	First transport corridor realizes modal shift (toward modern bus technologies), thereby reducing global and local pollutants.
	Bus operators on Insurgentes work under difficult conditions.	Working conditions for bus operators improve considerably in terms of time (1 working shift per day [12–14 hours] replaced by 1 [8-hour] shift) and safety.

The METROBUS BRT system's main characteristics are:

- Exclusive bus lanes
- Elevated bus stations for high platform vehicles
- Pedestrian facilities leading to the transport corridor's bus stations
- Concessions of services on the corridor to a restructured company using large and low polluting articulated buses
- Promotion of low-pollution passenger transport vehicles and scrapping program for old vehicles on Insurgentes
- Smart cards
- Automatic transit system

Figure 2. Insurgentes Corridor: First BRT in Mexico City



Key performance indicators of METROBUS:

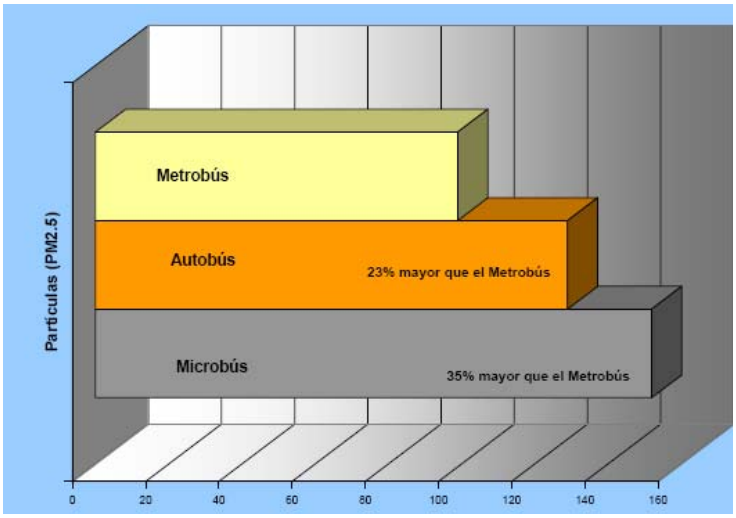
To date METROBUS is operating two corridors (Line 1 and 2) with 81 stations, of a length of 50 km, with connections to several metro-lines. The project supported the development of Line 1 (Insurgentes). The corridors go through 9 out of the 16 delegations. The length of the corridors is 30 km from north to south (line 1) and 20 km from west to east (line 2). Line 1 transports 350,000 passengers on a daily basis, and Line 2 transports 123,000 passengers, amounting to a total of 473,000 passengers using the system every day. According to surveys 15% of the users of the system have left their car at home in order to use METROBUS. To date METROBUS has transported 310 million people with its BRT system.[8]

The METROBUS system has reduced a total of 107,257 tCO^2e between 2005 and 2008, of which 50,000 tCO^2e are being reduced per year by line 1 and 20,000 tCO^2e by line 2. In terms of local pollution, the reduction of local pollutants emissions is estimated at 11,096 t per year (1,108 t/year of CO; 9,709 t/year of hydrocarbons, 206 tNO^2/year, and 1.27 t of PM smaller than 10 µg). METROBUS includes access for disabled persons such gratuity of service, access ramps to stations, tactile guides for blind people, same level access to buses from platforms, exclusive spaces for wheelchairs, acoustic alarm system in buses, and elevators for wheelchairs. The payment system is automatic with electronic cards. To date 4 million cards have been in use.

The successful creation of the enabling environment as well as the satisfactory operation of the Insurgentes corridor have led to the plan to expand the system and to have a total of 200 km of corridors in operation in Mexico City by the end of the current administration. The successful experience is also feeding the development of the UTTP which seeks to contribute to the transformation of urban transport in Mexican Cities toward a lower carbon growth path.

[8] An articulated bus is said to transport the equivalent of 126 cars based on car occupancy rates in Mexico. These buses are certified with Euro IV and include 209 articulated and 12 bi-articulated buses.

Figure 3. Reduction of relative exposure to particulate matter by METROBUS



Exposure to $PM_{2.5}$ in micrograms per cubic meter

The benefits of the operation of the Insurgentes corridors from the perspective of the different beneficiaries can be summarized as follows:

For the user of the transport system:

- Time savings; Safer transfers and trips
- Improvement in urban image and in quality of life
- Health benefits through reduced exposure to local pollutants
- Better accessibility for people with disabilities; Affordability

For the transport operators:

- Integration into a formal business structure
- Change to a better planned, more competitive and profitable business
- Better working conditions and work security

For the government:

- More efficiency (organized fleets) and control of public transport
- Lower investment in comparison to other transport modes
- Development of a sustainable transport system
- Incentives for introduction of new technologies and alternative fuels
- Improved relationship with private bus operators
- Increased security and reduction in accident rates

Sub-objective 3: Field test demonstrates less polluting, climate friendly transport alternatives; Decisions made on alternative transport are based on data from field tests. The achievement of this sub-component was rated satisfactory. This component has achieved a solid field test with a protocol that continues to be applied. Data generated through the test has provided valuable information on the performance of alterative bus technologies in the

conditions of Mexico City and guide future decision making on technology selection. Specifically data produced on hybrid bus performance has supported the successful approval of a grant to introduce a fleet of articulated buses into Mexico City. The buses are expected to be purchased by the end of 2010 (a copy of the results of the field test, published in 2007) are in the project files.

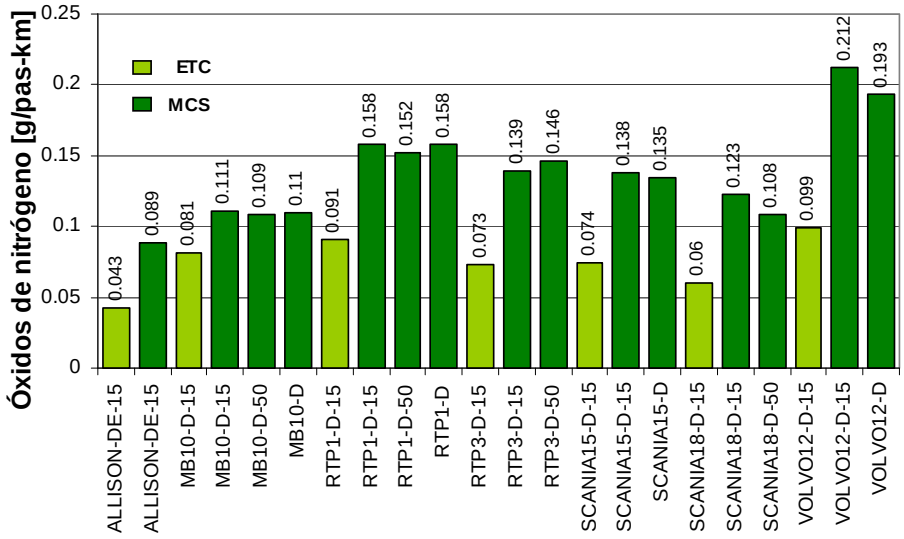
Background:
Although there was information on alternative bus technologies and a growing amount of data on field tests of new types of vehicles (most notably in New York, Toronto, and São Paulo), information on operation under real conditions at Mexico City's altitude was not available. Running a field test in Mexico City was considered timely and complementary to existing information on the basis of:
(a) the magnitude of the air quality problem;
(b) the recently completed comprehensive Third Air Quality Management Plan;
(c) the availability of a modeling tool, focused on the characteristics of the metropolitan area to simulate and evaluate impacts of the proposed measures;
(d) the presence of bus manufacturers; and
(e) available data on local and greenhouse gas emissions (inventories) that provide the current baseline.

The field test yielded data on emissions information for the different types of buses and also provided data on bus operation and maintenance. This complemented and validated information already available. The project supported the comparative pilot field test for alternative drives (standard, series and parallel drives) and fuels (standard diesel, low sulfur diesel, and CNG) to test the comparative and absolute technical, economic, and environmental viability and climate advantages under typical operations in the MCMA. The testing vehicles were operated on a route that was chosen to represent the average conditions of the metropolitan area in terms of supply, demand, physical and topographic characteristics, and service providers. The buses operated under normal conditions, and their emissions were regularly measured under a scientifically designed and statistically representative test protocol. The field test consisted of real-time measurement of the following parameters: (a) emissions (local and global) resulting from current and anticipated driving cycles; (b) real operating costs; (c) fuel efficiency per type of vehicles, and other indicators of significant experience from institutions such as MIT. The test was aimed at:
(a) developing a scientific test protocol adapted to Mexico City's conditions that can produce significant data on emission reductions, fuel efficiency, and indicators of operating and maintenance costs;
(b) using the results of the pilot test to simulate the level of reductions in local and global pollutants that could be obtained by assuming various scenarios of adoption of these technologies; and
(c) enabling cost effectiveness and possibly cost-benefit analyses to determine the extent or rate to which the adoption of these technologies is justified compared to other air quality measures. The test was linked to other components in that it complements regulatory and institutional activities that would enable the development of corridors with the examination of alternative buses to be used in the corridors, to reduce GHG emissions in the transport system. A part of the field test this component also included the provision of an essential framework for evaluation of alternative vehicle options.

Test results

The dynamometer and online tests were conducted during 2005 and 2006 at the installations of the STE and over the actual Insurgentes Avenue, prior to construction of the Bus Rapid Transit System. Because the test fleet consisted of only a few vehicles per type and in many cases for advanced technologies a single vehicle was tested, caution should be exercised in extrapolating the information obtained. The results have been reported and published (West Viriginia University 2005; SMA 2006). The test results for the dynamometer clearly indicate advantages in emissions of N2O, particulates, and CO2 for the hybrid parallel drive vehicle (the series drive did not reach Mexico City on time for tests on the dynamometer) over the standard drive diesel vehicles.

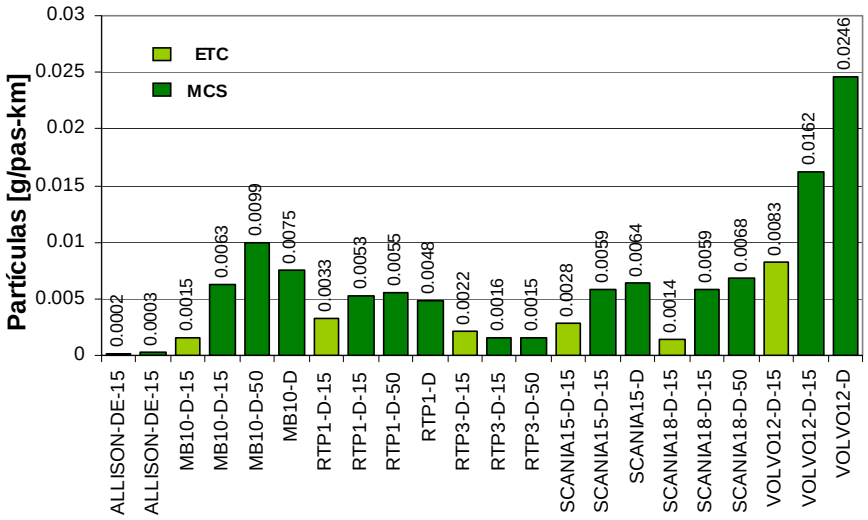
Figure 4. Emissions of N_2O in grams per passenger-kilometer for the testing fleet



Source: SMA, 2006

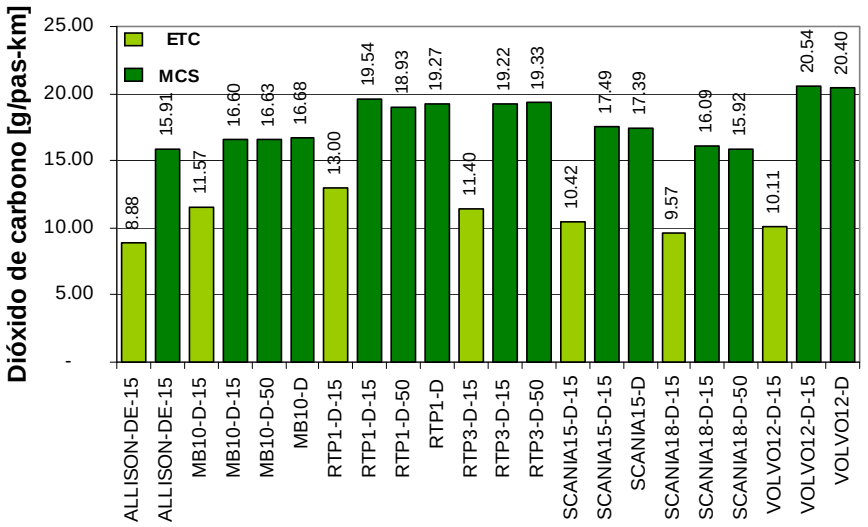
Figure summarizes the results of the dynamometer test on N_2O for both cycles. The hybrid parallel drive vehicle clearly outdistanced all other vehicles in the fleet. Figure 12 likewise summarizes the corresponding results for PM_{10}. Again, the hybrid vehicle had lower emissions of particulates compared to the rest of the fleet.

Figure 5. Particle emissions in grams per passenger-kilometer for the testing fleet



Source: SMA, 2006

Figure 6. CO_2 emissions in grams per passenger-kilometer for the testing fleet



Source: SMA,2006

Sub-objective 4: MCMA transport projects incorporate climate change issues in design and operation. The achievement of this sub-component is rated satisfactory. This component focused on strengthening the integration of climate change concerns in the planning of transport project and on strengthening the capacity to quantify related local and global emission reductions. The main result of this component was the development of a baseline methodology to account for the emission reductions resulting from the operation of the Insurgentes corridor as well as of the Eje 8 corridor. The analysis was realized before the start of the construction and once the Insurgentes corridor was operating. This methodology has been applied in the case of Insurgentes and has served to quantify the emission reductions through the operation of the BRT system. The

methodology has undergone several changes due to the pilot character of the task and the complex review process by the UNFCCC meth panel but latest review results indicate favorable outcomes of the submitted methodology. Furthermore the component has resulted in strengthening SMA's capacity in elaborating GHG emission inventories and in obtaining GHG emission baselines. The staff in the area of inventories in the SMA (but also two representatives of the State of Mexico) was trained in the realization of inventories and baselines of the main GHG. The current administration demonstrates a high commitment to the reduction of local and global airborne pollutants in transport projects and has the measurement tools in place to account for the exact reduction potential of planned projects.

SETRAVI's legal review was done as part of the analysis for the creation of Metrobus. Cost-benefit analysis and the environmental impact analysis were conducted as part of the design of the Insurgentes Corridor BRT system. CC impacts assessment was done as part of the preparation of the carbon finance operation.

Sub-objective 5: Better understanding of the potential of high capacity vehicles, non motorized modes of transport as well as increased public awareness of the advantages of transport corridors and climate friendly technologies. The achievement of this sub-component has been rated satisfactory. This component has resulted in the publication of a variety of reports[9] of which the following are of particular importance: 1) Field Test report; 2) Local climate change strategy for Mexico City; 3) Local climate change action plan for Mexico City; and 4) Final report of GEF introduction of climate friendly measures in transport. Furthermore, this component contributed to the design of the non motorized transport campaign. The City is commited to implement the campaign beyond the project life. Surveys conducted annually by METROBUS indicate a high satisfaction of the users with the corridor system. (See Annex 6)

Sub-objective 6: Effective Project Management team established adequate for use in future operations. The project has been executed in a satisfactory manner. The multi-disciplinary composition and technical capacity of the working groups resulted extremely valuable for achieving the project's objectives in an integral manner. The day to day operations of the project were responsibility of the project implementation unit consisting of one general project coordinator, and technical and administrative-financial coordination units. The PIU operated in a very satisfactory and responsive way, provided the Bank on a regular basis with detailed progress reports and achieved the majority of the pre-defined objectives. Coordination arrangements between the project actors, the financial intermediary and the Bank were adequate.

3.3 Efficiency

An incremental cost analysis was done as a requirement of the GEF. The baseline scenario assumed the continued investment and operation of diesel buses. The implementation of the baseline scenario entailed costs estimated at US$4.1 million, while the GEF alternative incurred costs estimated at US$12.2 million. The incremental costs associated with the implementation of project were estimated at US$8.1 million. The GEF funded US$5.8 million of this as part of the project. Other cofinancing sources funded the balance.

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[9] The oficial gazette publicized the guidelines of the Metrobus operations: Gazette No. 98, September 24, 2004. The establishment of the Insurgentes Corridor was publicized in Gazette No. 101, October 1, 2004. The creation of Metrobus was publicized in Gazette No. 29, March 9, 2005.

The project supported the development of the enabling environment (barrier removal, organizational measures) and field tests that are essential for the construction of the bus rapid transit system. As a result, the BRT system of a total of 50km was successfully established. Infrastructure costruction costs of Insurgentes Corridor are estimated at US$3.5 millon per km. In comparison, those for Phase I of the TransMilenio system in Bogota, Colombia (a total of 41km) are reported at about US$210 million or US$5.0 million per km. (Ardila and Menckhoff, 2002). However, it needs to be taken into consideration that the unit cost involves many factors, including not only project management, but also design, implementation, materials, labors etc. which may significantly differ from each other.

3.4 Justification of Overall Outcome Rating
(combining relevance, achievement of GEOs, and efficiency)
Rating: Highly Satisfactory

This rating reflects the fact that the project achieved the majority of its measurable outcome indicators defined in the PAD and went even beyond some of the expected outcome indicators. Specifically, the project supported the harmonization of sector planning in the environment, transport and urban development as it relates to air quality measures; it supported the adoption and initiation of the climate change action strategy for the city, in that regard the metropolitan character of the plan remained limited due to the limited participation of the State of Mexico; it achieved the adoption of organizational and barrier removal measures to facilitate the implementation of sustainable climate friendly transport strategies as demonstrated by the successful operation of the Insurgentes corridor and of the subsequent corridor on Eje 4 Sur; it developed and executed a sound, scientifically designed test protocol providing emission and cost data of use for decision making on alternative bus technologies; it reached the incorporation of climate change consideration in the design and operation of transport projects; it led to the increased use of high capacity vehicles, non-motorized transport modes as well as the increased public awareness of the advantages of transport corridors and climate friendly technologies; and finally it was managed in a satisfactory manner. The achieved results are already providing a basis for follow up activities.

3.5 Overarching Themes, Other Outcomes and Impacts
(if any, where not previously covered or to amplify discussion above)
(a) Poverty Impacts, Gender Aspects, and Social Development

In Mexico s public transport services are mainly used by the poor who are transit-dependent and live often far away from jobs and services. The project achieved the implementation of a cleaner, more efficient and affordable transport system on the Insurgentes corridor thus directly benefiting the poor. Furthermore the Insurgentes BRT has achieved a reduction in exposure to local pollutants with impacts on the health of the users of the system.

(b) Institutional Change/Strengthening
(particularly with reference to impacts on longer-term capacity and institutional development)

Specifically, the support provided by the project led to the creation of METROBUS, a decentralized public entity with independent legal status and independent management, under the Secretary of Transport. METROBUS' primary focus is the management and planning of the

corridor program. It also monitors the program's performance and assists in replicating the experience. METROBUS supervises fare collection and prepayment systems. It contracted a specialized company to provide, install, and maintain the necessary payment collection system. METROBUS has managed the system in a very satisfactory manner and is also going to operate the corridors under the expansion program. In addition to that METROBUS is today the project manager for the carbon finance operation supported by the World Bank and has already produced its third emission reduction report. Furthermore, the project achieved the operation of the corridors by efficient transport operators (CISA was created in the context of the project by the former private bus operators and covers 75% of the operation). A private trust fund has been established for the administration, distribution and investments of the revenues.

(c) Other Unintended Outcomes and Impacts (*positive or negative, if any***)**
The project should be considered the basis of the proposed CTF operation in Mexico (UTTP).

3.6 Summary of Findings of Beneficiary Survey and/or Stakeholder Workshops

A project closing workshop was carried out on the 25th of March, 2009. This workshop focused on the policies and measures achieved as a result of the project. The participation of high level government officials demonstrates the success and the importance of the project outcomes to them. (Mexico City's Secretary of Transport, Secretary of Transport, General Director for the management of air quality in the SMA, General Director of Planning and Transportation, Director of the Climate Change and CDM Program of the SMA. Three hundred people participated in the workshop, and the detailed presentations can be found in the project files.

Conclusions from the workshop include 1) the importance of applied testing of technologies, specifically of articulated and bi-articulated buses that are used by METROBUS. The testing techniques resulted most adequate in economic and environmental terms; 2) the complications of considering transport alternatives in a city like Mexico City. The implementation of proposals and mechanisms represents a major challenge in order to convert the transport in a dignified system for the inhabitants of Mexico City; 3) the challenges that climate change entails, not only for Mexico City and its inhabitants, but worldwide. The projects and programs need to focus on sustainability and mitigation of local and global pollutants; and 4) the importance and the success of the PIMAAT in converting the Mexico City to a sustainable alternative transport modalities and an example to be followed by other cities. (See Annex 6)

4. Assessment of Risk to Development Outcome
Rating: Low. The risk that the development outcomes of the project will not be maintained is very low.

Long term responses have been established through the project such as the development of the first local climate change strategy which guides policies and actions in the field of climate change and which started implementation. Furthermore, the enabling environment for transport corridors remains stable and provide the framework for the expanded corridor system. The data generated through the field test and the tools acquired (emission measurement tools) guide the selection process on alternative bus technologies. Transport projects in Mexico City include climate and local air quality considerations as integral parts in their planning and implementation.

Future challenges include the strengthening of metropolitan considerations in transport programs planning. Also, the climate change team inside the SMA requires further consolidation and support in implementing its climate change strategies in the fields of mitigation and adaptation.

5. Assessment of Bank and Borrower Performance

(relating to design, implementation and outcome issues)

5.1 Bank

(a) Bank Performance in Ensuring Quality at Entry

(i.e., performance through lending phase)

Rating: Highly Satisfactory

The Bank performance at project entry was highly satisfactory. The project was well identified, responsive to the request and needs of the country and consistent with the Bank's Country Assistance Strategy (CAS), government priorities and the UNFCCC. The technical assistance and appraisal process provided a thorough assessment that resulted in a smooth project implementation. The implementation arrangements resulted adequate. The performance indicators were realistic and useful for assessing the progress towards achieving the project objectives. The support provided to the implementing agencies was adequate and issues and potentials were identified and addressed on time.

(b) Quality of Supervision

(including of fiduciary and safeguards policies)

Rating: Satisfactory

The Bank team visited the project approximately twice a year. In addition to the review of progress reports provided by the clients and to continuous interaction with the clients, the visits further helped the team to address issues proactively and to support the achievements of project objectives. At the same time the Bank team was flexible and proactive, developing during project implementation the first transport carbon finance operation as a result of consideration of emission reduction revenues right from the beginning in the project planning.

(c) Justification of Rating for Overall Bank Performance

Rating: Satisfactory

This rating is based on the quality of preparation and supervision, and the experience and proactivity of the Bank team. The clients also rated the performance of the Bank as satisfactory. The technical and financial knowledge of the team was deemed very useful for project implementation. The twice a year supervision missions by the Bank were just right to stay abreast of implementation progress to guarantee an overall project supervision beyond desk reviews of issued progress reports and continuous interaction with the client. The Bank support was considered beneficial for the capacity building and dissemination activities. The involvement of the Bank reassured the clients that the funds would be managed in a transparent and efficient way. The clients however expressed some concerns that the bureaucracy of the Bank would increase transaction cost because of lengthy and complex Bank procedures.

5.2 Borrower

(a) Government Performance

Rating: Highly Satisfactory

The government performance is rated highly satisfactory. The project set a precedent in dealing with BRT projects in Mexico City and serves now as a basis for replication efforts. This rating

reflects the fact that the project was able to develop the first Latin American city wide climate change action strategy, to remove barriers to the implementation of the first BRT system in Mexico City, to lay the foundation for the development of the first carbon finance operation in transport in Mexico, to produce a solid field test and protocol that guides further bus testing as well as the selection of alternative bus technologies, and finally to integrate of climate concerns in the planning of transport projects in Mexico City and to raise awareness on climate change. The implementing government agencies are credited with these achievements.

(b) Implementing Agency or Agencies Performance

Rating: Highly Satisfactory

The performance of the climate change team inside the SMA has been excellent. They have led the development of the climate change strategy and significant mainstreaming of climate change concerns into other sector programs. Secretary of Transport (SETRAVI) has demonstrated their commitment to establishment of Metrobus, the replacement of microbuses, the regulartory framework for the new transport system (BRT). Electric Transport Services (STE) demonstrated their technical capacity by successfully conducting the field tests and providing the necessary logistics for the testing, e.g., space, fuel storage, etc.

(c) Justification of Rating for Overall Borrower Performance

Rating: The overall performance of the overall borrower performance was satisfactory.

BANOBRAS was the financial intermediary. BANOBRAS appointed a core group of staff with the required expertise to assist in the intermediation process. During the preparation and supervision stages, BANOBRAS provided the necessary inputs. BANOBRAS also participated in most field visits during supervision and was instrumental in providing information on the status of accounts, contracting processes, including bidding, and procurement information on a timely basis. Audits were done on a timely basis. The project did benefit from the participation of BANOBRAS.

6. Lessons Learned

(both project-specific and of wide general application)

The metropolitan character of the project remained limited. Although the project was designed from a metropolitan perspective, the involvement of the State of Mexico which shares the same transport and air quality related problems was limited. The project was not able to overcome political differences between the Federal District´s and the State of Mexico´s administrations. Future transport programs need to use tools that are independent from these political differences in order to overcome state borders and to address common issues.

Before implementing the BRT system, it is essential to count with an integral transport plan (ITP). Given that any major transport decision has a direct impact on land use, air quality and climate, it is important that municipalities and deciding authorities are aware of the long-term nature of these inter-relationships and plan accordingly. ITPs should address at least (i) institutional reform in the transport sector; (ii) a traffic management component; (iii) a public transport component; (iv) direct poverty impact component (access improvements to low-income areas); (v) a transport infrastructure maintenance plan; (vi) environmental evaluation of the ITPs; and (vii) climate change mitigation and local air quality considerations.

A suitable business environment for public transport is a requisite for sustainable gains in environmental efficiency and performance. The case of Mexico City has demonstrated that the

creation of an enabling environment is necessary before sustainable measures can be implemented. The adequate regulatory, institutional and technical frameworks were in place before starting construction and provide a solid base for the expansion of the system. Specifically the creation of a stable institution for the management of the corridor, the involvement of private bus operators, the new regulatory framework under which services are being provided, and the structuring of an integrated fare represented success factors in the development of METROBUS.

The mainstreaming of the climate change agenda is key for its successful implementation. The climate change team inside the SMA has undergone a considerable strengthening as a result of the project and has been the main driver for the development of the local climate change strategy. Also, significant mainstreaming of climate change concerns into other sector programs has been achieved. However, in order to maintain these achievements it is key to count with a consolidated team with sufficient resources to function and implement identified climate change actions as well as with the integration of climate change considerations into the relevant sectors.

Broader lessons:

Sustainable transport programs are also key to reducing impacts on exposure to airborne pollutants in urban areas. The health risks due to air pollution (specifically ozone and PM) are quantified by estimating the relationship between the incidence of adverse health effects and air quality. Data obtained as part of the efforts described in this document for Mexico City indicate that obtaining air quality compliance for ozone and PM10 and key airborne pollutants (AQS1) offers benefits of approximately US$2 billion per year, with high and low estimates of benefits of some US$4 billion and US$400 million, respectively. This is a substantial health benefit that needs to be considered when the benefits of transport sector improvements are examined. The INE study has shown that the operation of METROBUS has significantly reduced exposure to local pollutants by users of the METROBUS system. Further improvements in bus technologies and fuel types will continue to reduce this exposure.

Bus rapid transit systems provide an emerging model of surface urban transport in Latin America, typified by the experiences in Bogotá, Curitiba, and other cities, and starting to take shape as well in Mexico City. This model seeks to optimize the use of public space and promote gains in efficiency, safety, and environmental performance. These systems respond to the need for cost-effective mass transport but also serve to advance the goals of low carbon footprint and reduced loads of air toxics and local criteria pollutants, and complement investments already made in subways and other mass transport systems. The widespread adoption of BRT systems in Latin American countries and the associated reductions in emissions of local and global concern stand in contrast with increases in the energy intensity of passenger transport in industrialized North America. The experience of these systems should be of interest to urban planners and policy makers in those countries for their potential application.

Mexico City is positioned for a citywide transport corridor approach. The successful METROBUS pilot experience has demonstrated the feasibility of the BRT concept for the city and provided important lessons learned for its replication. The programmatic approach is already among the current administration's priorities, including the use of cleaner bus technologies.

Development of transport baseline methodologies needs to be further encouraged. To date there are still very few approved transport baseline methodology. The availability of more

methodologies would provide an additional incentive to move ahead faster with BRT concepts in developing countries. The case of Mexico has demonstrated how the prospect of carbon finance helped to surmount several barriers. However, efforts invested through the project have just resulted in the approval of a transport baseline methodology by the CDM meth panel. This great achievement will significantly benefit BRT and sustainable transport programs in Mexico and worldwide .

Further field testing of bus technologies is needed for defining emission standards and for the decision-making process on alternative bus technologies for public transport. The field test has provided helpful data for the operation of alternative bus technologies under real conditions at Mexico City's altitude. However, because the test fleet consisted of only a few vehicles per type and in many cases for advanced technologies a single vehicle was tested, further field testing is needed to strengthen the database for decision making on bus technologies for public transport with major emission reduction potentials.

Introduction of new bus technologies and low carbon fuels needs to be encouraged to form a larger share of the modal and fuel mix. The analysis of these systems should take into account the economic benefits of avoided health and climate impacts. The proposed expansion of METROBUS will correspondingly increase the net reduction in GHG in Mexico City. A 10-corridor system has the potential to reduce annual emissions by between 300,000 and 500,000 tons per year, more if low carbon bus technologies (hybrid drives) are deployed. The combination of modal shift and reduced congestion with low-carbon, low air toxic vehicles will place the city at the forefront of developments in climate- and health-responsive BRTs worldwide.

7. Comments on Issues Raised by Borrower/Implementing Agencies/Partners

(a) Borrower/implementing agencies

BANOBRAS: In BANOBRAS's opinion, the World Bank's performance in the execution of this project was satisfactory; however, it should be mentioned that the executor required more time than the World Bank could give it, considering the origin of the grant funds. For BANOBRAS, it has been a satisfactory experience to collaborate with the Government of the Federal District, as the financial agent of the Federal Government, and with the World Bank, in the administration of the grant funds.

The Secretariat of the Environment, City of Mexico:

The World Bank's management during the implementation of the project entitled "Introduction of Environmentally Friendly Measures in Transport (PIMAAT)" has been extremely successful and fully satisfactory to the Government of the Federal District and to the Secretariat of the Environment. The results achieved during the Bank's management confirm the success of this important project. The project's objectives were achieved satisfactorily and several of them exceeded the expected results, benefitting the population, especially children and the elderly, and have brought about improvements in health by significantly reducing the emission of GHG and other pollutants to which the population had been exposed.

Another point which demonstrates that the World Bank's performance is satisfactory, is the total support provided to the GDF through the SMA and the SETRAVI, ensuring that coordination among project agents, BANOBRAS and the World Bank was always conducted under the most appropriate terms.

Annex 1. Project Costs and Financing

(a) Project Cost by Component (in USD Million equivalent)

Components	Appraisal Estimate (USD millions)	Actual/Latest Estimate (USD millions)	Percentage of Appraisal
HARMONIZATION OF SECTOR STRATEGIES	**0.40**	**0.47**	**118%**
DEFINITION OF AN ENABLING ENVIRONMENT FOR SUSTAINABLE TRANSPORT	**2.90**	**2.60**	**90%**
FIELD TEST	**1.50**	**1.53**	**102%**
TECHNICAL ASSISTANCE AND TRAINING	**0.40**	**0.13**	**33%**
PUBLIC AWARENESS AND DISSEMINATION	**0.17**	**0.25**	**147%**
PROJECT MANAGEMENT	**0.43**	**0.64**	**149%**
Total Baseline Cost	**5.80**	**5.62**	
Physical Contingencies	0.00	0.00	
Price Contingencies	0.00	0.00	
Total Project Costs	**5.80**	**5.62**	
Project Preparation Facility (PPF)	0.00	0.00	
Front-end fee IBRD	0.00	0.00	
Total Financing Required	**5.80**	**5.62**	

(b) Financing

Source of Funds	Type of Cofinancing	Appraisal Estimate (USD millions)	Actual/Latest Estimate (USD millions)	Percentage of Appraisal
Borrower		2.40	pending	
Global Environment Facility (GEF)		5.80	5.62	97%
Local Sources of Borrowing Country		3.00	pending	
SHELL Foundation		1.00	1.87	187%
Japan (PHRD)		0.00	1.52	
German Trust Fund GTF			0.10	
Canadian Trust Fund			0.30	

Annex 2. Outcomes and Outputs by Component

Indicators	Baseline Value		Final results	
	Number or text	Date	Number or text	Date
GEO Indicator				
1. Harmonization of sector strategies on air quality issues and Integrated Climate Change Actions Plan;	No Metropolitan Climate Change Action Plan is available; No harmonization of urban, transport and air quality plans and planning processes has taken place .	04/10/2003	City wide climate change action strategy and program developed, adopted and under implementation representing strategic guidance tool for climate change actions; The Climate Change Action Plan was developed with strong cooperation of transport, environment and urban development authorities	06/30/2009
2. Identification of organizational and barrier removal measures (enabling environment) to facilitate the implementation of sustainable, climate friendly strategies;	No Corridors in Mexico City.	04/10/2003	The enabling environment for public transport in the city was revamped, allowing for a better organization of the business model and regulations that would allow the development and operation of METROBUS. The Insurgentes corridor was successfully developed and counts with a financially, socially and environmentally sustainable operation. Metrobus operates two more corridors in a financially sound way and plans expansion to a total of 10 corridors under current administration.	06/30/2009
3. Field test demonstrates less polluting, climate friendly transport alternatives;	Alternnative transport has not been tested in Mexico City.	04/10/2003	Field test results provide data/results for decision taking with regard to buses to be used in this and in future corridors. Future corridors expected to partially operate with hybrid-	06/30/2009

			natural gas buses; support to introduce hybrid bus fleet approved and under planning process.	
4. MCMA transport projects incorporated climate change issues in design and operation.	MCMA transport projects don't incorporate climate change issues in design and operation.	04/10/2003	Two corridor projects were developed in Mexico City contribute to the reduction of local and global pollutants. Transport corridor expansion program in progress (to date 2 corridors under operation). Other transport projects included design of non-motorized transport campaigns. A methodology for monitoring and verification of GHG emissions from the transport sector was developed.	06/30/2009
5. Better understanding of potential of high capacity vehicles, non-motorized transport modes as well as incresased public awareness of advantages of transport corridors and climate friendly technologies	There is no project.	04/10/2003	Transport corridors represent a recognized option to improve public transport and to reduce transport caused emissions in Mexico. Transport corridor program (masterplan) under implementation.	06/30/2009
6. Effective Project Management team established adequate for use in future operations.	No project (management).	04/10/2003	Project activities have been realized with sustainable results.	06/30/2009
Intermediate outcome indicator(s)				
1. Official issuance of city-wide climate change action plan.	No climate change action plan	04/10/2003	Climate change Action strategy and program presented at next COP. Strategy guides City's government's actions on climate change.	06/30/2009
2. Completion of development of the regulations, institutional structure, business and management aspects of	No enabling environment for corridors.	04/10/2003	Metrobus operates in a satisfactory and sustainable way. Two new corridors under implementation (Eje 4 Sur and Insurgentes extension)	06/30/2009

Metrobus. Metrobus in final stage of creation.				
3. Satisfactory first stage of field test: 22 buses representing most available advanced and current standard technologies tested with dynamometer and RAVEM. Final test report published in may 2006.	No field testing of alternative bus technologies in Mexico City.	04/10/2003	Results support decision taking process for technology for this and future corridors.	06/30/2009
4. Future transport projects incorporate climate change mitigation measures.	Transport Projects don't consider climate change aspects.	04/10/2003	Planned transport projects include climate change and air quality considerations, technical training provided to bus operators, maintenance staff, etc., emission measurements completed and capacity to develop emission inventories strengthened.	12/31/2008
5. Dissemination program: showcasing corridor for the GDF population including TV, video and brochures, indicating characteristics, benefits and costs; scientific publications of field test results.	No dissemination.	04/10/2003	Dissemination of project completed and reaching parties impacted by project. Public acceptance of corridor concept. Surveys indicate satisfaction with new transport system.	12/31/2008
6. Most Project activities designed and performed satisfactorily.	No project management.	04/10/2003	Sustainability of management and results of transport and climate projects in Mexico city.	12/31/2008

Annex 3. Economic and Financial Analysis

(including assumptions in the analysis)

An incremental cost analysis was done as a requirement of the GEF. The baseline scenario assumed the continued investment and operation of diesel buses. The implementation of the baseline scenario entailed costs estimated at US$4.1 million, while the GEF alternative incurred costs estimated at US$12.2 million. The incremental costs associated with the implementation of project were estimated at US$8.1 million. The GEF funded US$5.8 million of this as part of the project. Other cofinancing sources funded the balance.

The project supported the development of the enabling environment (barrier removal, organizational measures) and field tests that are essential for the construction of the bus rapid transit system. As a result, the BRT system of a total of 50km was successfully established. Infrastructure costruction costs of Insurgentes Corridor are estimated at US$3.5 millon per km. In comparison, those for Phase I of the TransMilenio system in Bogota, Colombia (a total of 41km) are reported at about US$210 million or US$5.0 million per km. (Ardila and Menckhoff, 2002)

Annex 4. Bank Lending and Implementation Support/Supervision Processes

(a) Task Team members

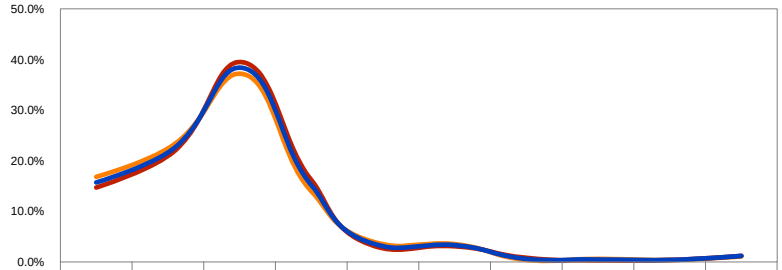
Names	Title	Unit	Responsibility/ Specialty
Lending			
Supervision/ICR			
Walter Vergara	Lead Chemical Engineer	ENV	TTL
Dmitri Gourfinkel	Financial Management Analyst	LCSFM	
Seraphine Marie Haeussling	Consultant	LCSEN	
Gabriel Penaloza	Procurement Specialist	LCSPT	
Keko Ashida Tao	Operations Analyst	LCSEN	ICR

(b) Staff Time and Cost

Stage of Project Cycle	Staff Time and Cost (Bank Budget Only)	
	No. of staff weeks	USD Thousands (including travel and consultant costs)
Lending		
FY98		9.73
FY99		66.20
FY00		132.31
FY01		43.51
FY02		75.92
FY03		43.83
FY04		13.82
FY05		0.00
FY06		0.00
FY07		0.00
FY08		0.00
Total:		385.32
Supervision/ICR		
FY98		0.00
FY99		0.00
FY00		0.00
FY01		0.00
FY02		0.00
FY03		33.06
FY04		52.90
FY05		55.17
FY06		46.85
FY07		46.18
FY08		50.67
Total:		284.83

Annex 5. Beneficiary Survey Results (to be translated)

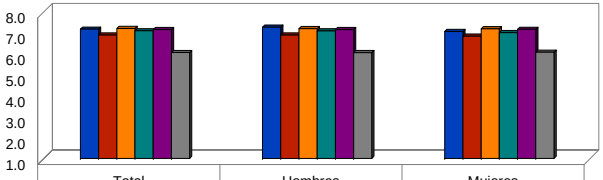
TERCERA ENCUESTA DE OPINIÓN A USUARIAS/OS DEL METROBUS SOBRE EQUIDAD DE GÉNERO
(16-19 DE JUNIO DE 2009)
En una escala de 1 a 10, donde 1 es peor y 10 mejor,
¿qué calificación le daría usted al servicio que presta el Metrobús?



	10	9	8	7	6	5	4	3	2	1
Total	15.7%	21.6%	38.4%	15.2%	3.1%	3.3%	0.6%	0.5%	0.4%	1.2%
Hombres	14.7%	20.9%	39.5%	16.2%	2.7%	3.1%	0.8%	0.3%	0.4%	1.2%
Mujeres	16.8%	22.4%	37.2%	14.0%	3.5%	3.5%	0.4%	0.6%	0.4%	1.1%

Investigaciones Sociales Aplicadas, SC ***Tercera Encuesta de Opinión a Usuarias/os del Metrobús sobre Equidad de Género*** México, junio de 2009, 1680 casos.
Ponderación con base en: Investigaciones Sociales Aplicadas, SC ***Conteo de Usuarias/os del Sistema Metrobús,*** México, junio de 2009.

TERCERA ENCUESTA DE OPINIÓN A USUARIAS/OS DEL METROBUS SOBRE EQUIDAD DE GÉNERO
(16-19 DE JUNIO DE 2009)
Le voy a leer algunas características y me gustaría que me dijera, en su opinión,
¿cómo califica al Metrobús en estos aspectos: pésimo, muy malo, malo, bueno, muy bueno o excelente?
(recalculado a escala de uno a diez)

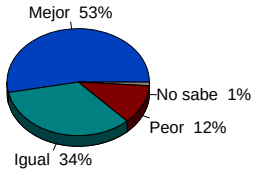


	Total	Hombres	Mujeres
Forma de pago	7.2	7.3	7.1
Acceso a la estación	6.9	6.9	6.8
Limpieza de la estación	7.2	7.2	7.2
Seguridad de la estación	7.1	7.1	7.0
Estado del autobús en general	7.2	7.2	7.2
Módulo de atención en estaciones	6.1	6.0	6.1

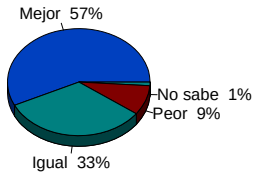
Investigaciones Sociales Aplicadas, SC ***Tercera Encuesta de Opinión a Usuarias/os del Metrobús sobre Equidad de Género*** México, junio de 2009, 1680 casos.
Ponderación con base en: Investigaciones Sociales Aplicadas, SC ***Conteo de Usuarias/os del Sistema Metrobús,*** México, junio de 2009.

TERCERA ENCUESTA DE OPINIÓN A USUARIAS/OS DEL METROBUS SOBRE EQUIDAD DE GÉNERO
(16-19 DE JUNIO DE 2009)
Comparándolo con otros modos de transporte, en su opinión
¿piensa usted que el servicio que presta el Metrobús es mejor, igual o peor que el Metro?

Junio de 2008



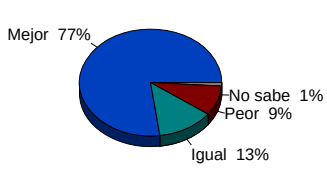
Junio de 2009



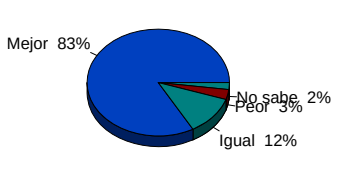
Investigaciones Sociales Aplicadas, SC ***Tercera Encuesta de Opinión a Usuarias/os del Metrobús sobre Equidad de Género*** México, junio de 2009, 1680 casos.
Ponderación con base en: Investigaciones Sociales Aplicadas, SC ***Conteo de Usuarias/os del Sistema Metrobús,*** México, junio de 2009.

TERCERA ENCUESTA DE OPINIÓN A USUARIAS/OS DEL METROBUS SOBRE EQUIDAD DE GÉNERO
(16-19 DE JUNIO DE 2009)
Comparándolo con otros modos de transporte, en su opinión
¿piensa usted que el servicio que presta el Metrobús es mejor, igual o peor que los microbuses?

Junio de 2008



Junio de 2009



Investigaciones Sociales Aplicadas, SC ***Tercera Encuesta de Opinión a Usuarias/os del Metrobús sobre Equidad de Género*** México, junio de 2009, 1680 casos.
Ponderación con base en: Investigaciones Sociales Aplicadas, SC ***Conteo de Usuarias/os del Sistema Metrobús,*** México, junio de 2009.

Annex 6. Stakeholder Workshop Report and Results (SMA summary)

A project closing workshop was carried out on the 25th of March, 2009. This workshop focused on the policies and measures achieved as a result of the project. The workshop was opened by Mexico City's Secretary of Environment (Lic. Martha Delgado Peralta) summarizing the policies that the Government of Mexico City promotes in the field of sustainable transport. This presentation was followed by a description of the objectives and achievements of the GEF project by Dr. Adolfo Mejia Ponce de Leon, director of the SMA.

The workshop included the participation of the City's secretary of transport, Lic. Raul Armando Quintero, who presented the programmed plans and objectives of SETRAVI in order to convert mainly the public transport in a sustainable transport.

The workshop was also assisted by the participation of the environmental specialist of the World Bank, Ricardo Hernandez, and by Lic. Alejandro Olivo Villa, sub-director of technical and financial assistance, explaining the economic collaboration mechanisms between the government agencies.

The METROBUS director Guillermo Calderon Aguilera presented the METROBUS system focusing on the environmental benefits as a result of its operation. His analysis included data on the passengers transported by the system, as well as the reduction of pollutants benefitting the city's whole population.

The technical project coordinator, Joel Delgadillo Ramirez, exposed the specific project details, its objectives and the challenges encountered during project implementation. The General Director for the management of air quality in the SMA, Dr. Victor Hugo Paramo Figueroa, commented on the importance of applied testing of technologies, specifically of articulated and bi-articulated buses that are used by METROBUS. He concluded that the testing techniques resulted most adequate in economic and environmental terms.

The general director of planning and transportation, Arq. Sergio Anibal Martinez Sanchez, exemplified the complications of considering transport alternatives in a city like Mexico City. The implementation of proposals and mechanisms represents a major challenge in order to convert the transport in a dignified system for the inhabitants of Mexico City. The director of the climate change and CDM program of the SMA, Ing. Oscar Vazquez Martinez, explained the challenges that climate change entails, not only for Mexico City and its inhabitants, but worldwide. He pointed out that the projects and programs need to focus on sustainability and mitigation of local and global pollutants.

Finally, Dr. Adolfo Mejia Ponce de Leon, thanked all the project's collaborators and the presence of those that are interested in converting this city in a sustainable alternative and an example to be followed by other cities. 300 persons participated in the closing workshop and the detailed presentations can be found in the project files.

Annex 7. Summary of Borrower's ICR and/or Comments on Draft ICR

OPINION OF BANOBRAS ON THE EXECUTION OF THE PROJECT

BACKGROUND. The amount of the grant was US$5.8 million, which the Global Environment Facility (GEF) granted through the World Bank to the Mexican Government. The contract was signed on December 13, 2002 for the Government of the Federal District, through the Secretariat of the Environment, to finance its "Introduction of Environmentally Friendly Measures in Transport" Project (PIMAAT) until March 31, 2008. Its objective was to contribute to the development of policies and measures that promote a modal change in transport in the Metropolitan Area of Mexico City toward transport options that are more efficient, less polluting and environmentally friendly in terms of climate. For the execution of this grant, BANOBRAS signed a grant agreement with the World Bank and the SHCP on December 13, 2002, and a Resource Administration Agreement with the GDF on April 7, 2003.

PROCUREMENT AND HIRING PROCESSES. During the operation of this grant, BANOBRAS supported the executor in the preparation of terms of reference and their inclusion in the annual Procurement and Hiring Plan (PAC), and submitted requests to the World Bank for no-objections in bidding processes for the selection and hiring of the team to conduct pollution testing, and the hiring of specialists and consulting firms to conduct the studies. Thus, it was possible to comply in a timely and proper manner with the regulations of the World Bank and those of the Mexican Government that apply to the project.

DISBURSEMENT OF RESOURCES. In terms of financial management, and in accordance with the grant agreement, BANOBRAS opened a special (designated) account in which it administered grant resources. Thus, it made the corresponding payments to authorized staff members of the Project Implementation Unit (Unidad de Implantación del Proyecto [UIP]) and to the individual consultants hired, during project execution. The project ended its execution period on March 31, 2009. Of the total amount of grant resources (US$5.8 million), US$5.6 million were disbursed, representing nearly 97% of the total. The World Bank granted a four-month administrative extension (until July 31, 2009), during which time BANOBRAS completed its verification of documents pertaining to resources received from the grant in a timely and proper manner, reimbursed the remaining funds to the World Bank, and closed the special (designated) account, to the complete satisfaction of the international financial agency. In light of the above, it is our opinion that the executor's financial management of the project and the support provided by the financial agent were satisfactory.

PROJECT MONITORING AND SUPERVISION. BANOBRAS constantly monitored the performance of the project in order to ensure its execution in accordance with the established contractual provisions. In particular, BANOBRAS participated in project supervision missions jointly with the World Bank and the SHCP, and monitored compliance with the agreements.

PROGRESS REPORTS. BANOBRAS reviewed the quarterly and semi-annual Financial Monitoring Reports (FMRs) that the Government of the Federal District (GDF) submitted on progress in project execution, prepared those for which it was responsible, and delivered them in a timely and proper manner to the World Bank and the SHCP, in accordance with the deadlines established in each case. Prior to project conclusion, the executor prepared a report on the results

of the project and disseminated it to the public at a public hearing. BANOBRAS submitted this report to the World Bank and received the Bank's approval.

AUDITS. BANOBRAS supported the Secretariat of the Environment of the Government of the Federal District in the timely submission of information to the consulting firm Del Barrio y Cia., S.C. for the conduction of annual audits, throughout the project's life cycle; the audit reports were free of observations. For its part, the consulting firm Del Barrio y Cia., S.C. performed excellent review work, with which BANOBRAS obtained the approval of the audit reports which met with the World Bank's full satisfaction.

CONCLUSIONS. Grant execution is considered highly satisfactory because project objectives and targets were broadly achieved, thanks to the efficient work that was performed and the coordination that was established among participating agencies, i.e., the executor (Government of the Federal District, through the Secretariat of the Environment) and other local government agencies, the support received from the SHCP, the efficient work performed by the auditing office of Del Barrio y Cia., S.C., BANOBRAS's management as financial agent, and the good preparation and execution of the project by the World Bank's technical and financial team. In particular, it should be noted that the executor worked with a team of technical and financial specialists who were assigned to the project and committed to achieving its objectives and targets, forming the Project Implementation Unit (UIP) in charge of fulfilling the commitments for which the executor was responsible. The project results, about which we are aware, are admirable. It is worth mentioning that the executor was able to make use of the grant funds to improve the public transport system for passengers and the air quality of Mexico City, through:

- The creation of the METROBÚS company in charge of constructing a Bus Rapid Transit (BRT) corridor with dedicated lanes on the Avenida de los Insurgentes. This corridor has signaled the modal change in public transit.
- The introduction of articulated vehicles with new technologies and various fuels, with fewer emissions of polluting particles. Public transit vehicles under concession contracts (*peseros*) have been removed from circulation and destroyed in an orderly manner.
- The generation of carbon offsets which were sold to the World Bank. This has become a pioneering example in Latin America on this subject.
- The implementation of the mandatory use of school buses, thus reducing the number of private vehicles in circulation and decreasing pollution.
- The integration of the Climate Action Program, with measures for the mitigation and capture of greenhouse gases and adaptation to climate change.
- With the experience gained from the creation of this corridor, the local authority is replicating the project in a comprehensive, coordinated manner with other modes of transportation on other important roads in the city.

In BANOBRAS's opinion, the World Bank's performance in the execution of this project was satisfactory; however, it should be mentioned that the executor required more time than the World Bank could give it, considering the origin of the grant funds. For BANOBRAS, it has been a satisfactory experience to collaborate with the Government of the Federal District, as the financial agent of the Federal Government, and with the World Bank, in the administration of the grant funds.

LESSONS LEARNED. For BANOBRAS, the execution of this grant was an example of success and thus we believe that it is worthwhile to use it as a case study to determine the key factors that affected the flexibility of execution and to try to replicate them in other projects. In light of the above, BANOBRAS is very willing to continue collaborating with the Government of the Federal District, as the financial agent of the Federal Government, in the financial implementation of the actions it undertakes to improve public transit and air quality for the benefit of the residents of Greater Mexico City.

Annex 8. Comments of Cofinanciers and Other Partners/Stakeholders [Secretariat of the Environment]

INTRODUCTION OF ENVIRONMENTALLY FRIENDLY MEASURES IN TRANSPORT

RELEVANCE OF THE PROJECT

OVERALL COMMENTS

The project entitled "Introduction of Environmentally Friendly Measures in Transport" (PIMAAT) was carried out under a grant made by the World Bank in the amount of US$5.8 million, through the National Bank for Works and Services (Banobras).

The project's objective was to develop policies, regulations and measures that would aid in the long-term modal change toward transportation that is more efficient, less polluting and emits fewer greenhouse gases (GHG) in the Metropolitan Zone of the Valley of Mexico (ZMVM).

Under the current administration, climate change is the prevailing issue in the project. Because this is a cross-cutting issue, climate change and clean development measures form part of all the projects carried out under this grant. The recurring points are: reduction of GHG in the ZMVM, adaptation measures, carbon offset trades, energy efficiency, and of course reduction of climate change effects.

Mexico City's Climate Action Program (PACCM) is the city's environmental policy tool aimed at consolidating efforts to address climate change. PIMAAT resources were used to support the execution of measures to ensure its implementation. The dynamic of this tool and the magnitude of its effects will oblige future administrations to continue its proposals.

Throughout the PIMAAT, several changes took place both in the names of the original projects and in the list proposed at the start. One example is the project to introduce mandatory school busing, which underwent various modifications during its implementation.

The grant financed tests of pollutant emissions under real operating conditions. These tests made it possible to conduct several studies aimed at developing a specific testing protocol for this city that can be used reliably in other studies of cities around the world. The grant enabled the purchase of a portable vehicular emissions monitoring system (Ride-Along Vehicle Emissions Measurement [RAVEM]) to monitor public transit emissions. Its use made it possible to demonstrate the reduction in pollutant emissions through the introduction of more efficient means of transportation.

Other important products of the PIMAAT include the results of the Public Transit Sustainability Study. This is an input for the current urban development, transport and roads programs that are being conducted by the Government of the Federal District (GDF).

Under the project, the publicity campaign for non-motorized transportation was designed. This contains the set of proposals that are being used to promote non-motorized transportation in Mexico City.

SUCCESS FACTORS

The interrelated factors that contributed to the PIMAAT's success brought about positive, replicable results, the most important of which are presented below:

a) Personnel and work team

The personnel who participated in the project demonstrated their full commitment. This, added to their professional knowledge, resulted in quality products. As a consequence of the grant, various interrelated work teams were formed; they worked independently, under the coordination of the Project Implementation Unit (Unidad de Implantación del Proyecto [UIP]), which was also created under the grant.

The work team was mainly distributed in three groups located in two bureaus of the Secretariat of the Environment: the UIP and the Bureau of Climate Change and Clean Development Mechanism Projects, both in the General Bureau of Policy Planning and Coordination; and the Office of Sustainable Transport Promotion, under the General Bureau of Air Quality Management.

b) Project Implementation Unit

The UIP worked in two areas: Technical Coordination and Administrative and Financial Coordination. Its general duties were to supervise and administer the PIMAAT's financial resources.

The Technical Coordination section was in charge of participating in:

- Determining the projects to be carried out each year;
- Preparing the terms of reference for studies to be contracted;
- Forming multidisciplinary groups to monitor and evaluate the studies contracted; and
- Issuing payments when the studies were delivered to the Secretariat's satisfaction.

The Administrative Coordination section was in charge of:

- Ensuring that the project's operation was conducted in accordance with the Grant Agreement and the Project Appraisal Document;
- Ensuring that hiring procedures met the guidelines established by the World Bank, the Federal Government and the Government of the Federal District, and coordinating communications among the agencies involved;
- Keeping the accounting records of the project's operations and its financial statements; and
- Handling external audits, quarterly reports and annual reviews of the project's financial statements.

c) Institutional coordination

The PIMAAT involved coordination among various agencies. The first level included the World Bank, BANOBRAS and the Secretariat of the Environment. The UIP coordinated with all

agencies dealing with the project's various study areas to create five work groups associated with project components.

The agencies that participated in monitoring the various works were mainly the Secretariat of Transportation and Roads, the Metro Mass Transit System, the Electric Streetcar System (Sistema de Transportes Eléctricos), the Passenger Transit Network, the Secretariat of Urban Development and Housing, and the Secretariat of Public Safety, all part of the Government of the Federal District. Participating Federal Government agencies included the Secretariat of the Environment. The State of Mexico was represented by the Secretariat of Communications and Transportation. Participating offices of the Secretariat of the Environment were the General Bureau of Air Quality Management and the General Bureau of Policy Planning and Coordination.

The General Bureau of Air Quality Management and the General Bureau of Policy Planning and Coordination brought together highly skilled personnel to conduct studies such as Mexico City's Climate Action Program and public transit emissions studies.

PRINCIPAL ACHIEVEMENTS

The PIMAAT contributed various products, including:

- Reduction of greenhouse gas emissions.
- Implementation of the Transit Corridors System (Metrobús).
- Preparation, printing and presentation of Mexico City's Climate Action Program.
- Construction of bicycle paths (*ciclovías*).
- Development of a testing protocol for public transit vehicles and continuity in its use, as well as the portable emissions measurement system (RAVEM).
- Continuity for carrying out clean development mechanisms to reduce greenhouse gas emissions.
- Direct participation of franchise holders in the operation of the Insurgentes corridor and the Tepalcates–Tacubaya corridor.
- Incorporation of the concept of a regulatory agency for private companies that provide public transit services.
- Support of financial sources for the project's financial and technical aspects.
- Greater understanding of the Kyoto Protocol and application of clean development mechanisms.
- The experience gained may be used, with necessary adjustments, by any other city to improve public transit and conduct measures aimed at reducing greenhouse gas emissions.

PRINCIPAL OBSTACLES

Communications among all levels were excellent, despite the administrative complexities of the triple regulation that the project involved, because any action had to comply with the requirements of the World Bank and of the Federal Government through BANOBRAS, and the administrative and legal requirements of the Government of the Federal District. Triple regulation slowed the process of obtaining resources and sometimes took several months.

With regard to the implementation of transit corridors, the main obstacle was the resistance of operators to change their units and their way of working. A business scheme was proposed, with an agency in charge of operating the service. This made it necessary to hold numerous meetings with operators and neighbors, at which the benefits of incorporating a transit system such as Metrobús were presented.

It was necessary to prepare a new methodology for obtaining Emission Reduction Certificates, and the Metrobús system is currently the most advanced in this matter.

It is essential to have a procedural manual that clearly indicates how to request projects, the types of projects to be financed, and the administrative procedures that must be conducted with the various authorities, among other points.

The units to be evaluated during field tests must be carefully selected to avoid delays due to errors in the performance of these tests, with pre-established cycles.

Adequate inter-institutional and inter-disciplinary coordination must be established to facilitate project development. It is very important to take customs requirements into account in the case of imported equipment.

Funds must be allocated to lease public transit units. A warehouse for repairs and test reagents is also recommended.

SUMMARY OF MEXICO CITY'S TRANSIT SYSTEM SUSTAINABILITY PROGRAM.

The project proposes a restructuring in three complementary subsystems for the purpose of increasing the service quality and operating conditions of the public transit system.

a) Integrated high-capacity system incorporating electric streetcars and Metrobús corridors.

This integrated system's potential demand is estimated at 6 million trips-person per day (30% of total transportation in the Federal District). To achieve the integration of this system, connectivity among subsystems should be encouraged from the time of the design stage, and a single fare system should be developed that is more practical and less difficult for users. It is also recommended that complementary measures be adopted to ensure greater safety and connectivity with non-motorized transportation, of greater interest to users of private automobiles. The current option of dedicated central lanes, stations with high platforms, and articulated buses with left-side doors and raised floors appears to be adequate, because it protects the Metrobús system from invasion by other means of transportation and facilitates options for connection with electric streetcars in light of the small number of bus corridors that can built with these characteristics.

b) Complementary system of protected corridors for buses.

This proposal deals with the idea of streetcar corridors on main arteries (*ejes viales*), but it is proposed that this costly technology be replaced in light of the transportation capacity offered by conventional buses operating in dedicated two-lane corridors along sidewalks, not in central lanes. The advantage of operating with two lanes is that local services with stops at each station

and express service can be offered, with stops at hubs (*paradas nodales*). All that is required is the construction of bus stops with long platforms to avoid conflicts of bus bottlenecks where several routes converge. It can also be completed with streetcar corridors where quiet, non-polluting transportation is required or is justified by the zone's historic and cultural heritage. Microbus traffic should not be permitted.

c) System fed by microbuses.

Because it may be complicated to supervise and monitor offenders in the corridors, it is proposed that microbus routes be redesigned as feeder routes of the systems described above and as local routes between avenues and secondary roads. This means that it will also be necessary to restructure the entire Passenger Transit Network, concentrating it in the sectors included inside the *Periférico,* and allowing microbuses to spread out in all outlying districts (*distritos periféricos*) on medium and long routes. This will eliminate competition between both modes of transportation in the outlying districts and improve the operating conditions of the RTP system which is currently obliged to use larger units in order to meet the demands of hard-to-reach districts. This new public transit configuration requires the construction of new CETRAMs near the *Periférico* to facilitate connections for residents of outlying districts. Including microbuses in the single-fare system is not proposed, and thus it will be necessary to pay the costs of microbuses and of integrated transit.

d) Complementary measures

A series of complementary strategic courses of action must be implemented to make the proposed system operation. These courses of action are:

Executive bus service:
This proposal is not new. It deals with medium-capacity bus services that connect middle- and high-income zones with commercial areas such as Polanco, Santa Fé and the Historic District. It is aimed at motorists or taxi users who are able to pay for a safe, quality service.

Reorganization of taxi services:
The registered vehicle fleet totals 130,000 units and has experienced continuous growth in the past 20 years, but does not correspond to demand. This means that supply has grown at a higher rate than that of increased demand, causing many taxicab owners to operate under unsafe conditions. It is also estimated that unregistered taxicabs (called "*taxis piratas*" or pirate taxis) increase supply so that the total number of taxis probably exceeds 150,000, with a demand of 1,200,000 trips per day.

Design of quiet transit areas
Quiet transit areas refer to districts accessible by bicycle that join various pedestrian zones. They are characterized by physical restrictions on automotive traffic and favor local transit solutions such as pedestrian walkways, bicycles and short taxi rides. This also implies restrictions and regulations on parking for non-residents of these zones. These areas can only be conceived under the framework of neighborhood improvement programs in each *delegación* or district, where development criteria for pedestrians and bicyclists will be implemented in urban hubs with a high collective value, such as commercial or town centers. It also implies developing these areas to generate non-motorized trips within their boundaries, connecting them with a network of safer,

wider bicycle paths, rehabilitating urban spaces and promoting low-intensity transportation that has little environmental impact. Motorized solutions are not eliminated but they are restricted and concentrated in modes of local transportation; non-motorized means, connected to the main transportation network, are also promoted.

Incorporation of safe network of bicycle paths:
Current bicycle promotion policies should continue to be further encouraged. The closing of streets for Sunday strolls and the construction of the main bicycle network on primary roads corresponds to strong demands and may offer transport solutions for a variety of uses. A joint policy is also needed to efficiently promote non-motorized transportation.

RELEVANCE OF THE PROJECT'S OBJECTIVE, TAKING INTO ACCOUNT THE GOVERNMENT'S PRIORITIES AND PLANS

The project fits perfectly in the Green Plan (*Plan Verde*), which is a medium-term government program that contains strategies and actions aimed at the sustainable development of Mexico City and is the city government's primary horizontal planning instrument.

Point 4 Transportation: The recovery of roads for efficient, non-polluting, good-quality mass transit, and the promotion of non-motorized transportation involve the following three strategies:

E1. Promote efficient, non-polluting, good-quality mass transit and recover the use of roads for the majority.

The most important product is the Metrobús system, which currently has two corridors: Indios Verdes–Caminero and Tacubaya Tepalcates. There are multiple benefits, because transportation is efficient, safe, comfortable and reliable; moreover, its dedicated lane allows it travel more easily than on the lanes used by automobiles that travel along the same route.

These achievements also include eliminating the routes of microbuses that travel along these two corridors. A new business scheme is introduced for route owners so that they can provide better service. Carbon offsets are also traded, adding to all the actions taken to reduce GHG emission through the implementation of the Microbús system.

E3. Encourage non-motorized transportation

Support was obtained for the construction of bicycle paths and dissemination campaigns to promote the modal change in transportation. The city government is also promoting bicycle marathons and Sunday strolls which have encouraged many citizens to use this type of transportation and spend time with their families.

Point 5 Air: Control atmospheric pollutants that are most prevalent and that affect the population's health (ozone and fine particles), and consolidate the reduction of toxic pollutant emissions.

E1. Increase passenger efficiency or cargo transported.

With the elimination of microbuses on Metrobús's two corridors, which in some cases leads to old vehicles being sent to the junkyard, more efficient engines are now being used instead of old, eight-cylinder gasoline engines. Transportation capacity is also increased, considerably reducing emissions per passenger transported and also reducing transfer times.

E2. Support the efforts of transportation and energy plans and gauge the benefits of the Green Plan in terms of air quality.

A field testing protocol is in place and is replicable in any other city, with the necessary modifications. This protocol has made it possible to obtain the emission factors of the public transit vehicle fleet with internal combustion engines.

Point 7 Climate Change and Energy: Reduce GHG emissions, strengthen the renewable energy market and conduct climate change adaptation efforts for the population.

E1. Prepare Mexico City's Climate Action Plan.

Mexico City's Climate Action Program 2008–2012 was prepared and submitted, and work is currently underway to define the measures proposed in this planning instrument, including a diagnostic in which GHG emissions, vulnerability to climate change, and strategies to meet stated objectives are reviewed.

E2. Support the efforts of transportation, water, air, public space, waste and energy plans that decrease greenhouse gas emissions.

Public transit corridors such as those of Metrobús constitute mass transit with regulated operations and centralized revenue, operating exclusively in dedicated lanes, with predetermined stops and infrastructure for boarding and exiting by passengers.

The PIMAAT considered the development of a program to promote pedestrian and bicycle transportation, called non-motorized transportation. Its objective included promoting bicycle use as a means of transportation and called for a modal change. Conditions for pedestrians were improved, bicycle use was expanded by improving its image, and intermodal transportation is being promoted through incentives to schools and employers.

E5. Reduce Mexico City's vulnerability to climate change and design adaptation measures for the general population.

In this regard, a study was conducted which indicates that the Climate Change Adaptation Measures Program would promote a set of short- and long-term actions to reduce the risks associated with the city's population and economy. The courses of action included are: identification of threats and analysis of vulnerability; integration of the adaptation perspective to increase existing capacity; and implementation of adaptation measures.

For the above reasons, the PIMAAT was fully included in the previous administration and is also fully included in the current administration of the Government of the Federal District.

Annex 9. List of Supporting Documents

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23. GETINSA. Diseno Ejecutivo del Corredor Insurgentes

24. GETINSA. Environmental Impact Assessment of Insurgentes Corridor

25. PDD: Project Design Document: Mexico, Insurgentes Avenue Bus Rapid Transit Pilot Project. Document version: 1.4; Document date: 31-Oct-05.

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27. NMM: CLEAN DEVELOPMENT MECHANISM - PROPOSED NEW METHODOLOGY:

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